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BIOGAS Titration Manager

08/2012, Edition 1A

User Manual

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Section 1 Specifications

Specifications are subject to change without notice.

Methods	
End point titration	1 to 3 pre-set
Inflection point titration	Auto determination of 1 to 4 inflection points with programmable IP acceptation windows. IP detection using 1st and 2nd derivative curve.
Titration stops at	pH, mV, mL, IP number
Titrant addition techniques	Incremental dynamic, incremental monotonic and continuous dynamic.
Titrant calibration	
pH electrode calibration	Up to 5 points using IUPAC standards or 4-7-10 Series buffers with error recognition on buffer used.
Direct pH/mV measurements	With recording on stable reading.
Back titration with manual reagent addition	
Sequencing of up to 3 methods	
Coupling of 2 methods in one beaker	
Measuring ranges - Resolution	
pH value	-9 to 23 pH - 0.001 pH
mV value	±2000 mV - 0.1 mV
Temperature	-10 °C to +100 °C (14 to 212 °F) - 0.1 °C
Printout	
Automatic. GLP compliant	
3 levels of detail	
Results	
In each method, calculation of up to 4 results and 2 user-defined equations	
Units	
All standard units for samples/results	
User-defined result units	
Storage capacity	
Global password protection for programming access	
Non-volatile memory for storage of the last 60 results	
10 user programmable methods	
Libraries with more than 30 electrodes and 20 titrants pre-identified	
Embedded operating procedures for burette and reagent exchange operations	
Sample list	
Up to 20 data with alphanumeric ID	
Electrode stand - stirring	
Magnetic stirrer	22 reproducible speeds (0 to 1100 rpm) in 50 rpm steps
Propeller connection	
Beaker volume	5 to 400 mL

Burette	
1 embedded burette stand	
Burette volumes available	1, 5, 10, 25, 50 mL
Burette motor	18000 steps
Complies with ISO/FDIS 8655-3	
UV-protected encapsulated glass syringe	
Embedded operating procedures	burette exchange, air bubble removal (Flush) Fill, Empty function
Inputs/outputs	
1 indicator electrode inputs	
1 reference electrode input	
Selectable polarised input from -1 mA to +1 mA in 1 µA steps, DC or AC	
Differential input	
Temperature input	
0-5 V TTL output	
Serial connections	Printer/PC, balance, sample changer and additional titrator for use with TitraMaster 85 PC Software
PS/2 port for PC keyboard and/or barcode reader	
General specifications	
Casing	Fully splashproof. Graphic 128 x 128 dot LCD protected from spillages. Soft-touch alphanumeric keypad (silicone)
Languages	English, German, Danish, French, Italian, Spanish, Swedish
Dimensions (H x W x D)	380 x 230 x 450 mm (1.25 x 0.75 x 1.48 ft) (excl. tubing)
Weight	5 kg (excluding reagent bottles)
Power requirements	115 VAC (±10 %) or 230 Vac (±10 %) 50...60 Hz - 45 VA On/Off power switch
Mains fuses	T1A L250V, slow blow (2 fuses)
Secondary fuses	T4 A, 230 V (1 fuse) The secondary fuse is mounted on the printed circuit board. If necessary, contact a manufacturer‘s Service engineer for replacement of the fuse, as the instrument casing must be opened.
Environmental operating conditions	
Environmental operating conditions (working)	5 to 40 °C (41 to 104 °F), max. 80 % relative humidity (without water condensation)
Environmental operating conditions (storage)	-20 to 60 °C (-4 to 140 °F), max. 80 % relative humidity (without water condensation)
Altitude ≤ 2000 m	
Level of pollution: 2	
Transitory overvoltage: class II	
Limited Warranty	
The warranty period for instruments is 2 years from the date of shipment.	

Section 2 General Information

2.1 Safety notes

Please read this entire manual before unpacking, setting up, or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual

2.1.1 Use of Hazard information

⚠DANGER

Indicates a potentially or imminently hazardous situation that, if not avoided, results in death or serious injury.

⚠WARNING

Indicates a potentially or imminently hazardous situation that, if not avoided, may result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation that, if not avoided, could result in damage to the instrument. Information that requires special emphasis.

Note: *Information that supplements points in the main text.*

2.1.2 Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol, if noted on the instrument, will be included with a danger or caution statement in the manual.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	This symbol, when noted on the product, identifies the location of a fuse or current limiting device.
	Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user. ***Note:*** *For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.*

2.1.3 Chemical and Biological Safety

⚠ DANGER

Potential danger with contact with chemical/biological substances.

Working with chemical samples, standards and reagents can be dangerous.

Make yourself familiar with the necessary safety procedures and the correct handling of the chemicals before use and read and follow all relevant safety data sheets.

Normal operation of this device may require the use of chemicals or samples that are biologically unsafe.

- Observe all cautionary information printed on the original solution containers and safety data sheets prior to their use.
- Dispose of all consumed solutions in accordance with the local and national regulations and laws.
- Select the type of protective equipment suitable to the concentration and quantity of the dangerous material being used.

⚠ DANGER

The BIOGAS Titration Manager has been developed to meet the requirements of volumetric titration applications. It is therefore aimed at experienced users who have the knowledge required to operate the instrument and implement the security instructions enclosed. Please remember that the BIOGAS Titration Manager must not, under any circumstances, be used to perform tests on living beings.

⚠ WARNUNG

The BIOGAS Titration Manager may not be used in dangerous environments.

The manufacturer and its suppliers reject any express or indirect guarantee for use with high-risk activities.

Follow the following safety information, in addition to any local guidelines in force.

Safety information for the correct use of the instrument:

- Do not vibrate or jolt the instrument.
- Do not open the instrument.
- Guarantee is voided if the instrument is not used in accordance with the guidelines present in this document.

ACHTUNG

The manufacturer is not responsible for damages resulting from misapplication or misuse of this product and rejects the regulation of such damages, including direct, indirect and consequential damages, and in full accordance with applicable law. The user is solely responsible for the identification of critical applications and risks and taking appropriate measures to protect processes during a possible equipment malfunction.

Section 3 Installation

⚠ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

3.1 Unpacking the instruments

The BIOGAS Titration Manager comes packaged with the following items:

- BIOGAS Titration Manager, one burette, zero version
- B525, Burette Stand, 25 mL, red cover with connection tubing
- Accessories for Titration Manager burette stand
- Set of Cables for Tiration Workstation (w/o serial PC Printer cable)
- Cell kit
- Titration Vessel, PP, 40-100 mL (pack of 10 pcs of 956-265)
- Titration Vessel, PP, 22-45 mL (pack of 10 pcs of 956-178)
- User Manual BIOGAS
- Basic User Manual BIOGAS, multilingual
- Method Guide for FOS/TAC (organic acids (FOS) and total inorganic carbon (TAC)), En-Ger
- Installation form (Fr-Eng-Ger)

Note: *If any of these items are missing or damaged, contact the manufacturer or a sales representative immediatly.*

3.2 Operating environment

The following conditions are necessary to ensure correct instrument operation and accurate results:

- Place the instrument firmly on an even surface. Do not push any objects under the instrument.
- Maintain an ambient temperature of 5 to 40 ºC (41 to 104 ºF) for proper instrument operation.
- The relative humidity should be less than 80 %; moisture should not condense on the instrument.
- Leave at least a 15 cm (6 in.) clearance at all sides for air circulation to avoid overheating of electrical parts.
- Do not operate or store the instrument in extremely dusty, damp or wet locations.
- Keep the surface of the instrument and all accessories clean and dry at all times. Splashes or spills on the instrument should be cleaned up immediately.

NOTICE

Protect the instrument from temperature extremes, including heaters, direct sunlight and other heat sources.

3.3 Power connections

NOTICE

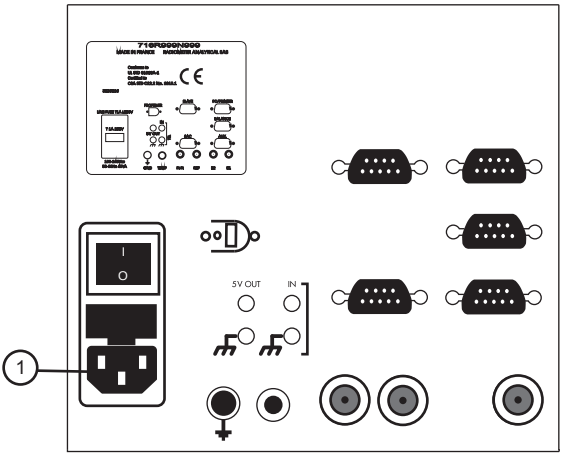
Use only a grounded socket for the connection of this device to the power supply. If you are not sure if the sockets are grounded, have this checked by a qualified electrician. The power plug serves in addition to the power supply to isolate the device quickly from the power source where necessary. During the disconnection from the power source it must be made sure that the correct power plug is pulled (for example by labeling the sockets). This is recommended for long-term storage and can prevent potential dangers in the event of a fault. Therefore make sure that the socket to which the device is connected is easy to reach by each user at all times.

⚠WARNING

Electrical dangers and fire hazard.

Only use the supplied power cable.

Figure 1 Power connection

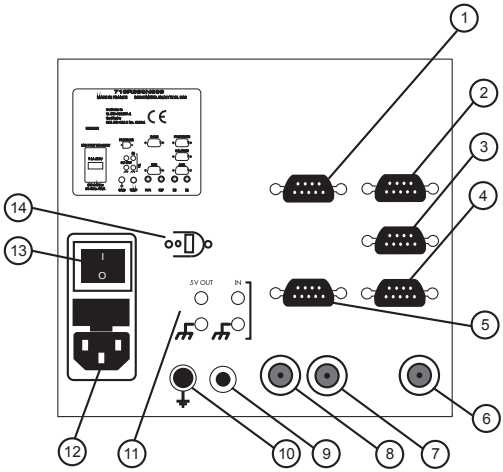


1	Power connection

1. Plug the power cable into the back of the instrument (Figure 1).
2. Insert the plug of the power cable into a grounded mains socket (100–240 V~ / 50–60 Hz).
3. Switch the power button to "On" to turn on the instrument (Figure 2, position 13).

