SG-5000BT

Density / Specific Gravity / Portable Concentration Meter

Instruction Manual

Version 1.3

Contents

1 About the Instruction Manual

This instruction manual informs you about the installation and the safe handling and use of the product. Pay special attention to the safety instructions and warnings in the manual and on the product.

The instruction manual is a part of the product. Keep this instruction manual for the complete working life of the product and make sure it is easily accessible to all people involved with the product. If you receive any additions or revisions to this instruction manual from Eagle Eye, these must be treated as part of the instruction manual.

Conventions for safety messages

The following conventions for safety messages are used in this instruction manual:

DANGER
Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE
Notice indicates a situation which, if not avoided, could result in damage to property.

TIP *Tip gives extra information about the situation at hand.*

Typographical conventions

The following typographical conventions are used in this instruction manual:

Convention	Description
<key>	The names of keys and buttons are written inside angle brackets.

Convention	Description
"Menu Level 1 > Menu Level 2"	Menu paths are written in bold, inside straight quotation marks. The menu levels are connected using a closing angle bracket.

2 Safety Instructions

2.1 General Safety Instructions

Liability

- Read this instruction manual before using SG-5000BT.
- Follow all tips and instructions contained in this instruction manual to ensure the correct use and safe functioning of SG-5000BT.
- Make sure that this instruction manual is easily accessible to all personnel involved with the instrument.
- This instruction manual does not claim to address all safety issues associated with the use of the instrument and samples. It is your responsibility to establish health and safety practices and determine the applicability of regulatory limitations.
- Eagle Eye only warrants the proper functioning of SG-5000BT if no adjustments have been made to the mechanics, electronics, and firmware.
- Only use SG-5000BT for the purpose described in this instruction manual.
  Eagle Eye is not liable for damages caused by incorrect use of SG-5000BT.
- The results delivered by SG-5000BT not only depend on the correct functioning of the instrument, but also on various other factors. We therefore recommend you have the results checked (e.g. plausibility tested) by skilled personnel before consequential actions are taken based on the results.

Installation and use

- SG-5000BT is **not** an explosion-proof instrument and therefore must not be operated in areas with risk of explosion.
- The installation procedure shall only be carried out by authorized personnel who are familiar with the installation instructions.
- Do not use any accessories or spare parts other than those supplied or approved by Eagle Eye (see Chapter 5).

- Make sure all operators are trained to use the instrument safely and correctly before starting any applicable operations.
- In case of damage or malfunction, do not continue operating SG-5000BT. Do not operate the instrument under conditions which could result in damage to goods and/or injuries and loss of life.
- If liquid was spilled over the instrument, switch the instrument off and disconnect it from the mains. Clean and dry the housing of the instrument. If you suspect that liquid got into the instrument, have the instrument cleaned and checked for electrical safety by a service technician.
- Ensure that spilled liquids cannot get into plug connections or venting slots of electrical equipment.

Moving the instrument

- Make sure that all hoses and the measuring cell are empty before you move or lift SG-5000BT.
- When carrying the system, keep it close to your body.

Handling of chemicals

- Observe all safety regulations regarding the handling of the samples, cleaning, rinsing and waste liquids (e.g. use of safety glasses, gloves, respiratory protection, exhaustion, etc.).
- Check the chemical resistance of all materials (see Appendix A.2) which come into contact with the sample or cleaning liquid before starting the measurement.
- Make sure that different liquids (samples and cleaning liquids) or gases that come into contact with each other are chemically compatible. They should not react exothermally or produce any solid particles that might stick to the inner wall of the measuring cell.
- Prior to starting a measurement or cleaning procedure, make sure that all parts that come into contact with fluids, especially the measuring cell, the injection adapters, hoses and waste container, are properly connected and in good condition.
- Prior to starting a measurement or cleaning procedure, check the injection adapter for leak tightness (see Chapter 7.7).

Precautions for highly flammable samples and cleaning agents

- Observe and adhere to your national safety regulations for handling the measured samples (e.g. use of safety goggles, gloves, respiratory protection, etc.).

- Place SG-5000BT on a laboratory bench with a non-flammable surface, preferably made of bricks, ceramics or stoneware.
- Only store the minimum required amount of sample, cleaning agents and other flammable materials near the SG-5000BT.
- Do not spill sample/cleaning agents or leave their containers uncovered. Immediately remove spilled sample/cleaning agents.
- Keep any sources of ignition, like sparks and open flames, at a safe distance from SG-5000BT.
- Make sure that the setup location is sufficiently ventilated. The environment around SG-5000BT must be kept free of flammable gases and vapors.
- Supply a fire extinguisher.
- Ensure the sufficient supervision of SG-5000BT during operation.

Service and repairs

- Service and repair procedures may only be carried out by authorized personnel or by Eagle Eye.
- Prior to sending SG-5000BT to your Eagle Eye representative or Eagle Eye for repair or service, make sure that all liquids and solvents are completely drained out of the instrument.

Disposal

- Concerning the disposal of SG-5000BT, observe the legal requirements in your country.

3 The Measuring Principle

Definition of density and specific gravity

The density ρ of a sample is defined as mass divided by volume:

$$\rho = \frac{m}{V}$$

The specific gravity SG is calculated by dividing the density of a sample by the density of pure water:

$$SG = \frac{\rho_{Sample}}{\rho_{Water}}$$

Density and specific gravity values are highly temperature-dependent.

The oscillating U-tube method

The sample is introduced into a U-shaped borosilicate glass tube that is being excited to vibrate at its characteristic frequency. The characteristic frequency changes depending on the density of the sample. Through a precise determination of the characteristic frequency the density of the sample can be calculated. Due to the temperature dependency of the density value, a precise temperature control of the sample is required.

Concentration measurement

In binary mixtures, the density of the mixture is a function of its composition. Thus, by using density/concentration tables, the density value of a binary mixture can be used to calculate its composition.

This is also possible with so-called quasi-binary mixtures. These are mixtures containing two major components and some additional components which are present in very small concentrations compared to the two main components. Many decarbonated soft drinks, for example, can be considered to be quasi-binary solutions of sugar in water because the concentration of flavors and acids are very small compared to sugar and water. Thus, the sugar concentration can be measured with a density meter.

4 SG-5000BT - An Overview

The SG-5000BT - combines the accuracy and functionality of a benchtop density meter with the usability and flexibility of a mobile instrument. It is designed to aid you during your daily routine within the laboratory.

Reliability and power under any circumstances

The SG-5000BT density meter is the first benchtop density meter providing optional off-the-line operation - for the purpose of compensating electrical power outages, flexibility regarding the position of the instrument within the lab, or temporary operation outside the lab. The compact and lightweight design ensures low space requirements in the lab as well as convenient moving of the instrument.

Accurate measured results

Based on the oscillating U-tube principle the instrument measures the density of liquid samples. The density value can be automatically converted into concentration values for a large number of factory-programmed substances. You can also program special substances as required. Sample naming ensures perfect traceability of results.

Viscosity-related errors are automatically corrected. In the SG-5000BT, an optional adjustment with a standard of high viscosity and high density leads to an enhanced precision for samples with high viscosities and high densities.

An integrated Pt 100 platinum thermometer together with Peltier elements provides an extremely precise thermostatting of the sample.

Precise sample filling

Accurate and repeatable results strongly depend on bubble-free filling, ensured by SG-5000BT's optionally integrated peristaltic pump.

The FillingCheck™ feature automatically detects gas bubbles in the measuring cell by an advanced analysis of its oscillation pattern and generates a warning message. Additionally you can visually inspect the measuring cell using a real-time camera (U-View™).

User interface

SG-5000BT's user interface supports easy and intuitive operation in all routine applications. Just select the settings fitting your application and create your own methods.

Besides the keys you can also operate the SG-5000BT with the support of an external keyboard or bar code reader, connected to the USB interface. All relevant information is well structured and appealingly shown on the large color LC display.

Data management

You can export your measured data in the format of your choice (csv, txt, html) to a USB flash drive or - via the Bluetooth interface - to a PC. Also other kinds of data - like firmware updates, custom functions or instrument backups - can conveniently be transferred from or to an external device. Printouts are done via the Bluetooth interface without the need for any cables.

5 Checking the Supplied Parts

SG-5000BT was tested and packed carefully before shipment. However, damage may occur during transport.

1. Keep the packaging material (box, foam piece, transport protection) for possible returns and further questions from the transport and insurance company.
2. Check the delivery for completeness by comparing the supplied parts to those noted in Table 5.1.
3. If a part is missing, contact your Eagle Eye representative.
4. If a part is damaged, contact the transport company and your Eagle Eye representative.

Table 5.1: Supplied parts

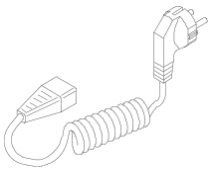
Symbol	Pcs.	Article Description	Mat. No.
	1	SG-5000BT density meter	94680
	1	Power supply	94677
	1	Power cord Europe USA UK Thailand China	 65146 52656 61865 79730 27011
	1	Instruction manual English	 96271

Table 5.1: Supplied parts

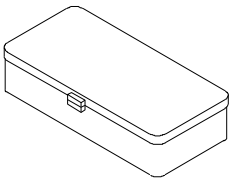
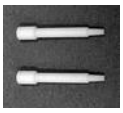
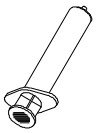
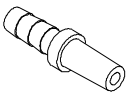
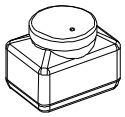
Symbol	Pcs.	Article Description	Mat. No.
	1	Accessory kit containing:	96734
	2	Injection adapter Luer	98459
	2 m	Hose 3 x 5 mm silicone (transparent)	50814
	10	Syringe 2 mL Luer	51974
	2	Male Luer plug PTFE	63865
	2	Adapter Luer cone	63863
	1	Angular screwdriver Torx T8	99282
	1	Waste vessel	6210

Table 5.2: Optional parts

Article Description	Mat. No.
Options	
Peristaltic pump	91803
Roller cassette fluran tubing	99306
Li-Ion accumulator 7.5 V 4.8 Ah Saft	92634
Data handling	
Keyboard German USB	80809
Keyboard USA USB	80807
Printer CMP-10BT Bluetooth/RS232C	97154
FTDI USB-USB null modem cable	98720
Bluetooth USB adapter	99180
Car adapter 12 V, 5 A for SG-5000BT	99278
Protection	
Protecting cover for keyboard	13350
Syringes	
Syringe 2 mL Luer (1 pc.)	51974
Syringes 2 mL Luer (10 pcs.)	58802
Syringes 2 mL Luer (1000 pcs.)	66399
Syringes 5 mL Luer (100 pcs.)	6772

6 Description of the Instrument

6.1 View of the Front and Right Side

Fig. 6 - 1 View of the front and right side of SG-5000BT

1 ... Softkeys
2 ... Color LC display
3 ... Battery charge status LED
4 ... Power on key with LED
5 ... Sample inlet and outlet
6 ... Start/stop key for the air pump
7 ... Arrow keys

Keys at the front side

	For switching the instrument on and off.
	For starting and stopping the air pump.
	Softkeys for selecting menu items and for navigation. The function of the two middle softkeys can be configured.
	Arrow keys for navigation within the menu and for the entry of characters .

TIP For faster up and down navigation, keep the arrow keys pressed.

For details about the battery status information, see Chapter 15.2.

