# TitroLine® 7500 KF

TITRATOR

**SI Analytics**

a **xylem** brand

**Wichtige Hinweise:** Die Gebrauchsanleitung vor der ersten Inbetriebnahme des Titrators TitroLine® 7500 KF bitte sorgfältig lesen und beachten. Aus Sicherheitsgründen darf der Titrator TitroLine® 7500 KF ausschließlich nur für die in dieser Gebrauchsanleitung beschriebenen Zwecke eingesetzt werden.

Bitte beachten Sie auch die Gebrauchsanleitungen für die anzuschließenden Geräte.

Alle in dieser Gebrauchsanleitung enthaltenen Angaben sind zum Zeitpunkt der Drucklegung gültige Daten. Es können jedoch von SI Analytics sowohl aus technischen und kaufmännischen Gründen, als auch aus der Notwendigkeit heraus, gesetzliche Bestimmungen der verschiedenen Länder zu berücksichtigen, Ergänzungen am Titrator TitroLine® 7500 KF vorgenommen werden, ohne dass die beschriebenen Eigenschaften beeinflusst werden.

**Important notes:** Before initial operation of the Titration Unit TitroLine® 7500 KF, please read and observe carefully the operating instructions. For safety reasons the Titration Unit TitroLine® 7500 KF may only be used for the purposes described in these present operating instructions.

Please also observe the operating instructions for the units to be connected.

All specifications in this instruction manual are guidance values which are valid at the time of printing. However, for technical or commercial reasons or in the necessity to comply with the statuary stipulations of various countries, SI Analytics may perform additions to the Titration Unit TitroLine® 7500 KF without changing the described properties.

**Instructions importantes:** Prière de lire et d'observer attentivement le mode d'emploi avant la première mise en marche du Titrateur TitroLine® 7500 KF. Pour des raisons de sécurité, le Titrateur TitroLine® 7500 KF pourra être utilisé exclusivement pour les usages décrits dans ce présent mode d'emploi.

Nous vous prions de respecter également les modes d'emploi pour les appareils à connecter.

Toutes les indications comprises dans ce mode d'emploi sont données à titre indicatif au moment de l'impression. Pour des raisons techniques et/ou commerciales ainsi qu'en raison des dispositions légales existantes dans les différents pays, SI Analytics se réserve le droit d'effectuer des suppléments concernant le Titrateur TitroLine® 7500 KF pour séries de dilution qui n'influencent pas les caractéristiques décrits.

## Notes to the Manual

The provided manual will allow you the proper and safe handling of the titration instruments.

The pictogram ⚠ has the following meaning:

> For maximum security, observe the safety and warning instructions in the Instructions .
> Warning of a general danger to personnel and equipment
> Non-compliance may result in injury or material will be destroyed.

**Status at time of printing**
Advanced technology and the high quality of our products are guaranteed by a continuous development. This may result in differences between this operating manual and your product We can not exclude mistakes. We are sure you understand that no legal claims can be derived from the information, illustrations and descriptions.

**Note**
A potentially more recent version of this manual is available on our internet website at www.si-analytics.com .
The German version is the original version and binding in all specifications .

# 1 Technical Specifications of the Titrator TitroLine® 7500 KF

## 1.1 Summary

The TitroLine® 7500 KF is suitable for the following applications:

The possible range of titrations includes volumetric KF and Dead stop titrations with a maximum of 50 memorisable methods.

The examples of possible use of the TitroLine® 7500 KF include:
- KF titrations with 1-component KF reagents
- KF titrations with 2-component KF reagents
- Dead stop titrations such a bromine number and sulphur dioxide in

- Compatible with TitriSoft 3.0.

In addition, the TitroLine® 7500 KF comes with following functionalities of the TITRONIC® 500 piston burette:

- Dosing
- Preparation of solutions

Each method allows for the setting of a variety of dosing and filling rates.

**Solutions to be used:**

Virtually, any liquids and solutions with a viscosity of < = 10 mm² / s such as concentrated sulphuric acid may be used. However, one has to avoid the use of chemicals that may attack glass, PTFE or FEP or that are explosive, such as hydrofluoric acid, sodium azide or bromine! Suspensions containing high solids percentages may clog or even damage the dosing system.

⚠ **General provisions:** ⚠

The safety guidelines that are applicable to the handling of chemicals have to be observed under all circumstances. This applies in particular to inflammable and/or etching liquids.

**Guarantee**

We provide guarantee for the device described for two years from the date of purchase. This guarantee covers manufacturing faults being discovered within the mentioned period of two years. Claim under guarantee covers only the restoration of functionality, not any further claim for damages or financial loss.
Improper handling/use or illegitimate opening of the device results in loss of the guarantee rights. The guarantee does not cover wear parts, as lobes, cylinders, valves and pipes including the thread connections and the titration tips. The breach of glass parts is also excluded. To ascertain the guarantee liability, please return the instrument and proof of purchase together with the date of purchase freight paid or prepaid.

## 1.2 Technical Data Titrator TitroLine® 7500 KF

Status Nov.21th 2013

**CE sign:** $\quad$ CE $\quad$ EMC compatibility according to the Council Directive: 2004/108/EG;
applied harmonized standards: EN 61326-1:2006
Low-voltage directive according to the Council Directive 2006/95/EG
Testing basis EN 61 010, Part 1

**ETL sign:**

Conforms to ANSI/ UL Std. IEC 61010-1
Certified to CAN/ CSA Std. C22.2 No. 61010-1
Testing basis EN 61 010, Part 1

**Country of origin:** $\quad$ Germany, Made in Germany

The following solvents/titration reagents are allowed to be used:
− All common titration solutions.
− As reagent water and all non-aggressive non-organic and organic fluids are allowed. If using combustible fluids fire please adhere to the Guidelines for Explosion Protection and Prevention of the chemical industry.
− For fluids with higher viscosity ($\geq$ 5 mm$^2$/s), lower boiling point or affinity to outgas, the filling and dosage speed can be adjusted.
− Fluids with viscosity over 20mm$^2$/s cannot be dosed.

Measurement input: $\quad$ Karl-Fischer (Dead-stop) connector for double platinum electrode
Polarisation voltage variably adjustable from 40 … 220 mV.
Connector: 2 x 4 mm - sockets.

|  | Measurement range | Display resolution | Measurement accuracy* without sensor probe |
|---|---|---|---|
| I [$\mu$A] | 0 ... 100 | 0,1 | 0,2 $\pm$ 1 Digit |

* The measurement uncertainty of the sensor probe has to be taken into account as well.

**Display:** $\quad$ 3.5 inches -1/4 VGA TFT display with 320x240 pixels.

Inputs: $\quad$ Measurement input µA: $\quad$ (Dead-Stop-) connector for double platinum electrode
Connection sockets: 2 x 4 mm)

**Power supply:** $\quad$ power supply 90-240 V; 50/60 Hz, power input: 30 VA
Use the Power supply TZ 1853, Type No.: FW 7362M/12 only!

**RS232-C Interface:** $\quad$ RS232-C interface separated galvanically through photocoupler
Daisy Chain function available.
Data bits: $\quad$ adjustable, 7 or **8** Bit (default: 8 Bit)
Stop bit: $\quad$ adjustable, **1** or 2 Bit (default: 1 Bit)
Start bit: $\quad$ static **1** Bit
Parity: $\quad$ adjustable: even / odd / **none**
Baud rate: $\quad$ adjustable: 1200, 2400, **4800**, 9600, 19200 (Default 4800 baud)
Address: $\quad$ adjustable, *(0 to 15, default: 01)*
RS232-1 $\quad$ for computer, input Daisy Chain
RS232-2 $\quad$ devices of SI Analytics, titrator TitroLine® 6000/7000/7500*,*
$\quad$ - Burettes TITRONIC® 500, TITRONIC® 110 *plus,* TITRONIC® *universal,*
$\quad$ - Balances of the types Mettler, Sartorius,
$\quad$ - Kern, Ohaus (for more, please contact SI Analytics)
$\quad$ - Exit Daisy Chain
**USB Interface:** $\quad$ 2 x USB-type A and 1 x USB-type B

| USB –Typ B ("slave") | for connecting a PC |
|---|---|
| USB –Typ A ("master") | for connecting: |
| | - USB keyboard |
| | - USB printer |
| | - USB "mouse" ("mouse"), |
| | - USB data media e.g. USB stick |
| | - USB Hub |

**Stirrer/pump TMKF**: **12V DC out**, **500mA**
power supply for stirrer TM 235 and KF titration stand TM 235 KF

**Housing material:** Polypropylene
**Front keyboard:** polyester coated
**Housing dimensions:** 15.3 x 45 x 29.6 cm (W x H x D), height incl. interchangeable unit
**Weight:** ca. 2.3 kg for basic unit
ca. 3.5 kg for complete device incl. interchangeable unit (with empty reagent bottle)

**Ambient conditions:** Ambient temperature: + 10 ... + 40 °C for operation and storage
Humidity according to EN 61 010, Part 1:
Max. relative humidity 80 % for temperatures up to  31 °C,
linear decrease down to 50 % relative humidity at a temperature of  40 °

**Interchangeable units**

| Compatibility: | units are compatible to the titrators TitroLine® 6000, TitroLine® 7000, TitroLine® 7500 KF and Piston Burette TITRONIC® 500 |
|---|---|
| Recognition: | automatically through RFID. Recognition of unit size and characteristics of the Titration- or dosing solution |
| Valve: | volume neutral cone valve made from fluorocarbon polymers (PTFE), TZ 3000 |
| Cylinder: | borosilicate glass 3.3 (DURAN®) |
| Hoses: | FEP hose set, blue |
| Bracket for supply bottle: | suitable for square glass bottle and misc. reagent bottles |
| Materials: | borosilicate glass DURAN®, fluorocarbon polymers (PTFE), stainless steel, polypropylene, |
| Dimensions: | 15 x 34 x 22.8 cm (W x H x D) incl. reagent bottle |
| Weight: | approx. 1.2 kg for interchangeable unit WA incl. empty reagent bottle |

| Dosing accuracy: | after DIN EN ISO 8655, part 3 |
|---|---|
| | Accuracy:        0.15 % |
| | Precision:       0.05 - 0.07 % |
| | (Depending on the used interchangeable unit) |

**Dosing accuracy  of the Titrator TitroLine® 7500 KF with WA interchangeable units:**

| Interchangeable. unit type No. | Volume [ml] | Tolerances of the $\varnothing_i$ of the glass cylinder [mm] | Dosage error* according to 100 % volume [%] | Reproducibility [%] |
|---|---|---|---|---|
| WA 05 | 5.00 | ± 0.005 | ± 0.15 | 0.07 |
| WA 10 | 10.00 | ± 0.005 | ± 0.15 | 0.05 |
| WA 20 | 20.00 | ± 0.005 | ± 0.15 | 0.05 |
| WA 50 | 50.00 | ± 0.005 | ± 0.15 | 0.05 |

**Specifications**　　**Titration Stand TM 235 KF**　　　　　Status Nov 21. 2013

In connection with the titrator TitroLine 7500 KF

**CE - Mark**　$\epsilon$　EMV – compatibility according to Council Directive 89/336/EWG;
Transient emissions according to norm EN 50 081, part 1
Interference resistance according to norm EN 50 082, part 2
Low voltage directive according to Council Directive 73/23/EWG
Last amended by directive 93/68/EWG; test criteria EN 61 010, part 1

**ETL sign:**



Intertek
4008661

Conforms to ANSI/ UL Std. IEC 61010-1
Certified to CAN/ CSA Std. C22.2 No. 61010-1

| | |
|---|---|
| Country of origin: | Germany / made in Germany |

Pump:　　　　　　　Free volume flow - air-:　flow rate 2.25 l / min
　　　　　　　　　　Delivery pressure max.　1.5 bar
　　　　　　　　　　Flow rate liquid medium　ca. 0,8 l / min
Stirring speed:　　　50 ... 1000 U/min

Hoses:　　　　　　　PVC-　hose, outer diameter 6 x 1 mm
　　　　　　　　　　PTFE- hose, outer diameter 4 x 0.5 mm

Connections
Power supply (top);:　Low voltage input 12 V / − on the backside of titration stand
　　　　　　　　　　Plug connection: plug for low voltage connection – phone jack-,
　　　　　　　　　　Positive pole at pin contact, inside contact $\varnothing$ = 2,1 mm, USA/Japan,
　　　　　　　　　　Power supply via titrator TitroLine 7500 KF
　　　　　　　　　　Use the Power supply TZ 1855, Type No.: FW 7555O/12 only!

Housing
　Material:　　　　　Polypropylene;
　Dimensions:　　　80 x 130 x 250 mm, H x W x D (height without stand rod)
　Weight:　　　　　1.0 kg

Ambient conditions:

Not suitable for explosive environments!

Climate:　　　　　　Ambient temperature:　+ 10 °C ... + 40 °C for storage and transport.
　　　　　　　　　　Humidity:　　　　　　According to EN 61 010, part 1:
　　　　　　　　　　　　　　　　　　　　Maximum relative humidity 80 % for temperatures up to
　　　　　　　　　　　　　　　　　　　　31 °C,
　　　　　　　　　　　　　　　　　　　　Linearly decreasing up to 50 % relative humidity
　　　　　　　　　　　　　　　　　　　　With a temperature of 40 °C

## 1.3 Warning and safety information

The TitroLine® 7500 KF corresponds to protection class III. It was manufactured and tested according to DIN EN 61 010, Part 1, Protective Measures for Electronic Measurement Devices and has left the factory in an impeccable condition as concerns safety technology. In order to maintain this condition and to ensure safe operation, the user should observe the notes and warning information contained in the present operating instructions. Development and production is done within a system which meets the requirements laid down in the DIN EN ISO 9001 standard.

For reasons of safety, the titrator TitroLine® 7500 KF must be opened by authorised persons only; this means, for instance, that work on electrical equipment must only be performed by qualified specialists.

⚠ **In the case of nonobservance of these provisions the titrator TitroLine® 7500 KFmay constitute a danger: electrical accidents of persons or fire hazard. Moreover, in the case of unauthorised intervention in the titrator TitroLine® 7500 KF as well as in the case of negligently or deliberately caused damage, the warranty will become void.** ⚠

Prior to switching the device on it has to be ensured that the operating voltage of the titrator TitroLine® 7500 KF matches the mains voltage. The operating voltage is indicated on the specification plate. Nonobservance of this provision may result in damage to the titrator TitroLine® 7500 KF or in personal injury or damage to property.

If it has to be assumed that safe operation is impossible, the titrator TitroLine® 7500 KF has to be put out of operation and secured against inadvertent putting to operation. In this case please switch the titrator TitroLine® 7500 KF off, pull plug of the mains cable out of the mains socket, and remove the titrator TitroLine® 7500 KF from the place of work.

➲ Examples for the assumption that a safe operation is no longer possible,
  ➲ the package is damaged,
  ➲ the titrator TitroLine® 7500 KF shows visible damages,
  ➲ titrator TitroLine® 7500 KF does not function properly,
  ➲ liquid has penetrated into the casing.

  ➲ If the titrator TitroLine® 7500 KF has been altered technologically or if unauthorized personnel tried or succeeded to open the instrument as attempt to repair it.

In case that the user operates such a device, all thereof resulting risks are on the user.

The titrator TitroLine® 7500 KF must not be stored or operated in humid rooms.

For reasons of safety, the titrator TitroLine® 7500 KF must only be used for the range of application described in the present operating instructions.

In the case of deviations from the intended proper use of the device, it is up to the user to evaluate the occurring risks.

⚠ **The relevant regulations regarding the handling of the substances used have to be observed:** The Decree on Hazardous Matters, the Chemicals Act, and the rules and information of the chemicals trade. It has to be ensured on the side of the user that the persons entrusted with the use of the titrator TitroLine® 7500 KF are experts in the handling of substances used in the environment and in titrator TitroLine® 7500 KF or that they are supervised by specialised persons, respectively.

During all work with titration solutions: ⚠ **Please wear protective glasses!** ⚠

The titrator TitroLine® 7500 KF is equipped with integrated circuits (EPROMs). X rays or other high energy radiation may penetrate through the device's casing and delete the program.
For working with liquids, not beeing common titration solvents, especially the chemical resistance of the construction materials of the titrator TitroLine® 7500 KF have to be considered (please also refer to chapter 1.1).

For the use of liquids with high vapour pressure or (mixture of) substances not being mentioned in chapter 1.1 as allowed substances, the safe and proper operation of the titrator TitroLine® 7500 KF has to be guaranteed by the user.
When the piston moves upwards within the cylinder, a microfilm of dosing liquid or titration solution will always remain adhered to the inner wall of the cylinder, but this has no influence on the dosing accuracy. This small residue of liquid, however, may evaporate and thus penetrate into the zone underneath the piston, and if non-admitted liquids are being used, the materials of the titrator TitroLine® 7500 KF may be dissolved or corroded (please refer also to chapter 8 "Maintenance and Care of the titrator TitroLine® 7500 KF").

# 2    Unpacking and First Operation

## 2.1  Unpacking

The titrator itself as well as all related accessory and peripheral parts have been carefully checked at the factory to ensure their correct function and size. The TitroLine® 7500 KF modules consists of:

- TitroLine® 7500 basic unit

- An interchangeable dosing unit WA 05, WA 10 or WA 20

- The KF titration stand (pump and stirrer) TM 235 KF including waste (1 L clear bottle), solvent (1 L amber bottle) and moisture bottle (100 ml) with all tubes.

- Titration vessel TZ 1770 including titration tip

- KF starter kit TZ 1789 with molecular sieve, glass wool and a set of syringes with needles.

- Electrode KF 1100

Please ensure that the small accessories are also removed in full from the packaging. For the scope of delivery, please refer to the enclosed parts lists.



Fig. 1

## 2.2  Connection and installation of titrator and magnetic stirrer TM 235

The low voltage cable of the power supply TZ 1853 has to be plugged in to the 12 V socket „in", (see Fig. 8 back panel, chapter. 2.4.1), on the back panel of the titrator. Then plug the power supply into the plug socket.

Fig. 2a

Place the power supply easily accessible in order to be able to remove the titrator anytime easily from the power circuit.

As a rule, the TM 235 magnetic stirrer is arranged to the right of the piston burette. The magnetic stirrer is connected to the 12V **out**-socket in the rear panel of the piston burette using the TZ 1577 connection cable (scope of delivery of the basic device) (cp. 'Back panel' illustration, chapter 2.4). The stand rod (scope of delivery of the basic device) is screwed into the thread; subsequently the Z 305 titration clamp (scope of delivery of the basic device) is installed (fig. 2b).



Fig. 2b

## 2.3  Installation and Connection of the TM 235 KF titration stand and titration vessel

The titrator TitroLine® 7500 KF and the TM 235 KF may be placed on any flat surface.

As a rule, the TM 235 KF titration stand is arranged to the right of the titrator.

The pump/stirrer is connected to the 12V **out**-socket at the rear panel of the TitroLine® 7500 KF using the TZ 1577 connection cable (scope of delivery of the basic device) (cp. 'Back panel' illustration, chapter 2.4).

The stand rod (scope of delivery of the basic device) is screwed into the thread of the TM 235 KF.

The titration vessel TZ 1770 is mounted at the stand rod. Please take care that the metal clamp is adjusted as shown in the attached photo:

Fig. 3a

Put all three white inner plastic adapters at the waste, solvent and moisture bottle.

Fill the moisture bottle with molecular sieve.

Connect the PVC and PTFE plastic tubes as shown in the next pictures.

The PVC tubes are connected to the connectors at the back side of the TM 235 KF. The long PVC tube is used for the connection of the waste bottle. The two shorter PVC ones are used to connect the moisture bottle and the solvent bottle.



Fig. 3b

The moisture bottle is connected to the right connector (view from above) of the TM 235 KF. The waste (clear) bottle is connected to the left connector.



Fig. 4

The PTFE tube from the clear waste bottle is adjusted to the ground (tube 1) of the titration vessel. The PTFE tube from the solvent bottle (tube 2) is adjusted as shown in the next two pictures:
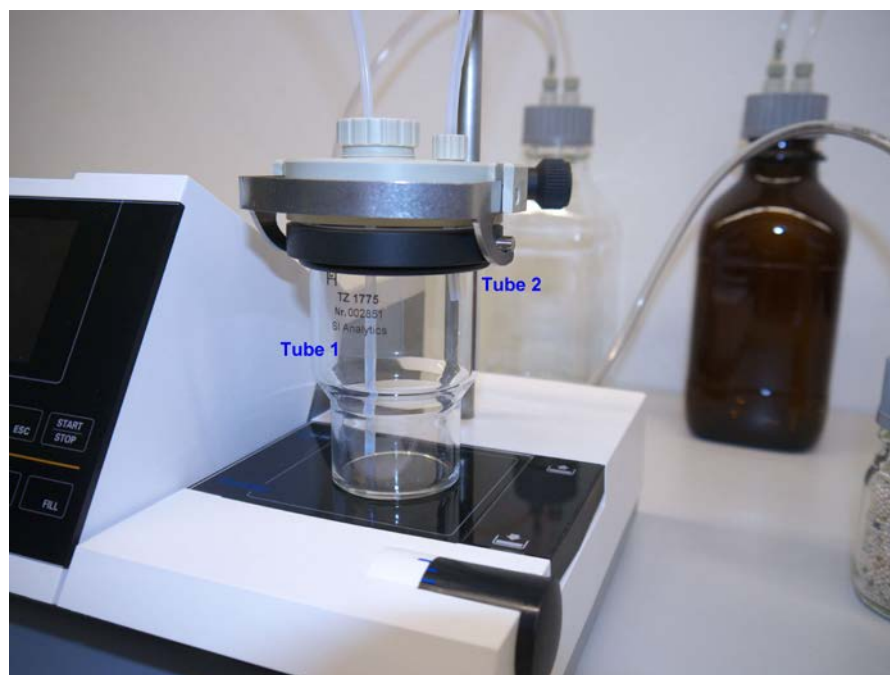


Fig. 5

Fig. 6

The burette tip is placed into the left NS 14 opening and connected to the valve of the interchangeable unit.