3.4 Interfaces

Figure 2 Interfaces



1	RS232 socket. Not used.	**8**	**Pt-Pt** BNC socket. Double metal electrodes
2	**PC/PRINTER** RS232 socket. PC, cable A95X501 Printer, cables A95P201.	**9**	**TEMP** Cinch socket. Temperature sensors
3	RS232 socket. Not used.	**10**	Banana socket. Single metal electrodes for grounding only
4	**BALANCE** RS232 socket. Due to the large variety of balance and models, cables are made on demand, please contact your local supplier.	**11**	Red and black banana sockets TTL 0 ±5 V input. Red and black banana sockets TTL 0 ±5 V output.
5	**SAC** RS232 socket. Sample changer, cable A95A202	**12**	Power connection socket. Line cord A95S001/A95S002
6	**E1** BNC socket. Combined pH or ISE electrodes w/wo temperature sensor, Single pH or ISE electrodes, Single or combined metal electrodes (Redox measurements)	**13**	power button: On/Off switch
7	**REF** BNC socket. Reference electrodes	**14**	Socket for propeller stirrer (Catalog Number: 904-480).

3.5 Installation of burettes and reagents

Refer to:

- *BIOGAS Titration Manager Installation form, Catalog Number: D26T044*
- *BIOGAS Titration Manager Reference Manual, Catalog Number: D21T087*, Section 5 Glossary, keywords «Installing burette» and «Installing reagent»

4.1 Power the instrument on and off

1. Connect the power cable to a power socket.
2. Switch on the instrument via the power switch on the back.

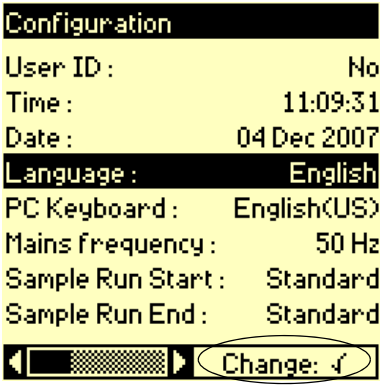
   The Main menu is displayed.

Note: *Always wait about 20 seconds before turning the instrument on again, otherwisethe electronic and mechanical systems will be damaged.*

4.2 Language selection

1. Press **Stop** for 3 seconds in the Main menu.

   The Setup menu is displayed.
2. Press **1** to enter the Configuration menu.



3. Select the Language line with the arrow keys and confirm.



4. Select the desired language and confirm.

Note: *Esc allows you to leave the screen without changing the language.*

The instrument functions in the selected language until the option is changed.

4.3 Display Contrast

If required, you can adjust the contrast of the display:

1. Select the Main menu.
2. Press **0** to increase the brightness, or press **7** to decrease the brightness.

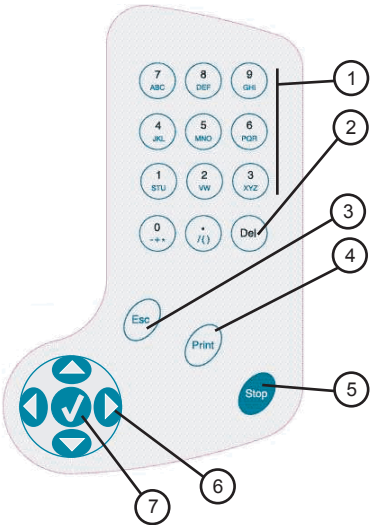
5.1 Overview

The interface of the BIOGAS Titration Manager has been specially designed to clearly guide you through every step of the programming and running of the analyses, whether you are a supervisor or a routine user.

An important part of this interface is to check and control the presence of different elements necessary to run the defined application.

5.1.1 Use of alphanumerical keypad

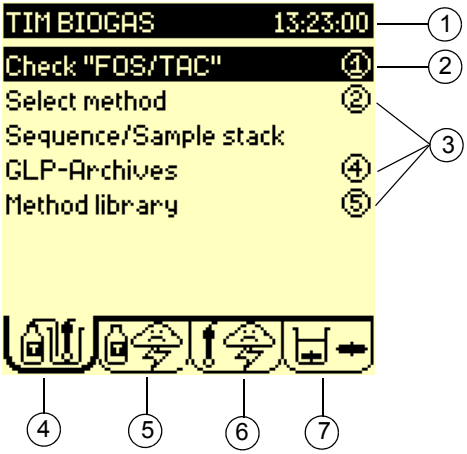
Figure 3 Alphanumerical keypad



1	Alphanumeric keypad to enter data and parameters on the same principle as mobile telephones. These keys can also be used for quick access to the different menus.	**5**	**Stop key**: stops an analysis or a burette function. Press this key for 3 seconds in the Main window to gain access to the setup parameters.
2	**Del key**: deletes the character on which the cursor is positioned. Operator may end the analysis before the max. titration time or the max. volume have been reached, if he considers his analysis finished. Calculations are performed.	**6**	**RIGHT, LEFT, UP, DOWN arrow keys** are used to move to different options within the menus.
3	**Esc key**: returns to the previous screen.	**7**	**Validation/Confirm key** : confirms a data entry, a message or a function asked for by the user.
4	**Print key**: prints the data concerning the screen displayed.		

5.1.2 General screen description

Figure 4 General screen description:



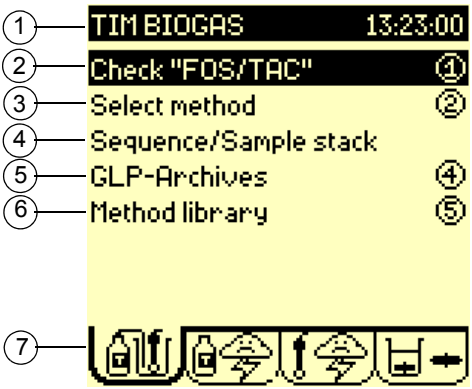
1	Title bar. Indicates the instrument name and the actual time. You will be shown how to personalise the name and adjust the time further on in the manual.	**5**	Reagent tab
2	Selected line	**6**	Electrode tab
3	Menu options. Press the corresponding number for quick access to the different menus. For example, press **5** to enter the Method library	**7**	Cell tab
4	Method tab		

Note: *The **UP** and **DOWN** keys allow you to select a line. To enter an option, select the line, and press the validation key. You can also press the corresponding numerical key.*

5.2 Main menu

When the instrument is switched on the Main window is displayed.

Figure 5 Main menu

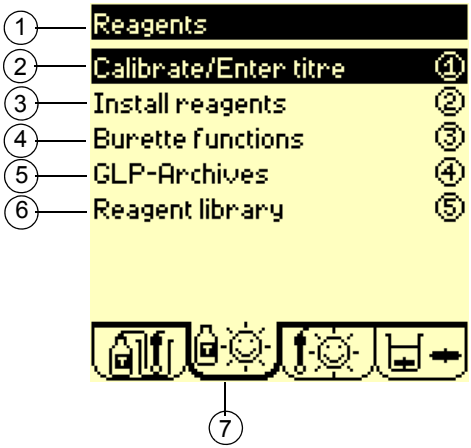


1	**Title bar**: indicates the instruments name and the current time.	**5**	**GLP-Archives**: access GLP tables and visualise the stored method sample results.
2	**Check or Run**: check or run the selected method /sequence. The method can be run when 2 sunny icons are displayed in the Reagents and Electrodes tabs. ***Note:*** *If a cloudy/stormy icon is displayed, activate the "Check" command. The Titration Manager will automatically guide you through the necessary operations required to solve the problem(s).*	**6**	**Method library**: supervisor use only: create, edit, reset and delete methods to correspond to your specific needs.
3	**Select method**: select method and view the main parameters of that method.	**7**	**Method icon**: Animated icon indicates when a method/sequence is running.
4	**Sequence/sample stack**: if a Sample Changer is used and declared in the Configuration menu, program the sample stack. Select or edit the sequence.		

5.3 Reagent menu

Press the **RIGHT** arrow key in the Main menu to move to the Reagent menu.

Figure 6 Reagents menu



1	**Title bar**: indicates the name of the window.	**5**	**GLP-Archives**: access GLP tables and visualise the last reagent calibration results.
2	**Calibrate/Enter titre**: determine the concentration of the titrant (titre) by running a calibration or a calibration sequence or by entering the titre manually.	**6**	**Reagent library**- supervisor use only: create, edit, reset and delete reagents to correspond to your specific needs.
3	**Install reagents**: install or replace reagents in a method or a sequence.	**7**	**Reagent icon:** Reagent status icon indicates the state of the reagent system. Four types of icons can be displayed. See table on the next page.
4	**Burette functions**: fill, empty, flush, rinse and replace burette.		