6.2 Rear View

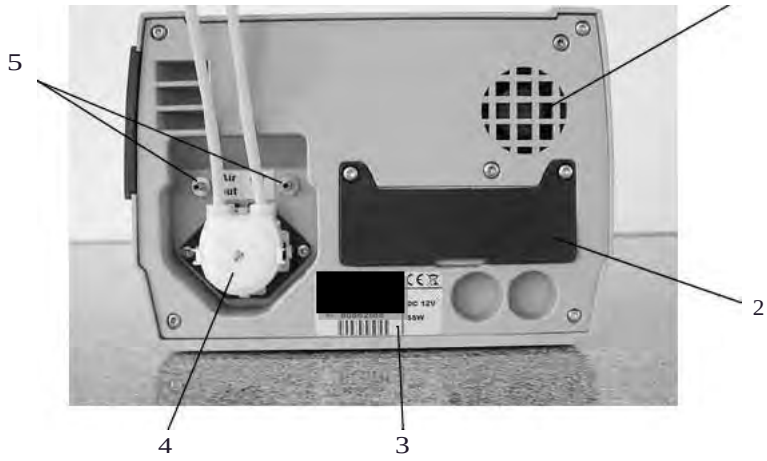


Fig. 6 - 2 Rear view of SG-5000BT

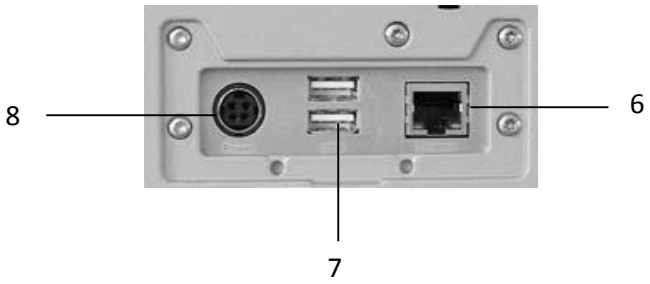


Fig. 6 - 3 Interfaces at the rear of SG-5000BT

1 ... Fan
2 ... Protection cap for interfaces
3 ... Type shield with serial number
4 ... Peristaltic pump with hoses (optional)
5 ... Air pump connector
6 ... Ethernet interface
7 ... USB interfaces
8 ... Power inlet

6.3 Operating Elements on the Main Screen

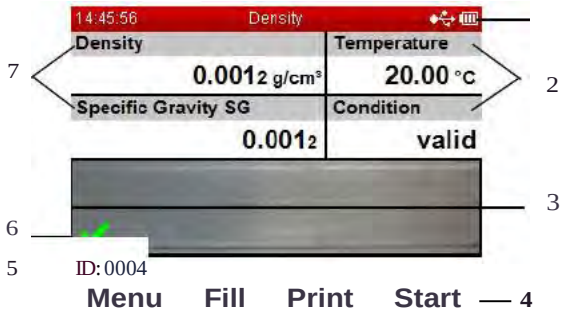


Fig. 6 - 4 Main screen example

1 ... Information header
2 ... Fixed output fields
3 ... Live image of measuring cell (U-View™)
4 ... Softkey functions
5 ... Sample ID field
6 ... Automatic filling error detection (FillingCheck™)
7 ... Configurable output fields

Information header

In the left part of the header, you find the current time. If a method is activated the name of the method is shown in the middle of the header. On the right side of the header you find different symbols:

	The pump symbol is shown when the optionally integrated peristaltic pump is active.
	The air pump symbol is shown when the air pump is activated.
	The USB symbol is shown when a USB flash drive is connected to one of the instrument's USB interfaces.
	The battery charge status symbol informs you about the battery charge status. For further information on different charge status symbols and their meanings, see Chapter 15.2.
PC	The PC symbol is shown when the instrument is connected to a PC.

Fixed output field

The two fixed output fields show the currently measured temperature in oC or oF and the condition of the current measurement.

Configurable output field

The measuring units shown in the two configurable output fields can be selected and stored according to your needs by entering a method.

Live image of the measuring cell

U-View™: a live camera view of the measuring cell enables you to check the measuring cell for correct filling.

FillingCheck™ symbol

The FillingCheck™ symbol shows a filling warning if the sample has not been filled properly. Different symbols are shown depending on the current error status (see Chapter 12.10.2).

Sample ID field

If a sample name was selected it is shown in the sample ID field. If no sample ID is selected the 4-digit consecutive counter of measurements is shown.

Softkey functions

At the bottom of the main screen the functions allocated to the four softkeys are shown. The functions for the outside right and outside left softkeys are fixed, the functions of the two middle softkeys can be configured (see Chapter 9.8).

The softkeys have different functions depending on the current menu level or dialog.

The softkeys on the main screen can have the following functions:

<Menu>	To open the main menu.
<Method>	Allows a quick access to the method list to select a method.
<ID>	Allows a quick access to the sample ID list to select a sample ID.
<Temp. ID>	Allows you to enter a temporary ID for the following measurement, e.g. by using the external keyboard or bar code reader.
<Check>	Allows a quick access to the check menu.
<Fill>	Starts and stops the optionally integrated peristaltic pump.
<Print>	Prints the currently displayed value.
<Start>	To start a measurement.
<Cancel>	To abort a measurement or to reject a measured result.
<Save>	To save the measured value and return to the monitor mode.
<▲>	To see the functions of a softkey if it is configured with more than one function.

Monitor mode

If you have not started a measurement yet, or if you have aborted or terminated a measurement by pressing <Cancel> or <Save>, the instrument is in the monitor mode and shows a continuous reading of the currently measured values.

Measuring mode

If you have started a measurement, the continuously measured values are shown until the measurement is finished. The final values are frozen. To save the measured value and change to the monitor mode, press <Save>.

7 Installing SG-5000BT

To install the instrument, put it on a bench, mount the filling adapters and hoses and connect the instrument to the mains. Define general instrument settings and perform an air check or water check to check the validity of the factory adjustment.

TIP *The integrated rechargeable battery is only charged to about 70 % when shipped. To benefit from the total capacity of the battery, connect the instrument to the mains until the battery LED stops blinking before using the instrument in the battery-operated mode.*

7.1 The Right Place

The installation conditions for SG-5000BT must correspond to conditions in a typical laboratory.

WARNING
Using hazardous or flammable chemicals as samples or cleaning liquids could destroy the instrument and cause serious injuries when not taking special precautions into account.

- See the section "Special precautions for flammable samples and cleaning agents" in Chapter 2 for information about a suitable installation place.

To guarantee temperature stability, do not place SG-5000BT:

- near a heater
- near an air conditioner
- on a vibrating surface or close to vibrating equipment
- in direct sunlight

NOTICE
A strong built-in cooling fan dissipates heat through the rear of SG-5000BT. Ensure that the airflow is not blocked.

NOTICE
High humidity or a measuring temperature that is significantly below the ambient temperature may lead to condensation within the measuring cell. Install a drying cartridge to prevent condensation (see Appendix D).

7.2 Mounting the Injection Adapters

1. Take the two Luer injection adapters from the accessory box.
2. Pull out the black transport plastic plugs from the tip of the injection adapters.

TIP *Keep the black transport plastic plugs for later. They can be used as an injection adapter tool to widen the tips of the adapters in case of leaks.*

3. Loosen the screw at the top of the filling adapter inlets using the Torx T8 angular screwdriver (from the accessory box).

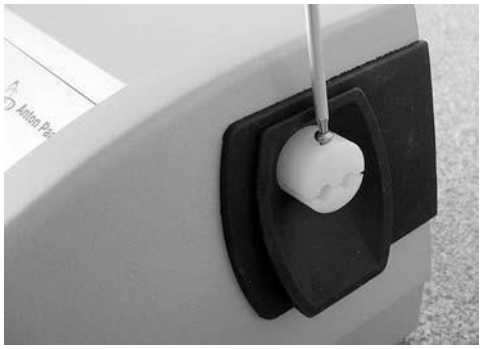


Fig. 7 - 1 Loosen the filling adapters fixing screw

4. Carefully insert the injection adapters into the openings of the filling adapter inlets until some resistance can be felt.
5. With moderate force, push the adapter into the filling adapter inlet.

CAUTION
If the adapters are inserted into the openings of the filling adapters by force, the density measuring cell may be damaged. Harmful liquids leaking from the instrument may cause injuries.

- Carefully insert the injection adapters into the openings of the filling adapter inlets until some resistance can be felt and then stop applying pressure on the adapters. The filling adapters stick out from the filling adapter inlets by about 1.5 cm (about 0.6 in).

6. Tighten the screw at the top of the filling adapter inlets.

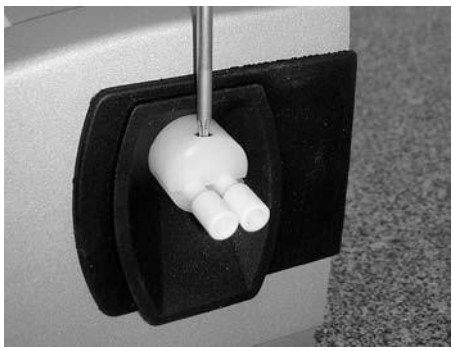


Fig. 7 - 2 Fixing the filling adapters

7.3 Checking for Leak Tightness

1. Close one adapter tightly with a male Luer plug.
2. Fill air under moderate pressure through the other adapter using a plastic syringe and wait for a few seconds.
3. Release the plunger of the syringe.

   If the connections are tight, the plunger of the syringe will be slowly pushed back by the pressure in the measuring cell.

   If the connections are leaking, the plunger will not move. In this case, repeat the mounting of the adapters.

CAUTION

Harmful liquids leaking from the instrument may cause injuries. Regular use and a high ambient temperature may affect the properties of the filling adapters.

- Check the connections for leak tightness on a regular basis. If the connections are leaking, remount the adapters.

7.4 Connecting the Air Pump Hose

1. Cut a piece of approx. 250 mm (10 in) length from the silicone hose (from the accessory box).
2. Attach the silicone hose to the air pump outlet.
3. Attach a Luer cone adapter (from the accessory box) to the other end of the silicone hose.

7.5 Preparing SG-5000BT for Filling with a Syringe

To connect the waste vessel

WARNING

Liquids leaking from the instrument may cause injuries and risk of fire.

- Only use the supplied hose and waste vessel if their materials are resistant to the samples and cleaning liquids that you are going to inject.
- If the supplied materials are not resistant, use other parts made of appropriate material.

1. Cut a piece of approx. 250 mm (10 in) length from the silicone hose (from the accessory box).
2. Attach a Luer cone adapter (from the accessory box) to one end of the silicone hose and insert it into the rear injection adapter of SG-5000BT.
3. Insert the other end of the silicone hose into the hole of the closed waste vessel cap.

Fig. 7 - 1 Connecting the waste vessel

7.6 Preparing SG-5000BT for Filling with the Peristaltic Pump

7.6.1 Exchanging the Peristaltic Pump Cassette

Two types of pump cassettes with different hose materials are available. The peristaltic pump, optionally integrated in SG-5000BT, comes with Novoprene hoses by default. Check the resistance of Novoprene to your measured samples and used rinsing agents. If necessary, replace the supplied pump cassette with a pump cassette with suitable hoses.

1. Remove the pump cassette from the instrument by pressing on the right and left clip and pulling the pump cassette from the motor shaft.

Fig. 7 - 2 Removing the pump cassette

2. When mounting the new pump cassette with suitable hoses onto the motor shaft, make sure that the hoses point upwards.

3. Push the pump cassette in the direction of the motor shaft until you hear a click.

7.6.2 Connecting the Hoses

For filling sample using the peristaltic pump, we recommend sucking the sample into the measuring cell. A Luer cone adapter is already pre-mounted on one sample hose of the peristaltic pump cassette.

2

Fig. 7-3 Filling with the peristaltic pump

To connect the waste vessel

Lead the peristaltic pump sample hose without Luer cone adapter (1) to the waste vessel.

To connect the sample hoses

1. Connect the peristaltic pump sample hose with Luer cone adapter connected (2) to the rear injection adapter of SG-5000BT.
2. Cut a piece of approx. 250 mm (10 in) length from the silicone hose (from the accessory box).
3. Attach a Luer cone adapter (from the accessory box) to one end of the silicone hose and insert it into the front injection adapter of SG-5000BT.
4. Insert the other end of the silicone hose into the sample vial.

7.7 Switching the Instrument On/Off

NOTICE
Before switching the instrument on, make sure that the correct line voltage is available (AC 100 to 240 V, 50 to 60 Hz; DC 12 V, 5 A).

TIP *In case of short large voltage fluctuations or electrical power outages, the integrated rechargeable battery of SG-5000BT serves as an integrated UPS (Uninterruptible Power Supply) and operation of SG-5000BT can be continued in the battery-powered mode.*

1. Connect the power inlet of SG-5000BT to the mains using the power cord.
2. To switch the instrument on, press the power key at the front.

   The green LED of the power key on the front side of the SG-5000BT indicates that the power is on.
3. Wait until the temperature has stabilized before you start measuring.
4. To switch the instrument off, press the power key.

7.8 Performing a First Check

1. To perform an air check, press <Menu> and select **"Checks/Adjustments > Checks > Air Check"** (see Chapter 10.2.2).
2. To perform a water check, press <Menu> and select **"Checks/Adjustments > Checks > Water Check"** (see Chapter 10.2.2).
3. Follow the instructions on the screen.

TIP *Press <Info> to see the latest instructions once more.*

4. If the check results are both OK, the instrument is ready for routine measurements.
5. If any of the results is not OK, clean the measuring cell and repeat the check.
6. If the check result is still not OK, perform an air/water adjustment (see Chapter 10.3.1).

8 Operating SG-5000BT

In this chapter, you find information about the installation and use of optional input devices. If you are using accessories that are not supplied by Eagle Eye, we do not guarantee their functionality and safety.

For operating SG-5000BT, you can use:

- the softkeys below and operating keys on the right hand side of the display
- an external keyboard to enter characters
- a bar code reader for sample identification (see Chapter 12.7.6)

8.1 Using the Softkeys

You can activate the functions at the bottom of the screen by pressing the respective softkey.

8.2 Using an External Keyboard

To connect the external keyboard

- Connect the external keyboard to one of the two USB interfaces that are located at the rear of the instrument.

To select the keyboard layout

When using an external keyboard, select the type of keyboard layout.

1. Press <Menu> and select **"Setup > Instrument Settings > Regional Settings > Keyboard Layout"**.
2. Select the preferred keyboard layout (English or German) and press <Save>.

To enter characters

Whenever characters or numbers are to be entered into the instrument, you can do so via the external keyboard.

To operate buttons with the function keys

When an external keyboard is connected, you can use the function keys <F1> to <F4> to operate the four buttons within the buttons area. <F1> corresponds to the outside left button, <F4> corresponds to the outside right button. To operate a button, press the corresponding <F> function.

To navigate within lists

To move the cursor one line up or down within the list, press the <↑> or <↓> key on your external keyboard.