Put first some glass wool and then molecular sieve in the plastic moisture tube. Place it to the other NS opening as shown in the next picture.
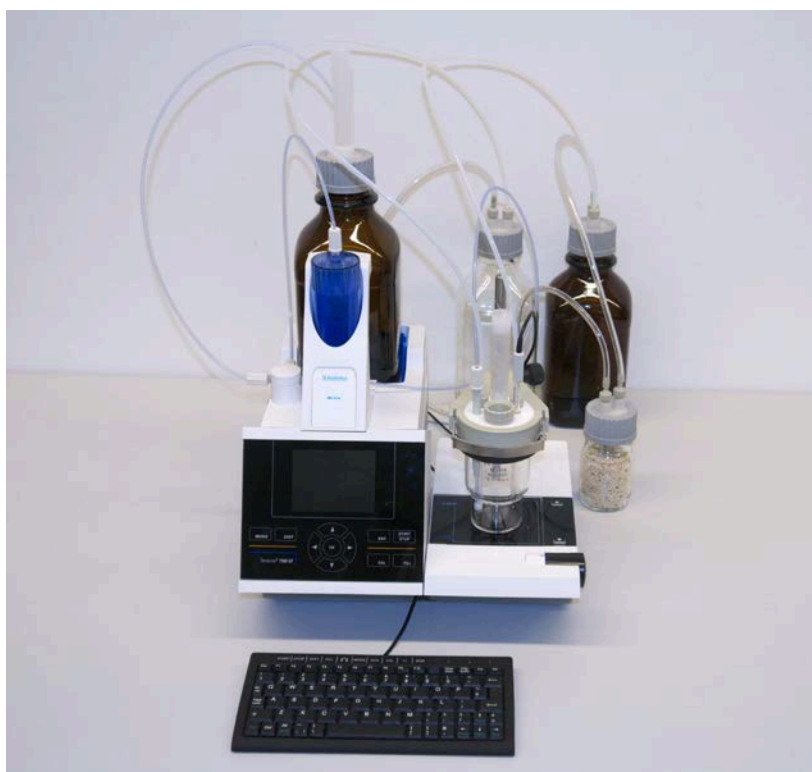


Fig. 7

The electrode KF 1100 is connected to the µA input.

The keyboard is connected to one of the USB –A ports.

## 2.4  Connecting the Titrator - Combination with Accessories and Additional Devices

### 2.4.1  Back panel of the titrator TitroLine® 7500 KF



Fig. 8

### 2.4.2  Connection ports of the TitroLine® 7500 KF

The TitroLine® 7500 KF is equipped with the following connections:

1) µA measurement input for the connection of double platinum electrodes (KF 1100 or Pt 1200, Pt 1400)
2) USB-B interface for connection to a PC
3) On/Off switch
4) Two USB-A ("Master") interfaces for connecting USB devices such as a keyboard, printer, manual control unit, USB memory device etc.
5) "in": Connection of the external power pack
6) "out": Connection of the TM 235 KF titration stand or TM 235 magnetic stirrer
7) Two RS232 ports, 4-channel (Mini-DIN):
   RS1 for connection to the PC
   RS2 for connection of a weighing balance and other devices from SI Analytics (burettes a.s.o.)

### 2.4.3  Connecting a printer

Printers with a USB interface are to be connected to one of the two USB-A interfaces. These printers **have to** feature HP PCL emulation (3, 3GUI, 3 enhanced, 5, 5e). So-called GDI printers cannot be used!
Alternatively the thermo-compact printer Seiko S445 can be connected.

### 2.4.4  Connecting a USB device (manual controller, keyboard, memory device, hub)

The following USB devices can be connected to the USB-A interfaces:
- PC-keyboard
- TZ 3880 manual controller (in the following: "mouse")
- Printer
- USB storage devices, e.g. USB sticks
- USB hub
- USB barcode scanners

### 2.4.5 Connection of analytical balances

Analytical balances are to be connected to the RS232-2 using an appropriate cable

## 2.5 Setting the Language of the Country

The ex-factory default language setting is English. When the piston burette is switched on, the main menu will appear once the boot sequence is completed:



Fig. 8

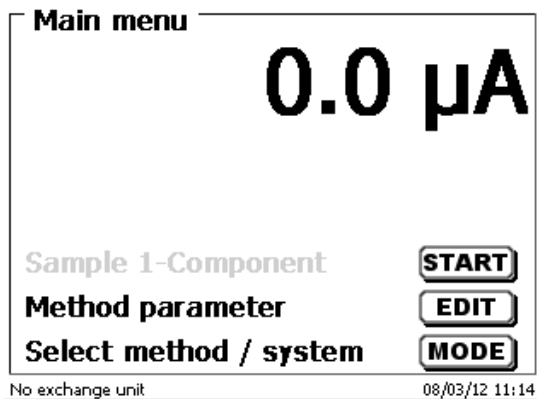Using <SYS/<F7> or <MODE>, followed by <System settings> you navigate to the system settings. The very first menu is to be used for setting the language of the country:
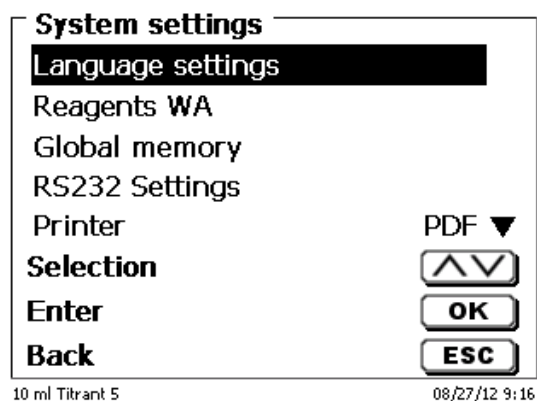


Fig. 9

Use <ENTER>/<OK> to call the menu. Select the national language using the <↑↓> arrow keys, confirm it with <ENTER>/<OK>:
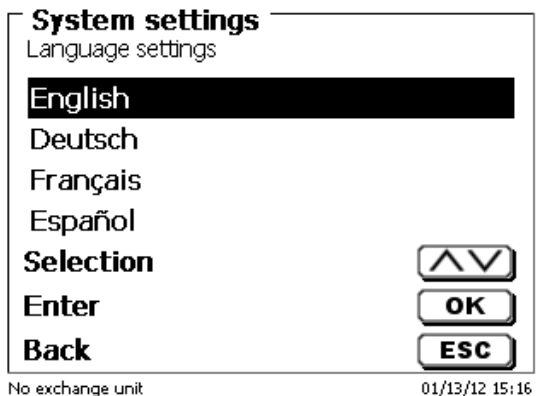


Fig. 10

The selected language will appear immediately. Pressing the <ESC> key twice will return the user to the main menu.

## 2.6  Interchangeable unit WA



Fig. 11

1) TZ 3871 - suction hose
2) TZ 3872 - connection hose
3) TZ 3873 - dosing hose without dosing tip and holding bracket;
   TZ 3874 - dosing hose with dosing tip and holding bracket
4) TZ 3801 - valve cover lid
5) TZ 3000 - 3/2-way valve
6) TZ 2003 - drying tube
7) TZ 3802 - threaded cap with borehole GL 45, incl. adapter with 2 openings for drying tube and suction hose
8) TZ 3803 - 1 litre reagent bottle, brown
9) TZ 3900 - UV protection, blue transparent
10) TZ 3875 - shaft for titration tip and
    TZ 3356 - titration tip unit, blue or micro titration tip white TZ 3285, adapter TZ 1525
11) TZ 1507 - plastic drip-down tubule

### 2.6.1   Installing the interchangeable unit

Fig. 11 shows a completely assembled interchangeable unit.

- Remove the valve with the attached hoses from the pack, and then push it on the valve support until it snaps in position.
- Slip on the valve cover lid on the valve as is shown in the illustration.
- Insert the TZ 3872 connection hose in the threaded hole provided in the burette cylinder, and then tighten it by hand.
- Insert the TZ 3871 suction hose into the threaded opening of the GL 45 or S 40 adapters, and then tighten it manually.
- Remove the standard dosing hose TZ 3874 from the valve and connect the dosing hose including from the KF titration vessel TZ 1770

## 2.7 Positioning and Replacing an Interchangeable Unit

The base unit comes with an RFID reader, and all the interchangeable units are equipped with an RFID transponder. This transponder can be used to store the following information:

- Unit size (cannot be changed)
- Unit ID (cannot be changed)
- Reagent name (default: blank)
- Concentration (default: 1.000000)
- Concentration determined on: (Date)
- To be used until: (Date)
- Opened/Produced on: (Date)
- Test according to ISO 8655: (Date)
- Charge description: (default: no charge)
- Last modification: (Date)

Each time an interchangeable unit is pushed onto the base unit, the data is automatically read out of the transponder.

### 2.7.1 Placing an interchangeable unit

The interchangeable unit is to be placed on the device unit as is shown in fig. 12 a-c; subsequently, it is to be pushed downwards until the black button latches on the left side.

Fig. 12.a

Fig. 12.b

Fig. 12.c

### 2.7.2 Removing an interchangeable unit

Removing the interchangeable unit is done in reverse order:

- Depress the black button on the left, and then pull the interchangeable unit forward as is shown in fig. 12 c – 12 a.

⚠ **Please note: Removing the interchangeable unit is only possible as long as the piston is in the lower position (zero position). Possibly, it may be necessary to press the <FILL> key first.** ⚠

### 2.7.3 Programming the titration unit

The data from the RFID transponder of the interchangeable unit will be read immediately (fig. 13).

Fig. 13

| Device is filling | |
|---|---|
| | **0.0 µA** |
| Sample 1-Component | START |
| Method parameter | EDIT |
| Select method / system | MODE |
| Reading exchange unit | 08/03/12 11:21 |
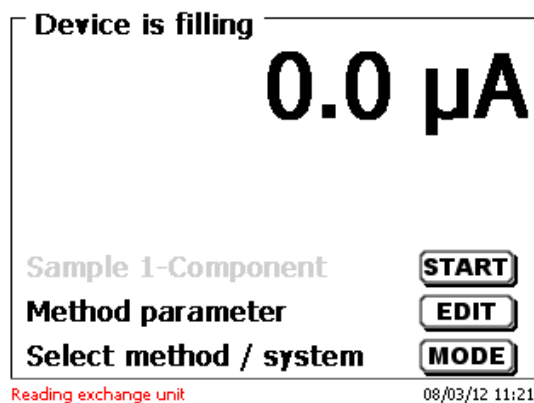
Following the reading operation, the input menu for the input of the reagents will be shown for approx. 10 seconds (fig. 14). The size of the interchangeable unit is displayed on the left side of the display (here 10 ml).
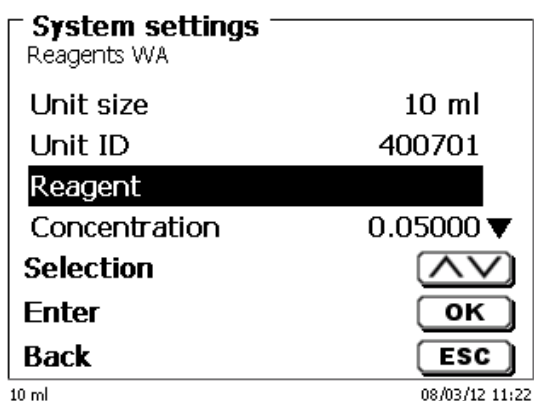
Fig. 14

| System settings | |
|---|---|
| Reagents WA | |
| Unit size | 10 ml |
| Unit ID | 400701 |
| Reagent | |
| Concentration | 0.05000 ▼ |
| Selection | ∧∨ |
| Enter | OK |
| Back | ESC |
| 10 ml | 08/03/12 11:22 |

When used for the first time, it is recommended to enter here at least the name of the reagent being used. To do so, confirm the "Reagent" selection with <ENTER>, then type the name and possibly the concentration (fig. 12).



Fig. 15

Press <OK>/<ENTER> to confirm (fig. 15). Following the optional input of additional parameter, press <ESC> to leave the reagents menu (fig. 16). The approximate concentration of the KF titrant (e.g. 5 or 2) should be entered under **concentration**. Thereby the drift in µg/min can be calculated in the right dimensions.



Fig. 16

You will be prompted for a confirmation of the values (fig. 17):



Fig. 17

If you selected <Yes>, the values will be written into the interchangeable unit. You can see this from a message in red colour displayed at the bottom. Upon completion, the left bottom corner of the display will show the new name of the reagent (fig. 18). In the present case this is Titrant 5.
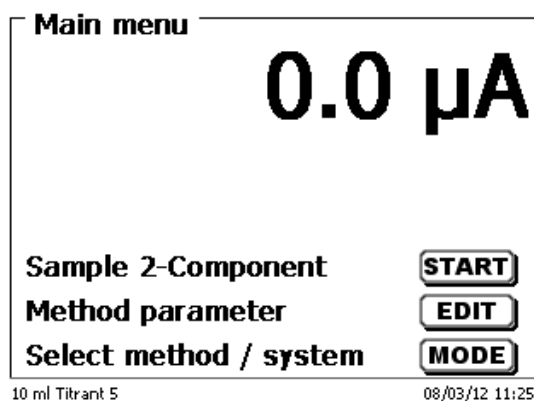
Fig. 18

## 2.8 Initial Filling or Rinsing of the Entire Interchangeable Unit

Initial filling of the interchangeable unit is done using the <rinsing > rinsing programme.
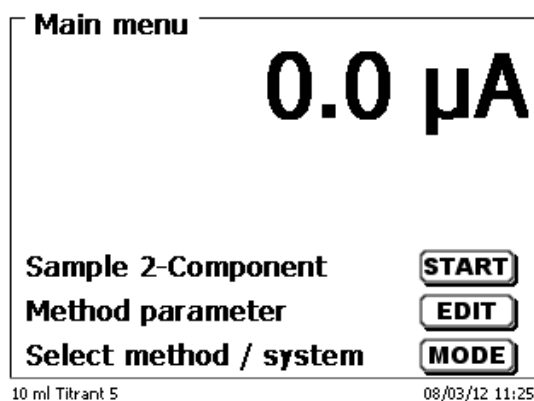


Fig. 19

On the main menu (fig. 19), press <MODE> key to navigate to the methods/system (fig. 20).
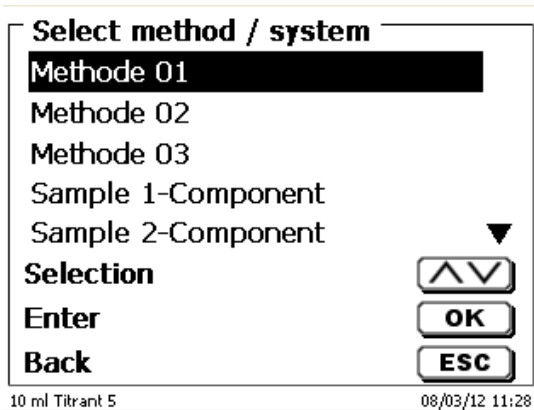


Fig. 20

Pressing <↑> twice will take you to the <Rinsing> selection immediately (fig. 21).
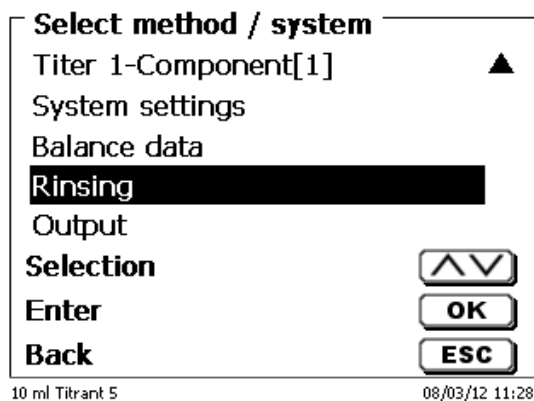
```
┌─ Select method / system ──────┐
│  Titer 1-Component[1]        ▲ │
│  System settings              │
│  Balance data                 │
│  ███Rinsing███████████████    │
│  Output                       │
│  Selection            [∧∨]    │
│  Enter                [ OK ]  │
│  Back                 [ ESC ] │
└───────────────────────────────┘
  10 ml Titrant 5      08/03/12 11:28
```

Fig. 21

Confirm the selection by pressing <ENTER>:

```
┌─ Rinsing ─────────────────────┐
│  ███Rinse 1 x█████████████    │
│  Rinse 2 x                    │
│                               │
│                               │
│                               │
│  Selection            [∧∨]    │
│  Enter                [ OK ]  │
│  Back                 [ ESC ] │
└───────────────────────────────┘
  20 ml NaOH 0.1 mol/L    09/13/11 8:31
```
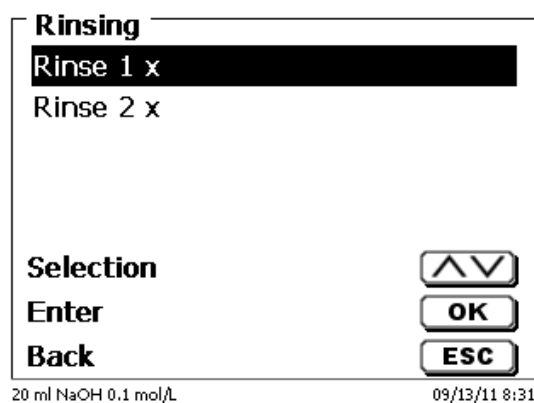
Fig. 22

At this point you can select the number of rinsing cycles (Fig. 19). Initial filling requires a minimum of two rinsing cycles. You can stop the rinsing operation (Fig. 20) at any time by pressing <STOP> and then resume rinsing with <START>.

```
┌─ Rinsing ─────────────────────┐
│  Rinse 2 x                    │
│                               │
│         4.567 ml              │
│                               │
│         40.000 ml             │
│                               │
│  Stop                 [STOP]  │
│  Abort                [ ESC ] │
└───────────────────────────────┘
  20 ml NaOH 0.1 mol/L    09/13/11 8:34
```

Fig. 23

While the initial filling or rinsing programme is being run, please place a sufficiently dimensioned waste vessel under the titration tip. The best is when the titration tip is mounted in the KF titration vessel.

## 2.9 Filling the titration vessel with solvent

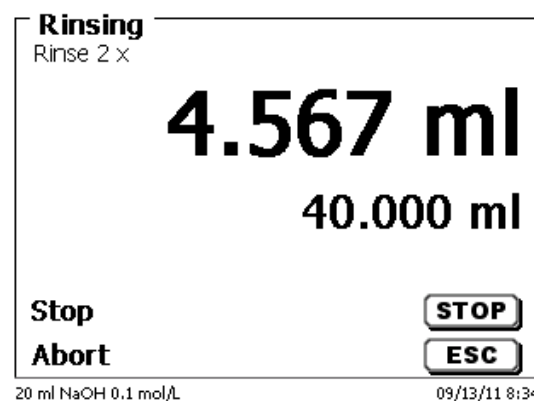The solvent is pumped from the solvent bottle into the titration vessel by pushing down the front part of the rocker switch on the titration stand TM 235 KF. Pump solvent into the titration vessel until the titration tip and the electrode are completely immersed. This will be approx. 35-40 ml of solvent:
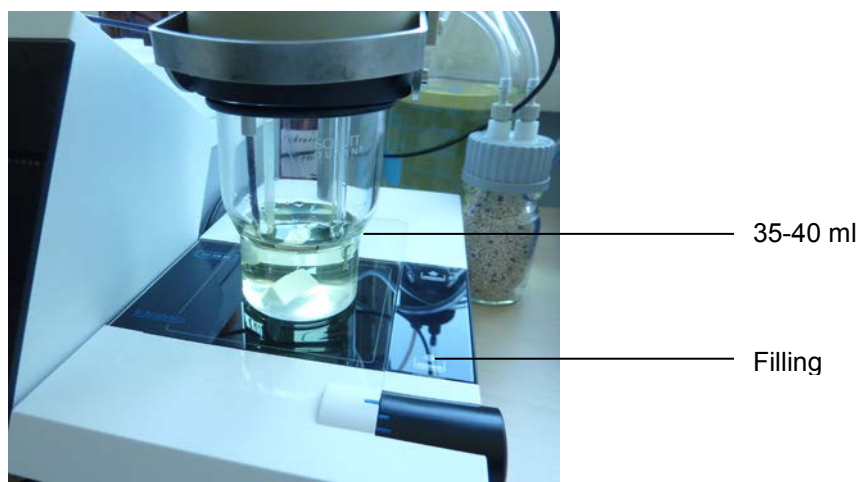


35-40 ml

Filling

Fig. 24

## 2.10 Replacing the Glass Cylinder and the PTFE Piston

Replacing the glass cylinder and the piston does not require any additional tools. In certain cases the piston extractor has to be used.