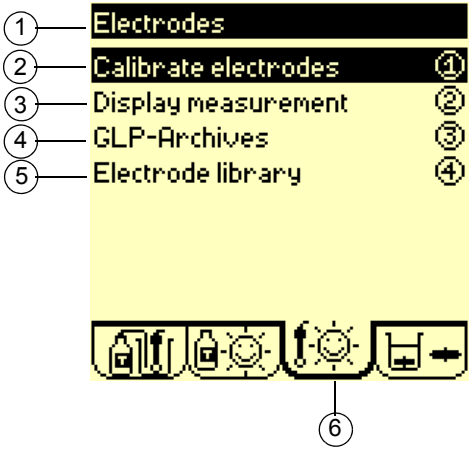
Table 1 Reagent icons

Icon	Description
	**Sunny icon:** The reagent calibration or manual entry of the titre has been performed for all the reagents present in the system. Everything is just right!
	**Cloudy icon:** The reagent calibration of one of the reagents in the system should be performed within 12 or 24 hours.
	**Stormy icon:** The reagent calibration of one of the reagents in the system has elapsed. At least one of the reagents present in the system has not been installed.
	**Question mark:** There is a problem in the editing of the reagent system. You need to be in Supervisor mode to solve the problem. Check the sequence/method parameters of the reagent or the electrode. Check the sequence or method, (press **1** in the Main window). The instrument indicates the possible errors and prompts you to correct them until ? disappears.

5.4 Electrode menu

Press twice the **RIGHT** arrow key in the Main menu to move to the Electrode menu.

Figure 7 Electrode menu



1	**Title bar**: indicates the name of the window.	**4**	**GLP-Archives**: access GLP tables and visualise the last electrode calibration results.
2	**Calibrate electrode**: run a calibration or a calibration sequence using the installed electrodes.	**5**	**Electrode library**- Supervisor use only: create, edit, reset and delete electrodes stored in the instrument.
3	**Display measurement**: displays mV and/or pH and/or temperature at a connected electrode of the electrode system.	**6**	**Electrode icon**: Electrode status icon indicates the state of the electrode system. Four types of icons can be displayed. See table on the next page.

Table 2 Electrode icons

Icon	Description
	**Sunny icon:** The calibration has been performed on the electrode present in the system. Everything is just right!
	**Cloudy icon:** The electrode calibration of the electrode present in the system should be performed within 12 or 24 hours.
	**Stormy icon:** The calibration date has elapsed for the electrode present in the system. If acceptance limits have been set for the calibration: at least one calibration result lies outside the programmed acceptance limits.

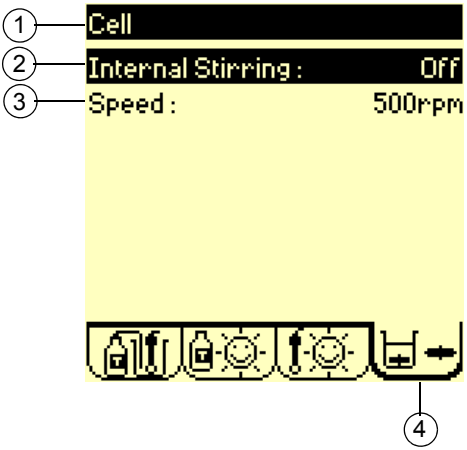
Table 2 Electrode icons

Icon	Description
	**Question mark:** There is a problem in the editing of the electrode system. You need to be in Supervisor mode to solve the problem. Check the sequence/method parameters of the reagent or the electrode. Check the sequence or method, (press **1** in the Main window). The instrument indicates the possible errors and prompts you to correct them until ? disappears.

5.5 Cell menu

Press three times the **RIGHT** arrow key in the Main menu to move to the Electrode menu.

Figure 8 Cell menu



1	**Title bar**: indicates the name of the window.	3	**Speed**: select the internal stirring speed, from 100 to 1100 rpm by steps of 50 rpm.
2	**Internal stirring**: command stirrer On/Off (see Apply internal stirring).	4	**Cell icon**: animated icon indicates when the magnetic stirrer or propeller is operating.

Apply internal stirring

1. Select **Internal stirring = ON**,
2. In the field **Speed**, select a stirring speed.

Apply external stirring

1. Connect the Stirring Propeller, part no. 904-480, to the Titration Manager (see Figure 2 on page 10, position 14).

   Line 1 is automatically replaced by **External stirring**.
2. Select **External stirring = ON**.

3. Adjust stirring by turning the stirring propeller knob.

   Note: *You can consult the corresponding table between the position (1 to 9) and the stirring speed by selecting the field* ***Speed setting****.*

5.6 Setup Menu

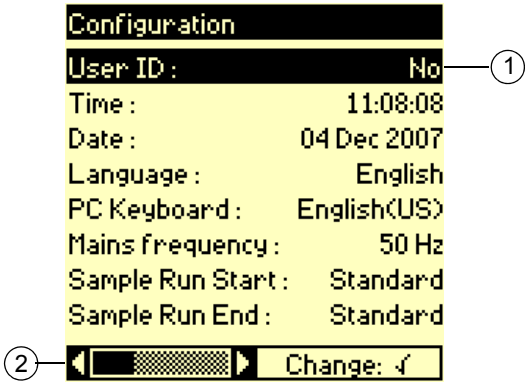
1. Press **Stop** for 3 seconds in the Main window to move to the Setup menu.
2. Enter the **Supervisor code** to differentiate between the Routine mode and the Supervisor mode.
   - In Routine mode, the user is able to select and run methods.
   - In Supervisor mode, the user can create, edit, select and run methods. A Supervisor code is also used to protect your parameters from any unwanted changes.

Note: *Continue without entering a Supervisor code.*

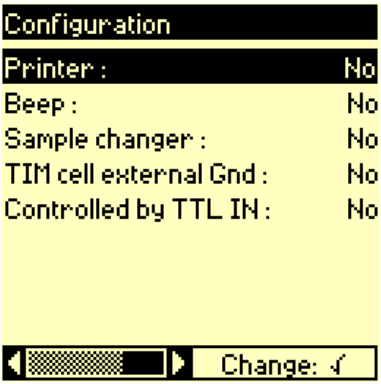
5.6.1 Configuration menu

1. Press **1** to enter the **Configuration** menu.

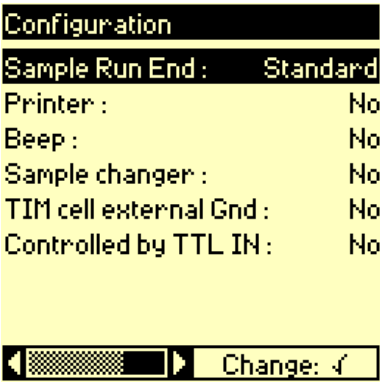
Figure 9 Configuration menu



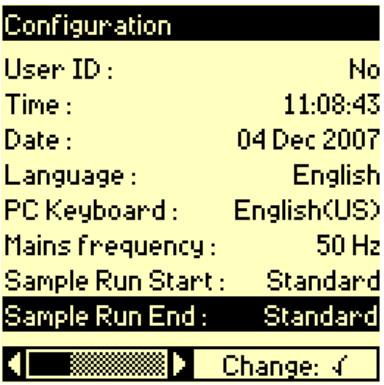
1	Use the **UP** and **DOWN** arrow keys to select the parameter.	2	**Horizontal scroll bar**. The position of the bar indicates the first screen in the Configuration menu. Use the **RIGHT** arrow key to move to the next screen ***Note:*** *The position of the bar indicates the last screen in the Configuration menu*



2. Press the **RIGHT** arrow key to move to the next screen in the **Configuration** menu.



3. Press the **UP** arrow key to scroll in the **Configuration** menu.



4. Press the **LEFT** arrow key to return to the first screen in the **Configuration** menu.

5.6.1.1 Date and time



1. Select **Time** in the **Configuration** menu.
2. Enter the hours (from 00 to 23).

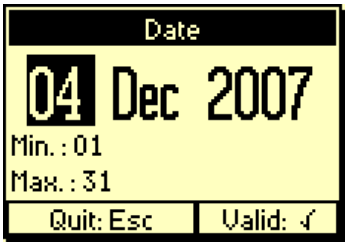


3. Press the **RIGHT** arrow key.
4. Enter the minutes (from 00 to 59).



5. Press the **RIGHT** arrow key.
6. Enter the seconds (from 00 to 59).

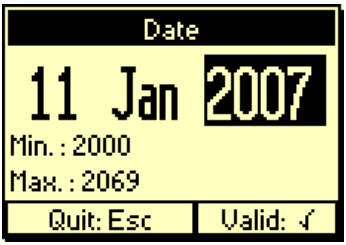
   Note: *The LEFT arrow key allows you to return to the previous screen to modify an entered value.*
7. Press the validation key (as indicated on the screen).



8. Select **Date**.
9. Enter the day (from 00 to 31).



10. Press the **RIGHT** arrow key.
11. Press the **UP/DOWN** arrow keys to select the month.



12. Press the **RIGHT** arrow key.
13. Enter the year (from 2000 to 2069).
14. Press the validation key (as indicated on the screen).

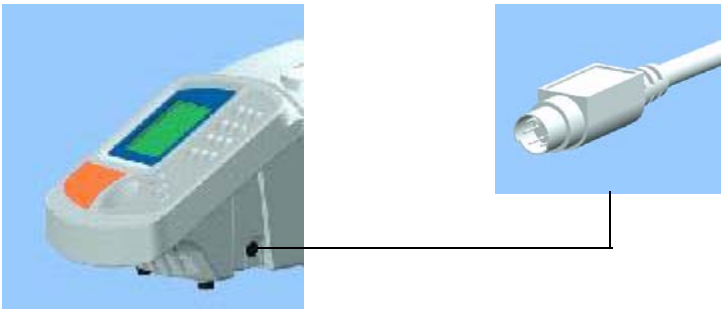
5.6.2 Customize the Titration Manager

You can assign a name to your BIOGAS Titration Manager, which will be permanently displayed in the title bar of the **Main menu**.

5.6.2.1 PC keyboard entry

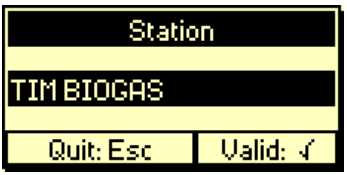
1. Connect a PC keyboard to the 6-pin plug situated on the left hand side of the instrument (see Figure 10).