To exit dialog windows and wizards with/without saving

- To move one menu level higher and save changes, press the <↵> key on your external keyboard.
- To move one menu level higher without saving changes, press the <Esc> key on your external keyboard.
- To navigate to the next wizard step, press <↵> on your external keyboard.

9 Defining General Settings

9.1 Language Settings

You can choose between two different menu languages:

1. Press <Menu> and select **"Setup > Instrument Settings > Regional Settings > Language"**.
2. Select the preferred language (English, German) and press <Save>.

9.2 Date and Time Settings

During operation the information header always displays the current time.

To set the date

1. Press <Menu> and select **"Setup > Instrument Settings > Date and Time > Set Date"**.
2. Enter the current day, month and year and confirm with <Save>.

To set the time

1. Press <Menu> and select **"Setup > Instrument Settings > Date and Time > Set Time"**.
2. Enter the current time and confirm with <Save>.

To set the date format

1. Press <Menu> and select **"Setup > Instrument Settings > Date and Time > Date Format"**.
2. Select the preferred date format and press <Save>.

To set the time format

1. Press <Menu> and select **"Setup > Instrument Settings > Date and Time > Time Format"**.
2. Select the preferred time format and press <Save>.

9.3 Units

To set the density unit

1. Press <Menu> and select **"Setup > Instrument Settings > Units > Density"**.
2. Select the preferred density unit (g/cm^3, kg/m^3) and press <Save>.

To set the temperature unit

1. Press <Menu> and select **"Setup > Instrument Settings > Units > Temperature"**.
2. Select the preferred temperature unit (°C, °F) and press <Save>.

9.4 Air Pump Settings

You can set the timeout after which the air pump is stopped according to your needs.

1. Press <Menu> and select **"Setup > Instrument Settings > Drying Time"**.
2. Select the preferred drying time (01 to 10 minutes) and press <Save>.

9.5 Sound Settings

When sound is enabled, SG-5000BT beeps when an operating key or softkey is pressed. When sound is disabled, the instrument only beeps when it is switched on and off.

1. Press <Menu> and select **"Setup > Instrument Settings > Beep"**.
2. Select the preferred setting (Beep on, off) and press <Save>.

9.6 Energy Saving Mode

Enabling the energy saving mode lowers the power consumption of the instrument and thus extends battery life when operating the instrument with the integrated rechargeable battery.

You can set your instrument to switch off or to activate the screensaver after a certain time of inactivity.

TIP *The automatic switch-off will only be applied when the instrument is in the battery-powered mode.*

To set the automatic shutdown

1. Press <Menu> and select **"Setup > Instrument Settings > Energy Saving > Automatic Shutdown"**.

2. Select the preferred setting for the automatic switch-off (Off, 30 minutes, 1 hour, 3 hours, 6 hours) and press <Save>.

   When the automatic switch-off is disabled, the instrument will remain switched on until it is turned off using the key.

To set the screensaver

1. Press <Menu> and select **"Setup > Instrument Settings > Energy Saving > Screensaver"**.

2. Select the preferred setting for the screensaver (Off, 5 minutes, 10 minutes, 15 minutes, 30 minutes, 1 hour) and press <Save>.

9.7 Backlight

To optimize the visibility of results on the screen within your measuring environment, you may select the intensity of the backlight (10 % to 100 %) of the LC display.

1. Press <Menu> and select **"Setup > Instrument Settings > Backlight"**.

2. Select the preferred setting (10 % to 100 %) and press <Save>.

TIP *You can temporarily change the brightness of the display by pressing the arrow keys when you are in the main screen.*

9.8 Allocating Softkey Functions

On the front of SG-5000BT there are four softkeys. When the instrument displays the main screen, the outside left softkey always takes you to the main menu and pressing the outside right softkey starts a measurement. The two softkeys in the middle can be allocated with one out of six predefined functions. The allocated function is only available on the main screen.

If more than one function is allocated to a softkey, it shows the ▲ sign.

The functions available are "Method", "Temp. ID", "ID", "Check", "Fill" and "Print".

Method	Leads to the method list to select a method for the following measurement.
Temp. ID	Enables you to enter a temporary ID which will not be stored in the sample ID list. This function is ideal for sample identification via a bar code reader.
ID	Leads to the sample ID list to select an ID for the following measurement.
Check	Leads to the check menu to start an air check, water check or custom check.
Print	Enables immediate print-out of the measured value using the Bluetooth interface.
Fill[a]	Starts and stops the peristaltic pump for filling the sample.

a. Only available if the optional peristaltic pump is integrated and activated.

1. Press <Menu> and select **"Setup > Instrument Settings > Softkey"**.
2. Select "Softkey 1" (left softkey) or "Softkey 2" (right softkey).
3. To add functions to the softkey, select the functions in the list and press <On>.
4. To remove functions from the softkey, select the functions in the list and press <Off>.
5. Press <Save>.

9.9 Password Protection

You can protect your instrument with a password according to your demands. If the password protection is enabled, the password needs to be entered before changing the settings, before performing an adjustment and before changing the measurement settings.

For performing measurements as well as selecting measuring methods or sample IDs no password entry is required.

You can change the password anytime later or disable password protection entirely. Keep your password information safe.

To set, change or delete a password

1. Press <Menu> and select **"Setup > Instrument Settings > Password Protection"**.
2. If your instrument is already password protected, enter your current password and press <Login>.
3. Enter your new password using the arrow keys and press <Save>.
4. If you want to disable the password protection entirely, enter <0000> as the new password and press <Save>.
5. Enter the password again and press <Save>.

9.10 Battery Settings

You can decide whether

- to benefit from the maximum life time of the battery by not using the whole battery capacity (default setting). This setting enables up to 2 or 6 hours (depending on the battery type) of off-the-line operation if the measuring temperature stays the same, or
- to benefit from the whole battery capacity, which results in a longer, more efficient off-the-line operation, but slightly reduced battery life time.

1. Press <Menu> and select **"Setup > Instrument Settings > Battery Settings"**.
2. Select the preferred setting (Long Life, High Capacity) and press <Save>.

10 Checking, Adjusting and Calibrating the Instrument

10.1 Definitions

Checking

Checking the correct state of operation of an instrument by measuring a sample of exactly known measurement properties and comparing the result with the expected values.

Adjusting

Enabling correct measurements in the future by injecting a sample of exactly known measurement properties (standard) and adjusting the instrument constants in a way that the known correct results are found by the instrument. Usually at least two standards are needed with measurement properties that encompass the expected measurement results of your samples for a successful adjustment.

Calibrating

Calibrations are checking procedures which are carried out using certified standards. By comparing the measured result with the standard reference value, you can validate the quality of your measurements.

10.2 Checks

10.2.1 Editing Check Settings

You can edit the check temperature, the name (custom check only), the reference value (custom check only) and the tolerance of density checks as well as the atmospheric pressure to be considered.

TIP *Checks are always performed with the measurement criterion currently selected (see Chapter 12.4 for how to change the measurement criterion).*

Tolerance

The factory preset for the check tolerance for all density checks is 0.0005 g/cm^3.

To edit the temperature, tolerance limits and atmospheric pressure

1. Press <Menu> and select **"Checks/Adjustments > Check Settings"**.
2. Select the type of setting you want to change and press <OK>.

3. Change the settings according to your needs and press <Save>.

TIP *If you change the check settings, the changes will be applied to all checks (air check, water check and custom check)*

To edit the custom check

You can create one custom check on your instrument, enabling you to perform a check with a reference liquid of your choice.

1. Press <Menu> and select **"Checks/Adjustments > Check Settings"**.
2. Select "Custom Sample Reference" to change the reference value of your custom check.
3. Select "Custom Sample Name" to enter the name of your reference liquid.
4. To change other settings like check temperature, tolerance or atmospheric pressure, see above.
5. Change the settings according to your needs and press <Save>.

10.2.2 Performing Density Checks

With density checks, carried out in regular intervals, you can ensure a high and stable accuracy of your density and concentration measurements.

During a density check, you fill a medium of known density (air, water or a customer-specific standard liquid) into the measuring cell and compare the measured density with the reference value.

The instrument performs the density checks at the measuring temperature of your choice. The density of the filled medium at the measuring temperature is calculated and the actually measured density is compared with the calculated value. With water checks and custom checks, this calculated value is calculated for the set temperature. With air checks, the calculated value is calculated for the set temperature and the entered air pressure.

When to do water checks and custom checks

Use the water check and custom check to verify that the instrument is measuring with satisfactory accuracy. We recommend performing a water check or custom check every day before starting the measurements. Perform additional water checks or custom checks on demand depending on your judgement, e.g. when you get unexpected results.

When to do air checks

Use the air check to evaluate the efficiency of your cleaning and drying procedure. We recommend performing an air check every day after the measurements have been finished and the measuring cell was cleaned and dried. Perform additional air checks on demand depending on your judgement, e.g. after the measurement of critical samples that might stick to the measuring cell (e.g. samples containing adhesives, sticky particles, proteins).

To perform a density check

TIP *During the check procedure, press <Info> to see the latest instruction or information once more.*

1. Press <Menu> and select **"Checks/Adjustments > Checks"**.
2. Select the respective check type (Air Check, Water Check or Custom Check) and press <OK>.
3. Follow the instructions on the screen.

   For a water check use freshly degassed ultra pure (bi-distilled or deionized) water.

   For an air check clean and dry the measuring cell properly.

   When the check is finished, the following information is displayed:

   - Measured value
   - Check result ("Check Passed" or "Check Failed")
   - Deviation from the reference value.
4. Press <Print> if you want to print the check result.
5. Press <Save> to save the density check.

   The result is stored within the list of measured data.

If the water check failed, we recommend taking corrective actions until the check is valid again:

- Check the quality of the water.
- Clean the measuring cell thoroughly.
- If the above-mentioned actions do not help, perform an air/water adjustment.

TIP *You can also allocate this function to a softkey on the main screen by selecting "Check" in the menu* ***"Setup > Instrument Settings > Softkey"*** *(see Chapter 9.8).*

10.3 Adjustments

TIP *During the adjustment procedure, press <Info> to see the latest instruction or information once more.*

10.3.1 Performing an Air/Water Adjustment

An air/water adjustment has to be performed if the water check had a "not passed" result and using freshly degassed ultra pure water and cleaning the measuring cell did not help. The adjustment media are dry air and freshly degassed ultra pure (bi-distilled or deionized) water.

The air/water adjustment takes 5 to 10 minutes if the instrument is already clean and dry and equilibrated to 20 °C.

The adjustment procedure can be aborted by pressing <Cancel>.

To perform an air/water adjustment

1. Press <Menu> and select **"Checks/Adjustments > Adjustments > Air/ Water Adjustment"**.

   The atmospheric pressure is displayed. Use a calibrated external absolute pressure sensor to get an exact pressure value and correct the value displayed on SG-5000BT accordingly.

   Do not use the atmospheric pressure that you can get from a local weather station because this usually is not the absolute atmospheric pressure. Use a calculated atmospheric pressure at sea level.

2. Press <Continue> to start the adjustment.

3. Rinse and dry the measuring cell and press <Start>.

   The air adjustment routine is carried out.

   The result of the air adjustment is shown on the screen.

- If you are unsatisfied with the result, press <Repeat> to once more carry out an air adjustment.

- Otherwise press <Continue> to continue with the water adjustment.

4. Fill freshly degassed ultra pure (bi-distilled or deionized) water into the measuring cell and tap <Start>.

   Check that the water is filled without air bubbles.

TIP *If the water was filled without air bubbles, you can ignore a possible error message "Filling Warning" during the adjustment routine. The coefficients for the FillingCheck™ function are also adjusted during the adjustment procedure.*

   The water adjustment routine is carried out.

The result of the water adjustment is shown on the screen.

5. Select one of the options

   - <Cancel> to cancel the adjustment
   - <Repeat> to repeat the water adjustment or
   - <Continue> to see the adjustment results of the air and water adjustment

6. Press <Save> to save the new adjustment.

10.3.2 Performing a Temperature Range Adjustment

You can adjust your instrument over the whole temperature range to reach the maximum accuracy for measurements at different temperatures than 20 °C.

During the temperature range adjustment, an air adjustment is performed at 30 °C and 40 °C, then a water adjustment at 40 °C and 30 °C. The whole adjustment takes about 30 minutes.

The adjustment procedure can be aborted by pressing <Cancel>.

1. Press <Menu> and select **"Checks/Adjustments > Adjustments > Temperature Range Adjustment"**.

2. Follow the instructions on the screen.

3. Check that the freshly degassed ultra pure water is filled without air bubbles.

TIP *If the water was filled without air bubbles, you can ignore a possible "filling warning" during the adjustment routine. The coefficients for the FillingCheck™ function are also adjusted during the adjustment procedure.*

10.3.3 Performing a High Density/High Viscosity Adjustment

With a SG-5000BT you can perform an adjustment at high density and/or at high viscosity to reach an exceptionally high accuracy for the measurement of high density values and/or samples with a high viscosity.

For the high density adjustment you need a standard that has a high density (higher than 1.40000 g/cm^3), but low viscosity (similar to water).