- Remove the interchangeable unit from the base unit.
- Unscrew the hose between the glass cylinder and the valve from the glass cylinder.
- Rotate the blue UV protection 5 to 6 times to the left to loosen it.
- You can remove the UV protection and pull out of the glass cylinder together with the piston inside it.
- Insert a new glass cylinder and piston (Fig. 25) into the interchangeable unit, and then slip on the blue UV protection again.
- Tighten the blue UV protection again by rotating it 5 to 6 times to the right.
- The piston rod should project 1-2 cm out of the interchangeable unit (Fig. 26 a). At this point, tilt the unit forward until the slanted bottom side is in flat contact with the lab table (Fig. 26 b). This forces the piston into its correct position. Should the piston be forced somewhat too far into the glass cylinder, simply pull it out and place it in the correct position according to the procedure described above.
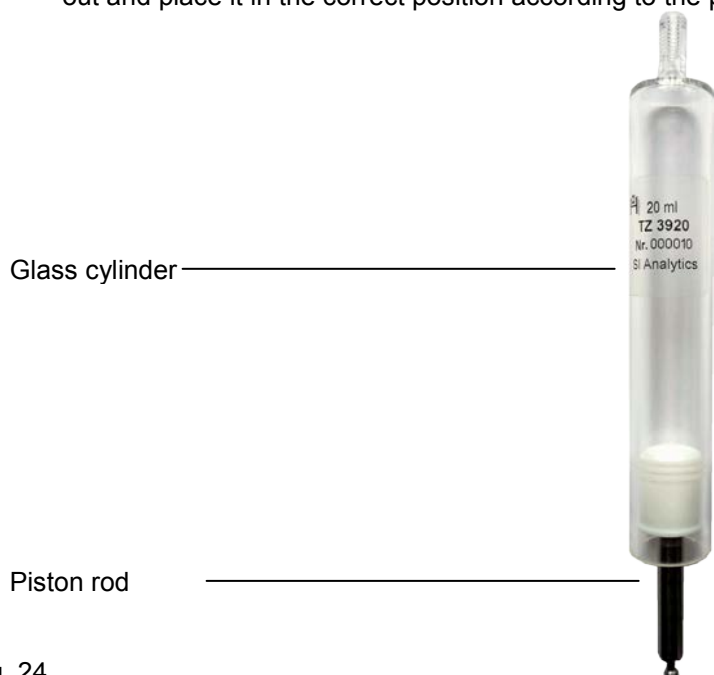


Glass cylinder

20 ml
TZ 3920
Nr. 000010
SI Analytics

Piston rod

Fig. 24

Piston rod

Fig. 25 a



Fig. 25 b

Basically, it should be noted that within one and the same interchangeable unit only the specified cylinder size may be installed, since otherwise the coding which is memorised within the interchangeable unit will no longer match the cylinder size. This will entail incorrect dosage. And for the sake of dosing and analytical accuracy, it is also recommended to replace the PTFE pistons each time a defective glass cylinder is replaced. This applies in particular to glass breakage, since broken glass may damage the sealing rings of the PTFE piston.

**Please note:** As a rule, the hoses and cylinders will contain chemicals which may spill or be splashed around in the course of disassembly. The relevant safety precaution measures applicable to the handling of the chemicals concerned have to be observed.

# 3 Working with the Titrator TitroLine® 7500 KF

## 3.1 Front Keyboard
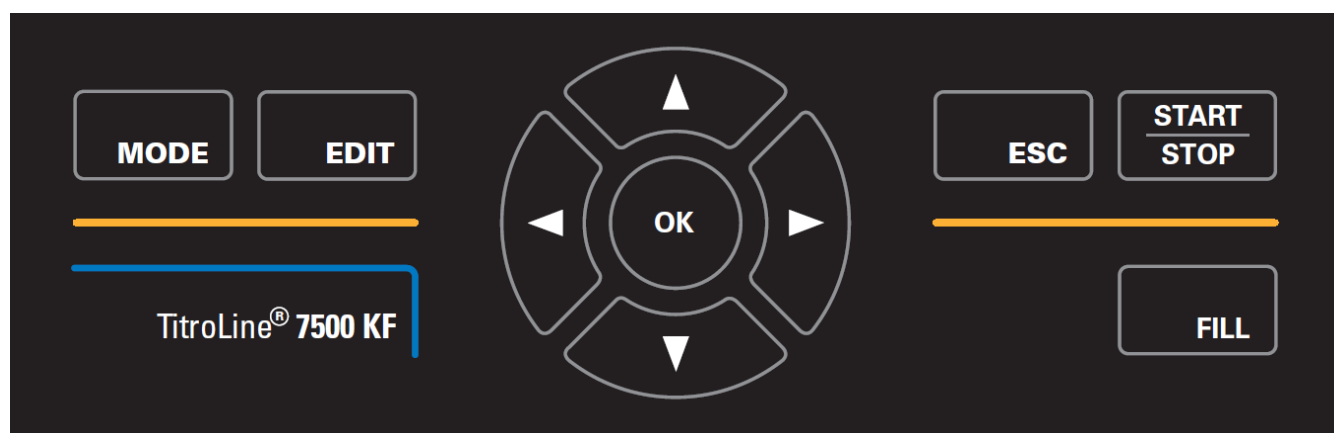
Apart from alphanumeric input (a-z, A-Z, 0-9) and a few other functions, almost all functions can be performed using the front keyboard.

**<Mode>:**      Methods selection, rinsing, system settings
**<EDIT>**:      Changing the current method, new method, copy and delete method
**<ESC>:**      **<ESC>** will take you back to the previous menu level.
**<START>**:    Start and Stop of a current method
**<FILL>**:      Filling the unit

The individual functions are described in detail in **Chapter 3.4, External PC Keyboard**.

## 3.2  Display

The display consists of a graphical LCD display with a resolution of 320 x 240 pixels.
It also offers the possibility to display graphics, e.g. the measuring curve while or after the titration is/was running:
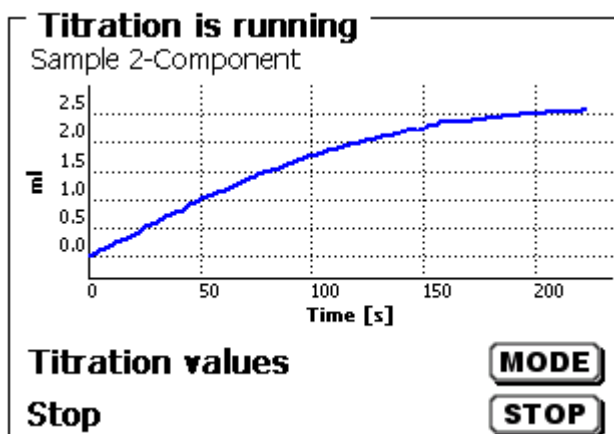
## 3.3  Manual controller "mouse"

The "mouse" (Fig. 23) can be used dosing applications and sample preparation methods. The mouse is not included in the scope of delivery of the TL 7500 basic unit.

Fig. 26

| Mode | Black key | Grey Key |
|---|---|---|
| Dosage through Dosage method | Start dosage | Filling |
| Preparation of solutions | Start dosage | Filling |

## 3.4  External PC Keyboard

| Keys | Function |
|---|---|
| <ESC> | <ESC> will take the user to the previous level on the menu. |
| <F1>/<START> | Start of a selected method |
| <F2>/<STOP> | Stop of the current method |
| <F3>/<EDIT> | Change of the current method, new method, copy method |
| <F4>/<FILL> | Fill the interchangeable unit |
| <F5>/⚖ | Display and modification of the balance data. With <Shift + F5> display and modification of the global memories |
| <F6>/<MODE> | Selection of method, rinsing, system settings |
| <F7>/<SYS> | System settings (language selection, time/date ...) |
| <F8/<CAL> | Without function |
| <F9>/+ / - | Change of sign |
| <F10>/<DOS> | Call dosing menu |
| Num/ Scroll Lock/ Lock | Without function |
| Prt Sc Sys Rq | Without function |
| <ESC> | Selection of the method-selection menu from the main menu. Elders: <ESC> will take you back to the previous level in the menu. |
| < ↑> < ↓ > <←> <→> | Selection of individual menus and numeric values |
| 0...9 | Input of numeric values |
| <ENTER> | Confirmation of input parameters |
| < ←Backspace > | Deletion of one input digit / an input character to the left of the blinking cursor |
| Letters, ASCII-symbols | Alphanumeric input possible. Uppercase and lowercase possible. |
| All other keys | Do not have any function |

## 3.5 Menu Structure

There are 4 selection menus:
- Start or main menu
- Method parameters
- Method selection
- System settings

After power-up, the main menu is always the first menu to appear. The method displayed will always be the last method that was used (Fig. 27).

Fig. 27

Pressing <START> will result in the immediate execution of the method shown. <EDIT>/F3 will take you to the method parameters (Fig. 28).

Fig. 28

At this point you can
- modify the current method
- create a new method
- call and memorise standard methods
- copy or delete an existing method

Use the <↓> und <↑> keys to select the submenus, confirm your selection with <OK>/<ENTER>. <ESC> will take you back to the main menu.

<MODE>/F6 leads you to the "select method" menu (Fig. 29).

```
┌─ Select method / system ────────┐
│ Sample 2-Component          ▲   │
│ Titer 1-Component (liq. st.)    │
│ Titer 1-Component[1]            │
│ System settings                 │
│ Balance data                ▼   │
│ Selection              [∧∨]     │
│ Enter                  [ OK ]   │
│ Back                   [ ESC ]  │
│ 10 ml Titrant 5      08/03/12 12:21 │
└─────────────────────────────────┘
```

Fig. 29

Existing methods can be selected by pressing the <↓> und <↑> keys and confirming the selection with <OK>/<ENTER>. Once the selection made, you will return to the main menu with the newly selected method. If no method is selected, <ESC> will also take you back to the main menu.

To navigate directly to the system settings (Fig. 30 and Fig. 31) you can use the <SYS>/F7 key; you can also navigate there through the method selection menu.

```
┌─ System settings ───────────────┐
│ Language settings               │
│ Reagents WA                     │
│ Global memory                   │
│ RS232 Settings                  │
│ Printer                PDF ▼    │
│ Selection              [∧∨]     │
│ Enter                  [ OK ]   │
│ Back                   [ ESC ]  │
│ 10 ml Titrant 5      08/03/12 12:21 │
└─────────────────────────────────┘
```

Fig. 30

```
┌─ System settings ───────────────┐
│ Date/time                   ▲   │
│ Reset                           │
│ Device informations             │
│ System tone                     │
│ Software Update                 │
│ Selection              [∧∨]     │
│ Enter                  [ OK ]   │
│ Back                   [ ESC ]  │
│ 10 ml Titrant 5      08/03/12 12:21 │
└─────────────────────────────────┘
```

Fig. 31

## 3.6  Main Menu

After power-up, the main menu is always the first menu to appear. The method displayed will always be the last method that was used (Fig. 32).
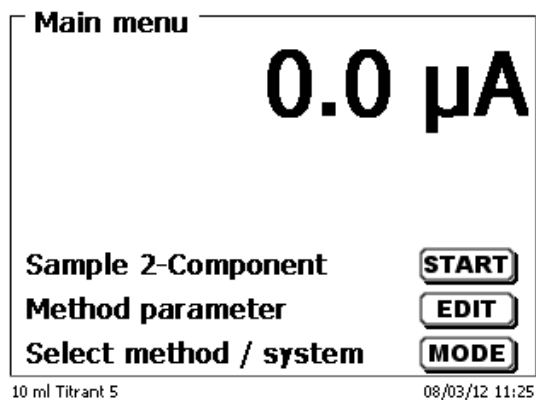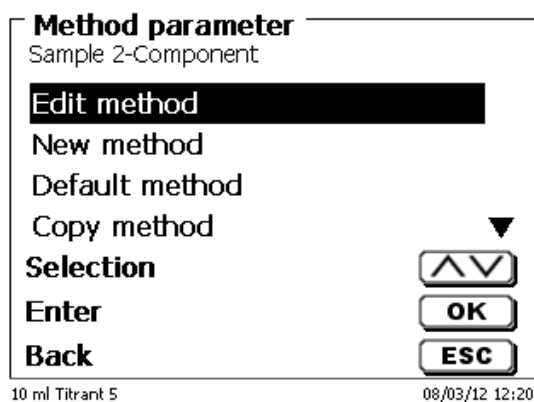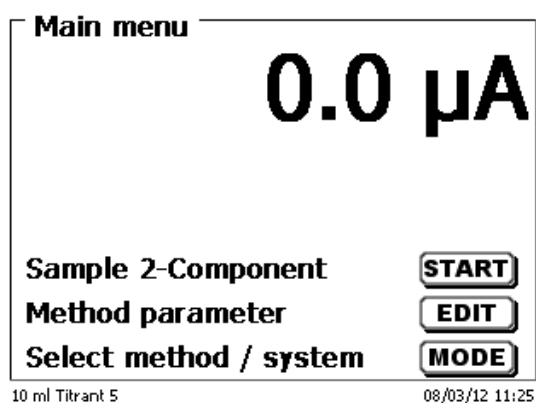
Fig. 32

### 3.6.1  Standard methods of KF Titration

If no titration has been performed yet, it is recommended to load one of the standard methods. These methods have default parameters and can generally be used immediately without changes. From the main menu, press F3/EDIT to access the methods menu:
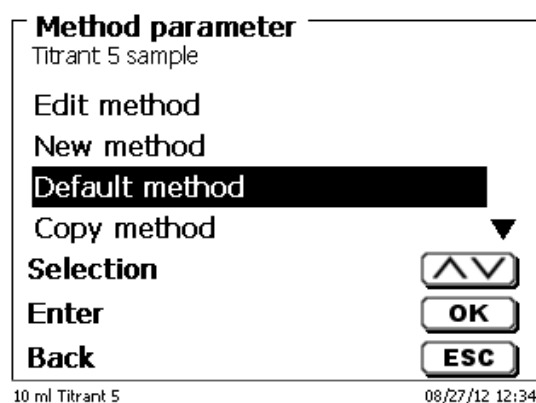
Fig. 33

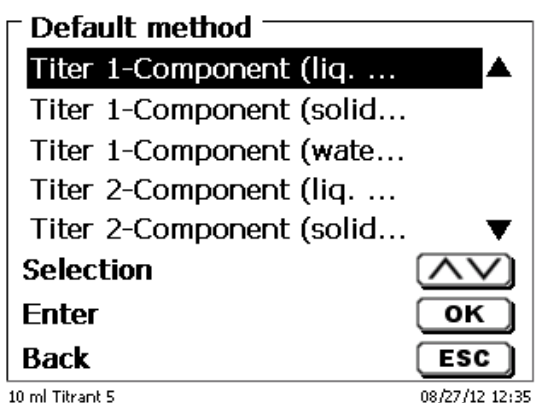From this menu, select the appropriate standard method:

Fig. 34

| Standard methods KF | Application |
|---|---|
| Titer 1-Component (liquid standard) | Determination of the concentration of the titration agent. Suitable for 1-component reagents. Standard is a liquid standard in ampoules with a concentration of 10 mg/g. |
| Titer 1-Component (solid standard) | Determination of the concentration of the titration agent. Suitable for 1-component reagents Standard is the standard substance sodium tartrat dihydrate with a water amount of 15.66 %. |
| Titer 1-Component (water) | Determination of the concentration of the titration agent. Suitable for 1-component reagents Standard is pure water |
| Titer 2-Component (liquid standard) | Determination of the concentration of the titration agent. Suitable for 2-component reagents. Standard is a liquid standard in ampoules with a concentration of 10 mg/g. |
| Titer 2-Component (solid standard) | Determination of the concentration of the titration agent. Suitable for 2-component reagents Standard is the standard substance sodium tartrat dihydrate with a water amount of 15.66 %. |
| Titer 2-Component (water) | Determination of the concentration of the titration agent. Suitable for 1-component reagents Standard is pure water |
| Sample 1-Component | Method for sample titrations with 1-component reagents |
| Sample 2-Component | Method for sample titrations with 2-component reagents |

Statistics are switched on. The mean value of the titer in mg/ml is automatically saved in the attachment. It is then used automatically in the sample titration.

The results of the sample titration are calculated in %. If needed, the unit can be converted into other units of measure, such as ppm.

### 3.6.2 Automatic KF Titration

The method being displayed can now be carried out immediately with <START>. The preconditioning is run first. The solvent and the titration vessel contain moisture (water) that should not influence the calculation of the result. The conditioning is run automatically after the Start button or the F1 key are pressed. The final conditions are the same as the conditions of the actual sample titration.
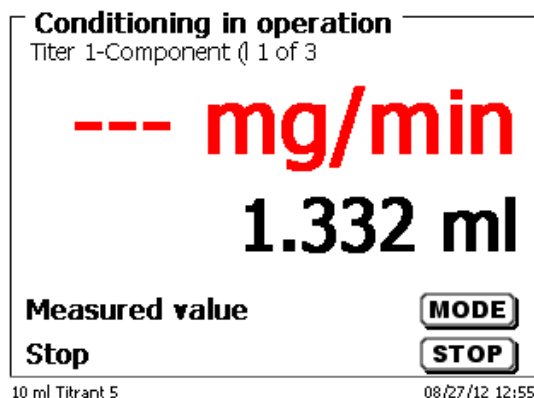
Fig. 35

When the final criteria are met, then there is an audible signal and Conditioning ready is shown on the display:
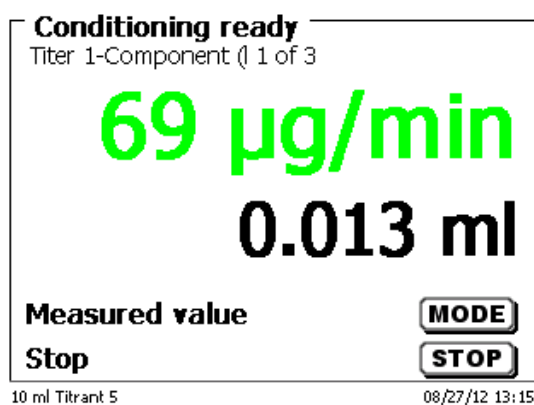


Fig. 36

The conditioning remains active until the actual titration is started by pressing <F1/START>. You are prompted immediately to add the sample:
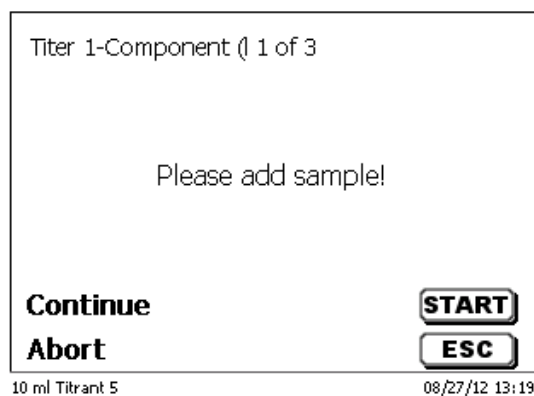


Fig. 37

After the sample or the standard is added, you must press <F1/START> again. Depending on the method settings, you will be prompted for the sample identification (Fig. 38) and the weighed-in quantity (Fig. 39). You can use an external PC keyboard for entering a 20-digit alphanumeric sample ID.
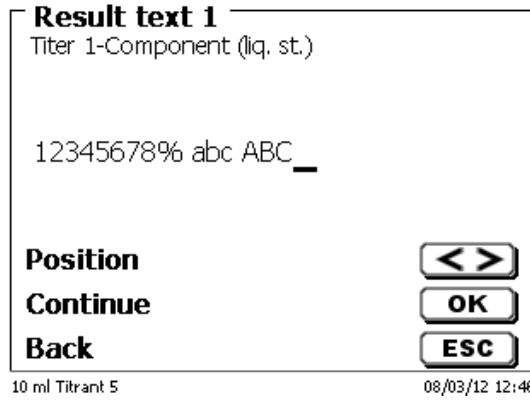
```
┌─ Result text 1 ─────────────────┐
│  Titer 1-Component (liq. st.)    │
│                                  │
│                                  │
│   12345678% abc ABC_             │
│                                  │
│                                  │
│  Position              < >       │
│  Continue              OK        │
│  Back                  ESC       │
│                                  │
│  10 ml Titrant 5       08/03/12 12:46 │
└──────────────────────────────────┘
```

Fig. 38

```
┌─ Edit weight ───────────────────┐
│                                  │
│      003.12810g                  │
│                                  │
│  Value                 ∧∨        │
│  Position              < >       │
│  Continue              OK        │
│  Back                  ESC       │
│                                  │
│  20 ml NaOH 0.1 mol/L  09/13/11 9:03 │
└──────────────────────────────────┘
```
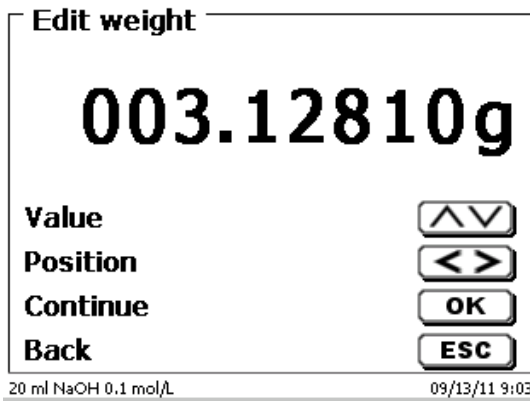
Fig. 39

The balance data can be entered using the front keyboard or an external keyboard. The input is to be confirmed with <OK>/<ENTER>.