Figure 10 PC Keyboard connection



2. Select **PC keyboard** in the **Configuration** menu.
3. Select **English (US)**.

   Note: *This allows you to use a QWERTY keyboard.*
4. Press **Esc** to return to the **SETUP** menu.
5. Press **3** (**Customize**).



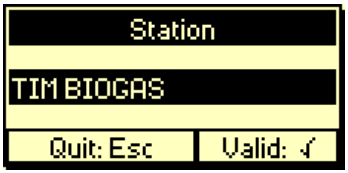
6. Select the **Station** parameter by pressing the validation key.
7. Use the keyboard to enter the desired name.
8. Select the line **HACH LANGE GmbH**.

   This line is used to enter information concerning the workplace, user(s) name(s), location, address etc.

9. Enter the text using the PC keyboard (maximum of 32 characters can be used).

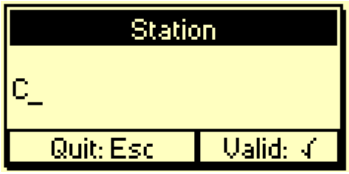
Note: *If the characters shown on the display do not correspond to the ones typed on the keyboard, redefine your keyboard type. To do this, press* ***Esc*** *then* ***1*** *and select* ***PC keyboard****.*

5.6.2.2 Alphanumerical keypad entry



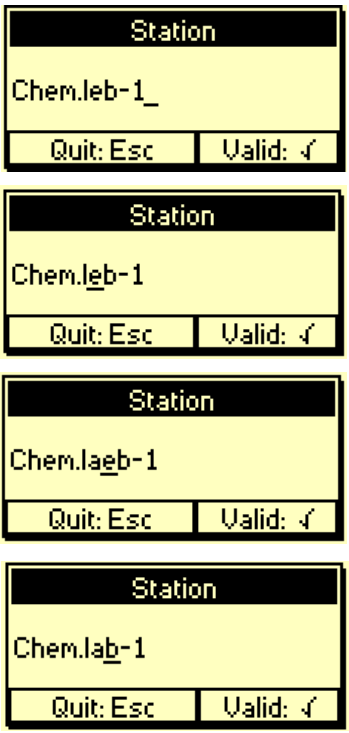
1. Press **3** (**Customize**) in the **Setup** menu.

2. Select the **Station** parameter by pressing the validation key.



3. **Example**: To replace "TIM BIOGAS" by "Chem.lab-1", proceed as follows:

- **a.** Press **7** until the letter "C" appears, then release the key. The cursor moves to the next position.
- **b.** Press **9** until the letter "h" appears.
- **c.** Continue until you have entered (em.lab-1).



4. To correct a typing error, proceed as follows:
   a. Press the **LEFT** arrow key to position the cursor on the letter "E".
   b. Press **7** to enter the letter "A". The letter E has been inserted between the letter "A" and the letter "B".
   c. Press **Del** to delete the "E".
   d. Press the validation key to confirm the entry.

5.6.2.3 Print data

1. Enter the Setup window: press **Stop** 3 seconds in the **Main** menu.
2. Enter the Configuration menu: press **1**.
3. Press the **RIGHT** arrow key to move to the second page in the Configuration menu.
4. Select the **Printer = On** and confirm.
5. Select
   Printer = 80 columns and
   Format = Listing or
   Page by Page.
6. Enter a **User ID** if required:
   a. In Configuration menu, select **User ID = Yes**.
   b. You will be prompted to enter a user ID at the start of a run method. This ID will appear on the printouts.
7. Enter a Customize the printout if required:
   a. In Configuration menu, press **3 (Customize)**.
   b. Enter the name of your workstation (max. 4 lines of 32 characters) (see 5.6.2 on

page 23). This information will appear as a header at the start of the printout.

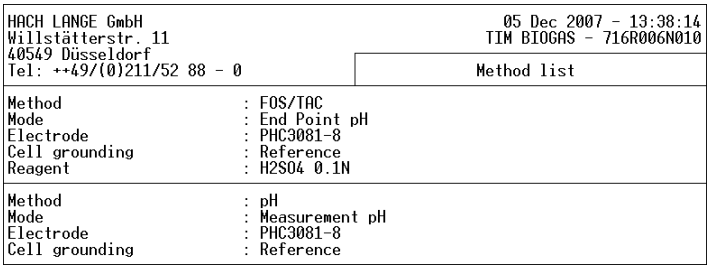
8. For automatic printout - select a condensed or detailed printout.
   - In the Printouts screen of the Edit method/reagent/electrode, select **Detailed = High** to obtain a full detailed printout,
   - In the Printouts screen of the Edit method/reagent/electrode, select **Detailed = Low** for a condensed printout.

5.7 Manual printouts

Method library

Press **Print**, in the Main window to give you an overview of the methods available in the method list.

Figure 11 Method library



Reagent library

Press **Print**, in the Reagents window to get an overview of the reagents available in the reagent list.

Electrode library

Press **Print**, in the Electrodes window to get an overview of the electrodes available in the electrode list.

5.8 Edit data

5.8.1 Edit method data

1. In the Main menu, press **5 Method library.**
2. Press **2** to access. These are the parameters entered in the **Edit method** screen.
3. Press **Print** to get an overview of the parameters of the current programmed method.

Figure 12 Method data

```
HACH LANGE GmbH                                   05 Dec 2007 - 14:03:26
Willstätterstr. 11                              TIM BIOGAS - 716R006N010
40549 Düsseldorf
Tel: ++49/(0)211/52 88 - 0                          Method : FOS/TAC

Mode              : End Point           Measure           : pH
Blank             : No
Temperature       : Entered             No. of tests      : 1
Cell grounding    : Reference

   PARAMETERS
Electrode         : PHC3081-8           Reagent           : H2SO4 0.1N
Predose until     : 5.5 pH              Start timer       : 00min10s
Maximum volume    : 25.0 ml             Direction         : Decreasing pH
Minimum speed     : 0.40 ml/min         Maximum speed     : 15.00 ml/min

Auxiliary output  : No
Addition          : No
Back titration    : No

End point no. 1   : 5.000 pH
EP delay          : 00min03s            Proportional band : 1.200 pH

End point no. 2   : 4.400 pH
EP delay          : 00min03s            Proportional band : 2.000 pH

     SAMPLE
Sample amount     : 5.0000 ml

     RESULT
Results by        : difference
No. of results    : 3                   No. of equations  : 2
No. of digits     : 3
Results factor    : No

             Result TAC
Result unit       : mg/l                Molar weight      : 100.09 g/mol
Reaction          : 2Smp + 1Titr ->
Calculate with EP : 1

         Result Volume A
Result unit       : ml
Calculate with EP : 1

         Result Volume B
Result unit       : ml
Calculate with EP : 2

            Equation FOS
((R3*4*1.66)-0.15)*500
Unit              : mg/l CH3COOH

          Equation FOS/TAC
(((R3*4*1.66)-0.15)*500)/R1
Unit              :

    PRINTOUTS
Title             : Analysis report
Detailed level    : High
Curve             : No
```

5.8.2 Edit reagent data

1. Press **5 Reagent library** in the **Reagent** menu.
2. Press **2** to access. These are the parameters entered in the **Edit reagent** screen.
3. Press **Print** to get an overview of the parameters of the current programmed reagent.

5.8.3 Edit electrode data

1. Press **4 Electrode library** in the **Electrode** menu

2. Press **2** to access. These are the parameters entered in the **Edit electrode** screen.
3. Press **Print** to get an overview of the parameters of the current programmed electrode.

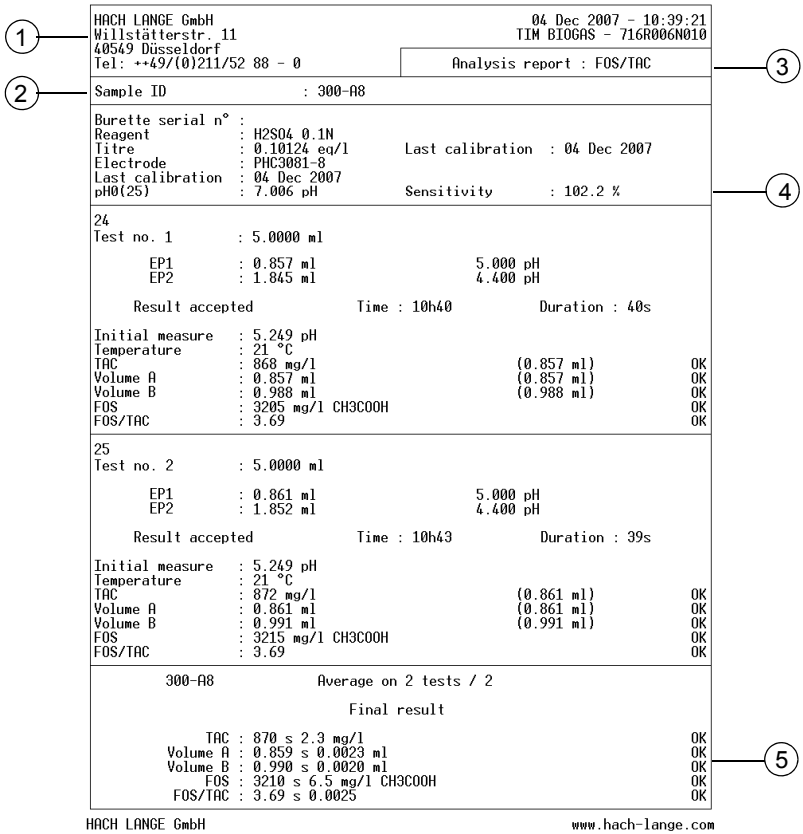
5.8.4 Automatic printouts

The **Print** key is inactive during a titration, pH/mV measurement, electrode or reagent calibration.