For the high viscosity adjustment, you need two standards:

- One standard with a viscosity of approx. 100 mPa·s and with exactly known density (±0.00002 g/cm^3).
- One standard with a viscosity of approx. 500 mPa·s and with exactly known density (±0.00002 g/cm^3).

The adjustment procedure can be aborted by pressing <Cancel>.

1. Press <Menu> and select **"Checks/Adjustments > Adjustments > High Density/Viscosity Adjustment"**.

2. Follow the instructions on the screen.

3. Check that the standard is filled without air bubbles.

TIP *If the standard was filled without air bubbles, you can ignore a possible "Filling Warning" during the adjustment routine. The coefficients for the FillingCheck™ function are also adjusted during the adjustment procedure.*

10.3.4 Resetting the Adjustment Data to Factory Adjustment

You can reactivate the factory adjustment for the density measurement.

If you want to undo all your adjustments, you can restore the factory adjustment.

1. Press <Menu> and select **"Checks/Adjustments > Restore Factory Adjustment"**.

2. Press <OK> to restore the factory adjustment.

10.3.5 Viewing and Printing Adjustment Data

You can view and print the detailed data for the current adjustments both for density and temperature.

1. Press <Menu> and select **"Checks/Adjustments > View Adjustments"**.

2. Select <Density Adjustment> or <Temperature Sensor Adjustment> to see the respective adjustment coefficients.

3. To perform a printout, press <Print>.

10.4 Calibrating

The goal of a calibration is to validate the accuracy of the density measurement.

To calibrate the instrument, measure a certified standard liquid and compare the result to the reference value indicated in the calibration certificate of the standard. The physical properties (density, viscosity) of the liquid density standards should be similar to those of the samples.

The frequency of calibrations with certified liquid density standards depends on your requirements and judgement. Recommendation: 1 to 2 calibrations per year.

NOTICE

- Always check the date of expiry of the calibration liquids.
- Store the calibration liquids in a cool and dark place.
- Use the calibration liquids immediately and only once after the container has been opened.

To perform a calibration

1. Perform a density check with water.
2. If necessary, carry out an air/water adjustment at 20 °C.
3. Thoroughly clean and dry the measuring cell.
4. Set the measuring temperature to "20 °C" and measurement criterion to "Equilibrium".
5. Open the bottle with the liquid density standard.

TIP *If your bottle with density standard has a septum, we recommend you pierce it carefully with any clean, sharp tool and fill a Luer tip syringe with standard liquid by pushing the tip into the hole of the septum, holding the bottle upside down and slowly pulling the plunger.*

6. Immediately after opening the bottle, inject the standard into the measuring cell of your SG-5000BT.
7. Perform a measurement.

TIP *If you have enough standard liquid, we recommend making a series of three measurements and take the arithmetic average of the results.*

8. After the measurement is finished, print the result.
9. Document the calibration procedure in a calibration protocol which contains the operator's name, date, place, description of the calibration procedure, results and the calibration certificate of the liquid density standard.

11 Communication with External Devices

11.1 Importing and Exporting Data

To select the data interface

For importing or exporting data, you can select the USB or Bluetooth interface.

The USB interface is used by default.

1. Press <Menu> and select **"Setup > Import/Export > Select Connection"**.
2. Select the preferred setting (USB, Bluetooth) and press <Save>.

To view the import/export settings

- Press <Menu> and select **"Setup > Import/Export > View Import/Export Settings"**.

11.1.1 Connecting a USB Flash Drive to the Instrument

- Insert a USB flash drive into one of the two USB interfaces that are located at the rear of the instrument.

TIP *Some older USB flash drives are formatted in the super floppy way. These are not compatible with your SG-5000BT instrument. USB flash drives formatted in the standard hard disk way are compatible.*

TIP *Do not connect more than one USB flash drive to the instrument at the same time. This could lead to a conflict and mean that the USB flash drive is not recognized by the system.*

11.1.2 Connecting a PC via Bluetooth

1. If your PC does not provide a Bluetooth interface, install a Bluetooth USB adapter on your PC.
2. Press <Menu> and select **"Setup > Import/Export > Select Connection"**.
3. Select **"Bluetooth"** and press <Save>.
4. In the **"Import/Export"** menu, select **"Select Bluetooth Device"**.

   The list of nearby Bluetooth devices is shown.
5. Select the corresponding Bluetooth device and press <OK>.
6. For details on how to import or export data, see Chapter 11.1.3 and Chapter 11.1.4. When asked for a PIN code, enter "1111".

11.1.3 Exporting Data

The following data can be exported from your instrument to a PC or USB flash drive:

- Measured data (see Chapter 14.2 for further options how to export measured data)
- Adjustment data
- Custom functions (custom-specific measuring units)
- Sample ID list
- Method list
- Instrument settings
- Device information

To export data

1. Connect a USB flash drive or a PC via Bluetooth to the instrument (see Chapter 11.1.1 and Chapter 11.1.2).

2. Press <Menu> and select **"Setup > Import/Export > Export"**.

3. Select the type of data you want to export and press <OK>.

11.1.4 Importing Data

The following data can be imported from a USB flash drive or from a PC via Bluetooth to your instrument:

- Custom functions list
- Sample ID list
- Method list
- Instrument settings

Files to be imported to SG-5000BT have to be created as a text-file, formatted correctly and named the following way to be recognized by the instrument:

Data type	File name	Format
Custom functions list	DMA500_CUSTOM.TXT	see Appendix B.2
Sample ID list	DMA500_ID.TXT	see Chapter 12.7.2
Method list	DMA500_METHOD.TXT	see Chapter 12.6.2
Instrument settings	DMA500_SETTINGS.TXT	

1. Connect a USB flash drive with the file to be imported stored on to the instrument.

2. Press <Menu> and select **"Setup > Import/Export > Import"**.

3. Select the type of data you want to export and press <OK>.

TIP *Custom function lists, sample ID lists, method lists or instrument settings installed on the instrument will be overwritten by newly imported lists.*

11.2 Connecting a Printer

You can either print your data on a Bluetooth printer, without the need for connection cables, or on an RS-232 printer.

To select the printer interface

You can select the serial or Bluetooth interface for printing of data. The Bluetooth interface is used by default.

1. Press <Menu> and select **"Setup > Instrument Settings > Printer > Select Connection"**.
2. Select the preferred setting (Bluetooth, Serial) and press <Save>.

To register a Bluetooth printer

1. Make sure the Bluetooth interface is selected as the printer interface.
2. Switch on the printer with Bluetooth interface.
3. On SG-5000BT, press <Menu> and select "**Setup > Instrument Settings > Printer > Select Bluetooth Printer**".

   The instrument searches for Bluetooth printers and then shows a list of the detected Bluetooth printers.
4. Select **"CITIZEN SYSTEMS"** and press <OK>.

To connect an RS-232 printer

To connect an RS-232 printer to the instrument, use the following cable connections:

FTDI USB-RS232 adapter	Mat. No. 98721
Gender changer DB9F/DB9F	Mat. No. 20193
Printer connection cable	Mat. No. 64433

1. Connect the USB ending of your USB to RS-232 adapter to a USB interface of your SG-5000BT.
2. Connect the gender changer to the RS-232 ending of the adapter.
3. Connect the 9-pin ending of the RS-232 printer cable to the gender changer and the 25-pin ending to the RS-232 interface of your printer.

To view the printer settings

- For information on the connection and device selected for printing, press <Menu> and select **"Setup > Instrument Settings > Printer > View Printer Settings"**.

11.3 Connecting a PC via USB

If SG-5000BT is connected to a PC via USB, you can collect data from SG-5000BT using AP-SoftPrint. The freeware AP-SoftPrint is an Excel Add-in for reading out measured values and status messages from SG-5000BT. You can also use a terminal program (e.g. TeraTerm) on your PC to send commands to SG-5000BT and collect data from SG-5000BT.

To connect the PC with USB cable

- Connect one end of the FTDI USB-USB null modem cable, Mat. No. 98720, to a USB interface of your SG-5000BT and the other end to a USB interface of your PC.

To set the serial printer handshake

If the serial printer handshake is not set, a loss of characters is possible.

1. Press <Menu> and select **"Setup > Instrument Settings > Printer > Serial Printer Handshake"**.
2. Select **"Hardware"** and press <Save>.
3. On your PC, set the handshake parameter of the corresponding serial interface accordingly to "Hardware (RTS/CTS)".

To operate the instrument using serial interface commands

You can operate the instrument using serial interface commands. In the terminal program of your PC, select the following virtual serial port settings for communication with your instrument.

Required settings	Output format
• Baud rate: 9600 • Data bits: 8 • Stop bits: 1 • Parity: none • Handshaking: Hardware (RTS/CTS)	• Language: always English • Decimal separator: . (dot) • Column separator: ; (semicolon) • Local echo: yes • Line end (receive/transmit): CR+LF

Serial interface commands

Commands can be written with or without blanks between the words, for example both "getdata" and "get data" are valid commands.

The following interface commands are available to operate the instrument:

Command	Description
start	Starts a measurement with the active method.
abort	Aborts the measurement.

Command	Description
continue	Continues with continuous measurement (in the monitor mode) after a measurement has been finished.
get data head	Gets meta data of the last measured sample. The meta data contains the names of the output quantities of the last measured sample. The measuring units as part of the output quantities depend on the method and are set in the **"Measurement Settings"** menu.
get data unit	Gets unit data of the output quantities of the last measured sample. For each output quantity the unit is returned.
get data	Returns the result values of the last measurement only once.
get raw data	Returns the current raw data values for "Period", "Density (not corrected)", "Temperature", and "Set Temperature".
finished	Returns the status of the measurement.
get id	Returns the serial number, instrument type, firmware version and protocol version.
help	Returns a list of the available serial interface commands.

Serial interface commands and responses

Command	Response	Description
start	measurement started	The command was accepted and the measurement was started.
	measurement already started	The measurement was already started.
abort	measurement aborted	The measurement was aborted.
	measurement not started	No measurement has yet been started.
continue	measurement continued	Measurement is continued in the monitor mode.
	measurement not started	No measurement was started.
get data head	data head: Date;time;Density; Specific Gravity SG; Temperature; Condition;ID	Example response with the default settings.
	no data available	No measurement has yet been finished and so no data is available.

Command	Response	Description
get data unit	;;g/cm³;;°C;;	Example response with the default settings.
get data	data: 10.01.11;12:22:08;0.9982;1.0000;20.00;valid;807433430-0011	Example response with the default settings.
	no new data available	No new measurement has yet been finished and so no new data is available.
get raw data	255.2440;0.9982;20.00;20.00	Example response.
finished	Measurement not started.	No measurement has yet been started.
	Measurement not finished	The measurement is in progress now.
	Measurement finished	The measurement was finished
get id	serial number: 80733300;SG-5000BT	Example response.
help	commands (protocol v0.10): get data get data unit get data head get raw data start finished continue abort getid	List of all available commands.

11.4 Connecting a PC via Ethernet

You can operate the instrument using serial interface commands via the Telnet option in your terminal program as well as see the measured data in html format or transfer a PDF file of the instruction manual from your instrument to any PC of your local network via Ethernet.

1. Connect the instrument to your local network via the Ethernet interface.
2. Press <Menu> and select **"Setup > Instrument Settings > Network > Network Connection"**.

To obtain the IP address automatically

- Select the option "DHCP" in the Network Connection menu to obtain an IP address automatically and press <Save>.

To enter the network parameters manually

1. If your network server has no DHCP functionality, select the option "Fixed IP" in the **"Network Connection"** menu and press <Save>.
2. Press <Menu> and select **"Setup > Instrument Settings > Network > IP Address"**.
3. Enter the IP address and press <Save>.
4. Press <Menu> and select **"Setup > Instrument Settings > Network > IP Mask"**.
5. Enter the correct IP mask and press <Save>.
6. Press <Menu> and select **"Setup > Instrument Settings > Network > Gateway"**.
7. Enter the correct gateway and press <Save>.

To deactivate the network connection

- Select the option "Off" in the **"Network Connection"** menu to deactivate the network connection.

To view the network settings

- Press <Menu> and select **"Setup > Instrument Settings > Network > View Network Settings"**.

To access instruction manual, device information and measured data

1. Open an internet browser on a PC that is connected to your local network.

2. Enter the IP address of your instrument in the address field of the browser and press the <Enter> key.

   Now the system information of your instrument is displayed together with a download link for a PDF file of the instruction manual and another download link for a HTML file containing the measured data.

To operate the instrument via network using serial interface commands

Required TCP/IP settings	Output format
• Host: IP address of your instrument • Telnet port#: 23	• Language: always English • Decimal separator: . (dot) • Column separator: ; (semicolon) • Local echo: yes • Line end: CR+LF

To see the supported serial interface commands, see Chapter 11.3.

12 Measuring

12.1 General Instructions for Measuring

WARNING

Handling samples with temperatures of more than 70 °C involves the danger of serious burns.

- Make sure you wear protective clothes or ensure alternative protection from burns when handling high temperature samples.

WARNING

Filling samples and cleaning liquids to which the wetted parts are not resistant will corrode the wetted parts. Sample leaking from corroded parts may cause serious injuries.