In the case of an automatic acceptance of the balance data, the weighed-in quantities will be read in from a memory. If the memory does not contain any balance data, a message will appear to indicate that no balance data are present:

```
┌─ Titration is running ──────────┐
│  pH titration                    │
│  No balance data available. Wait for │
│  automatic sample weight.        │
│                                  │
│                                  │
│                                  │
│  Titration progress    MODE      │
│  Stop                  STOP      │
│                                  │
│  20 ml NaOH 0.1 mol/L  09/13/11 9:04 │
└──────────────────────────────────┘
```
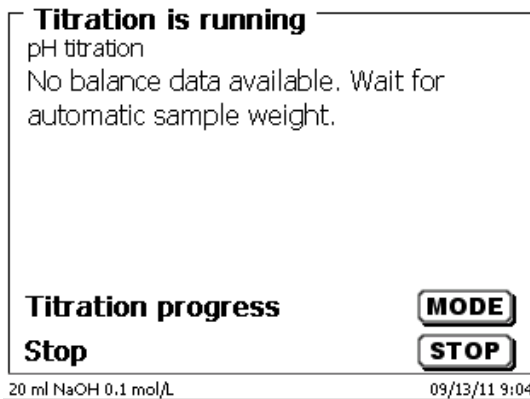
Fig. 40

Pressing the Print key will transfer the balance data, too. Titration will then begin directly after the transfer of the balance data without any further confirmation being necessary. The display shows either

the use in ml with the drift in µg/min
or the drift with the measured value in µA
or the titration curve in ml/time [s].

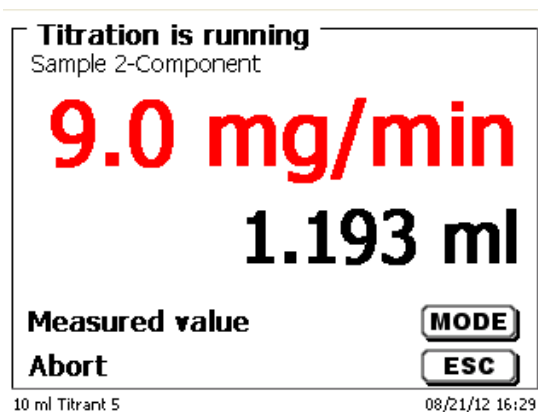You can switch between the individual displays with the <F6/MODE> key: The graphics are scaled automatically:
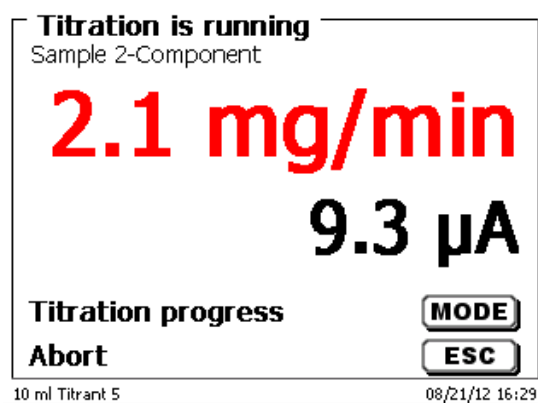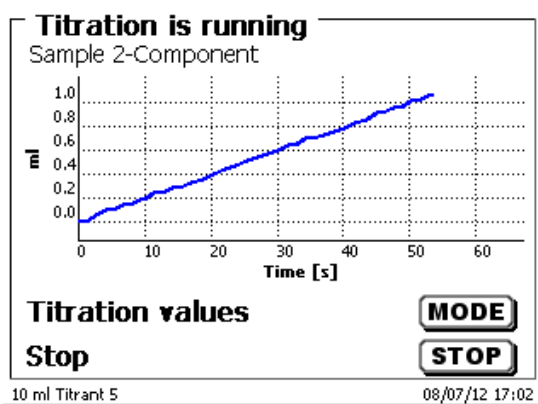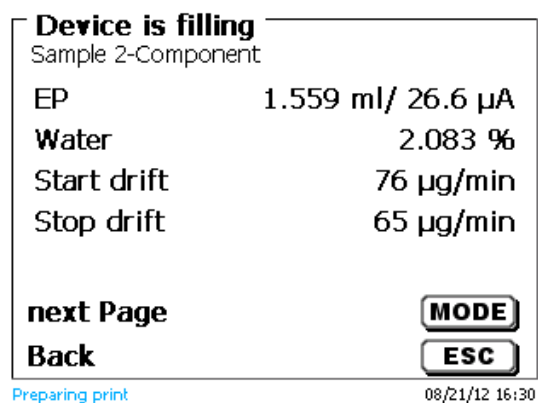
Fig. 41

Fig. 42

Fig. 43

Scaling of the chart will be done automatically. The result will be displayed at the end of the titration (Fig. 44 and 45).

Fig. 44

<MODE>/<F6> can be used to view the titration curve or further results:
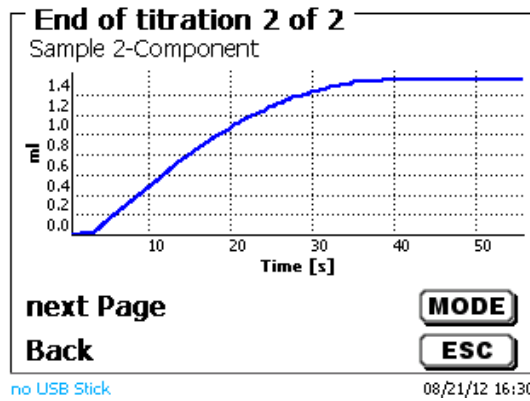


Fig. 45

If a printer is connected, the results will either be printed according to the settings made for the method, or else they will be memorised in the form of a PDF- and CSV-file file on a connected USB stick. If no printer or USB stick is connected, the bottom left corner of the display will show the message "no printer" or "no USB stick".<ESC> will take you back to the main menu where you can start the next titration immediately.

### 3.6.3 Dosage

To start a dosage method, please use the <START>/<F1> or the black key of the "mouse".
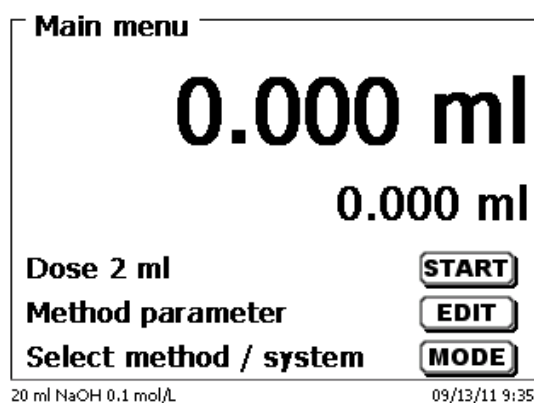


Fig. 46


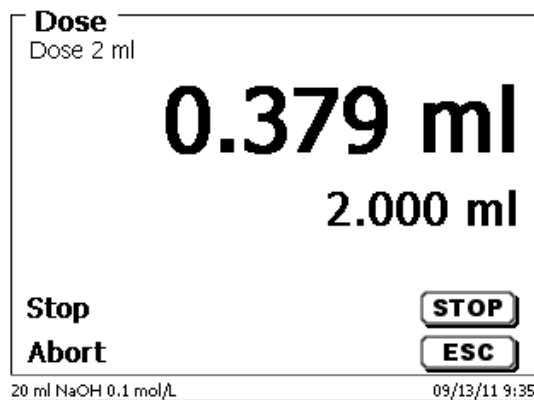
Fig. 47

The dosed volume will be briefly displayed before the display returns to the main menu.

**Dose**
Dose 2 ml

# 2.000 ml

2.000 ml

Back                    ESC

20 ml NaOH 0.1 mol/L              09/13/11 9:38

Fig. 48

**Main menu**

# 2.000 ml

2.000 ml

| Dose 2 ml | START |
| Method parameter | EDIT |
| Select method / system | MODE |

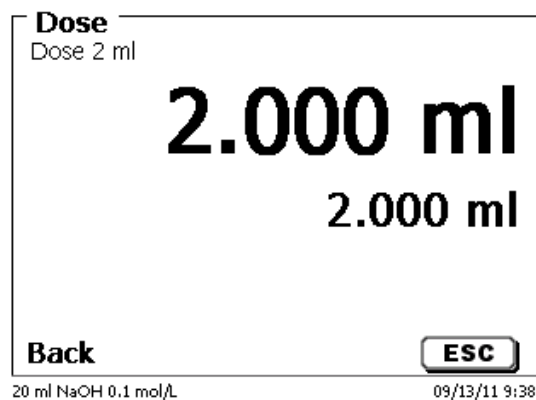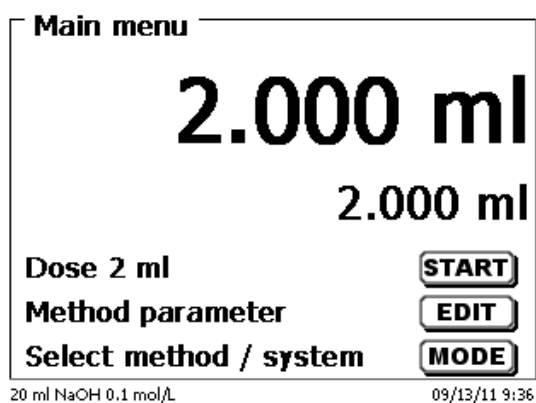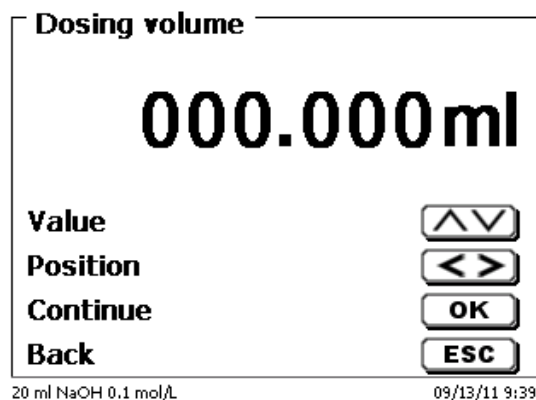20 ml NaOH 0.1 mol/L              09/13/11 9:36

Fig. 49

The next dosage operation can be started immediately. Filling of the unit will occur automatically. This option can be switched off. Then the cylinder will be filled when the maximum cylinder volume is reached. The unit can be filled at any time using <FILL>.

A dosing operation can also be performed without any dosing method with the <DOS>/<F10> key of the external keyboard:

**Dosing volume**

# 000.000ml

| Value | ∧∨ |
| Position | < > |
| Continue | OK |
| Back | ESC |

20 ml NaOH 0.1 mol/L              09/13/11 9:39

Fig. 50

This is the point to input the volume which will be dosed following the confirmation with <ENTER>/<OK>:
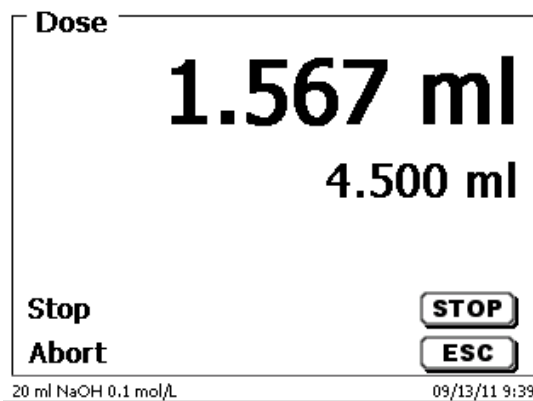
Fig. 51

Pressing the <ENTER>/<OK> key will cause the next dosing operation to be performed immediately:
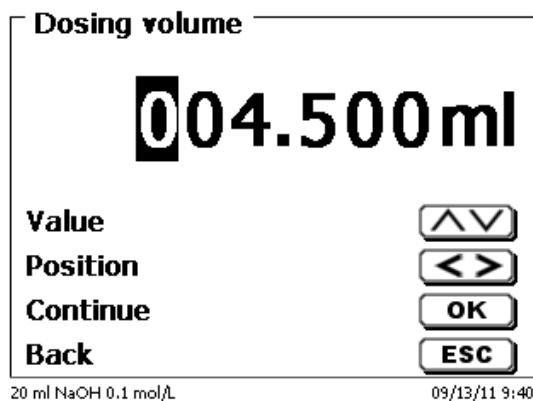


Fig. 52

In this case further dosages can be performed using <ENTER>/<OK>. Filling of the unit following dosage will not occur automatically here, unless the maximum cylinder volume has been reached. The unit can be filled at any time using <FILL>. <ESC> will take you back to the main menu.

### 3.6.4 Preparing Solutions

The so-called "Preparing solutions" method is a special dosing method. In this process, a solvent is dosed to a sample weight of a substance until the desired target concentration is reached:
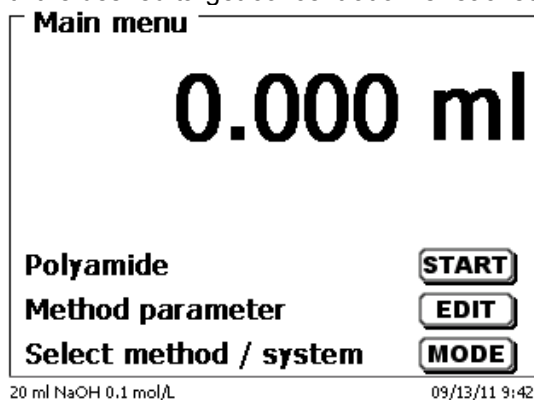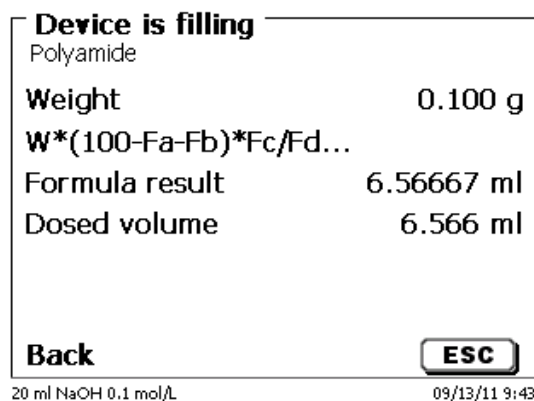
Fig. 53

Fig. 54

Fig. 55

If the calculated volume is greater than the maximum volume, an error message will be displayed and dosage will be suppressed for safety reasons:
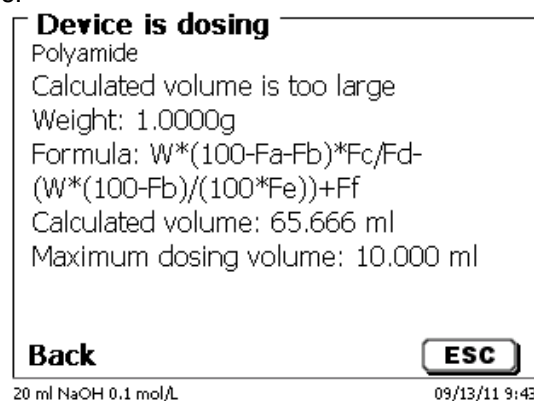
Fig. 56

# 4    Method Parameters

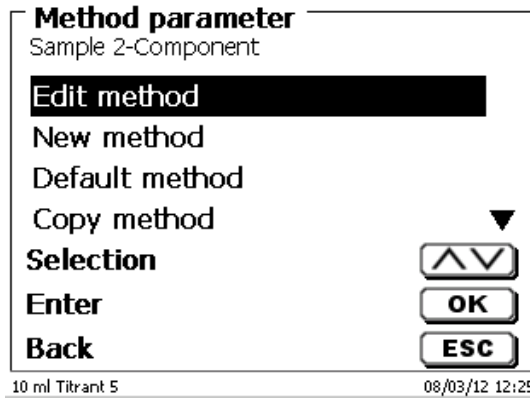From the main menu (Fig. 53), <EDIT>/<F3> will take you to the method parameters:

```
┌ Method parameter ─────────
Sample 2-Component

Edit method
New method
Default method
Copy method              ▼
Selection              ⟨∧∨⟩
Enter                  ⟨ OK ⟩
Back                   ⟨ ESC ⟩
10 ml Titrant 5            08/03/12 12:25
```

Fig. 57

## 4.1  Method editing and new method

If you select <edit method> or <new method> you will be taken to the modification or new creation of a method. Selecting <new method> will always lead to the prompt for the input of a method name (Fig. 58). This prompt will not appear in the case of the modification of an already created method.

```
┌ New method ───────────────
Method name



Methode 04




Position               ⟨ < > ⟩
Continue               ⟨ OK ⟩
Back                   ⟨ ESC ⟩
10 ml Titrant 5            08/03/12 12:26
```
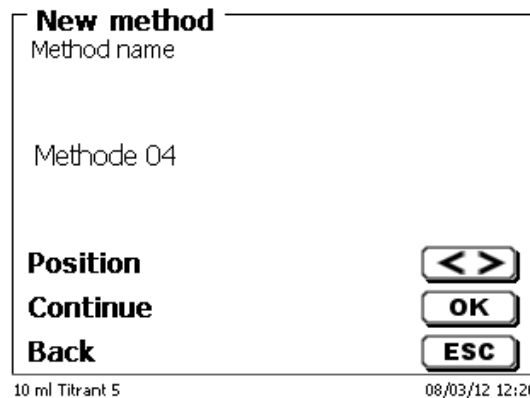
Fig. 58

The method name can contain up to 21 characters. Special characters are also possible. If no keyboard is connected, the method name being displayed has to be adopted (in the present case "Method 04"). Numbering of methods will occur automatically. Press <OK>/<ENTER> to confirm the input. The method name can be changed at any time. Please continue at this point with **Chapter 4.5**.

## 4.2  Default methods

The <Default methods> item of the TitroLine® 7500 KF contains a series of ready-made standard methods which can be conveniently selected (Fig. 59).

```
┌ Default method ───────────
Titer 1-Component (liq. ...   ▲
Titer 1-Component (solid...
Titer 1-Component (wate...
Titer 2-Component (liq. ...
Titer 2-Component (solid...   ▼
Selection              ⟨∧∨⟩
Enter                  ⟨ OK ⟩
Back                   ⟨ ESC ⟩
10 ml Titrant 5            08/03/12 12:28
```
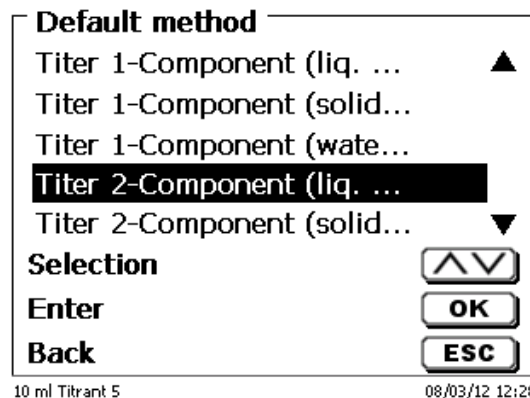
Fig. 59

Once the selection made, you are directly prompted for the input of the method name.

```
┌─ New method ──────────────┐
│ Method name               │
│                           │
│                           │
│   Titer 2-Component (liq. st.) │
│   ─                       │
│                           │
│                           │
│ Position           < >    │
│ Continue           OK     │
│ Back               ESC    │
├───────────────────────────┤
│ 10 ml Titrant 5   08/03/12 12:28 │
└───────────────────────────┘
```

Fig. 60

The standard name may be adopted or modified. Subsequently, you will be taken to the <Change method parameters> item. Please continue at this point with **Chapter 4.6**

## 4.3  Copy Methods

Methods can be copied or stored with a new name. If you select this function, the current method will be copied and you can include a new name

```
┌─ New method ──────────────┐
│ Method name               │
│                           │
│                           │
│   Sample 2-Component[1]    │
│   ─                       │
│                           │
│                           │
│ Position           < >    │
│ Continue           OK     │
│ Back               ESC    │
├───────────────────────────┤
│ 10 ml Titrant 5   08/03/12 12:29 │
└───────────────────────────┘
```

Fig. 61

A new name with the suffix [1] is assigned automatically in order to avoid the existence of two methods having the same name. Subsequently, you will be taken to the <Change method parameters> item. Then you proceed with **Chapter 4.6**.