The results obtained during a "Run" are printed automatically (see 5.6.2.3 on page 25).

Depending on the option selected for **Detailed** in the **Edit method/reagent/electrode - Printout** screens, you will obtain different types of printouts.

Figure 13 Example of a printout for a titration



1	**Header**: information entered in the Customize screen of the Setup window.	**4**	**Calibration data**: of the electrode and reagent used to perform the titration.
2	**Analysis ID**: User ID and Sample ID entered at the start of the titration (if option selected during editing).	**5**	**Titration results**: obtained at the end of the analysis.
3	**Title of report**: entered in Printouts screen during method editing.		

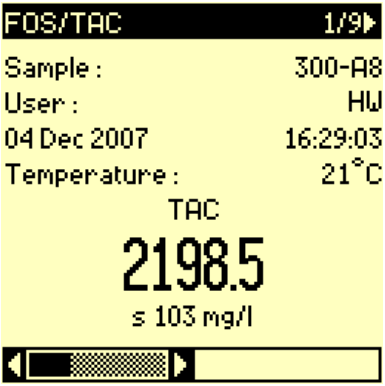
5.9 Store, send and recall data

5.9.1 The data log

The last 60 results are saved in the archives.

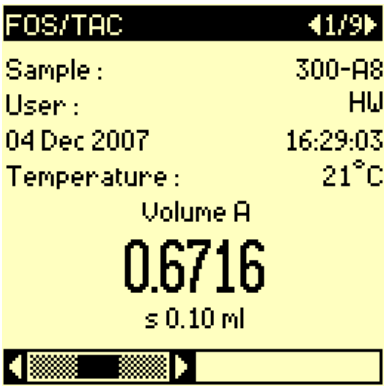
Enter the Main window and press **4** GLP-Archives to access.

Note: *The **RIGHT** and **LEFT arrow** keys allow you to move from one screen to the other.*

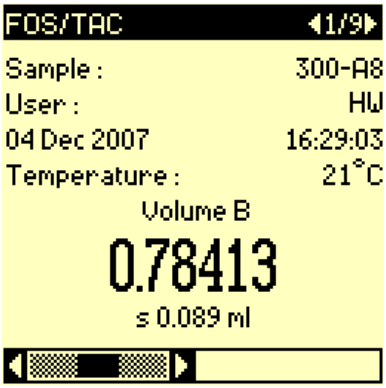


Examples:

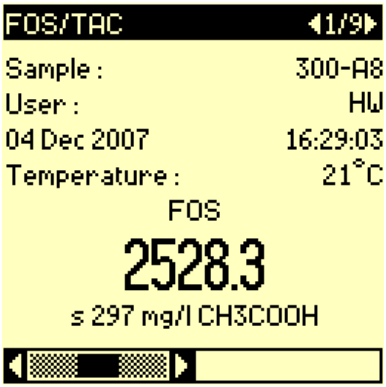
Result no. 1/9 = Mean and standard deviation
Mean and standard deviation calculated on "TAC" test results.



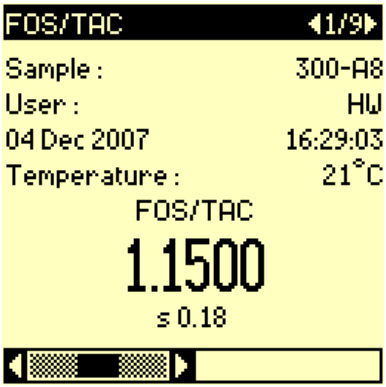
Result no. 1/9 = Mean and standard deviation
Mean and standard deviation calculated on "Volume A" test results.



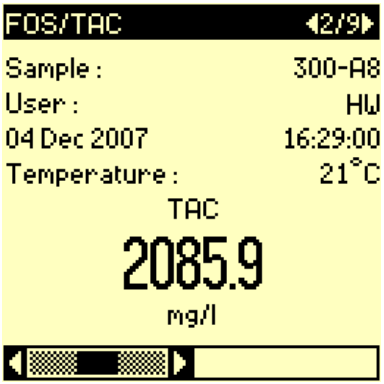
Result no. 1/9 = Mean and standard deviation
Mean and standard deviation calculated on "Volume B" test results.



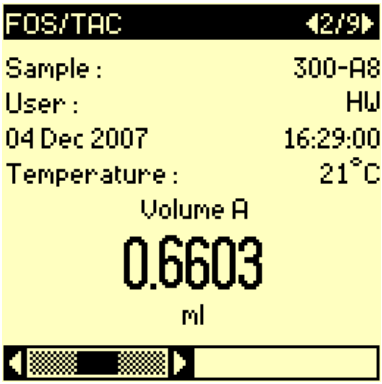
Result no. 1/9 = Mean and standard deviation
Mean and standard deviation calculated on "FOS" test results.



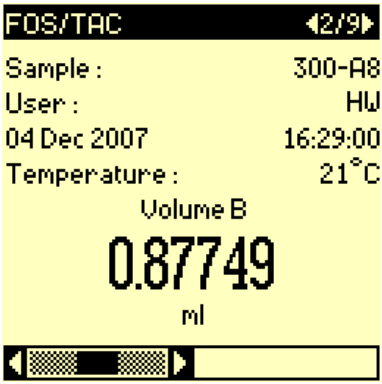
Result no. 1/9 = Mean and standard deviation
Mean and standard deviation calculated on "FOS/TAC" test results.



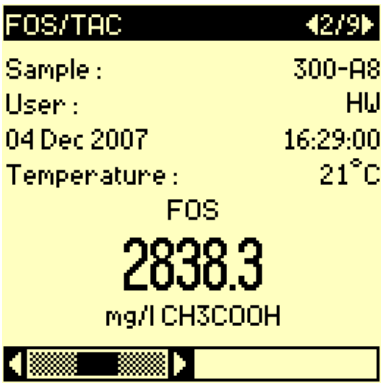
Result no. 2/9 = Test no.1
"TAC" result for test no.1.



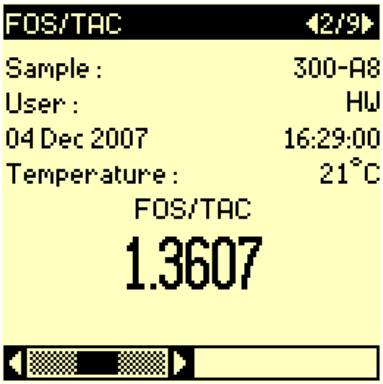
Result no. 2/9 = Test no.1
"Volume A" result for test no.1.



Result no. 2/9 = Test no.1
"Volume B" result for test no.1.

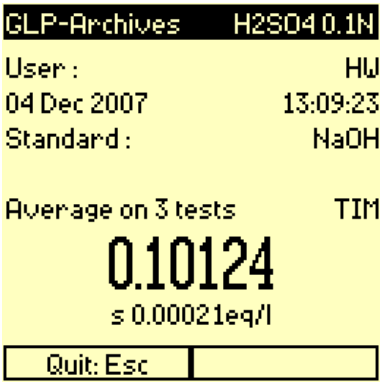


Result no. 2/9 = Test no.1
"FOS" result for test no.1.



Result no. 2/9 = Test no.1
"FOS/TAC" result for test no.1.

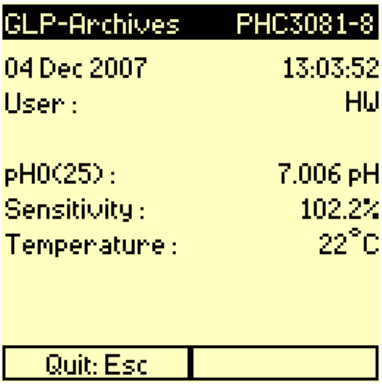
5.9.2 The reagent calibration log



The last performed (current) calibration of each reagent is saved in the archives.

Enter the **Reagent** menu and press **4 GLP-Archives** to access.

5.9.3 The electrode calibration log



The last performed (current) calibration of each electrode is saved in the archives.

Enter the **Electrode** menu and press **3 GLP-Archives** to access.

5.10 Program instructions

Note: *Only the Supervisor is allowed to program the menus, Electrode, Reagent, and Method.*

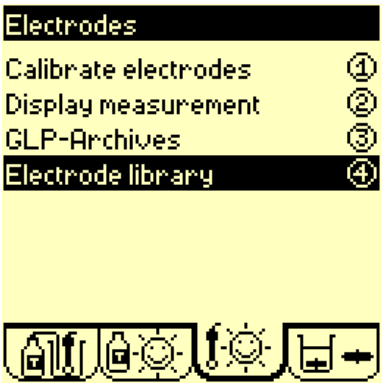
To select the Supervisor mode:

1. Press **Stop** for 3 seconds in the **Main** menu.
2. Enter the Supervisor code (see 5.6 on page 20).
3. Press **5 (Exit)**.
4. Select **Return in mode = Supervisor**.

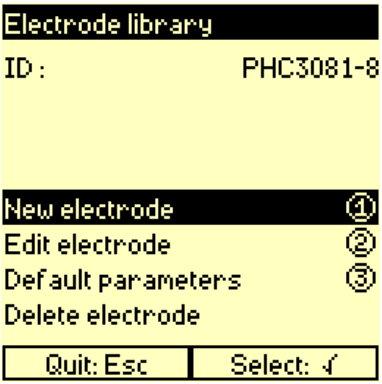
For first time users, it is recommended to program the instrument as follows:

1. Create the electrode(s) to be used to perform the measurements.
2. Create the reagent(s) to be used during the titration.
3. Create the method(s), which will consequently use the electrode(s) and reagent(s) created in the first two steps of programming.
4. Once you have finished programming, make sure that NO question marks "?" are displayed in the Reagent and Electrode tabs!