Before filling any sample or cleaning liquid into your SG-5000BT:

- make sure that all safety instructions concerning the use of chemicals and the use of flammable chemicals are met (see Chapter 2).
- make sure all wetted parts are resistant to the filled-in liquid (see Appendix A.2).
- make sure that you have suitable cleaning fluids at hand for cleaning the measuring cell (see Chapter 13.1).

NOTICE

Sample containing dissolved CO_2 will cause bubbles within the measuring cell with the effect of invalid measurement results. Make sure your sample is degassed carefully. For details on how to degas samples, see Appendix C.1.

TIP *Your filled sample is continuously measured and the measuring result is displayed. By storing the measuring result, you can print it or export it to a PC later.*

12.2 Selecting the Measuring Unit

For measuring your samples you can choose between a number of measuring units. All measuring units are derived from the density of the sample at the measured temperature.

To define the content of the first output field

1. Press <Menu> and select **"Measurement Settings > Measuring Unit 1"**.

   The list of the measuring units is displayed.

2. Select the preferred measuring unit and press <OK>.

   Some measuring units contain subitems with options to be selected.

3. Select the preferred option and press <OK>.

To define the content of the additional output field

1. Press <Menu> and select **"Measurement Settings > Measuring Unit 2"**.

   The list of the measuring units is displayed.

2. Select the preferred additional measuring unit and press <OK>.

   Some measuring units contain subitems with options to be selected.

TIP *If you select "None", only "Measuring Unit 1" in large font will appear on the main screen.*

3. Select the preferred option and press <OK>.

12.3 Setting the Measuring Temperature

1. Press <Menu> and select **"Measurement Settings > Measuring Temperature"**.

2. Enter the measuring temperature and press <Save>.

12.4 Selecting the Measurement Criterion

If you select "Predetermination", the instrument finishes the measurement before temperature equilibrium was reached and calculates the density at the set temperature in advance. This saves time but makes the result less accurate.

If you select "Equilibrium", the measurement finishes after temperature equilibrium was established.

1. Press <Menu> and select **"Setup > Measurement Criterion"**.

2. Select the preferred setting and press <Save>.

12.5 Activating/Deactivating the FillingCheck™

1. Press <Menu> and select **"Setup > Instrument Settings > FillingCheck™"**.
2. Select the preferred option (On, Off) and press <Save>.

12.6 Defining and Using Methods

You can define and store up to 20 measuring methods in your SG-5000BT.

For each method, you can set the following measuring parameters for measurements:

- Measuring unit(s)
- Measuring temperature

If you own several SG-5000BT instruments, you can import the same method list to all instruments.

12.6.1 Entering a New Method

1. Select the preferred measuring unit (see Chapter 12.2) and measuring temperature (see Chapter 12.3).
2. Press <Menu> and select **"Methods > Add New Method"**.
3. To enter the measuring method's name, select the characters one by one using the arrow keys and confirming each selection with <OK>.
4. To save the name, select the ✔ symbol in the list of characters and press <Save>.

12.6.2 Entering Method Lists

If you plan to set up or edit large method lists, you can do so conveniently on the PC and then import the list to SG-5000BT via the USB or Bluetooth interface.

TIP *To gain insight into the format to be used, first define one or two methods on the instrument (see Chapter 12.6.1) and then transfer these to the PC. After doing that you can conveniently enter further methods in the same format and import these into the instrument.*

For how to import method lists, see Chapter 11.1.4.

NOTICE
Importing a new method list automatically deletes the existing method list.

Supported characters

For the entry of method names and sample IDs, the instrument supports the space character and the following characters:

!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^
_	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	{	|	}
~			²		µ	Ä	Ö	Ü	ß	ä	é	ö	ü																	

Method list template

The following table explains the lines of a method list:

Method list format	Description
<DMA500>	
<METHODLIST>	
<METHOD>	
<NAME>Density</NAME>	Name of the first method
<UNIT1>1</UNIT1>	Measuring unit 1: Density
<UNIT2>7</UNIT2>	Measuring unit 2: Specific Gravity SG (for details see Appendix B)
<TEMPERATURE>20.00</TEMPERATURE>	Measuring temperature
</METHOD>	
<METHOD>	
<NAME>Sulfuric Acid</NAME>	Name of the second method
<UNIT1>22</UNIT1>	Measuring unit 1: Sulfuric Acid (H2SO4) (for details, see Appendix B)
<UNIT2>1</UNIT2>	Measuring unit 2: Density
<TEMPERATURE>20.00</TEMPERATURE>	Measuring temperature
</METHOD>	
<METHOD>	
</METHODLIST>	
</DMA500>	

12.6.3 Renaming Methods

You can only edit the name of an already existing method. The measurement settings defined within a method cannot be changed.

1. Press <Menu> and choose **"Methods > Edit Method"**.
2. Select the method you want to edit and press <OK>.
3. Change the name of the method according to your needs and press <Save>.

12.6.4 Deleting Methods

1. Press <Menu> and select **"Methods > Edit Method"**.
2. Select the method to be deleted and press <Delete>.
3. Select <Delete Selected Method> to delete only the selected method or <Delete All Methods> to delete all methods and confirm with <OK>.
4. Press <Yes> when asked if you really want to delete the selected method(s).

12.6.5 Selecting a Method

1. Press <Menu> and choose **"Methods > Select Method"**.

   All stored methods are displayed.
2. Select the preferred method and press <OK>.

TIP *You also can allocate this function to a softkey on the main screen by selecting "Method" in the menu* ***"Setup > Instrument Settings > Softkey"*** *(see Chapter 9.8).*

12.7 Defining and Using Sample IDs

You can assign different sample IDs to your measurements. This function helps to uniquely assign measured data to e.g.

- samples (sample identification)
- users who performed the measurement (user identification)
- the measuring point where the sample was taken, etc.

You can save up to 100 different sample IDs for full traceability of your results.

For details on the supported characters, see Chapter 12.6.2.

12.7.1 Entering the Sample ID

1. Press <Menu> and select **"Sample-ID > Add New Sample ID"**.
2. To enter the sample ID, select the characters one by one using the arrow keys and confirm each selection with <OK>.
3. To save the sample ID, select the  symbol in the list of characters and press <Save>.

TIP *If you enter a new sample ID and only select the tick symbol without entering letters for the ID, the sample ID is automatically given the name <empty>. The 4-digit consecutive number of the measuring data is then used as the ID.*

TIP *You can count the measurements performed with one sample ID. By entering one to four "#" signs at any position of your sample ID, you will see the one- to four-digit subcounter of measured values as part of your sample ID on the main screen. The subcounter will be set to (000)1 as soon as you either select another sample ID or select the same sample ID again.*

Example: By naming your sample ID "Tank 1 - ##", you will get "Tank 1 - 01", "Tank 1 - 02", etc. as sample ID on the main screen. By naming your sample "#### - Tank 1", you will get "0001 - Tank 1", "0002 - Tank 1", etc. as sample ID on the main screen.

TIP *If you reset the subcounter within a sample ID by mistake (by selecting the same sample ID again), switch the instrument off and on again to proceed with the next higher subcounter within this sample ID.*

12.7.2 Entering Sample ID Lists

If you plan to set up or edit large sample ID lists, you can do so conveniently on the PC and then import the list to SG-5000BT via the USB or Bluetooth interface.

To gain insight into the format to be used, first define one or two sample IDs on the instrument (see Chapter 12.7.1) and then transfer these to the PC. After doing that you can conveniently enter further sample IDs in the same format and import these into the instrument.

For how to import sample ID lists, see Chapter 11.1.4.

The following table shows the format of a sample ID list:

Method list format	**Description**
<DMA500>	
<IDLIST>	
<ID>	
<NAME>TANK 1</NAME>	Name of the first ID: <TANK 1>
</ID>	
<ID>	
<NAME>TANK 2</NAME>	Name of the second ID: <TANK 2>
</ID>	
</IDLIST>	
</DMA500>	

12.7.3 Renaming Sample IDs

1. Press <Menu> and select **"Sample ID > Edit Sample ID"**.
2. Select the sample ID you want to edit and press <OK>.
3. Change the sample ID according to your needs and press <Save>.

12.7.4 Deleting Sample IDs

1. Press <Menu> and select **"Sample ID > Edit Sample ID"**.
2. Select the sample ID you want to delete and press <Delete>.
3. Select <Delete selected ID> to delete only the selected sample ID or <Delete all IDs> to delete all sample IDs and confirm with <OK>.
4. Press <Yes> when asked if you really want to delete the selected ID(s).

12.7.5 Selecting a Sample ID

1. Press <Menu> and select **"Sample ID > Select Sample ID"**.

   All saved sample IDs are displayed.
2. Select the required sample ID and press <OK>.

TIP *You can also allocate this function to a softkey on the main screen by selecting "ID" in the menu* ***"Setup > Instrument Settings > Softkey"*** *(see Chapter 9.8).*

12.7.6 Entering Sample IDs Using a Keyboard or Bar Code Reader

You can enter temporary sample names via keyboard or use a bar code reader (not supplied by Eagle Eye) for automatic identification of your samples.

To enter sample names with the keyboard or bar code reader

1. Allocate the function "Temp. ID" to one of the two softkeys on the main screen (see Chapter 9.8 for how to allocate a function to a softkey).
2. Connect a keyboard or bar code reader to one of the USB interfaces.
3. Press the "Temp. ID" softkey when the instrument displays the main screen.
4. Key in the sample name or read the bar code and press <Save>.

   The sample name/bar code will be used as sample ID for the next measurement. This sample ID is only a temporary ID and will not be stored in the sample ID list.

12.8 Filling Sample

To achieve highly accurate measuring results, fill the samples into the measuring cell homogeneously and without bubbles.

NOTICE
Samples with a moderate tendency to corrode borosilicate glass such as strong alkali solutions (e.g. caustic soda) can be measured with the SG-5000BT. However, take care to remove such samples immediately after measurement and rinse the measuring cells properly. Check the validity of the adjustment more frequently than generally recommended. Perform a new adjustment, if necessary. The measuring temperature for strong alkali solutions should not be higher than 20 °C. Higher temperatures dramatically increase the speed of corrosion.

Sample amount

If the measuring cell is clean and dry, you need approx. 1 mL of sample. If you are measuring without cleaning and drying between the samples, you need a higher amount of sample because you have to flush residues of the previous sample out of the measuring cell to avoid cross-contamination.

Bubble detection using the camera (U-View™)

A live image of the measuring cell is shown continuously on the measuring screen and stored with each measurement. The live image only shows an optimized view of the straight parts of the U-tube as bubbles in this area have the greatest influence on the measured density result.

You can either fill the sample using the built-in peristaltic pump or using a glass or plastic syringe.

12.8.1 Filling with Luer Tip Syringe

NOTICE
Do not use syringes that contain lubricants. The lubricants can dissolve into your sample and lead to a systematic measuring error.

1. Fill the plastic syringe with the sample.
2. Connect the syringe to the sample inlet adapter.
3. Push the plunger of the syringe slowly and continuously until a drop emerges from the sample outlet adapter.
4. Leave the syringe in the filling position during the measurement.

Fig. 12 - 1 Filling sample using the plastic syringe

12.8.2 Filling Using the Peristaltic Pump

SG-5000BT can have a peristaltic pump installed as an option.

To set the filling time

You can set the filling time from 5 to 60 seconds. To check whether the filling time is correctly set, watch a filling process. The settings are correct if the sample is filled without bubbles and if some sample remains in the sample vial.

1. Press <Menu> and select **"Setup > Instrument Settings > Filling Time"**.
2. Change the filling time according to your needs and press <OK>.

To fill sample with the integrated peristaltic pump

On the front of SG-5000BT there are four softkeys. The two softkeys in the middle can be allocated with one out of six predefined functions.

1. Allocate one of the two softkeys at the front of the instrument with the function "Fill" (see Chapter 9.8).
2. Press the <Fill> softkey.

   The peristaltic pump starts to fill the sample into the measuring cell.

12.9 Performing a Measurement

To speed up measurements

- Prethermostatting: Prethermostat your samples to the measuring temperature before injection to reduce the time necessary for the temperature equilibration.

- Predetermination option: Using this option reduces the measuring time substantially (see Chapter 12.4).

To perform a measurement

1. Before starting a measurement, check that:

   - the hoses are connected correctly
   - the hose connections are tight
   - the waste hose leads into the waste container
   - the waste container's volume is large enough for the number of samples
   - the correct sample ID is selected
   - the correct method is selected
   - suitable cleaning liquids are available.

2. Fill the measuring cell with sample.

3. Press <Start> and wait until the measurement is finished.

   During measurements the last 1 or 2 digits might be gray colored. This means that the set temperature has not been reached yet. In that case, only the black colored digits are valid.

   The number of valid (black colored) digits increases during the measurement progress until all digits are black (when using equilibrium mode).

   During measurement the "Condition" output field shows the blinking message "measuring".

   When the measurement is finished, the background of the two configurable output fields turn black. The "Condition" output field shows the message "valid". The result values are frozen.

4. Press <Cancel> to cancel the measurement or to delete the result or press <Save> to save the result to the memory.

   The instrument returns to the monitor mode. Stored measurement data can be viewed, printed or exported later.