## 4.4  Delete Methods

If this function is selected, you will be prompted to know whether the current method is actually to be deleted. You have to reply **<Yes>** in explicit terms and also confirm this reply with <OK>/<ENTER>.

```
┌─ Delete method ───────────┐
│ Sample 2-Component        │
│ ┌───────────────────────┐ │
│ │ Yes                   │ │
│ └───────────────────────┘ │
│   No                      │
│                           │
│                           │
│ Selection          ∧∨     │
│ Enter              OK     │
│ Back               ESC    │
├───────────────────────────┤
│ 10 ml Titrant 5   08/03/12 12:31 │
└───────────────────────────┘
```

Fig. 62

## 4.5  Print method

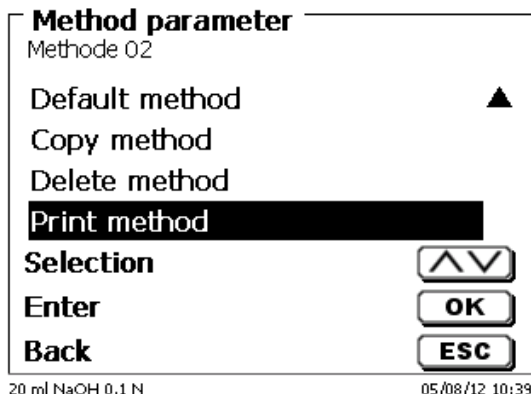The currently selected method can be printed on a connected printer or stored on an USB drive as PDF file

```
┌─ Method parameter ──────────
  Methode 02

  Default method              ▲
  Copy method
  Delete method
  Print method
  Selection              [∧∨]
  Enter                  [ OK ]
  Back                   [ ESC ]
```

Fig. 63        20 ml NaOH 0.1 N                    05/08/12 10:39

## 4.6  Change Method Parameters

The input or modification of the method name was already described in **Chapters 4.1** and 4.3.

```
┌─ Edit method parameter ──────
  Sample 2-Component

  Method name
  Method type            auto
  Mode                   KF
  Result                 ▼
  Selection              [∧∨]
  Enter                  [ OK ]
  Back                   [ ESC ]
```

Fig. 64        20 ml Titrant 5                     08/27/12 15:07
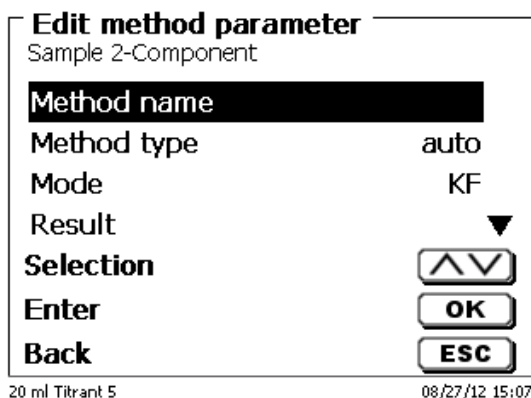
### 4.6.1  Method type

On the <Method type> you can select whether you wish to perform a manual or automatic titration, a dosage or whether you wish to prepare a solution.
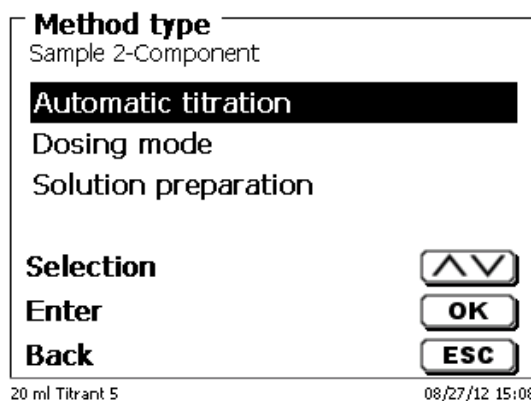
```
┌─ Method type ───────────────
  Sample 2-Component

  Automatic titration
  Dosing mode
  Solution preparation


  Selection              [∧∨]
  Enter                  [ OK ]
  Back                   [ ESC ]
```

Fig. 65        20 ml Titrant 5                     08/27/12 15:08

The selection of the Method type will have an influence on the further parameterisation of the method. For instance, if you select the dosing mode, neither a selection of a formula nor a change of the automatic titration mode (KF and dead stop) will be available.

For an automatic titration, you can select from the following modes:

- KF titration
- Dead Stop titration

### 4.6.1.1 KF and Dead stop titration

KF titration is a specific form of dead-stop titration. In normal dead-stop titration, titration is to the specified value in µA, which must be maintained for a defined time. In KF titration, this still occurs, but a specified drift criterion in µg/min must also be met. With KF titration, a conditioning step is also is preset in order to eliminate any moisture in the titration vessel and the solvent.

The first stage of the Dead stop and KF titration consists in the continuous dosing up to a delta value away from the set end point. The dosing speed can be adjusted. Subsequently, titration is performed with linear step sizes between the delta value and the end point.

The following titration parameters can be set for the dead-stop and KF titration:

| Titration parameter | Dead-stop titration | KF titration |
|---|---|---|
| µA-Endpoint | X | X |
| Delta µA-value | X | X |
| Linear steps in ml | X | X |
| Endpoint delay in s | X | X |
| Delay time (between linear steps) | X | X |
| Start delay time /extraction time | X | X |
| Conditioning on/off | - | X |
| Pre - titration in ml | X | X |
| Polarization voltage in mV | X | X |
| Minimum und maximum titration time in s | - | |
| Max. titration volume | X | X |
| Drift in µg/min | X | X |
| Dosing speed in % | | |

### 4.6.2 Result

Result offers the following settings:



```
┌─ Result ──────────────────────┐
│  Titer 1-Component (liq. st.)  │
│                                │
│  Result text                   │
│  Formula                       │
│  Unit                  mg/ml   │
│  Decimal places          4 ▼   │
│  Selection            [ ∧ ∨ ]  │
│  Enter                [  OK ]  │
│  Back                 [ ESC ]  │
│  10 ml Titrant 5   08/03/12 12:45 │
└────────────────────────────────┘
```

Fig. 71 d

The **Result text** may contain up to 21 alphanumeric characters including special characters.

```
┌─ Result text 1 ──────────
│ Titer 1-Component (liq. st.)
│
│
│  12345678% abc ABC_
│
│
│ Position              <>
│ Continue             OK
│ Back                 ESC
  10 ml Titrant 5        08/03/12 12:46
```

Fig. 72

Please confirm your input with <OK</<ENTER>.

### 4.6.2.1  Calculation Formula

The appropriate calculation formula is selected on the **Formula selection** submenu:

```
┌─ Formula selection ──────
│ Titer 1-Component (liq. st.)
│ ┌────────────────────────┐
│ │EX1                     │
│ └────────────────────────┘
│ (EX1-B)*T*M*F1/(W*F2)
│ (W*F2)/((EX1-B)*M*F1)
│
│ Selection            ∧∨
│ Enter                OK
│ Back                 ESC
  10 ml Titrant 5        08/03/12 12:47
```

Fig. 73 a

The following calculation formulae are available for automatic titration mode:

| Formula | Additional information |
|---|---|
| EP | Formula for calculating only the ml consumption |
| (EP-B)*T*M*F1/(W*F2) | Formula for calculating the concentration of a sample taking into account a blank value in terms of ml. |
| (W*F2)/(EP-B)*M*F1) | Formula for calculating a titer (T) of a titration solution. |

The abbreviations used here have the following meaning:

EP:         Consumption at the end point in ml
B:          Blank value in ml. Mostly determined by way of titration
T:          Titer of the titration solution (e.g. 5.012)
M:          Mol; mol- or equivalence weight of the sample
F1-F5       Factor 1-5. conversion factors
W           "Weight", weighed-in quantity in g or volume in ml."

After selecting a formula, please confirm your selection with <OK>/<ENTER>:

**Formula parameter**
(EX1-B)*T*M*F1/(W*F2)

| B (Blank value) | 0.0000 ml |
|---|---|
| M (Mol) | 1.00000 |
| F1 (Factor 1) | 0.1000 |
| W (Amount) | man ▼ |
| **Selection** | △▽ |
| **Enter** | OK |
| **Back** | ESC |

20 ml Titrant 5                    08/27/12 16:40

Fig. 69

The values for the blank value and the factors can be entered manually or read from a global memory. The values from a global memory were defined in advance by a titration or were manually entered.

**Formula parameter**
B (Blank value)

fix value

global memory

| **Selection** | △▽ |
|---|---|
| **Enter** | OK |
| **Back** | ESC |

20 ml NaOH 0.1 N                    05/08/12 12:00

Fig. 70

**Titre**
Global memory

| M01 | blank value | *0.3190 |
|---|---|---|
| M02 | Titer | *5.1710 |

| **Selection** | △▽ |
|---|---|
| **Enter** | OK |
| **Back** | ESC |

10 ml Titrant 5                    08/03/12 13:04

Fig. 71

The used global memory is displayed. Here in the example it is MO1 and MO2:

**Formula parameter**
(EX1-B)*T*M*F1/(W*F2)

| B (Blank value) | M01 |
|---|---|
| M (Mol) | 1.00000 |
| F1 (Factor 1) | 1.0000 |
| W (Amount) | man ▼ |
| **Selection** | △▽ |
| **Enter** | OK |
| **Back** | ESC |

20 ml Titrant 5                    08/27/12 16:46

Fig. 72

Storing results in global memories is described in Chapter 4.6.3.7

The values of the individual parameters of the selected calculation formula can now be input one by one.

**Formula parameter**
F1 (Factor 1)

## +00000.1000

| | |
|---|---|
| Value | ∧∨ |
| Position | < > |
| Continue | OK |
| Back | ESC |

10 ml Titrant 5                    08/03/12 13:07

Fig. 73

### 4.6.2.2  Sample weight and volume (sample quantity)

**Formula parameter**
(EX1-B)*T*M*F1/(W*F2)

| | |
|---|---|
| B (Blank value) | M01 |
| M (Mol) | 1.00000 |
| F1 (Factor 1) | 1.0000 |
| **W (Amount)** | **man ▼** |
| Selection | ∧∨ |
| Enter | OK |
| Back | ESC |

20 ml Titrant 5                    08/27/12 16:48

Fig. 74

**Formula parameter**
Amount

| | |
|---|---|
| **Weight manual** | |
| Weight automatic | |
| Fixed weight | |
| Manuel Volume | ▼ |
| Selection | ∧∨ |
| Enter | OK |
| Back | ESC |

20 ml NaOH 0.1 mol/L              09/13/11 12:44

Fig. 75

The Sample Quantity (W) item is used to select whether one is wishing to use a sample weight or a sample volume for titration or solution preparation.

You have the following options:

- **Manual sample weight**: The sample weight is enquired by a prompt at the start of the method/after conditioning (KF)
- **Automatic sample weight:** The sample weight is automatically transferred by a connected balance.
- **Fixed sample weight**: A fixed sample weight is input in g. This weight will then automatically be used for each start of the method.
- **Manual sample volume**: The sample volume in ml is prompted at the start of the method and manually input.
- **Fixed sample volume**: A fixed sample volume is input in ml. This volume will then automatically be used for each test of the method.

#### 4.6.2.3 Formula unit

The formula unit can be selected in the **Unit** submenu.
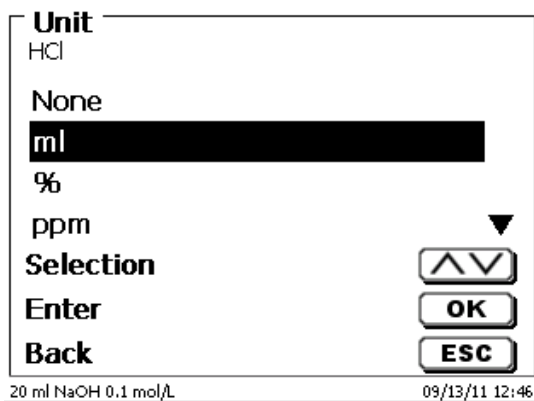


Fig. 76

Once the selection made (e.g. %), the unit will also be displayed as piece of information on the display.
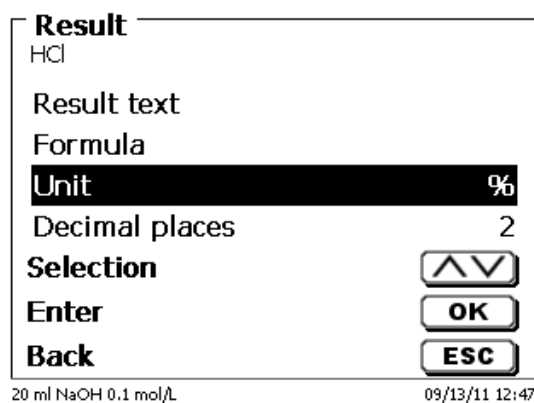


Fig. 77

#### 4.6.2.4 Formulae for the Preparation of Solutions

A selection of special calculation formulae is available for the Prepare Solutions mode. The appropriate calculation formula is selected on the Formula Selection submenu:
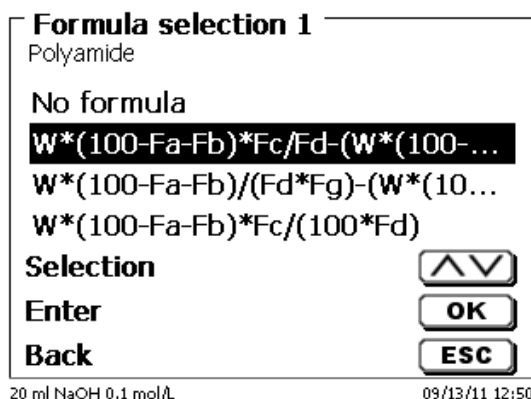
```
┌─ Formula selection 1 ──────────
  Polyamide

  No formula
  W*(100-Fa-Fb)*Fc/Fd-(W*(100-...
  W*(100-Fa-Fb)/(Fd*Fg)-(W*(10...
  W*(100-Fa-Fb)*Fc/(100*Fd)

  Selection              [∧∨]

  Enter                  [ OK ]

  Back                   [ ESC ]
  ─────────────────────────────
  20 ml NaOH 0.1 mol/L        09/13/11 12:50
```

Fig. 78

A selection of 3 different calculation formulae is available:

**W\*(100-Fa-Fb)\*Fc/Fd - W\*(100-Fb) / (100\*Fe) +Ff**

**W\*(100-Fa-Fb)\*(Fd/Fg ) - W\*(100-Fb) / (100\*Fg) +Ff**

**W\*(100-Fa-Fb)\*Fc / (100\*Fd)**

Meaning of the individual factors:

W:      Weight of the sample in g

Fa:     Soluble foreign-matters portion in %

Fb:     insoluble foreign-matter portion in %

Fc:     Conversion factor for it unit
| | |
|---|---|
| g/l | = 10 |
| mg/l und ppm | = 10000 |
| g/100 ml | = 1 |
| % | = 1 |

Fd:     Target concentration of the solution to be prepared in g/l, mg/l (ppm), g/100 ml, or %

Fe:     Specific weight of the weighed-in sample in g/cm³

Ff:     Volume correction in ml. this volume correction is the required surplus dosage for compensating the volume contraction and the specific-weight difference between the sample weight and the solvent (please observe the note on volume correction)

Fg:     Specific weight of the solvent used in g/cm³

**Note on volume correction:**

The user has to decide on a case-by-case basis whether a volume correction is necessary and according to which procedure this correction is to be performed. As a rule, this volume correction may be omitted in the case of solutions with very low percentages of diluted substance.

### 4.6.2.5 Decimal digits

To conclude, it is possible to determine the number of decimal digits from 2-6. The standard setting is 2.
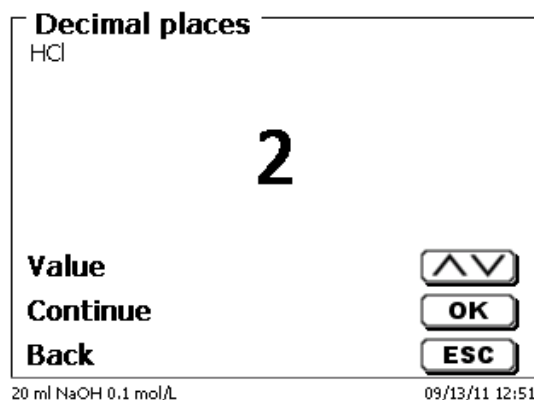
Fig. 79

### 4.6.2.6 Statistics

The mean value and relative standard deviation can be automatically calculated and documented by using statistics.

Fig. 80
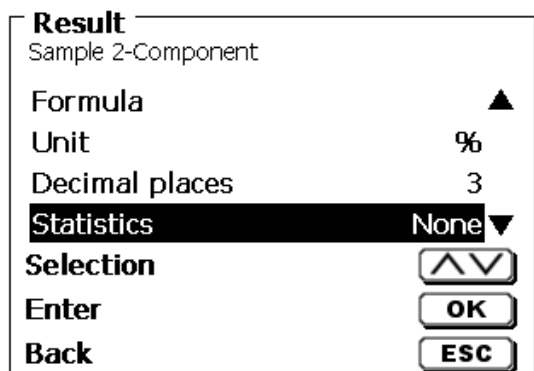
The calculation of the mean value is already possible from two individual values. The calculation of the relative standard deviation is only possible from 3 single values. The maximum quantity is 10.
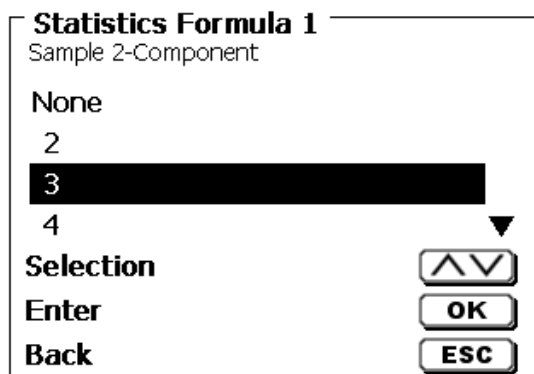
Fig. 81

The mean value and the relative standard deviation (RSD) are shown directly on the display.

### 4.6.2.7 Global Memories

Results of titrations can be written into one of the 50 global memories (M01 - M50) for additional calculations.
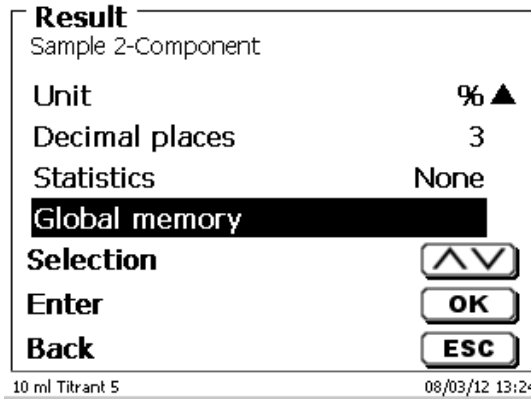


Fig. 82

The mean value is written into the global memory when the statistic is switched on. You enter the submenu with **<Enter/OK>**. If a global memory has not been created, a memory can be created by using the insert key **<Ins>**. The titrator proposes a memory name, such as **M01** (M01- M50). The name of the memory can be changed in reference to the application. Here in this example of **"M01"** for **"Blank value"**.
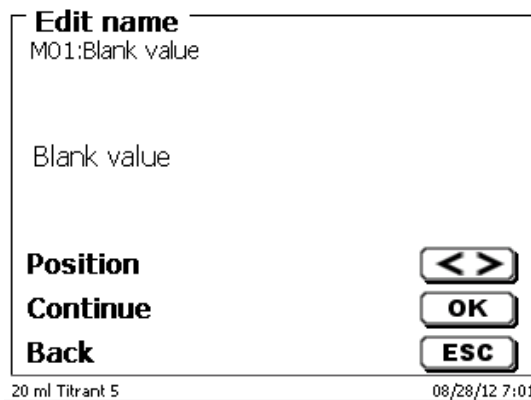


Fig. 83

This simplifies later the allocation of the global memory in another method.

**Example Titer determination:** The titer in mg/ml is defined with an extra Titer method. The result in mg/ml is thereby automatically written into global memory "Exchangeable unit".
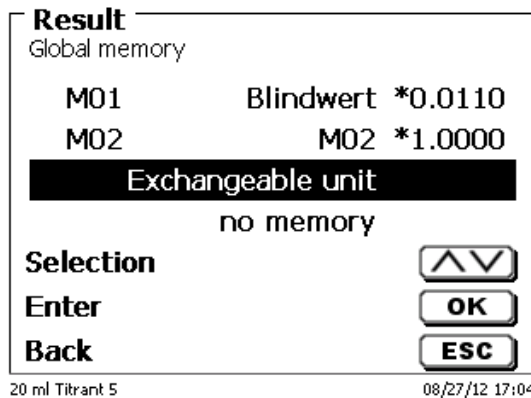


Fig. 84

The menu for the global memory can always be accessed by pressing Shift+F5 or via system settings. The name or values can be changed by using EDIT/F3 and have the methods shown that are used in the global memories.