5.10.1 Enter a new electrode



1. Enter the Elekctrode menu and press **4 (Electrode library)**.



2. Press **1 (New electrode)**.
3. Press the validation key in the **Function** field
4. Select the function of the electrode, refer to the Table 3.

Table 3 Electrode functions

Electrode type	Select function
pH single	pH
pH combined w/wo temp. sensor pH	pH
Single metal/redox	mV (i=0)
Combined metal/redox w/wo temp. sensor	mV (i=0)
ISE single	mV (i=0)
ISE Combined w/wo temp. sensor	mV (i=0)
Reference single	Reference
Temperature sensor	T°C
Ground metal	Ground
Double metal	mV (i>0)

5. Press the validation key in the **ID** field.
6. Select **Other** in the **From** field.

   Note: *The option **From = Catalogue** allows you to create an electrode from a list of preprogrammed electrodes.*

7. Enter the identification (ID) of the electrode, (up to 16 characters).
8. Press **1** twice.
9. Select the electrode **Type**, for electrodes with pH or mV functions:
   - **Single pH** - pH electrode (no reference part),
   - **Combined pH** - pH electrode with a reference part (with or without temperature sensor),
   - **Single metal/redox** - mV (i=0) function electrode with a reference part,
   - **Combined metal/redox** - mV (i=0) function electrode with a reference part (with or without temperature sensor).

Note: *When a* ***combined electrode*** *has been defined, the instrument will prompt you to specify if it has a built-in temperature sensor or not.*

Note: *When a* ***single electrode*** *has been defined, the instrument will prompt you to define a reference electrode in the* ***Edit electrode*** *screen.*

10. When a **combined or a reference electrode** has been defined, enter the potential (in mV) of the reference element versus the Standard Hydrogen Electrode (SHE).

This parameter enables to run calibration with automatic buffer recognition when working with different reference electrode systems. See the table giving the potential at 25°C versus the SHE of a few "reference elements/filling solution" couples (Table 4).

Note: *When a* ***combined pH or a single pH electrodes*** *has been defined, enter the internal pH of the electrode (pH int).*

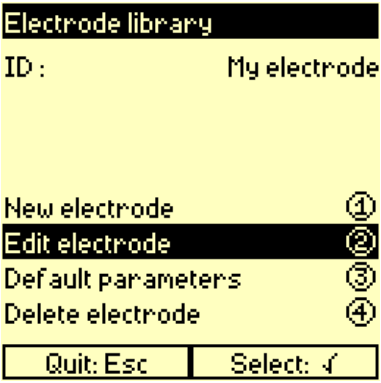
11. Press **1** to confirm.

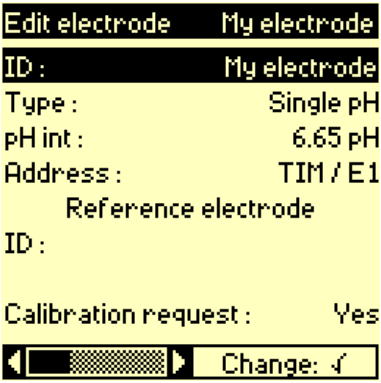
12. Edit the electrode parameters.

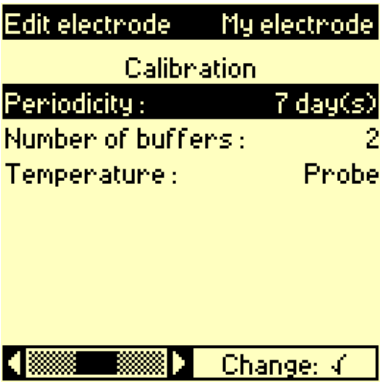
Table 4 Potential versus SHE of Reference electrodes

Reference element filling solution	Potential versus SHE	«Catalog list» electrodes
Hg/Hg_2Cl_2 - Saturated KCl SCE: Saturated Calomel Electrode	+244 mV	pHC4000, pHC4001, pHC4006, XC601, REF401, REF421, REF451, XR100, XR110, XR130, XR150, MC408Pt
Hg/Hg_2Cl_2 - 1M LiCl NCE: Normal Calomel Electrode	+280 mV	REF921
Hg/Hg_2SO_4 - Saturated K_2SO_4	+651 mV	REF601, REF621, XR200, XR230, MC602Pt, MC6091Ag
Hg/Hg_2SO_4 - 1 M H_2SO_4	+616 mV	
Hg/HgO - 0.1 M KOH	+174 mV	XR400, XR430, XR440
Ag/AgCl - Saturated KCl	+199 mV	XR300, XR820, XC100, XC111, XC120, XC161, XC200, XC250
Ag/AgCl - 3 M KCl	+208 mV	pHC3001, pHC3005, pHC3006, pHC3011, pHC3081, pHC3185, REF321, REF361, MC3051Pt, ISEC301F
Ag/AgCl - 1 M KCl	+235 mV	
Ag/AgCl - 0.6 M KCl (sea water)	+250 mV	
Red Rod - Saturated KCl	+199 mV	pHC2001, pHC2002, pHC2003, pHC2005, pHC2011, pHC2015, pHC2051, pHC2085, pHC2401, pHC2441, pHC2501, pHC2601, pHC2701, REF200, REF201, REF251, REF261, MC2095Sb, MC201Au-8

5.10.1.1 Edit an electrode







1. Enter the Electrode menu and press **4 (Electrode library)**.
2. Press the validation key and select the electrode to be edited from the list.
3. Press **2 Edit electrode**.

Note: *The **RIGHT** and **LEFT arrow** keys allow you to move from one screen to the other.*

4. Select whether the electrode should be calibrated or not (**Calibration request = Yes or No**).

Note: *If **Calibration request = No**, the electrode parameter edition is completed.*

Note: Electrode address*: indicates which Titration Manager socket the electrode is connected to: TIM / E1, Ref, Temp, GND or Pt-Pt.*

5. Enter the **Periodicity**.

   Indicates the maximum period of time between two calibrations. If the period of time is exceeded, pH measurements can no longer be performed using this pH electrode. The electrode must be calibrated.

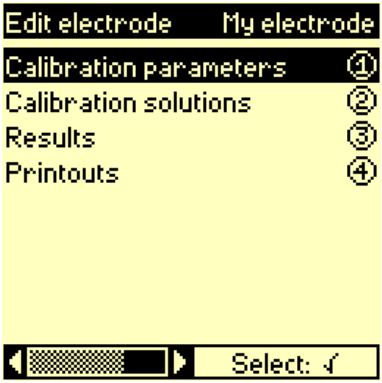
6. Enter the **Number of buffers**.

   Number of standards (1 to 5) to be used for the calibration.

7. Select **Temperature**.
   - If a temperature sensor is in use, select **Probe**.
   - If the temperature is entered manually via the numeric keypad, select **Entered**.
   - If the calibration is to be performed at 25°C, select **Fixed 25°C**.

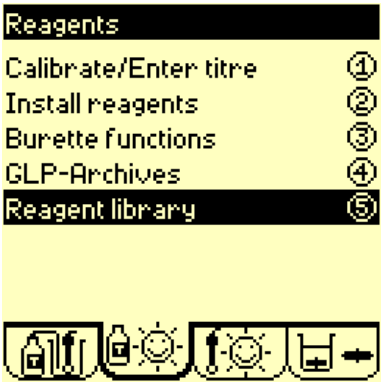
Note: *If you have selected **Temperature = Probe**, a temperature sensor must have been selected in the **Parameters** screen.*

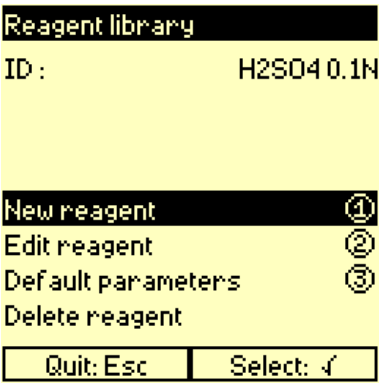
5.10.1.2 Enter the electrode parameters



1. Select **Calibrate request = yes**
2. Enter the electrode definition parameters
3. Go to the last **Edit electrode** screen.
4. Press **1** and enter the **Calibration parameters**: general parameters used during the calibration.
5. Press **2** and enter the **Calibration solutions parameters** concerning the standards used for the calibration.
6. Press **3** and enter the **Results parameters** concerning acceptation criteria that you can set on the results.
7. Press **4** and enter **Printouts parameters** defining the calibration report to be printed.

5.10.2 Enter a new reagent





1. Enter the Reagents menu and press **5 (Reagent library**).
2. Press **1 New reagent** and press the validation key.
3. Select **From = Other**.

Note: *The option **From = Catalogue** allows you to create a reagent from a list of common used reagents.*

4. Select **ID** and press the validation key.
5. Enter the reagent name (up to 16 characters).
6. Enter the "approximate" titre of the reagent (5 characters) in the **Target titre** field.
7. Enter the units (mM, M, mN, N) indicated on the reagent bottle. Use the following:

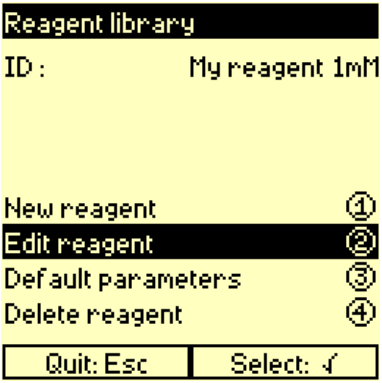
   mM = mmol/l, M = mol/l, mN = meq/l or N = eq/l).