5. Measure the next sample or clean and dry the measuring cell.

To print the measured value

You can transfer the measured value to a printer via the Bluetooth interface. For a compatible printer, contact your Eagle Eye representative. Register your printer as described in Chapter 11.2.

1. Switch on the printer with the Bluetooth interface.

2. Press the <Print> key when the measured value appears on the display.

   The measured value is printed.

You can also print out stored measured data later on (see Chapter 14.3).

To empty the measuring cell

- Empty the measuring cell by filling air into the cell using a syringe.
- To empty the measuring cell after filling with a peristaltic pump, remove the hose from the sample container and press the <Fill> softkey.
- You can also directly start with your cleaning procedure by replacing the sample vial with a vial filled with a cleaning agent.

12.10 Status and Filling Messages

12.10.1 Status Messages

Condition

The "Condition" output field gives information about the current status of measurement and may show the following messages:

measuring	Appears during temperature equilibration. The instrument shows a predetermined measuring result.
valid	Appears when the measuring temperature has been reached and the measurement result has stabilized according to the measurement criterion selected (see Chapter 12.4).

12.10.2 Filling Messages

Automatic bubble detection (FillingCheck™)

If the FillingCheck™ is activated, the "FillingCheck™" output field gives information about the current status of the filling process and may show the following messages:

Symbol	Filling message	Cause	Solution
	Filling Warning	Gas bubbles in the measuring cell.	Degas your sample (see Appendix C.1) before filling it into the measuring cell.
	Oscillator Warning	The measuring cell is only partly filled.	Fill the sample again.
	No Warnings	The sample was properly filled.	

NOTICE

Most cases of gas bubbles in the measuring cell are detected by the automatic bubble detection, but not all. If you want to ensure a bubble-free filling, we recommend checking the filling visually by using the built-in camera (U-View™).

NOTICE

FillingCheck™ does not work for samples with viscosities above 2000 mPa·s. For this kind of sample, a filling warning may be generated even when the sample is filled without bubbles.

13 Cleaning and Storing the Instrument

To assure a constant and high accuracy of your measurements, employ a regular and effective cleaning routine and store the instrument under the recommended conditions.

13.1 Cleaning the Measuring Cell

WARNING
Liquids leaking from the instrument may lead to injuries and risk of fire.
Before filling any sample or cleaning liquid into your SG-5000BT, make sure that:

- all safety instructions concerning the use of chemicals and the use of flammable chemicals are met (see Chapter 2).
- all wetted parts are resistant (see Appendix A.2).

NOTICE
Do not use any mechanical action for cleaning the measuring cell.

Cleaning frequency

Clean and dry the measuring cell at least after each working day or working shift.

Cleaning more frequently can be necessary ...

- when you perform adjustments.
- when you measure a sample that is not miscible with the previous sample (e.g. water after a petrochemical sample).
- when you want to measure using a minimum sample amount.
- when you measure a sample that could chemically react with the previous sample.

Cleaning liquids

For cleaning and drying, employ two cleaning liquids:

- Cleaning liquid 1 dissolves and removes sample residues in the measuring cell. It has to be a good solvent for all sample components.
- Cleaning liquid 2 removes cleaning liquid 1 and is easily evaporated by a stream of dry air in order to accelerate drying of the cell. Cleaning liquid 2 has to be a good solvent for cleaning liquid 1.

Recommended for aqueous samples and beverages: water (cleaning liquid 1) and non-denatured ethanol (cleaning liquid 2).

Recommended for petrochemical samples: petroleum naphtha (cleaning liquid 1) and acetone (cleaning liquid 2).

If you are not sure if a cleaning liquid is suitable for your sample, perform a preliminary test in a test tube to see if any phase separation, precipitate or opalescence can be observed.

To clean the measuring cell

1. Rinse the measuring cell with cleaning liquid 1 (minimum 5 mL).

   If your sample is viscous or contains particles, use more cleaning liquid.

NOTICE
If you filled your sample using the integrated peristaltic pump, exchange the sample vial by a vial filled with your cleaning liquid and fill the cleaning liquid with the peristaltic pump by pressing the <Fill> softkey at the front of DMA 500. This ensures that the hoses are cleaned together with the measuring cell.

2. Empty the measuring cell.
3. Rinse the measuring cell with cleaning liquid 2 (minimum 5 mL).
4. Empty the measuring cell.
5. If needed, dry the measuring cell with dry air.

13.2 Drying the Measuring Cell

If the ambient humidity is higher than 90 % relative humidity, use a drying cartridge (see Appendix D).

1. Connect the air pump hose with the Luer cone adapter to one of the injection adapters.
2. Press the  key.
3. Wait until the measuring cell is dry (stable density reading).
4. Stop the air pump by pressing the  key.

13.3 Cleaning the Housing and Display

To clean the housing and display, use a soft cloth dipped in ethanol or warm water. If necessary, you can use a mild solvent (pH < 10).

WARNING

Ethanol is a highly flammable liquid.

- Make sure that all safety instructions regarding the use of flammable liquids (see Chapter 2) are strictly followed.

NOTICE

Never use:

- highly nonpolar solvents (e.g. toluene, hexane, solvent naphta)
- strong acids or bases (e.g. nitric acid, sulfuric acid, hydrochloric acid, caustic soda)
- strong mechanical action (steel brush).

13.4 Storing the Instrument

Clean and dry the measuring cell (see Chapter 13.1) before storing the instrument for more than one day. Otherwise, algae may grow on the glass surface that are difficult to remove.

For storage for less than one day, the measuring cell can be filled with deionized water or the last cleaning liquid that has been injected. In case of syringe injection, leave the syringe mounted to the injection adapter to prevent spillage of the liquid.

14 Handling the Measurement Data

14.1 Accessing Saved Measured Data

Your instrument can store 1000 result data files with camera pictures. If the memory contains 1000 saved values, further values will overwrite the oldest saved values. Each saved value is given a consecutive 4-digit number. If you delete all measuring data, the counter starts again at 0001. When you are in the "Measured Data" menu, in the headline, the amount of currently stored results is shown in brackets.

Your instrument supports two forms of result visualization:

- In the multiple sample view you can see a number of results listed in a table.
- In the single sample view you can see a more detailed view of one result as well as the image of the measuring cell at a time.

To access the multiple sample view

- Press <Menu> and select **"Measured Data"**.

  The list of results is displayed.

To access the single sample view

1. In the multiple sample view, select the sample that you want to see in more detail.
2. Press <Detail> to open the single sample view.
3. Press <Picture> to see the image of the measuring cell stored with the result.
4. Use the arrow keys to see the previous or next result.

14.2 Exporting Measured Data

Your instrument supports the export of data in the data formats .csv, .txt and html.

To set the data export file format

1. Press <Menu> and select **"Setup > Import/Export > Data Format > File Format"**.
2. Choose the data format, <CSV>, <TXT> or <HTML>, and press <Save>.

TIP *When exporting results in the html file format, the images are exported together with the results.*

To set the delimiter format for exports

1. Press <Menu> and select **"Setup > Import/Export > Data Format > Delimiter"**.

2. Choose the delimiter, <,> [comma], <;> [semi-colon] or </> [slash], and press <Save>
   .

To set the decimal point format

1. Press <Menu> and select **"Setup > Import/Export > Data Format > Decimal Point"**.

2. Choose the decimal point, <.> [point] or <,> [comma], and press <Save>.

   Your changes are accepted and used for the following data export. The settings for delimiter and decimal point are only applied with CSV data exports.

To export data

1. Access the multiple or single sample view as described in Chapter 14.1.

2. Insert a USB flash drive into a USB interface or connect the instrument to a PC via Bluetooth (see Chapter 11.1.2).

3. Press <Export> and select **"Export Range"**.

4. Select one of the four options (Export Current Day, Export Last 7 Days, Export Date Range, Export All Data) and press <OK>.

5. For the option **"Export Date Range"**, enter the date range for which you want to export the results and press <Export>.

For further alternatives how to export the whole list of measured data, see Chapter 11.1.3.

14.3 Printing Measured Data

You can transfer the saved measuring data to a printer via the Bluetooth interface. For a compatible printer, contact your Eagle Eye representative.

To print saved measured data

1. Before printing the first time, register the printer on the instrument as described in Chapter 11.2.

2. Switch on the printer with the Bluetooth interface.

3. Press <Menu> and select **"Measured Data"**.

4. Select the measured value required for printing using the arrow keys.

5. Press <Export>.
6. Select **"Print Selected Data"** to print the selected measured value or **"Print Range"** to print the data measured in a certain period of time.
7. Select one of the four options (Print Current Day, Print Last 7 Days, Print Date Range, Print All Data) and press <OK>.
8. For the option **"Print Date Range"**, enter the date range for which you want to print the results and press <Print>.

14.4 Deleting Measured Data

To delete all results

1. Press <Menu> and select **"Measured Data"**.
2. Press <Delete> and select **"Delete All Measured Data"**.

To delete a single result

1. Enter the single sample view of the result to be deleted.
2. Press <Delete>.
3. Press <Yes> when asked if you really want to delete the result.

Or:

1. Press <Menu> and select **"Measured Data"**.
2. Select the measurement result you want to delete.
3. Press <Delete> and select **"Delete Selected Measured Data"** and press <OK>.

15 Maintenance

15.1 Exchanging the Pump Cassette with the Hoses

NOTICE
Liquids leaking from a collapsed sample hose may lead to corrosion of the instrument. Check the pump hose for abrasion. Exchange the pump cassette including the hoses regularly to avoid corrosion.

See Chapter 12.8.1 for details on how to exchange the peristaltic pump cassette.

15.2 Recharging Batteries

WARNING
Handling of the battery pack by unauthorized persons may lead to fire or explosion.

- The integrated Li-Ion battery pack is a soft pack which is only designed to be permanently inserted in the SG-5000BT.
- An exchange of the battery pack may only be performed by authorized service personnel.
- Do not change the battery pack on your own.

You can see the charge state of the battery by looking at the battery symbol in the top right-hand corner of the display.

The following symbols are possible:

Symbol	Description
	The battery is full.
	The battery is a little low.
	The battery is low.
	The battery is empty.
	The battery is in the recalibration mode.

Furthermore, the current status of the battery is indicated by the battery LED.

Battery LED	Description
blinks green	The battery is being charged.
lights green	The instrument is disconnected from the mains and therefore in the battery-operated mode.
blinks red quickly	The capacity of the battery is lower than 10 % of its total capacity. When the batteries are almost empty, the warning "Low Battery" is displayed. After the second warning "Battery Empty", the instrument switches itself off.
off	The instrument is connected to the mains and the battery is fully charged.

To recharge the battery

- If the battery is flat, you can easily recharge it by connecting the instrument to the mains.
- Perform a battery recalibration twice a year (see Chapter 15.3).
- If the battery cannot be recharged anymore or the capacity decreases dramatically, contact your Eagle Eye service partner.

15.3 Battery Recalibration

During the battery recalibration the integrated rechargeable battery of SG-5000BT is completely discharged and charged again to bring the charge status of the battery cells into line. We recommend to perform a battery recalibration twice a year. Perform an additional recalibration if you recognize a noticeable decrease in the battery performance.

1. Make sure that the instrument is connected to the mains. Do not disconnect it or switch it off during the battery recalibration. Otherwise the recalibration is aborted.
2. Press <Menu> and select **"Setup > Battery Recalibration"**.

15.4 Making a Backup of the Instrument Settings

You can use this utility for saving your current instrument status including all system and measurement settings for safety reasons in case someone changes the settings accidentally.

A backup file includes the following:

- instrument settings
- custom functions
- measured data including images
- sample IDs
- methods
- internal system data
- adjustment data

1. Connect a USB flash drive to your instrument.
2. Press <Menu> and select **"Setup > Backup/Restore > Backup"**.

15.5 Restoring the Instrument Settings

In case someone changed the instrument or measurement settings by accident, you can restore your backup file on the instrument.

TIP *It is not possible to restore a backup file on an instrument with another serial number or software version.*

1. Make sure that the instrument is connected to the mains.
2. Connect a USB flash drive to the instrument.

   The backup file to be restored has to be stored in the root directory of the USB flash drive connected.
3. Press <Menu> and select **"Setup > Backup/Restore > Restore > Restore Instrument Settings"**.
4. Select the backup file you want to restore on the instrument and press <OK>.

15.6 Carrying Out a Firmware Update

TIP *Your Eagle Eye representative will inform you when a new firmware update for your SG-5000BT is available. After receiving the update file, you can import it to the instrument from a USB flash drive.*

1. Make sure that the instrument is connected to the mains.
2. Connect a USB flash drive to one of the USB interfaces.
3. Press <Menu> and select **"Setup > Update Instrument Firmware"**.

15.7 Viewing the System Information

Information about the instrument is saved in the instrument and can be accessed or exported at any time. This information includes the following:

- Manufacturer
- Instrument name
- Serial number
- Device Status:
  - Measured data xxxx/1000
  - Sample IDs xxx/100
  - Methods xx/20
- Software version
- Creation date of the firmware version
- Software build
- Additional internal hardware and software status information

- Press <Menu> and select **"Setup > Device Information"**.

  The device information is displayed.