Fig. 85

### 4.6.3 Titration parameters

The **<Titration parameter>** submenu is used to determine the actual parameters of the method. The parameters were already introduced in chapter 4.6.2.1:



Fig. 86



Fig. 87

**Generally applicable titration parameters**

Depending on the titration mode (KF or dead stop titration) it is possible to enter a variety of parameters. The following parameters are valid for the KF and dead stop titration modes:

- Initial waiting time
- Fixed delay
- Step size
- Pretitration
- Polarization voltage
- End of titration

**Start delay time/Extraction time (KF):**

With dead-stop titration, the start wait time passes at the beginning of titration. In KF titration, the start wait time = the extraction time. The extraction time ends after the sample is supplied. The start wait/extraction time can be specified between 0 and 999 seconds.
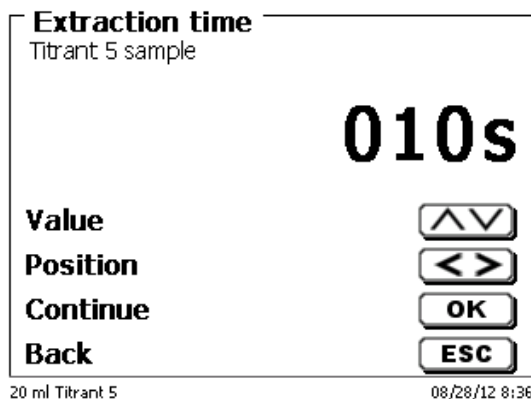
Fig. 88

**Conditioning**

Conditioning (only KF) is activated for every KF method. It can be shut off via a PC for external control:
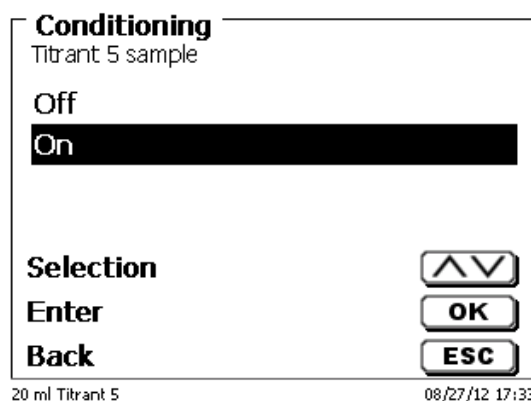
Fig. 89

**Fixed delay time**

The **fixed delay time** is the waiting time between the linear titration steps at the end of the titration until the Endpoint. The fixed delay time can be set between 0 and 999 seconds:
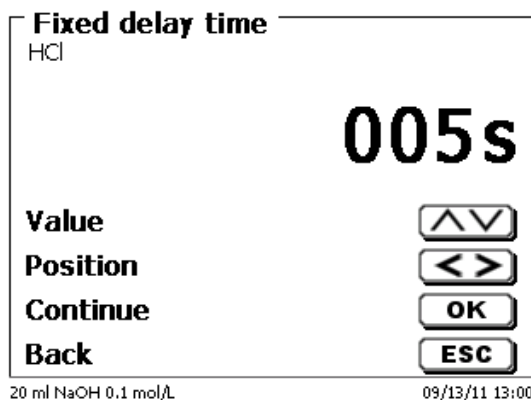
Fig. 90

**Step size**

The step size can be set from 0.001 to 5.000 ml. typical value for the KF titration are 0.002 – 0.01 ml.
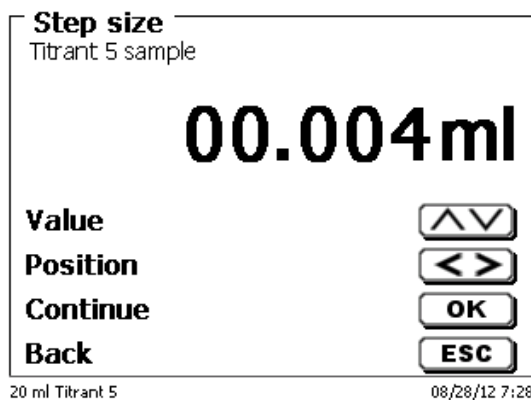
Fig. 91

In this type of titration, linear step width is used after the continuous titration stage.

**Titration direction (only dead stop titration mode)**

The titration direction can be set to "**increase**" or "**decrease**". For instance, if you wish to perform a sulfurous titration with iodine solution you have to select "**increase**". For an iodometric back titrating with Sodium thiosulfate you have to select "**decrease**".
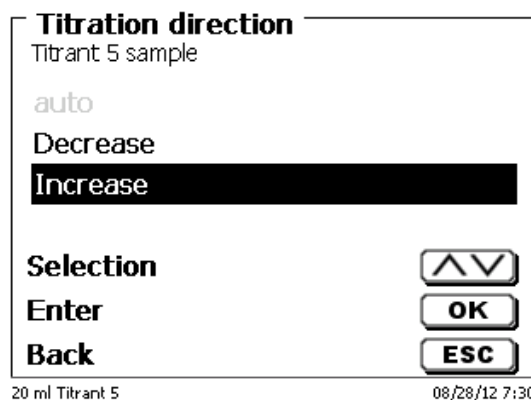


Fig. 92

**Pretitration**

If the titration agent consumption is roughly known, you can set a pretitration volume on the **<Pretitration>** menu. In this process, a defined volume is dosed ( = pretitrated) following the initial waiting time. After the addition of the pretitration volume, another defined span of time is observed as the waiting time before the next titration step is added. The pretitration volume is automatically added to the titration agent consumption. The pretitration volume can be set from 0.000 and 99.999 ml, the possible range for setting the waiting time following pretitration is between 0 and 999 seconds.
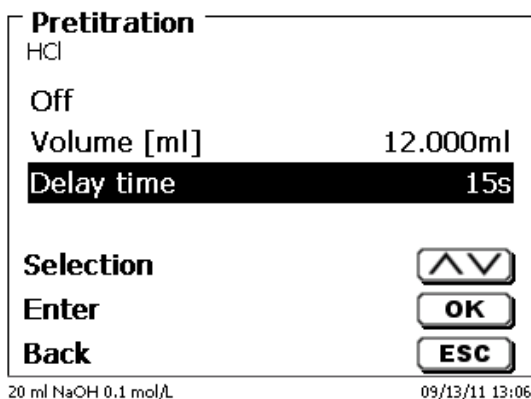


Fig. 93

**Polarization voltage**

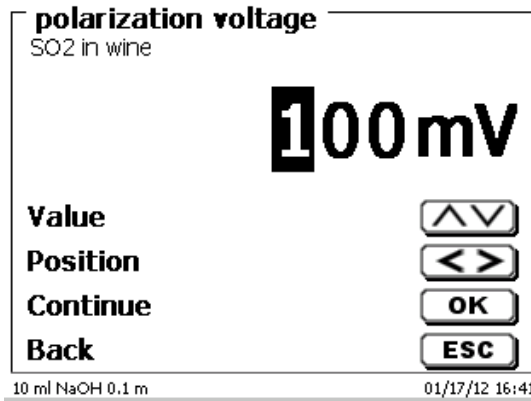Polarisation voltage in mV can be set for KF and dead stop titration.

Fig. 94

The values can be set between 40 and 220 m. The pre-setting is 100 mV.

| | |
|---|---|
| Low polarisation voltage: | insensitive |
| High polarisation voltage: | sensitive |

### 4.6.4  Titration end

The end of a titration is reached, and the result will be calculated as soon as, or if, respectively:

- The defined **End value** in µA value has been reached
- The Endpoint delay in seconds has been adhered
- The drift value in µg/min has been reached
- The predefined value ml has been reached (**Maximum titration volume**)
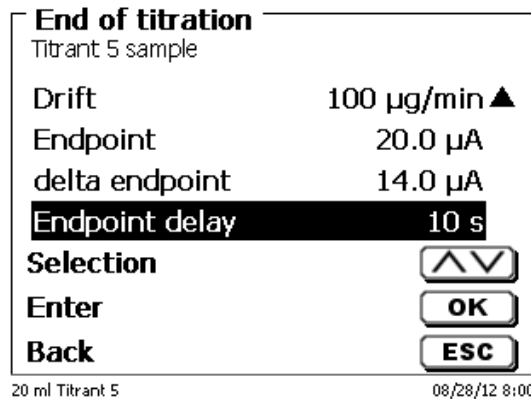- The conditions for minimum and maximum titration time are maintained
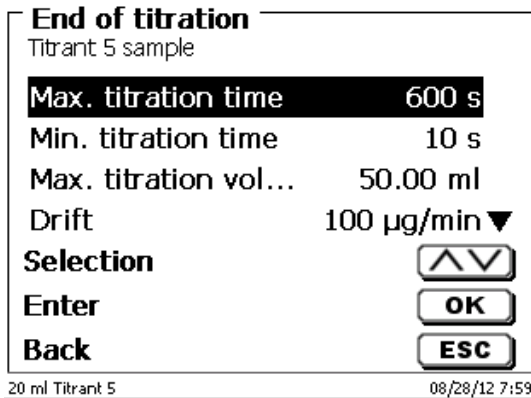


Fig. 95



Fig. 96

**Maximum titration time**

The **maximum titration time** can be set between 0 – 9999 seconds. The default setting is 600 seconds. The maximum titration time is generally used for KF titration, which can create a high continuous drift from a secondary reaction and thus cannot reach a stable endpoint.

**Minimum titration time**

The **minimum titration time** can be set between 0 – 9999 seconds. The default setting is 10 seconds. The minimum titration time prevents premature termination of the titration if there is a delay in the extraction of water from the sample. The minimum titration time is used in combination with the extraction time. It expires while the extraction time is still active.

**Maximum titration volume**

Setting of the **maximum titration volume** should always make sense. It also serves as a safety criteria to prevent excessive titration, i.e. a possible overflow of the titration vessel. The maximum titration volume can be set between 1.000 und 999.999 ml:
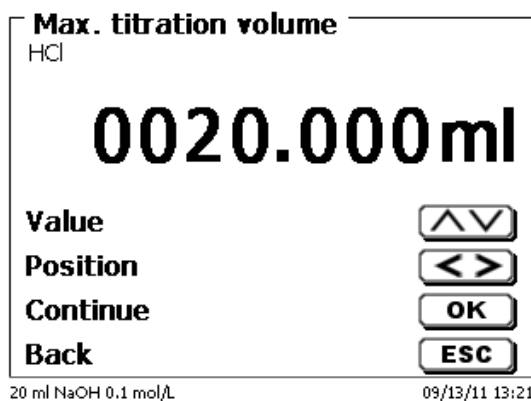


Fig. 97

The default setting is 50 ml. The volume for conditioning is included in the count!

**Drift**

The drift is calculated in µg/min from the titration mean consumption/time x concentration of the titration solution. A stable drift at the beginning and end of the titration is important if you want to obtain reproducible results. This applies in particular to samples with low water content in the bottom percentage range (<0,1%). The drift value should also not be set too low because the titration time will increase considerably. An airtight and dry titration vessel has a drift of < 50 µg/min. This corresponds to consumption of 10 µl (0,01 ml) of titrant at a concentration of 5 mg/ml. For many applications, a drift value of 100 – 150 µg/min is entirely sufficient. The default drift value setting is 100 or 150 µg/min for sample titration. 50 µg/min is the default setting for titer methods.

**Endpoint µA**

The range of the µA input can be selected between 0.0 and 100.0. For KF titration, values between 10 – 30 µA are practical. The standard value is 20 µA.

**Delta Endpoint µA**

The Delta value in µA is one of the most important parameters for KF and dead-stop titration. The lower the Delta value is, the longer the titration (dosing) is at a continuous speed. When using single-component reagents and pure methanol as a solvent, the Delta value should be set at < 5 µA. Values of 2 or 3 µA are practical. This is because the KF reaction in methanol runs relatively slowly. When using double-component reagents or also when using combination solvents, the Delta value must be set at > 10 to prevent rapid overtitration. Values of 14 or 15 µA are practical.

**Endpoint delay**

The endpoint delay is set in seconds. It can be set from 0 – 100000 seconds. The standard value is 10 seconds. Brief endpoint delays (5 seconds) are practical when

- using very small increments (e.g., 0,001 ml)
- using a titer of 1 mg/ml
- creating a secondary reaction with a higher drift value
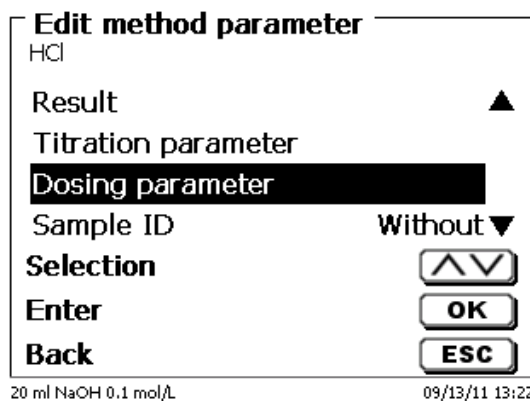
### 4.6.5 Dosing parameter



Fig. 98

The dosing parameters (dosing speed, filling speed and max. dosing/titration volume) are determined for each method. This applies to all types of methods such as automatic titration, dosing and Solution Preparation.
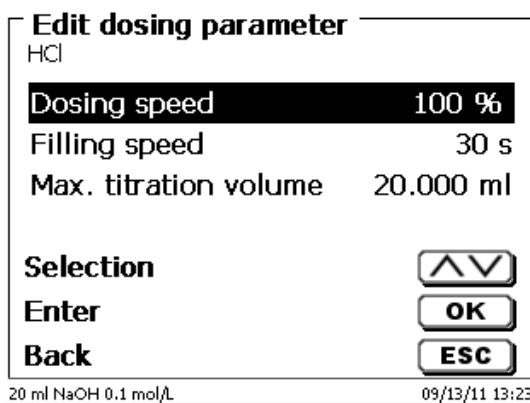


Fig. 99

The dosing speed can be set in % from 1 to 100 %. 100 % is the maximum dosing speed.

| Interchangeable unit | Max. dosing speed [ml/min] |
|---|---|
| WA 05 | 10 |
| WA 10 | 20 |
| WA 20 | 40 |
| WA 50 | 100 |

The filling speed can be set in terms of seconds from 20 to 999. The standard setting of this value is 30 seconds. For diluted aqueous solutions the filling speed can be six to 20 seconds. For non-aqueous solutions the filling speed should be set to the 30 seconds. In the case of highly viscous solutions such as concentrated sulphuric acid the filling speed should be further reduced down to 40 - 60 seconds.

Depending on the method type, the (maximum) living volume or titration volume can be set to 999.999 or even 9999.999.

The following filling options can be set for the dosing mode:
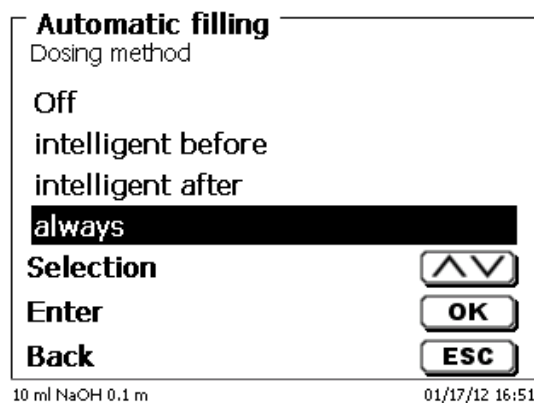
Fig. 100

If"off"is selected for filling, filling it will not occur automatically after each dosing step.

If "intelligent before" is selected for filling, a verification will be performed each time prior to the next dosing step in order to determine whether the dosing step can still be made without a filling operation. Should this prove to be impossible, the first thing to occur is filling, followed by the dosing step.

If "intelligent after" is selected for filling, a verification will be performed after the next dosing step to find out whether the next dosing step can still be made without filling.

If „always" is selected for filling, filling will occur automatically after each dosing step.

### 4.6.6    Sample identification

In the manual titration and in the preparation of solutions it is possible to input a sample identification. The possible input includes manual, automatic or no sample description at all.
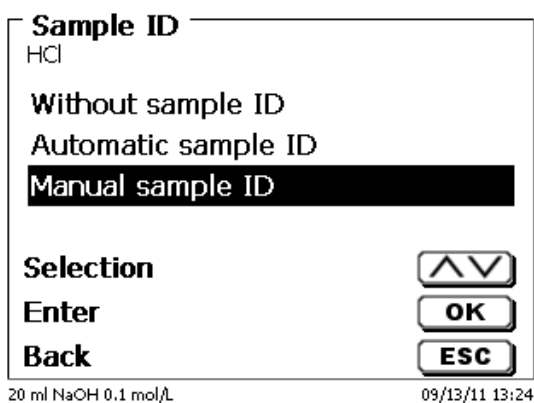


Fig. 101

For a sample description of the 'manual', a prompt for the sample description will always be displayed at the start of the method (Cp. also chapter 3.6, Main menu). For an 'automatic' sample description there will be selected a master description (in the current case this is water, cp. Fig. 102), which will then automatically be numbered starting on 01.
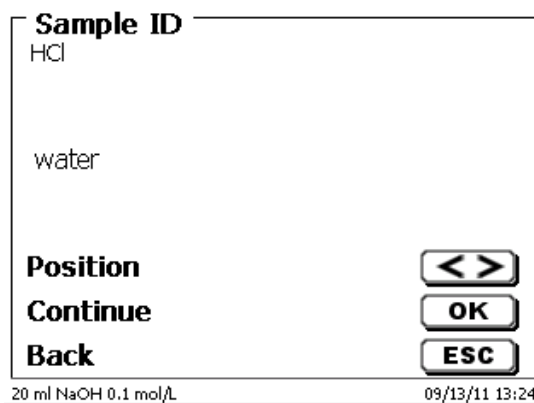


Fig. 102

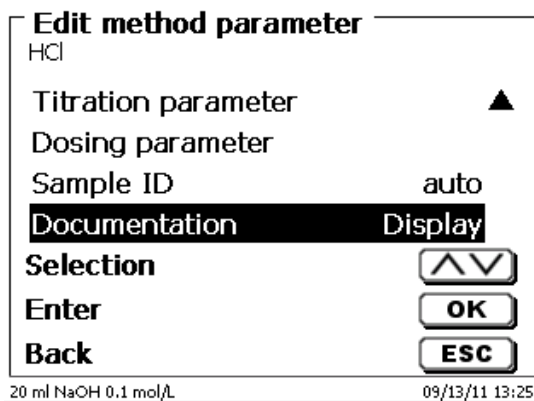After a new power-up, numbering will resume with 01.

### 4.6.7 Documentation

Fig. 103

Three different format settings are available for documentation on a printer or USB device: "short", "standard (with curve)" and "GLP":
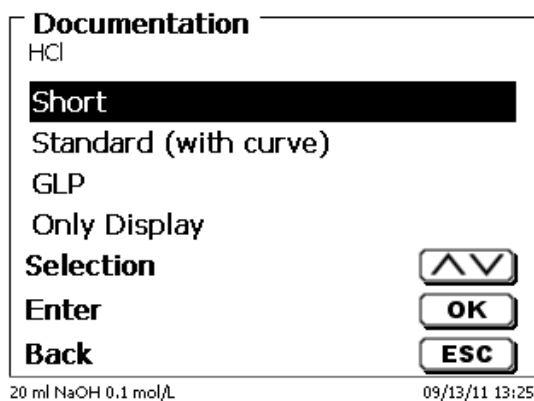
Fig. 104

| Method type | Short documentation | Standard documentation | GLP-Documentation |
|---|---|---|---|
| Automatic titration | Method name, date, time, duration of titration, sample description, weight/volume, starting and end measurement values, results and calculation formula | Same as 'Short documentation' + titration curve | Same as 'Standard documentation' + method contents |
| Dosing | Method name, date, time | N/A | Same as 'Short documentation' + method contents |
| Prepare solutions | Method name, date, time, sample designation, weight/sample, results and calculation formula | N/A | Same as 'Short documentation' + method contents |

# 5    System settings
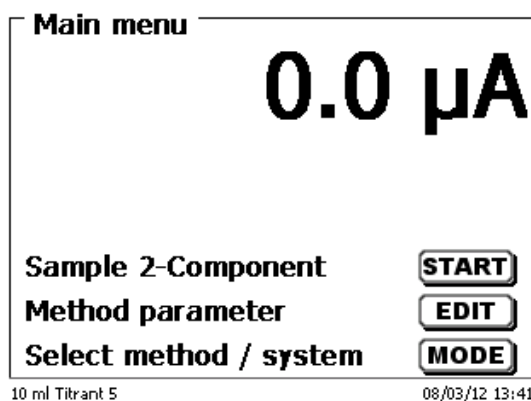


Fig. 105

From the main menu (Fig. 107), <SYS>/<F7> will get you to the system settings:
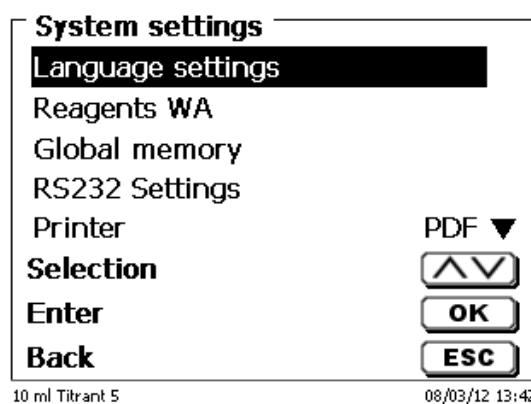


Fig. 106

Setting the national language was already described in **Chapter 2.5**.