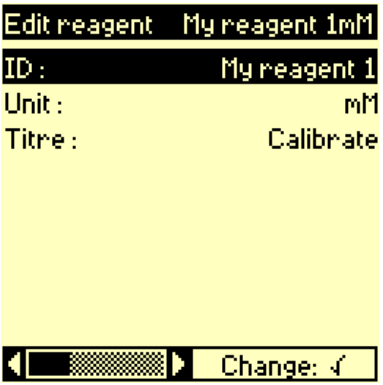
   Note: *Once the units have been confirmed, they are added to the reagent ID and target titre.*

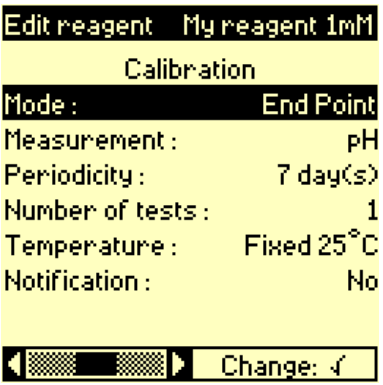
Note: *If molar units are selected (mM or M), it is necessary to enter the stoichiometric coefficients for the chemical reaction in the **Results** screen.*

8. Press **1** twice to create the reagent.
9. Edit the reagent parameters.

5.10.2.1 Edit a reagent







1. Enter the Reagent menu and press **5 (Reagent library)**.
2. Press the validation key and select the reagent to be edited from the list.
3. Press **2 Edit reagent**.

Note: *The **RIGHT** and **LEFT arrow** keys allow you to move from one screen to the other.*

4. Enter the unit: mM = mmol/l, M = mol/l, mN = meq/l or N = eq/l). The unit is indicated on the reagent bottle.
5. Select **Titre = Enter** or **Calibrate**.
   - Select **Enter** if you already know the titrant concentration and do not wish to perform a calibration.
   - Select **Calibrate** if you wish to perform a calibration. Enter the calibration parameters.
6. Select the type of method for **Mode**. You have the choice between End Point, Monotonic IP, Dynamic IP or Continuous IP.
7. Select the measurement mode for the calibration (pH, mV or mV at imposed current).
8. Enter the **Periodicity**.

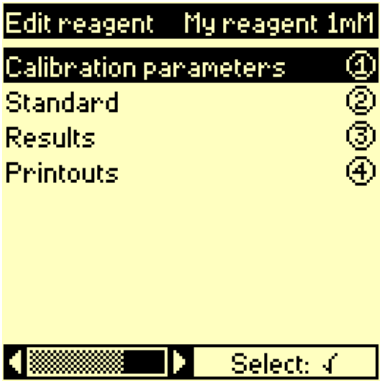
   Indicates the maximum period of time between two calibrations. If the period of time has elapsed, titrations can no longer be performed using this titrant.
9. Enter the **Number of tests**.

   This is the number of times the calibration method will be repeated, i.e. the number of beakers to prepare for the calibration.
10. Select **Temperature**.
    - If a temperature sensor is in use, select **Probe**.
    - If the temperature is entered manually via the numeric keypad, select **Entered**.
    - If the calibration is to be performed at 25°C, select **Fixed 25°C**.

Note: *If you have selected **Temperature = Probe**, a temperature sensor must have been selected in the **Parameters** screen.*

Note: *If you want a message to be displayed upon starting the calibration, select **Notification = Yes** then enter the message (3 lines of 32 characters maximum).*

5.10.2.2 Enter the reagent parameters



1. Select **Titre = Calibrate**
2. Enter the **Edit reagent** menu and press **1 (Calibration parameters)**.

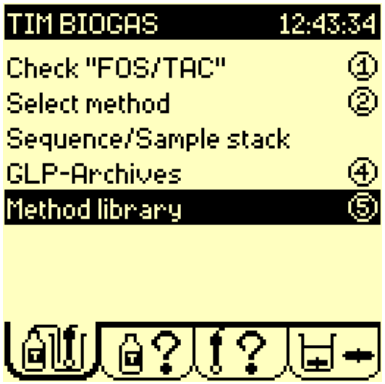
   The **Calibration parameters** are general parameters used during the calibration.
3. Press **2 (Standard)**.

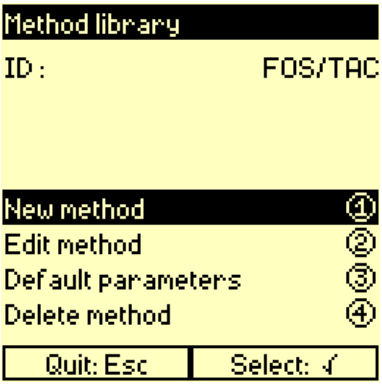
   The **Standard parameters** concerning the standard solution used for the calibration.
4. Press **3 (Results)**.

   The **Results parameters** concerning stoichiometric coefficients for the chemical reaction (if required).
5. Press **4 (Printouts)**.

   Enter **Printouts parameters** defining the calibration report to be printed.

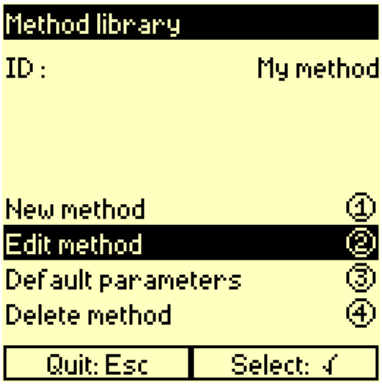
5.10.3 Enter a new method

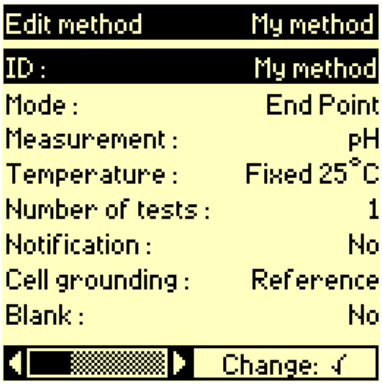




1. Enter the Method menu and press **5 (Method library**).
2. Press **1 New method** and press the validation key.
3. Select **ID** and press the validation key.
4. Enter a method name (up to 16 characters).
5. Press **1 to confirm**.
6. Edit the method parameters.

5.10.3.1 Edit a method





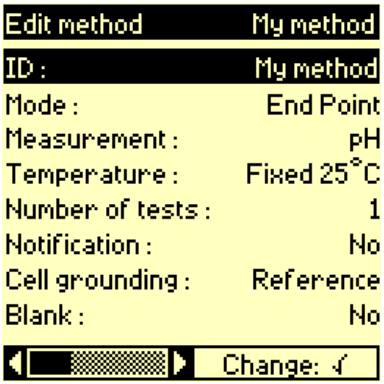
1. Enter the Method menu and press **5 (Method library)**.
2. Press the validation key and select the method to be edited from the list.
3. Press **2 Edit method**.

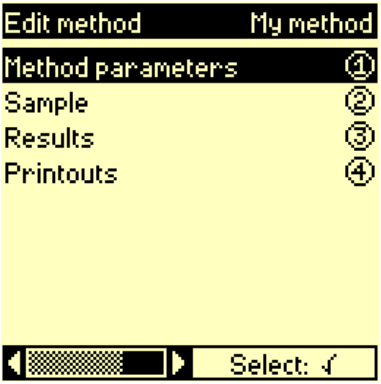
Note: *The **RIGHT** and **LEFT arrow** keys allow you to move from one screen to the other.*

4. Select the method mode. The modes available are:
   - **Measurement** (pH, mV or mV at imposed current)
   - **End point** (titration to a preset mV or pH end point)
   - **Coupled** (methods chained in a same beaker)
   - **Continuous IP** (Inflection point detection with continuous addition of the titrant)
   - **Monotonic IP** (Inflection point detection with incremental addition of the titrant, increments of equal size)
   - **Dynamic IP** (Inflection point detection with incremental addition of the titrant, increments of varying size)
5. Select the measurement mode:
   - pH
   - mV
   - mV at imposed current.
6. Select **Temperature**.
   - If a temperature sensor is in use, select **Probe**.
   - If the temperature is entered manually via the numeric keypad, select **Entered**.
   - If the calibration is to be performed at 25°C, select **Fixed 25°C**.
7. Enter the **Number of tests**, i.e. the number of times the method is to be repeated.
8. Select the way the cell grounding of the measuring electrode will be performed:
   - **Reference**: reference electrode connected to the **Ref** socket on the titration system.
   - **Metal**: metal electrode connected to the **GND** socket on the titration system. For titrations in very resistant medium.
   - **Other**: an electrode which does not belong to the electrode system.
9. If you want a message to be displayed upon starting the method, select **Notification = Yes** then enter the message (3 lines of 32 characters maximum).

10. Select **Blank**:
A blank or blank sample is usually a solvent used to dissolve or dilute the sample. This blank may contain traces of the species you are analysing.
    - Select **Yes** for Blank when you want to subtract the volume of titrant used to titrate the solvent from the volume found for the dissolved or diluted sample.Enter the unit: mM = mmol/l, M = mol/l, mN = meq/l or N = eq/l). The unit is indicated on the reagent bottle.

5.10.3.2 Enter the method parameters





1. Enter the **Edit method** menu and press **1 (Method parameters)**.
   The **Method parameters** are general parameters concerning the electrode and reagent used by the method.
2. Press **2 (Sample)**.
   The **Sample parameters** concerning the sample amount analysed.
3. Press **3 (Results)**.
   The **Results parameters** defining the results and stoichiometric coefficients for the chemical reaction (if required).
4. Press **4 (Printouts)**.
   The **Printouts parameters** defining the analysis report to be printed.

5.11 Run analyses

5.11.1 Introduction

5.11.1.1 Working in Supervisor mode

When programming in **"SUPERVISOR"** mode, it is recommended to work in stages. These stages *should* be carried out in the order described below:

1. Define your electrode(s)

Identify electrodes (including temperature sensors) to be used for the analysis.