15.8 Viewing and Printing Raw Data

In the **"Service Testmode"** menu, you get a live view of sensor signals including raw data. You can also print the live raw data.

To view live raw data

- Press <Menu> and select **"Measurement Settings > Service Testmode"**.

  The following quantities are listed:

Density	Currently measured density.
Density NC	Currently measured, not viscosity-corrected density.
MeasState	Status information indicating the status of the density measurement.
FillState	Status information about correct filling of the U-tube. Values different from zero indicate an incorrect filling.
Period	Measured oscillation period.
Quality	Oscillation quality.
T-Cell	Temperature measured in the measuring cell.
T-Heatsink	Temperature of the heat sink.
T-Battery	Temperature of the battery.
T-CaseIntern	Internal chip temperature of the power control processor on the mainboard.
Battery Voltage	Measured battery voltage.
Battery Current	Measured current of the battery.
Battery State	Status information of the battery: Bit 0: Battery available Bit 1: Battery used as power source Bit 2: Battery is being charged Bit 3: Battery charging finished Bit 4: Battery is discharged via resistor Bit 5: Battery use as power source enforced Bit 6: Battery available, but no communication possible Bit 7: Battery is being charged when instrument switched-off Bit 8: Battery type 1 installed (for 2 h off-the-line operation)

Appendix A: Technical Data

A.1 Measuring Performance

Measuring range	0 to 3 g/cm^3
Repeatability s. d. density	0.0002 g/cm^3
Accuracy density	0.001 g/cm^3
Measuring temperature	15 °C to 40 °C (59 °F to 104 °F)
Repeatability s. d. temperature	0.1 °C
Accuracy temperature	0.3 °C
Measuring time	approx. 30 sec.
Pressure range	0 to 3 bar
Sample volume	approx. 1 mL
Battery operation lifetime	> 2 hours
Full range viscosity correction	yes
Automatic bubble detection	yes
Live image from measuring cell	yes

A.2 Wetted Parts

The following materials are in contact with samples and the cleaning liquids.

Material	**Part**
PTFE (Polytetrafluoroethylen)	Filling adapter
Borosilicate glass	Measuring cell

Standard accessories:

Material	**Part**
Polyethylene	Waste vessel
Polypropylene/Polyethylene	Syringe 2 mL Luer
PTFE (Polytetrafluoroethylen)	Male Luer plug, adapter Luer cone
Novoprene	Hose 3 x 5 mm Novoprene (for the peristaltic pump)
Silicone	Hose 3 x 5 mm silicone

A.3 General Technical Data

Dimensions (L x W x H)	210 mm x 200 mm x 135 mm
Weight	2150 g
Power	max. 55 W
Power supply	AC 100 - 240 V, 50/60 Hz, 1.4 A; DC 12 V, 5 A
Rechargeable battery type	Li-Ion 7.4 V, 2.25 Ah Li-Ion 7.5 V, 4.8 Ah
Housing material	Styrol-Butadien (SB TSG VL 94 V0)
Environmental conditions (EN 61010)	Indoor use only
Ambient temperature	15 to 35 °C
Air humidity	10 to 90 % relative air humidity, non-condensing
Pollution degree	2
Overvoltage category	II DC 12 V Automotive Spec. AC Adapter (see type shield)
Altitude	max. 3000 m (9800 ft)
Display	TFT, 70 x 53 mm, 320 x 240 Pixel
Memory	1000 results
Interfaces	1 x Bluetooth V2.0+EDR, Class 2 1 x Ethernet 10/100 MBit 2 x USB 1.1 FullSpeed Host

Appendix B: Measuring Units and Custom Functions

B.1 Description of the Measuring Units

Fixed output fields

Meas. units	Description
Temperature	Temperature in the measuring cell measured by the Pt 100 measuring sensor.
Condition	Current condition of the measurement

Configurable output fields

Meas. units	ID	Options	Description
Density	1	Density	Value of viscosity-corrected true density in g/cm³ or kg/m³.
	2	Density (not corrected)	Density value without viscosity correction. The density is correct for samples with a viscosity at around 1 mPa·s (water). Noticeable high readings for samples of higher viscosity.
	7	Specific Gravity SG	Density of the sample divided by the density of water.
	9	Apparent SG	Apparent density divided by the apparent density of water at the specified temperature. Apparent density is the weight in air (not mass!) divided by the volume.
	10	Apparent Density Steel	Apparent density referring to scales which are adjusted with steel weights.
	11	Apparent Density Brass	Apparent density referring to scales which are adjusted with brass weights.
Alcohol	12	Alcohol (% v/v)	Ethanol concentrations in percentage by volume (% v/v) according to the tables of the International Organisation of Legal Metrology (OIML), temperature according to ITS 90, based on true density at 20 °C.
	13	Alcohol (% w/w)	Ethanol concentrations in percentage by weight (% w/w) according to the tables of the International Organisation of Legal Metrology (OIML), temperature according to ITS 90, based on true density at 20 °C.
	14	Proof	Proof degrees at 15.56 °C (60 °F), based on true density at 20 °C.

Sugar / Extract	15	Brix	Concentration of extract / sugar (saccharose) of beverages in percentage by weight, NBS Table 113, based on true density at 20 °C.
	16	Extract	Extract in percentage by weight, Plato table, based on true density at 20 °C.
	17	Baumé	Concentration of extract / sugar (saccharose) of beverages based on specific gravity at set temperature (t). For liquids heavier than water °Be = (145 x SGt/t - 145) / SGt/t For liquids lighter than water °Be = (140 - 130 x SGt/t) / SGt/t.
Acid / Base Tables	18	Hydrochloric Acid (HCl)	Table of CRC Handbook of Chemistry and Physics, based on true density at 20 °C, range 0 to 40 %.
	22	Sulfuric Acid (H2SO4)	CRC Handbook of Chemistry and Physics, based on true density at 20 °C, range 0 to 94 %.
	19	Sodium Hydroxide (NaOH)	Landolt-Boernstein, based on true density at 20 °C, range 0 to 50 %.
	20	Phosphoric Acid (H3PO4)	Landolt-Boernstein, based on true density at 20 °C, range 0 to 100 %.
	21	Nitric Acid (HNO3)	Landolt-Boernstein, based on true density at 20 °C, range 0 to 100 %

API Functions	23	API Gravity A @ 15 °C	API gravity for the product group A (crude oil) converted to 15 °C.
	24	API Gravity B @ 15 °C	API gravity for the product group B (fuels) converted to 15 °C.
	25	API Gravity D @ 15 °C	API gravity for the product group D (lubricants) converted to 15 °C.
	26	API Gravity A @ 60 °F	API gravity for the product group A converted to 60 °F.
	27	API Gravity B @ 60 °F	API gravity for the product group B converted to 60 °F.
	28	API Gravity D @ 60 °F	API gravity for the product group D converted to 60 °F.
	56	API Gravity A @ 20 °C	API gravity for the product group A (crude oil) converted to 20 °C.
	60	API Gravity B @ 20 °C	API gravity for the product group B (fuels) converted to 20 °C.
	61	API Gravity D @ 20 °C	API gravity for the product group A (lubricants) converted to 20 °C.
	68	API Gravity A @ 29.5 °C	API gravity for the product group A (crude oil) converted to 29.5 °C.
	69	API Gravity B @ 29.5 °C	API gravity for the product group B (fuels) converted to 29.5 °C.
	70	API Gravity D @ 29.5 °C	API gravity for the product group A (lubricants) converted to 29.5 °C.
	29	API SG A @ 15 °C	Conversion of specific gravity at measuring temperature to specific gravity at 15 °C for the product group A (crude oil).
	30	API SG B @ 15 °C	Conversion of specific gravity at measuring temperature to specific gravity at 15 °C product group B (fuels).
	31	API SG D @ 15 °C	Conversion of specific gravity at measuring temperature to specific gravity at 15 °C for the product group D (lubricants).
	32	API SG A @ 60 °F	Conversion of specific gravity at measuring temperature to specific gravity at 60 °F for the product group A (crude oil).
	33	API SG B @ 60 °F	Conversion of specific gravity at measuring temperature to specific gravity at 60 °F for product group B (fuels).
	34	API SG D @ 60 °F	Conversion of specific gravity at measuring temperature to specific gravity at 60 °F for the product group D (lubricants).
	62	API SG A @ 20 °C	Conversion of specific gravity at measuring temperature to specific gravity at 20 °C for the product group A (crude oils).
	63	API SG B @ 20 °C	Conversion of specific gravity at measuring temperature to specific gravity at 20 °C for the product group B (fuels).

API Functions	64	API SG D @ 20 °C	Conversion of specific gravity at measuring temperature to specific gravity at 20 °C for the product group D (lubricants).
	71	API SG A @ 29.5 °C	Conversion of specific gravity at measuring temperature to specific gravity at 29.5 °C for the product group A (crude oils).
	72	API SG B @ 29.5 °C	Conversion of specific gravity at measuring temperature to specific gravity at 29.5 °C for the product group B (fuels).
	73	API SG D @ 29.5 °C	Conversion of specific gravity at measuring temperature to specific gravity at 29.5 °C for the product group D (lubricants).
	35	API Density A @ 15 °C	Conversion of density at measuring temperature to density at 15 °C for the product group A (crude oil).
	36	API Density B @ 15 °C	Conversion of density at measuring temperature to density at 15 °C for the product group B (fuels).
	37	API Density D @ 15 °C	Conversion of density at measuring temperature to density at 15 °C for the product group D (lubricants).
	38	API Density A @ 60 °F	Conversion of density at measuring temperature to density at 60 °F for the product group A (crude oil).
	39	API Density B @ 60 °F	Conversion of density at measuring temperature to density at 60 °F for the product group B (fuels).
	40	API Density D @ 60 °F	Conversion of density at measuring temperature to density at 60 °F for the product group D (lubricants).
	65	API Density A @ 20 °C	Conversion of density at measuring temperature to density at 20 °C for the product group A (crude oil).
	66	API Density B @ 20 °C	Conversion of density at measuring temperature to density at 20 °C for the product group B (fuels).
	67	API Density D @ 20 °C	Conversion of density at measuring temperature to density at 20 °C for the product group D (lubricants).
	74	API Density A @ 29.5 °C	Conversion of density at measuring temperature to density at 29.5 °C for the product group A (crude oil).
	75	API Density B @ 29.5 °C	Conversion of density at measuring temperature to density at 29.5 °C for the product group B (fuels).
	76	API Density D @ 29.5 °C	Conversion of density at measuring temperature to density at 29.5 °C for the product group D (lubricants).

System	4	Period	Period value of the oscillator at the measuring temperature.
	41	Measuring State	Status information indicating the status of the density measurement.
	42	Filling State	Status information indicating the filling status.
	8	Set Temperature	Set measuring temperature.
Optional custom functions		IDs 10002 and higher	Custom functions can be 1D polynomials or tables (see Chapter 12.3). Contact your Eagle Eye representative to obtain a custom function.
	0	None	

B.2 Using Custom Functions

In addition to the predefined measuring units, you can import up to ten custom functions to the instrument and select one of these as the measuring unit.

Two different kinds of custom functions can be installed on the instrument

- tables
- one-dimensional polynomials

All custom functions are summarized in one text file, the custom function list. The custom function list is transferred to the instrument.

A custom function list is a text file which starts with

<DMA500>
<CUSTOMLIST>

and ends with

</CUSTOMLIST>
</DMA500>.

The custom function list has to be saved as "DMA500_CUSTOM.txt".

To add a table to the custom function list

You can either enter a table from a literature source or you can create your own table by measuring mixtures of known concentrations at several temperatures within the required temperature and concentration range. The more reference values are entered for the calculation of a custom function, the more accurate the calculation will be.

You can add a table in the following format:

Custom table format	Description
<CUSTOMTABLE>	
<NAME>Custom Function 1</NAME>	Name of the custom function
<UNIT>% v/v</UNIT>	Measuring unit
<DECIMALPLACES>2</DECIMALPLACES>	Number of decimal places
<TEMPERATURE>20.00</TEMPERATURE>	Measuring temperature
<VALUE>	First input value, whereas "IN" states the density value and "OUT" states the related concentration value
<IN>+0.999000E+00</IN>	
<OUT>+1.000000E-00</OUT>	
</VALUE>	
<VALUE>	Second input value, whereas "IN" states the density value and "OUT" states the related concentration value
<IN>+1.970000E+00</IN>	
<OUT>+4.000000E+00</OUT>	
</VALUE>	
<CUSTOMTABLE>	

You can, as required, add further density and concentration values related to each other in the same format.

To add a 1-d polynomial to the custom function list

To add a new custom function of the 1-d polynomial type to the custom function list, the coefficients for the calculation of your measuring unit need to be transferred to the instrument in the correct format.

You can add a 1-d polynomial in the following format.