## 5.1  Interchangeable Unit - Reagents

Each interchangeable unit is equipped with an RFID transponder. This transponder can be used to store the following information:

- Unit size: (the default setting, cannot be changed)
- Unit ID: (default setting, cannot be changed)
- Reagent name: (default: blank)
- Concentration: (default: 1.000000)
- Concentration determined on: (Date)
- To be used until: (Date)
- Opened/Produced on: (Date)
- Test according to ISO 8655: (Date)
- Charge description: (default: no charge)
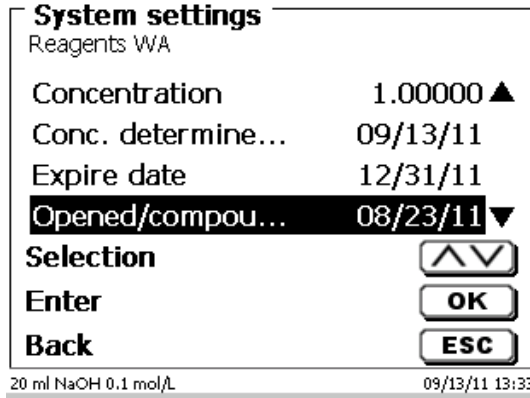- Last modification: (Date)
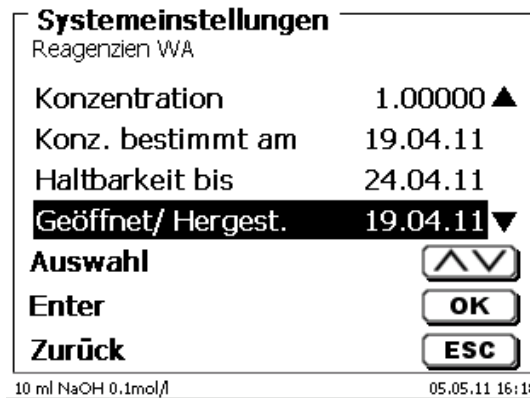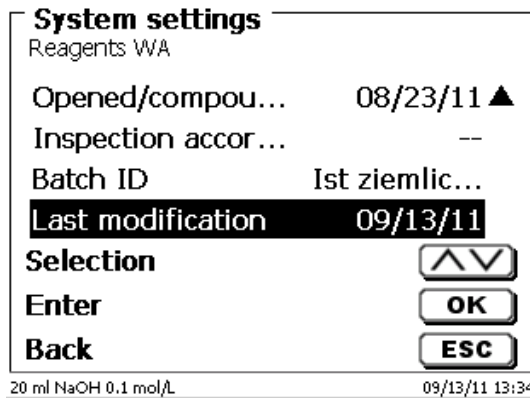
Fig. 107

Fig. 108

Fig. 109

If you leave the <Reagents WA> menu using <ESC>, you will always be prompted to know whether you wish to adopt the values:
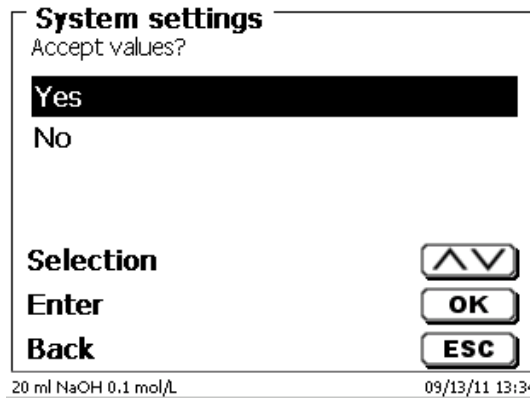
Fig. 110

If <Yes> is selected, the updated values will be written into the RFID transponder of the interchangeable unit.

## 5.2 RS232 Settings

The <RS232 settings> item can be used to determine the device address of the TitroLine® 7500 KF and set the parameters of the two RS232 interfaces independent from each other:

```
┌ System settings ─────────┐
│ RS232 Settings            │
│                           │
│ Device address      01    │
│ RS232-1 (Printer/PC)      │
│ RS232-2 (Balance)         │
│ Reset RS settings      ▼  │
│ Selection          [∧∨]   │
│ Enter              [ OK ] │
│ Back               [ ESC ]│
│ 20 ml NaOH 0.1 mol/L  09/13/11 13:36│
└───────────────────────────┘
```
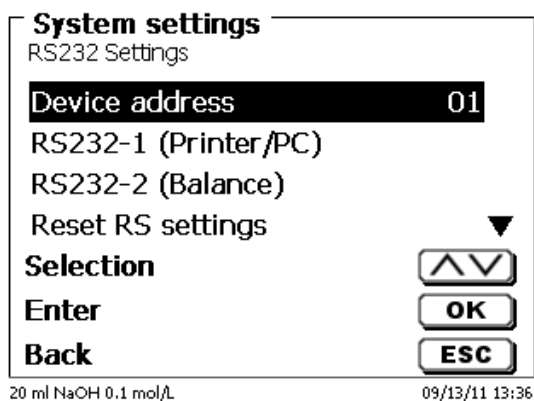
Fig. 111

The device address can be set from 0 – 15. Address 1 is the default setting:

```
┌ System settings ─────────┐
│ Device address            │
│                           │
│                           │
│            1              │
│                           │
│                           │
│ Value              [∧∨]   │
│ Continue           [ OK ] │
│ Back               [ ESC ]│
│ 20 ml NaOH 0.1 mol/L  09/13/11 13:37│
└───────────────────────────┘
```
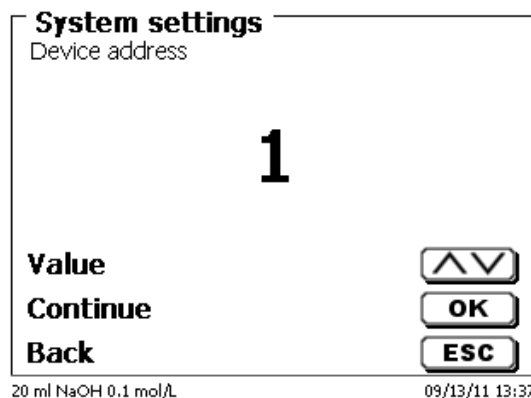
Fig. 112

The baud rate is preset to 4800. It may be set to 1200 – 19200:

```
┌ System settings ─────────┐
│ RS232-1 Settings          │
│                           │
│ Baud rate         4800    │
│ Parity              No    │
│ Data bit             8    │
│ Stop bits            1    │
│ Selection          [∧∨]   │
│ Enter              [ OK ] │
│ Back               [ ESC ]│
│ 20 ml NaOH 0.1 mol/L  09/13/11 13:37│
└───────────────────────────┘
```

Fig. 113

Fig. 114

The parity can be selected amongst <No>, <Even> and <Odd>. <No> is the default setting.



Fig. 115

You may select between 7 and 8 data bits. 8 bits is the default setting.



Fig. 116

The RS232 parameters can be set to the factory settings.

## 5.3 Date and Time

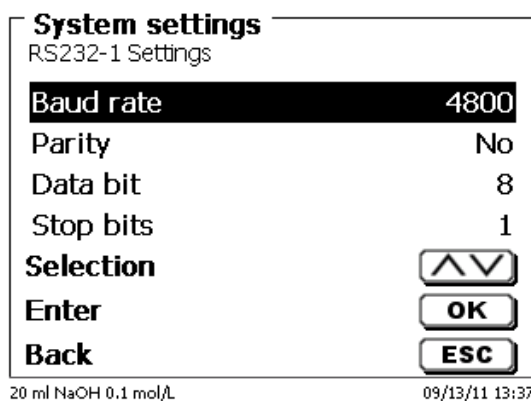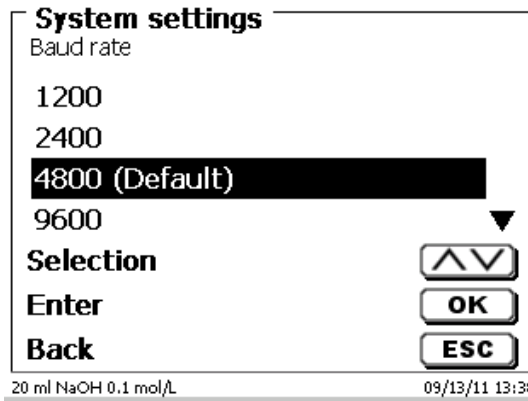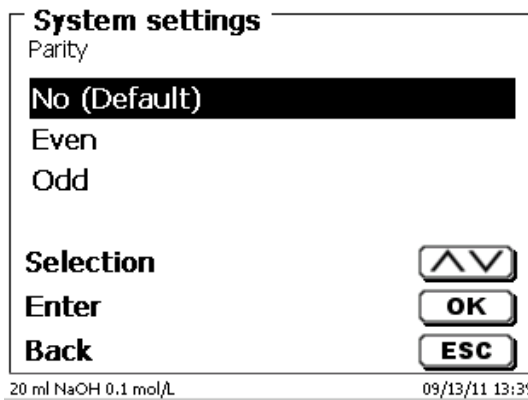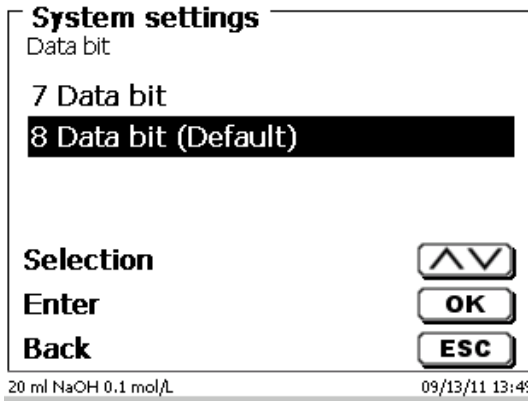The factory time setting is Central European Time. This setting may be changed, where necessary:

```
┌─ System settings ──────────────┐
│  Date and time                 │
│                                │
│  Date                09/13/11  │
│  Time               13:50:00   │
│                                │
│                                │
│  Selection            [∧ ∨]    │
│  Enter                [ OK ]   │
│  Back                 [ ESC ]  │
├────────────────────────────────┤
│ 20 ml NaOH 0.1 mol/L  09/13/11 13:50│
└────────────────────────────────┘
```
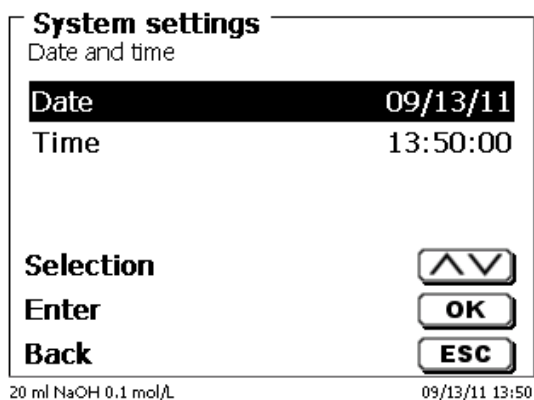
Fig. 117

## 5.4 Password

The activation of the password has not yet been implemented for the current version 12_18. Please contact SI Analytics for sending you an update version.

## 5.5 RESET

RESET will reset all settings to the factory setting.

**Please note:** All methods will also be deleted. So please print the methods or export/copy them to a **connected USB storage medium (this will be possible with a higher update!).**

The RESET has to be confirmed separately once again:

```
┌─ System settings ──────────────┐
│  Reset to factory settings?    │
│                                │
│  Yes                           │
│  No                            │
│                                │
│                                │
│  Selection            [∧ ∨]    │
│  Enter                [ OK ]   │
│  Back                 [ ESC ]  │
├────────────────────────────────┤
│ 20 ml NaOH 0.1 mol/L  09/13/11 13:50│
└────────────────────────────────┘
```
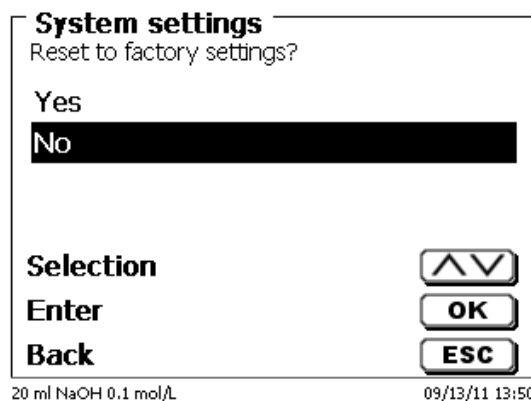
Fig. 118

## 5.6  Printer

For connecting printers please refer to chapter 7.3.



```
System settings
Printer

HP-PCL A4 (chromatic)
HP-PCL A4 (monochrome)
DPU S445
Print PDF
Selection              ∧∨
Enter                  OK
Back                   ESC

20 ml Titrant 5           08/28/12 9:36
```
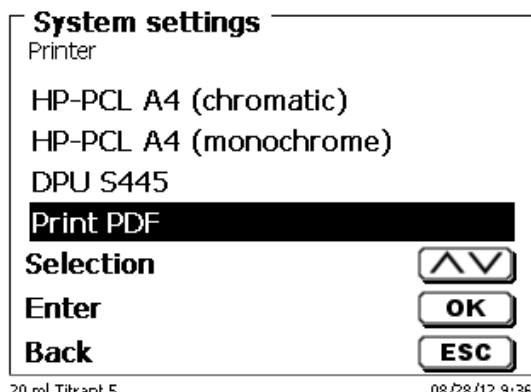
Fig. 119

## 5.7  Device Information

<Device Information> contains information about
- the current software version
- the serial number of the device
- printer driver and update version
- device address
- number of measurements (Starts of a method)
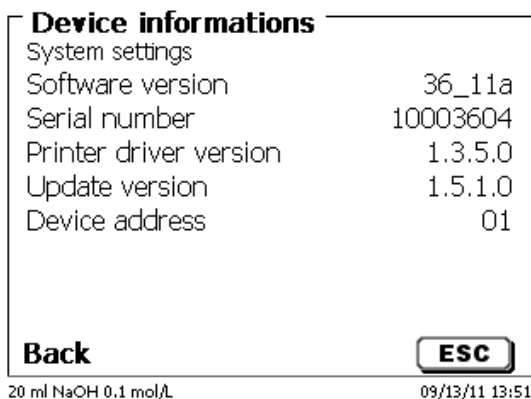- a number of strokes/filling cycles



```
Device informations
System settings
Software version           36_11a
Serial number            10003604
Printer driver version      1.3.5.0
Update version              1.5.1.0
Device address                  01



Back                         ESC

20 ml NaOH 0.1 mol/L      09/13/11 13:51
```

Fig. 120

## 5.8  System Tone

This is the point to set the volume of the system sounds and the front keyboard of the device. The system sounds become audible e.g. at the end of the titration or in case of an erroneous operation. The keys of the front keyboard produce a clicking sound if the key was used successfully.
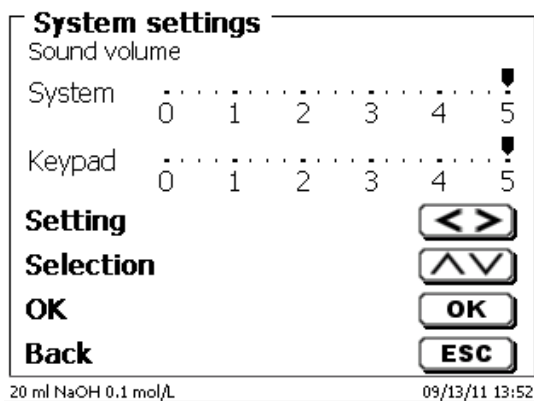
Fig. 121

No sounds will occur when the external keyboard is used.
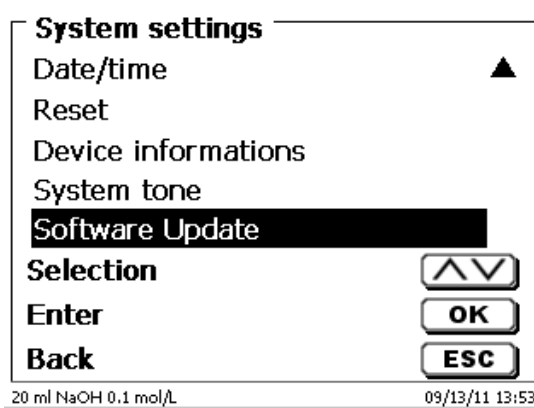
## 5.9  Software Update



Fig. 122

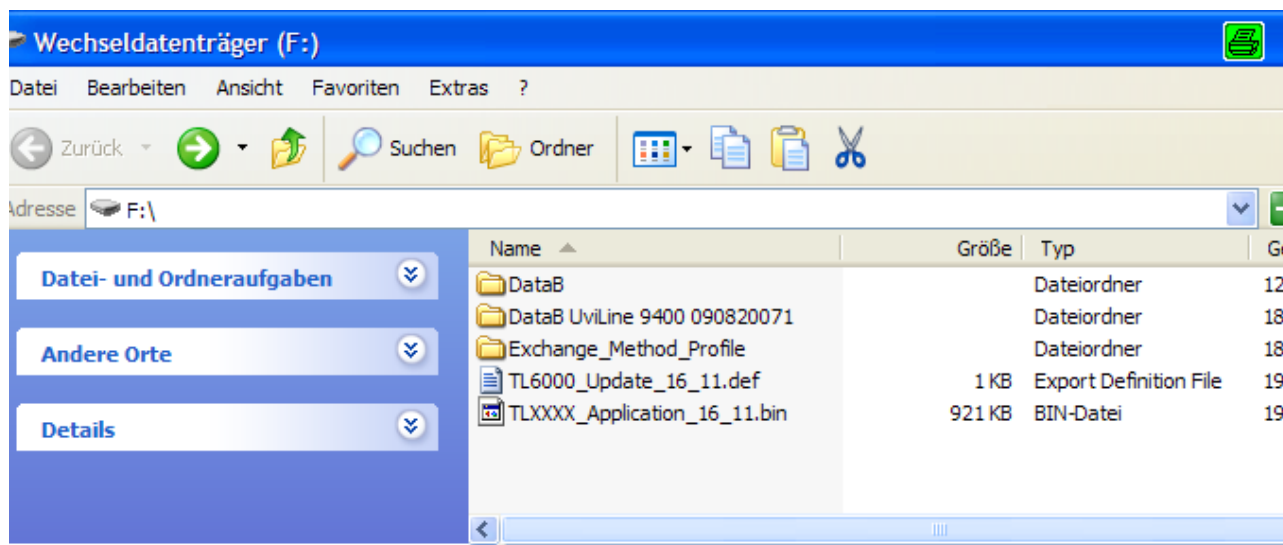An update of the device software requires a USB stick containing a new version. For this operation, the two files that are needed have to be located in the root directory of the USB device:



Plug the USB device into a free USB-A port, wait for some seconds, and then select the Software Update function. The valid software updates will be shown on the display. In the present case this is Version "16_11" of 19 April 2011.
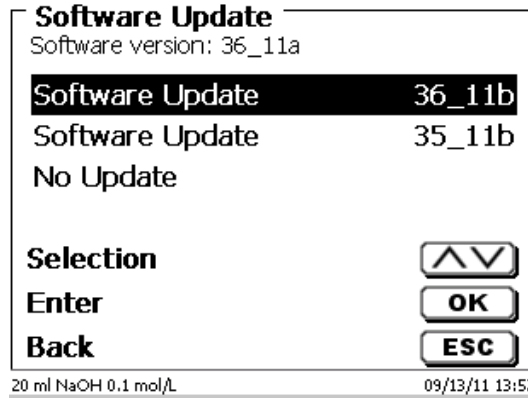
```
┌─ Software Update ──────────┐
│  Software version: 36_11a        │
│  ┌──────────────────────────┐  │
│  │ Software Update      36_11b │  │
│  └──────────────────────────┘  │
│   Software Update      35_11b   │
│   No Update                     │
│                                 │
│   Selection          [ ∧ ∨ ]    │
│   Enter              [  OK  ]    │
│   Back               [ ESC  ]    │
│  20 ml NaOH 0.1 mol/L   09/13/11 13:52 │
└─────────────────────────────┘
```

Fig. 123

After starting the update using <OK/ENTER>, next thing to appear is the following graphic:

```
oLine® 6000 □ □ □ □

        Waiting for system readiness...
        ▓▓▓▓▓▓▓▓

                              Vers.1.5.0.0.20
```
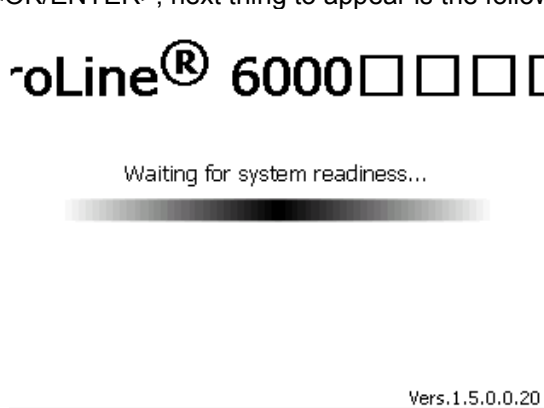
Fig. 124

which will change after a few seconds to the following display:

```
oLine® 6000 □ □ □ □

        System is updating. Please wait...
        ▓▓▓▓▓▓▓▓

                              Vers.1.5.0.0.20
```
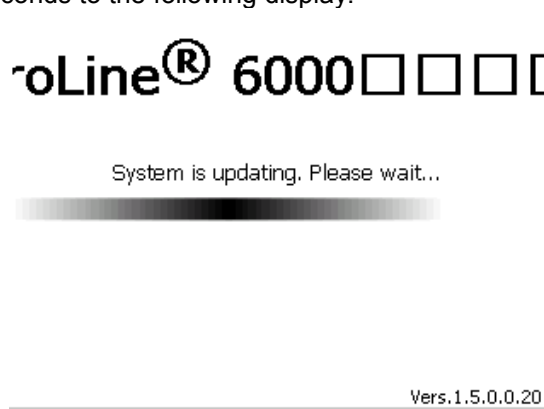
Fig. 125

Upon completion of the update (approx. 2-3 minutes), the device will shut down the software completely and proceed to a new start.