Electrodes can be created from the following lists, Catalogue, Other or Copy from. When creating the electrode, define if electrode calibration is required (or not), if yes specify the “periodicity” of the calibrations and the pH standards to be used. Refer to 5.9.3 The electrode calibration log on page 33.

2. Define reagent

   Identify reagents to be used for the analysis.

   Reagents can be created from the following lists, Catalogue, Other, Copy from. When creating the reagent, define if reagent calibration is required (or titre entered manually), if yes specify the “periodicity” of the calibrations and the calibration method. Refer to 5.10.2.2 Enter the reagent parameters on page 40.

Note: *If you are to perform a calibration, make sure that the electrode(s) used for the calibration are the same as those used in the method.*

3. Create a new method or Edit a pre-programmed one

   Create the measurement or titration method to be used for the analyses. Enter the parameters required to calculate the results, Refer to 5.10.3.2 Enter the method parameters on page 42.

   When you have finished programming, select the method or pre-programmed application, refer to Short-Form Reminder no. 3.

   If a sample changer is to be used, define the sample changer in the **Configuration** menu.

4. Check icons

The following icons indicate the exact state of your working system.

Table 5 Icons

Icon	Description
	**Sunny icon:** Everything is OK. Run the method or sequence. ***Note:*** *Sunny icons are required to run the method.*
	**Cloudy icon:** Action required within 12 or 24 hours. For example electrode and/or reagent calibration.

Table 5 Icons

Icon	Description
	**Stormy icon:** Electrode/reagent calibration date elapsed or reagent not installed.
	**Question mark:** It is a programming error, reagent and/or electrode is/are not defined in the selected method. Revise the method programming.

Note: *When Cloudy/Stormy/Question mark icons appear, Press* ***1 Check****. The Titration Manager will automatically guide you through the operations necessary to solve the errors encountered.*



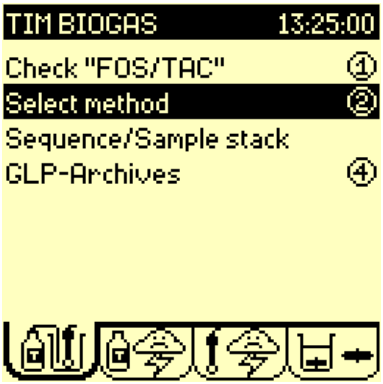
5. Run the method.

5.11.1.2 Working in Routine mode

In **"ROUTINE"** mode you are guided at every step, thanks to the clear-text messages and the icons present on the large graphic display.

A Routine operator has access to all the displays for *checking* purposes.

When working in **"ROUTINE"** mode, it is necessary to install your titration system according to the selected method or sequence, prior to running a method or sequence.



1. Press **2 (Select method)** in the main menu.

   If Question marks "?" are present in the electrode and/or reagent tabs. Programming error due to missing electrode/reagent parameters.
   Contact your supervisor.
2. Connect/Check electrode(s).
   Refer to *Short-Form Reminder no. 1*.

   Note: *When installing/checking an electrode system, do not forget to connect all the electrodes to the Titration Manager and disconnect all the electrodes that are not used by the method.*
3. Install/Check reagent.
   Refer to *Short-Form Reminder no. 2*.
4. Select **Start** in the main menu to run the analysis when Sunny icons are visible in the electrode and reagent tabs.
5. Run an electrode calibration when a Stormy icon appears in the electrode tab.
6. Run a reagent calibration when a Stormy icon appears in the titrant tab.
7. If you are unable to display the "Run" command due to the presence of Cloudy/Stormy icons in the Reagent and Electrode windows, activate the "Check" command.

   The BIOGAS Titration Manager will automatically guide you through the necessary operations required to solve the problem(s).

5.11.2 Run an elecrode calibration

Refer to Short-Form Reminder no. 4.

1. Select the method.
2. Install the electrode group.
3. Enter the **Electrode** menu.
4. Select **1 Calibrate electrodes**.
5. Press the validation key.
6. Select the electrode to be calibrated from the proposed list.
7. Press **1** to start the calibration.

5.11.3 Run a reagent calibration

Refer to Short-Form Reminder no. 5.

1. Select the method.
2. Install the reagent to be calibrated.
3. Install the electrode group to be used to perform the calibration.
4. Enter the **Reagents** menu.
5. Select **1 Calibrate/Enter titre**.

6. Press the validation key.
7. Select the reagent from the proposed list.
8. Press **1** to start the calibration.

5.11.4 Run a method

Refer to Short-Form Reminder no. 6.

1. Select the method.
2. Install the electrode group to be used to perform the analysis.
3. Install the reagent groups to be used to perform the analysis.
4. Display the **Main** menu. and press **1** to start the analysis.

5.11.5 Run a sequence

Refer to Short-Form Reminder no. 7.

1. Install the electrode group to be used to perform the analysis.
2. Install the reagent groups to be used to perform the analysis.
3. Display the **Main** menu.
4. Press **3**.
5. Press **1**.
6. Prepare the sample stack.
7. Display the **Main** menu and press **1** to start the analysis.

5.11.6 Run a direct measurement

Refer to Short-Form Reminder no. 8.

1. Select the method.
2. Install the electrode group.
3. Display the **Electrode** menu.
4. Press **2** to start the measurement.
5. Select the electrode in the list.

Note: *You can stop or start stirring by pressing **1**.*

Section 6 Maintenance

6.1 Cleaning the instrument

The BIOGAS Titration Manager requires minimum maintenance. The exterior surface can be cleaned with tepid water and wiped dry with a soft cloth.

Note: *Never use another solvent.*

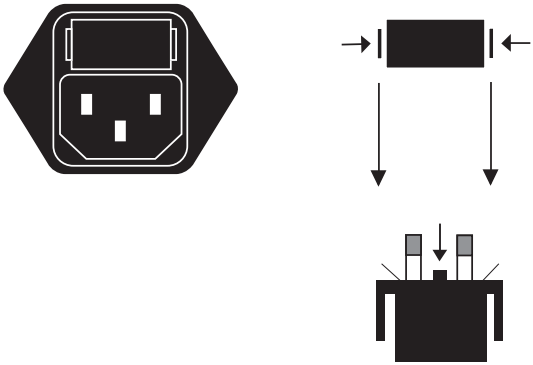
6.2 Fuse replacement

⚠WARNING

To avoid the risk of electric shock, disconnect the instrument from the power source before the fuse replacement procedure is commenced.

1. Switch off the instrument.
2. Disconnect line cord.
3. Remove the fuse holder.
4. Replace the used fuses with two new fuses, slow blow, 1.0 A (5 x 20 mm), part no. 450-020.
5. Put the cap back in place.

Figure 14 Fuse replacement



6.3 Servicing

⚠WARNING

Do not attempt to service this product yourself, except as noted in the User's guide or Reference Manual.

Please contact the service department of the manufacturer or the distributor.

Section 7 Troubleshooting

7.1 Troubleshooting

If you have forgotten an operation while editing the method, icons visible in the Electrode and Reagent windows indicate that an error(s) has occured.

To find out where the error has occured and to help you solve them, run the “Check” command in the Main window. The BIOGAS Titration Manager will automatically guide you through the operations required to solve the errors encountered.

Section 8 Replacement Parts and Accessories

8.1 Burette stands

	Cat. Number
B505 Burette Stand, 5 mL, UV protected with connection tubing	X51T026
B510 Burette Stand, 10 mL, UV protected with connection tubing	X51T017
B525 Burette Stand, 25 mL, UV protected with connection tubing	X51T026
B550 Burette Stand, 50 mL, UV protected with connection tubing	X51T028

8.2 Spare parts

	Cat. Number
Delivery tubing with anti-diffusion tip	X31T069
Titrant bottle stopper GL45 assembly with desiccant & suction tubing	X31T070
Titrant bottle stopper GL45 assembly with desiccant & suction tubing for B501	X31T110
Fuse, slow blow, 1.0A, (5 x 20 mm)	450-020
Magnetic stirrer rods x3	LYW064
Cylinder graduated 5mL	50837
Maintenance Kit of 3 tubes for B5xx	X31T115

8.3 Polypropylene titration vessels

	Cat. Number
Titration Vessel, PP, 40-100 mL (pack of 50 pcs)	904-490
Titration Vessel, PP, 22-45 mL (pack of 50 pcs)	904-489

8.4 Notebook keyboards

	Cat. Number
Notebook Keyboard 83-keys, PS/2 port, US version	X16T005
Notebook Keyboard 83-keys, PS/2 port, French	X16T006

8.5 Combined pH/Reference electrodes – Acid/Base titrations

	Cat. Number
pHC3081-8 - Combined pH electrode, Ag/AgCl, with temperature probe	E16M305

8.6 4-7-10 Series pH Standards

	Cat. Number
pH 4 - pH 4.00 at 25 °C, 500 ml	S11M012
pH 7 - pH 7.00 at 25 °C, 500 ml	S11M013
pH 10 - pH 10.00 at 25 °C, 500 ml	S11M014

8.7 Electrode Maintenance Solutions

	Cat. Number
RENOVO N - Normal Cleaning Solution, 250 mL	S16M001
RENOVO X - Xtra Strong Cleaning Solution, 250 mL	S16M002
KS400 - Pepsin in HCl Cleaning Solution, 250 mL	C20C370
KS410 - Thiourea Solution, 250 mL, for junction cleaning	C20C380
KS120 - KCl Solution, saturated with AgCl, 500 mL, for Ag/AgCl reference	C20C310
GK ANNEX - Electrode Maintenance Kit for pH & reference electrodes	S91M001

8.8 Titrant Solutions

	Cat. Number
Sulfuric acid standard solution, 0.1 N, 1000 mL	20253
Hydrochloric acid standard solution, 0.1 N, 1000 mL	1481253

Section 9 Contact Information

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