Custom 1-d polynomial format	**Description**
<CUSTOMPOLY>	
<NAME>Custom Function 2</NAME>	Name of the custom function
<UNIT>% w/w</UNIT>	Measuring unit
<DECIMALPLACES>2</DECIMALPLACES>	Number of decimal places
<TEMPERATURE>20.00</TEMPERATURE>	Measuring temperature
<MINDENS>0.99900</MINDENS>	Minimum density input value
<MAXDENS>1.45700</MAXDENS>	Maximum density input value
<MINOUT>0.00000</MINOUT>	Minimum output value displayed
<MAXOUT>0.00000</MAXOUT>	Maximum output value displayed
<C0>+0.000000E+00</C0>	Polynomial coefficients for calculation of the result in the respective measuring unit.
<C1>+1.000000E+00</C1>	
<C2>+0.000000E+00</C2>	
<C3>+0.000000E+00</C3>	
<C4>+0.000000E+00</C4>	
<C5>+0.000000E+00</C5>	
<C6>+0.000000E+00</C6>	
<C7>+0.000000E+00</C7>	
<C8>+0.000000E+00</C8>	
<C9>+0.000000E+00</C9>	
</CUSTOMPOLY>	

For how to import custom functions, see Chapter 11.1.4.

Appendix C: Measuring Special Samples

C.1 Degassing Samples

There are different methods for the degassing of liquid samples. The preferable method for your application depends on the kind of sample and the amount of gas that is dissolved in the sample. Always take care that you treat all samples in the same way in order to get reproducible measuring results.

Be aware of the fact that you may change the composition of many samples slightly during the pretreatment due to evaporation of volatile components.

To boil the sample

1. Boil the liquid for several minutes to remove dissolved air.
2. Fill a clean glass flask full with the boiled liquid and cover it.
3. Wait until the liquid has cooled down to the approx. measuring temperature.

WARNING

Boiling of liquids may induce a risk of fire and/or a health hazard.

- Do not boil any flammable liquid because of a high risk of fire.
- If your sample contains volatile compounds that are toxic, always handle it in an appropriate environment like a fume hood, especially when you boil your sample.

To stir the sample

- Stir your sample vigorously for 5 to 15 minutes (depending on the stirring equipment) until no bubbling occurs any more.
- You can also pour the sample through a paper filter after stirring to get an even more efficient degassing effect.

To use an ultrasonic bath

- Put your sample for approximately 5 to 10 minutes into an ultrasonic bath until the bubble formation stops.

C.2 Special Filling Techniques

Bubbling samples

If the sample to be measured tends to form gas bubbles, degas it before the measurement (see Appendix C.1).

If this is not possible, introduce the sample at a temperature higher than the measuring temperature.

You can also put the density meter at a slight angle by means of proper spacers below the right side of the SG-5000BT to allow the bubbles to escape due to buoyancy.

Suspensions and emulsions

Suspensions or emulsions may tend to separate in the measuring cells, giving incorrect results. Leave such samples in the measuring cell as briefly as possible. Pre-thermostat them before filling.

It may help to put spacers below the left legs of SG-5000BT, thus putting it at an angle to counterbalance the separation force generated by the oscillation of the measuring cell.

Highly viscous samples

Highly viscous samples can be heated up to lower the viscosity. Always heat the sample to a temperature that is approx. 15 °C higher than the measuring temperature, which can be 40 °C maximum.

Pastes

Paste-like materials like toothpaste or tomato ketchup can be filled by syringe. Inject these kind of samples into the measuring cell by pushing the plunger very slowly and continuously.

If the samples have a very high viscosity, you can fill them into the syringe by pulling the plunger completely out of the syringe, filling it from the back using a spoon and then mounting the plunger again.

Appendix D: Measuring at High Humidity/ Low Temperature Conditions

If the ambient air contains humidity and the measuring temperature is lower than the ambient temperature, condensation may occur in the measuring cell.

Condensation in the measuring cell causes adjustment and measurement errors in SG-5000BT. The higher the difference between the set measuring temperature and ambient temperature and the higher the air humidity, the easier condensation occurs.

To prevent condensation in the measuring cell

To prevent condensation in the measuring cell, connect a drying cartridge (Mat. No. 65085) to the "Air in" connector at the back of your instrument.

For a measuring temperature of 20 °C, a drying cartridge must be used under the following conditions:

Ambient temperature	Air humidity (r. h.)
20 °C	> 70 %
25 °C	> 50 %
30 °C	> 38 %

To regenerate moist ruby gel

The drying cartridge contains beaded ruby gel, a non-toxic drying agent. When active, the color of the drying agent is red. Ruby gel which has absorbed liquid turns orange. Moist ruby gel can be regenerated: Pour the ruby gel into a glass bowl and blow hot, dry air (max. 130 °C, 266 °F) through it for approx. 5 hours or place it in a laboratory oven for a few hours (or over night) until it is red again.

NOTICE

Do not use higher drying temperatures than 130 °C (266 °F), otherwise the indicator function of the ruby gel is spoiled.

Appendix E: Density Tables

Density of Air

At the temperature t in [°C] and the pressure p in [mbar] or [hPa] the density ρ of air in [g/cm³] is calculated using the following formula for an air humidity of 50 %:

$$\rho=(((0.34844*p-0.5*(0.252*t-2.0582))/(273.15+t)/1000))$$

The numbers are valid for a CO_2 content in air of 0.03 % by volume; the numbers change by ±1/19000 for every change in CO_2 volume content of ±0.0001.

Density of Air (5 °C to 40 °C)[1]

Composition of dry air in [v/v]: 78.110 % N_2; 20.938 % O_2; 0.916 % Ar; 0.033 % CO_2; 0.002 % Ne

The table lists values of air with 50 % air humidity.

Meas. temp. in °C	Density in g/cm³ at the pressure in mbar (=hPa)							
	900	920	940	960	980	1000	1013.25	1050
5	0.001129	0.001154	0.001179	0.001204	0.001229	0.001254	0.001271	0.001317
10	0.001107	0.001131	0.001156	0.001181	0.001205	0.001230	0.001246	0.001291
15	0.001085	0.001110	0.001134	0.001158	0.001182	0.001206	0.001222	0.001267
20	0.001065	0.001088	0.001112	0.001136	0.001160	0.001184	0.001199	0.001243
25	0.001045	0.001068	0.001091	0.001115	0.001138	0.001162	0.001177	0.001220
30	0.001025	0.001048	0.001071	0.001094	0.001117	0.001140	0.001156	0.001198
35	0.001007	0.001029	0.001052	0.001075	0.001097	0.001120	0.001135	0.001176
40	0.000989	0.001011	0.001033	0.001055	0.001078	0.001100	0.001115	0.001156

Density of Water (5 °C to 40 °C)[2]

T °C	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	.999964	.999962	.999960	.999958	.999956	.999954	.999951	.999949	.999946	.999943
6	.999940	.999937	.999934	.999930	.999926	.999923	.999919	.999915	.999910	.999906
7	.999901	.999897	.999892	.999887	.999882	.999877	.999871	.999866	.999860	.999854
8	.999848	.999842	.999836	.999829	.999823	.999816	.999809	.999802	.999795	.999788
9	.999781	.999773	.999766	.999758	.999750	.999742	.999734	.999725	.999717	.999708
10	.999699	.999691	.999682	.999672	.999663	.999654	.999644	.999635	.999625	.999615
11	.999605	.999595	.999584	.999574	.999563	.999553	.999542	.999531	.999520	.999508

1. Literature: F. Spieweck, H. Bettin: Review: Solid and liquid density determination tm 7/8 1992 p291
2. Literature: Spieweck, F. & Bettin, H.: Review: Solid and liquid density determination. Technisches Messen 59 (1992), pp. 285-292.

T °C	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
12	.999497	.999486	.999474	.999462	.999450	.999438	.999426	.999414	.999402	.999389
13	.999377	.999364	.999351	.999338	.999325	.999312	.999298	.999285	.999271	.999258
14	.999244	.999230	.999216	.999202	.999187	.999173	.999158	.999144	.999129	.999114
15	.999099	.999084	.999069	.999053	.999038	.999022	.999006	.998991	.998975	.998959
16	.998942	.998926	.998910	.998893	.998876	.998860	.998843	.998826	.998809	.998792
17	.998774	.998757	.998739	.998722	.998704	.998686	.998668	.998650	.998632	.998613
18	.998595	.998576	.998558	.998539	.998520	.998501	.998482	.998463	.998443	.998424
19	.998404	.998385	.998365	.998345	.998325	.998305	.998285	.998265	.998244	.998224
20	.998203	.998182	.998162	.998141	.998120	.998099	.998077	.998056	.998035	.998013
21	.997991	.997970	.997948	.997926	.997904	.997882	.997859	.997837	.997815	.997792
22	.997769	.997747	.997724	.997701	.997678	.997654	.997631	.997608	.997584	.997561
23	.997537	.997513	.997490	.997466	.997442	.997417	.997393	.997369	.997344	.997320
24	.997295	.997270	.997246	.997221	.997196	.997170	.997145	.997120	.997094	.997069
25	.997043	.997018	.996992	.996966	.996940	.996914	.996888	.996861	.996835	.996809
26	.996782	.996755	.996729	.996702	.996675	.996648	.996621	.996594	.996566	.996539
27	.996511	.996484	.996456	.996428	.996400	.996373	.996344	.996316	.996288	.996260
28	.996232	.996203	.996174	.996146	.996117	.996088	.996059	.996030	.996001	.995972
29	.995943	.995913	.995884	.995854	.995825	.995795	.995765	.995735	.995705	.995675
30	.995645	.995615	.995584	.995554	.995523	.995493	.995462	.995431	.995401	.995370
31	.995339	.995307	.995276	.995245	.995214	.995182	.995151	.995119	.995087	.995056
32	.995024	.994992	.994960	.994928	.994895	.994863	.994831	.994798	.994766	.994733
33	.994700	.994667	.994635	.994602	.994569	.994535	.994502	.994469	.994436	.994402
34	.994369	.994335	.994301	.994268	.994234	.994200	.994166	.994132	.994097	.994063
35	.994029	.993994	.993960	.993925	.993891	.993856	.993821	.993786	.993751	.993716
36	.993681	.993646	.993610	.993575	.993540	.993504	.993468	.993433	.993397	.993361
37	.993325	.993289	.993253	.993217	.993181	.993144	.993108	.993072	.993035	.992998
38	.992962	.992925	.992888	.992851	.992814	.992777	.992740	.992703	.992665	.992628
39	.992591	.992553	.992515	.992478	.992440	.992402	.992364	.992326	.992288	.992250
40	.992212	.992174	.992135	.992097	.992058	.992020	.991981	.991942	.991904	.991865

Appendix G: Firmware Versions

Firmware version	Release date	Document number	Comments
V1.003	27.04.2011	D18IB001EN-A	First released version.

Appendix H: Menu Tree

Measured Data	Export	Export Range	Export Current Day
			Export Last 7 Days
			Export Date Range
			Export All Data
		Print Selected Data	
		Print Range	Print Current Day
			Print Last 7 Days
			Print Date Range
			Print All Data
	Delete	Delete Selected Measured Data	
		Delete All Measured Data	
	Detail	Delete	
		Export	
		Picture	
Sample ID	Select Sample ID		
	Add New Sample ID		
	Edit Sample ID		
Methods	Select Method		
	Add New Method		
	Edit Method		
Measurement Settings	Measuring Temperature		
	Measuring Unit 1	Density	
		Alcohol	
		Sugar / Extract Tables	
		Acid / Base Tables	
		API Functions	
		Custom Functions	
		System	
	Measuring Unit 2	Density	
		Alcohol	
		Sugar / Extract Tables	
		Acid / Base Tables	
		API Functions	
		System	
		Custom Functions	
		None	
	Service Testmode		

Checks / Adjustments	Checks	Water Check	
		Air Check	
		Custom Check	
Checks / Adjustments	Check Settings	Temperature	
		Limit	
		Atmospheric Pressure	
		Custom Sample Reference	
		Custom Sample Name	
	Adjustments	Air / Water Adjustment	
		Temperature Range Adjustment	
		High Density / Viscosity Adjustment	
		Temperature Sensor Adjustment	
	View Adjustments	Density Adjustment	
		Temperature Sensor Adjustment	
	Restore Factory Adjustment		
Setup	Measurement Criterion		
	Import / Export	Export	Measured Data
			Custom Functions
			Sample ID
			Methods
			Instrument Settings
			Adjustments
			Device Information
		Import	Custom Functions
			Sample ID
			Methods
			Instrument Settings
		Data Format	File Format
			Delimiter
			Decimal Point
		View Import / Export Settings	
		Select Connection	
		Select Bluetooth Device	
	Instrument Settings	Softkeys	Softkey 1
			Softkey 2

Setup	Instrument Settings	Date and Time	Set Time
			Set Date
			Time Format
			Date Format
		Units	Density
			Temperature
		Printer	View Printer Settings
			Select Connection
			Select Bluetooth Printer
			Serial Printer Handshake
		Network	View Network Settings
			Network Connection
			IP Address
			Subnet Mask
			Default Gateway
		Regional Settings	Language
			Keyboard Layout
		Battery Settings	
		Password Protection	
		FillingCheck™	
		Backlight	
		Energy Saving	Automatic Shutdown
			Screensaver
		Beep	
		Drying Time	
		Filling Time	
	Backup / Restore	Backup Instrument Settings	
		Restore Instrument Settings	
	Battery Recalibration		
	Device Information		
	Update Instrument Firmware		