**Important:** In the course of an update, the methods will not be deleted! You can continue to use them.

If no valid update file is stored on the USB stick, the following message will appear:

```
┌─ Software Update ──────────┐
│  Software version: 36_11a        │
│  ┌──────────────────────────┐  │
│  │ No Update                   │  │
│  └──────────────────────────┘  │
│                                 │
│                                 │
│   Selection          [ ∧ ∨ ]    │
│   Enter              [  OK  ]    │
│   Back               [ ESC  ]    │
│  20 ml NaOH 0.1 mol/L   09/13/11 13:55 │
└─────────────────────────────┘
```

Fig. 126

# 6 Data Communication via RS232- and USB-B interface

## 6.1 General Information

The burette TitroLine® 7500 KF has two serial RS232-C interfaces to communicate data with other devices. By means of these two interfaces it is possible to operate several devices on one computer (PC) interface.

In addition to that, the TitroLine® 7500 KF also has an <u>alternatively</u> USB-B interface, which can only be used to connect a PC.

RS232-C-1 establishes the connection to a connected computer or to the previous device of the "Daisy Chain". At the RS232-C-2 it is possible to connect additional devices (Daisy Chain Concept).

| PIN assignment of the RS232-C interfaces: | **PIN-No.** | **Meaning / Description** |
|---|---|---|
| | 1 | T x D  Data output |
| | 2 | R x D  Data input |
| | 3 | Digital mass |

## 6.2 Chaining multiple devices —"Daisy Chain Concept"

In order to activate several devices in a chain individually, each device must have an own device address. For this it is at first necessary to establish a connection from the computer to the RS232-C interface 1 of the first devise in the chain by means of a RS232-C data cable, e.g. Type No. TZ 3097. With the additional RS232-C data cable, Type No. TZ 3094, the RS232-C- interface 2 of the first device is connected with the RS232-C-interface 1 of the second device. At interface 2 of the second device it is possible to connect an additional device.

The TitroLine® 7500 KF can also be connected via USB cable TZ 3840 (type A (M) – type B (M), 1.8m). It is also possible to connect the TitroLine® 7500 KF via USB cable TZ 3840 (type A (M) --- USB type B (M), 1.8 m) to a USB interface of a PC. To accomplish this connection, a driver has to be installed on the PC. Then the USB-B interface takes over the function of the RS232-1 interface.

The address always consists of two characters: e.g. address 1 of the two ASCII- characters <0> and <1>. The addresses can be set from **00** to **15**, i.e. 16 possibilities. It must be ensured that the devices in a chain have different addresses. If a device is addressed with its address, this device will process this command without sending it to another device. The reply to the computer has also an own address. The addresses are allocated as described in 📖 **Chapter 5.3**.

The burette TitroLine® 7500 KF receives commands from a PC at the interface **1** (USB- B) if the computer knows the address. It also sends the answer via this interface. If the address of the incoming command does not match the device address, the complete command will be forwarded to interface **2**. Interface 2 is connected to interface 1 of another device. This device checks the address as well and reacts to the command as the first TitroLine® 7500 KF did before.

All information (data strings) which arrive at interface 2 of the burette TitroLine® 7500 KF will immediately be send to the computer via interface 1 (or USB-B interface). Thus, the computer receives the data of all devices. In practice it is possible to connect up to 16 devices to one computer- (PC-) interface.

## 6.3 Instruction Set for RS-Communication

The commands consist of three parts: Address      two-digit aa,     e.g.: 01
Command                      e.g.: DA
Variable, if necessary    e.g.: 14
and end of command      <CR> <LF>

**Every** command must be completed with the ASCII - sign <CR> and <LF> (Carriage Return and Line Feed). Only if the respective action has ended the answers will be returned to the computer.

Example:     The command to dose 12.5 ml shall be sent to the burette TitroLine® 7500 KF with the address 2.

The command consists of the characters: 02DA12.5<CR LF>
In detail:     02      =    Device address
           DA      =    Dosage command with filling and zero points of the display
           12.5    =    Volume in ml to be dosed
           <CR LF> =    Control character as command end

| Command | Description | Reply |
|---|---|---|
| aaAA | automatic allocation of device address | aaY |
| aaMC1...XX | choosing a method | aaY |
| aaBF | "filling burette". Aufsatz wird gefüllt. | aaY |
| aaBV | output of dosed volume in ml | aa0.200 |
| aaDA | dose volume without filling, with adding the volume | aaY |
| aaDB | dose volume without filling, reset of the volume | aaY |
| aaDO | dose volume with filling, without adding the volume | aaY |
| aaGDM | dosing speed in ml/min | aaY |
| aaGF | filling time in seconds (min is 20, default 30) | aaY |
| aaES | "ESC" function one step backwards | aaY |
| aaEX | "exit" function.back to main menu | aay |
| aafd | µa "dead stop" measurement function | aay |
| aagdm | dosing speed in ml/min (0.01 – 100 ml/min) | aaY |
| aaGF | filling time in sec (adjustable 20 – 999 seconds) | aaY |
| aaGS | output serial no. Of device | aaGS08154711 |
| aaLD | output of the measurement data | aaY |
| aaLR | output report  (short report) | aaY |
| aaM | output the measurement value µA | aaM0.1000 |
| aaLI | output method content | |
| aaLO | output documentation (as configured) | |
| aaRH | request of identification | aaIdent:TL7500KF |
| aaRC | send last command | aa"last command" |
| aaRS | report status | aaStatus:*"text* |
| | possible answers are: | |
| | "STATUS:READY" for ready | |
| | "STATUS:dosing" dosing | |
| | "STATUS:filling" filling | |
| | "ERROR:busy" if no interchangeable unit  has been attached | |
| aaSM | start selected method | aaY |
| aaSEEPROM | EEPROM reset to factory defaults | aaY |
| aaSR | stop the actual function | aaY |
| aaSS | titration start with the transfer of the pH end value | aaY |
| aaSYS5 | adjust language to "German" | aaY |
| aaSYS1 | adjust language to "English" | aaY |
| aaSYS2 | adjust language to "French" | aaY |
| aaSYS3 | adjust language to "Spanish" | aaY |
| aaVE | Version number of the software | aaVersion |

# 7 Connection of Analytical Balances and Printers

## 7.1 Connection of Analytical Balances

As it often happens that the sample is weighed in on an analytical balance, it makes sense to connect this balance to the TitroLine® 7500 KF. To connect the balance to the TitroLine® 7500 KF, the balance must have a RS232-C-interface and the connection cable must be configured accordingly. For the following types of balances there are already assembled connection cables:

| 7.1.1 Balance | TZ-Number |
|---|---|
| Sartorius (all types), partially Kern, | TZ 3092 |
| Mettler AT, PR, PM | TZ 3093 |
| Mettler, AB-S, AG, PG | TZ 3099 |
| Precisa XT-Series | TZ 3183 |
| Kern with 9-pole RS232 | TZ 3180 |

For all other types of balances it is possible to obtain an already assembled connection cable (on demand). For this we need detailed information about the RS232-C-interface of the balance used.

The connection cable is to be connected to the RS232-C-interface 2 of the TitroLine® 7500 KF. This side of the connection cables always consists of a 4-pole mini-plug. The other side of the cable can, depending on the type of balance, be a 25-pole plug (Sartorius), a 9-pole plug (Mettler AB-S) or a 15-pole specialised plug (Mettler AT) etc.

In order to allow the balance data to be sent to the TitroLine® TitroLine® 7500 KF, the data transmission parameters of the titrator and the balance must correspond to each other. Additionally, it is necessary to carry out some more standard settings on the side of the balances:

➢ The balance is to send the balance data via RS232-C only by means of a print command.

➢ The balance is to send the balance data only after the display standstill.

➢ The balance should never be set to 'automatic sending' and/or 'send continuously'.

➢ 'Handshake' on the balance must be set to 'off', or even 'Software Handshake' or 'Pause'.

➢ No special characters such as **S** or **St** are allowed to be used as prefix in the balance data of the balance data string. In such a case it might be possible that the TitroLine® 7500 KF cannot process the balance data correctly.

After you have connected the balance with the appropriate cable to the TitroLine® 7500 KF and have adjusted all settings in the balance software, and possibly in the TitroLine® 7500 KF, you can now test the data transfer of the balance very easily. Start the method. After conditioning, press Enter to start the sample titration. Confirm the sample ID. Then, the display asks you:

a) To press the print-button at the balance → Parameters to 'weighted sample automatically'

b) To enter the weighted sample → then the parameters are still set to 'weighted sample manually'

Put an object onto the balance and press the print button. After the standstill of the balance display there will be beep at the TitroLine® 7500 KF and the transmitted balance data appear:

a) After approx. 5 sec. in the display and the display changes automatically into the measuring display.

b) The weighted sample must again be confirmed with <Enter> or <OK>.

## 7.2  Balance data editor

Pressing the die **<F5/balance symbol >** function key will invoke the so-called balance data editor.
A list with the existing balance data will appear:

**List of balance data**
3 Weights

| 002 | M | 10.42980 | g | 13:59:57 |
| 003 | M | 0.87360 | g | 14:00:10 |
| 004 | M | 4.37650 | g | 14:00:21 |

Selection  ∧∨
Enter  OK
Back  ESC

20 ml NaOH 0.1 mol/L          09/13/11 14:00

Fig. 127

The balance data can be edited one by one. Following a change, a cross will appear opposite the weighed-in quantity:

**List of balance data**
3 Weights

| 002 | M | 10.42980 | g | 13:59:57 |
| 003 | *M | 0.86360 | g | 14:00:10 |
| 004 | M | 4.37650 | g | 14:00:21 |

Selection  ∧∨
Enter  OK
Back  ESC

20 ml NaOH 0.1 mol/L          09/13/11 14:00

Fig. 128

Weights may be deleted or added individually. It is also possible to delete all weights at one stroke.

**Balance data**
003 *M  0.86360 g

Edit weight
Delete weight
Add weight
Delete all?
Selection  ∧∨
Enter  OK
Back  ESC

20 ml NaOH 0.1 mol/L          09/13/11 14:01

Fig. 129

If no balance data is available, the "No balance data found" message will appear:
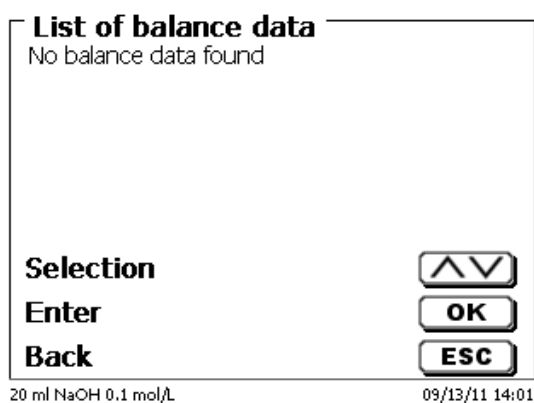
Fig. 130

## 7.3 Connection of Printers

The results, calibration data and methods can be printed on the following media:

- HP PCL compatible printer (A4) chromatic and monochrome (e.g. laser printer)
- Seiko DPU S445 (Thermo paper 112 mm width)
- On the USB stick in PDF- and CSV-format

To connect the printers to the burette please use the USB socket. When printing, please check whether the correct printer is connected. It is not possible to print „HP"printer layouts on another thermal printer or vice versa. The printer settings should always be checked and adjusted after changing the printer.
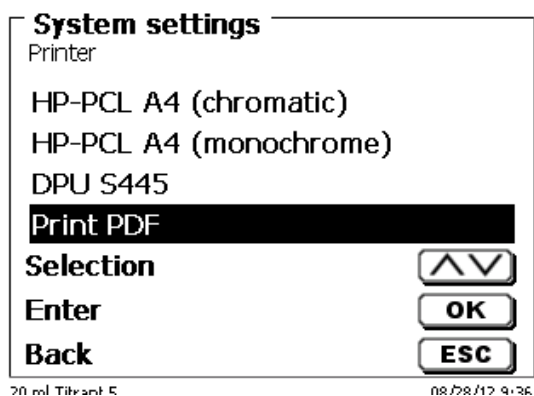


Fig. 131

Only one printer should be connected for one Titrator because an automatic printer recognition is not activated. Print PDF is the default setting. If you select "Print PDF", please make sure that a USB stick is connected to the device.

# 8 Maintenance and Care of the TitroLine® 7500 KF

The preservation of the proper functioning of the piston burette requires testing and maintenance work to be performed on a regular basis.

Regular inspections are essential prerequisites for the correctness of the volume and the proper functioning of the piston burette.

The accuracy of the volume is determined by all chemicals-carrying components (piston, cylinder, valve, titration tip and hoses). These parts are subject to wear and tear, i.e. zthey are or wearing parts, respectively. The piston and cylinder are subject to particular strain, hence they require special attention.

**Heavy strain:**
Use of e.g. concentrated solutions, reagents and chemicals (> 0.5 mol/L); chemicals attacking glass, such as fluorides, phosphates, alkali solutions; solutions with a tendency to crystallising out; Fe (III) chloride solutions; oxidising and corroding solutions such as iodine, potassium permanganate, Cer (III), **Karl-Fischer titration agent,** HCl; solutions with a viscosity of > 5 mm$^2$/s; frequent, or even daily use.

**Normal strain:**
Use of solutions, reagents and chemicals (up to 0.5 mol/l) which do not attack glass, crystalize out or corrode.

**Interrupted use** :
If the dosing system is not in use for more than two weeks, we recommend emptying and cleaning the dosing unit [6]. This applies in particular under the operating conditions referred to in the „Heavy strain" section. If this recommendation is not adhered to, the piston of the valve may become leaking, this may result in damage to the piston burette.
If the liquid is left within the system, you will also have to reckon with corrosion and an alteration of the solutions used over time, which includes e.g. crystallisation. Considering that as of the state of the art there are no plastic hoses available for the use in titration equipment which would be perfectly free of diffusion phenomena, particular attention is to be paid to the range of the hose lines.

| We recommend the following inspection and maintenance work | Heavy strain | Normal strain |
|---|---|---|
| Simple cleaning:<br>☐    Wiping off splashed chemicals from the outer surface. [1] | Whenever required in operation | Whenever required in operation |
| Sight check:<br>☐    Check for leakage in the area of the dosing system. [2]<br>☐    Is the piston tight? [3]<br>☐    Is the valve tight? [4]<br>☐    Titration to clear? [5] | Weekly, when putting back into operation | Monthly, when putting back into operation |
| Basic cleaning of the dosing system:<br>☐    All parts of the dosing system to be cleaned separately. [6] | Every three months | Whenever necessary |
| Technical inspection:<br>☐    Check for air bubbles in the dosing system. [7]<br>☐    Visual inspection<br>☐    Check of the electrical connections. [8] | Semi-annually when putting back into operation | Semi-annually when putting back into operation |
| Verification of the volume according to ISO 8655:<br>☐    Perform basic cleaning<br>☐    Inspection according to ISO 8655 Part 6 or Part 7. [9] | Semi-annually | Annually |

**Please note:** Depending on the respective application, there may be different specifications for the entirety of the inspection and maintenance work to be performed. The individual intervals may be extended if no complaints occur, but they will have to be shortened again as soon as any problem has arisen.

The inspection of the metrological reliability including maintenance work is offered as a service by SI Analytics GmbH (including a manufacturer's certificate, if so ordered). For this purpose, the titration device is to be sent in to SI Analytics GmbH.

Detailed description of the inspection and maintenance work:

[1]     Wipe off using a soft cloth (and some water with a normal household detergent).

[2]     Leaking connections can be identified by moisture or crystals at the threaded connections of the hoses, at the sealing lips of the piston inside the dosing cylinder or at the valve.

[3]     If any liquid becomes visible below the first sealing lip, it has to be checked at short timely intervals whether any liquid will build up under the second sealing lip, too. In this case both the piston and the glass cylinder have to be replaced immediately. It is easily possible that in operation small liquid droplets build up under the first sealing lip, but they may also disappear again. This phenomenon alone is no reason for replacement.

[4]     The valve has to be removed from its housing for inspection. In this process, the hoses remain connected to the valve. Please check for moisture underneath the valve. When reinserting the valve, please make sure that the small cam at the rotating axis is fitted into the corresponding groove again.

[5]     The titration tip must be free of sedimentation or crystals which might obstruct the dosing process or falsify the results.

[6]     Remove the cylinder, take the valve out of the valve housing, unscrew the hoses and then rinse all parts carefully with distilled water. For the assembly of the cylinder, hoses and other parts of the interchangeable unit, please refer to the operating instructions.

[7]     Dose one burette volume, then refill. Air bubbles will gather at the tip of the cylinder and in the titration hose where they can be detected easily. If bubbles become visible, please re-tighten all connections finger tight, and then repeat dosing. If air bubbles still remain within the system, [6] please check the valve and replace the hose connections. The air bubbles may also occur at the interface between the sealing lip of the piston and the cylinder. If a reduction of the filling speed will not do, the dosing unit has to be replaced.

[8]     Check the electrical plug contacts for corrosion and mechanical damage. Defective parts have to be repaired or replaced by new parts.

[9]     Please refer to the application „Burette inspection according to ISO 8655 Part 6".

# 9      Storage and transportation

If the titrator TitroLine® 7500 KF or the interchangeable units have to be stored over some time, or to be dislocated, the use of the original packing will be the best protection of the devices. However, in many cases this packing will not be available anymore, so that one will have to compose an equivalent packaging system. Sealing the lower section in a foil is hereby recommended.

The devices should be stored in a room with a temperature between +10 and +40°C, and the (relative) humidity of the air should not exceed 70 %.

If the interchangeable have to be stored over some time, or to be dislocated, the fluids inside the system, especially aggressive solution have to be removed (please refer also to chapter 8. „Maintenance and Care of the burette").

# 10     Recycling and Disposal

The present piston burette and its packaging are manufactured as far as possible from materials which can be disposed of environmental-friendly and recycled in a technically appropriate manner.

**Please note:** The main printed board carries a lithium battery. Batteries should not to be disposed of with the normal domestic waste. They will be taken back and recycled or disposed of properly by the manufacturer at no cost.

Should you have any questions regarding disposal, please contact SI Analytics.

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# SI Analytics

## EG - KONFORMITÄTSERKLÄRUNG
## EC - DECLARATION OF CONFORMITY
## CE - DÉCLARATION DE CONFORMITÉ
## CEE - DECLARATIÓN DE CONFORMIDAD

| Wir erklären in alleiniger Verantwortung, dass das folgende Produkt | We declare under our sole responsibility that the following product | Nous déclarons sous notre seule responsabilité que les produit ci-dessous | Declaramos bajo nuestra única responsabilidad, que los produit listados a continuación |
|---|---|---|---|
| **Titrator** | **Titration unit** | **Titrateur** | **Titulador** |
| **TitroLine® 7500 KF** | | | |
| auf das sich diese Erklärung bezieht, übereinstimmt mit den folgenden EG Richtlinien. | to which this declaration relates are in conformity with the following EC directives. | auquel se réfère cette déclaration est conforme directives CE soul vantes. | todo lo relative a esta declaración está en conformidad con las directivas CEE siguientes |
| EMV EG-Richtlinie 2004/108/EG Sicherheit EG Richtlinie 2006/ 95 | EMC EC-Directrive 2004/108/EG Safety EC-Directrive 2006/ 95 | CEM CE-Directive 2004/108/EG Sécurité CE-Directive 2006/ 95 | CEM CEE siguientes 2004/108/EG Seguridad CEE siguientes 2006/ 95 |
| Angewandte harmonisierte Normen oder normative Dokumente | Applied harmonized standards or normative documents | Normes harmonisées ou documents normative appliquées | Estándares armonizados aplicados o documentos normativos |
| EMV EN 61326-1:2006 Sicherheit EN 61010-1 :2001 | EMC EN 61326-1:2006 Safety EN 61010-1 :2001 | CEM EN 61326-1:2006 Sécurité EN 61010-1 :2001 | CEM EN 61326-1:2006 Seguridad EN 61010-1 :2001 |

Mainz den 20.08.2012

Dr. Robert Reining
Geschäftsführer, Managing Director

Konf. No.:Titrat 015

**SI Analytics GmbH**
Hattenbergstraße 10
55122 Mainz
Deutschland, Germany, Allemagne

**Typ / type / type / tipo**                    **TitroLine® 7500 KF**

**Bescheinigung des Herstellers**

Wir bestätigen, dass das oben genannte Gerät gemäß   DIN EN ISO 9001, Absatz 8.2.4 „Überwachung und Messung des Produkts" geprüft wurde und dass die festgelegten Qualitätsanforderungen an das Produkt erfüllt werden.

**Supplier's Certificate**
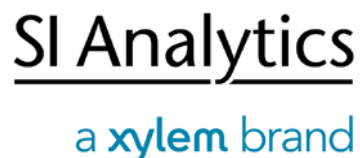
We certify that the above equipment has been tested in accordance with DIN EN ISO 9001, Part 8.2.4"Monitoring and measurement of product" and that the specified quality requirements for the product have been met.

**Certificat du fournisseur**

Nous certifions que le produit a été vérifié selon DIN EN ISO 9001, partie 8.2.4 "Surveillance et mesure du produit" et que les exigences spécifiées pour le produit sont respectées.

**Certificado del fabricante**

Certificamos que el aparato arriba mencionado ha sido controlado de acuerdo con la norma DIN EN ISO 9001, sección 8.2.4 „Seguimiento y medición del producto" y que cumple con los requisitos de calidad fijados para el mismo.

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