Anton Paar

Instruction Manual and Safety Information

# Alex 501
# Alex 301

Alcohol and Extract Meter

Find out more

**www.anton-paar.com**

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# Table of contents

# 1 Safety instructions

**Read the documentation**

- Read the documentation before using the product.
- Follow all hints and instructions in the documentation to ensure the correct use and safe functioning of the product.

## 1.1 General safety instructions

**General**

- The documentation is a part of the product. Keep it for the complete working life of the product and make it easily accessible to all persons involved with the product. If you receive any additions or revisions from Anton Paar, these must be treated as part of the documentation.

**Liability**

- This document does not claim to address all safety issues associated with the use of the product and samples. It is your responsibility to establish health and safety practices and to determine the applicability of regulatory limitations.
- Anton Paar only warrants the safe and proper functioning of the product if no modifications are made to mechanics, electronics, or software.
- Use the product only for the purpose described in the documentation. Anton Paar is not liable for damages caused by incorrect use of the product.
- The results delivered by the product depend on the correct function of the product and various other factors. We recommend that you have experts check the results (i.e., perform plausibility testing) before taking consequential actions based on the results.

**General precautions**

- Observe and adhere to your national safety regulations regarding the handling of all substances associated with your measurements (e.g. use safety goggles, gloves, respiratory protection, etc.).
- Check the wetted parts of the product for chemical resistance to all samples and cleaning liquids.

**For products directly connected to electrical supply**

- Install the product so that you can easily separate it from the electrical supply (pull the power plug) at any time.

**Installation**

- The installation procedure shall only be carried out by authorized personnel who are familiar with the installation instructions.
- Use only accessories, consumables, or spare parts supplied or approved by Anton Paar.

**Using the product**

- Ensure that all operators have been trained beforehand to use the product safely and correctly.
- Ensure that the product is sufficiently supervised during operation.
- In case of damage or malfunction, stop operating the product. Do not operate the product under conditions that could result in damage to goods or injuries or loss of life.
- Take measures that spilled liquids cannot get into plug connections or venting slots of electrical appliances.
- If you suspect that spilled substances got into the product, disconnect the product from the electrical supply and have it checked for electrical safety by a service technician authorized by Anton Paar.

**Precautions for flammable samples and cleaning agents**

- Keep potential sources of ignition, like sparks or open flames, at a safe distance from the product.
- Place the instrument on a laboratory bench made of fireproof material, preferably bricks, ceramics, or stoneware.
- Store only the minimum required amount of sample, cleaning liquids, and other hazardous materials near the product.
- Do not spill sample/cleaning liquids or leave their containers uncovered. Immediately remove spilled sample/cleaning liquids.
- Ensure that the setup location is sufficiently ventilated. The environment of the product must be kept free from flammable gases and vapors.
- Provide fire-extinguishing equipment.

**Operation in areas with risk of explosion**

- The product is **not** explosion-proof and therefore must not be operated in areas with risk of explosion.

**Service and repairs**

- Service and repair procedures may be carried out only by authorized persons or by Anton Paar.

**Disposal**

- Concerning the disposal of the product, observe the legal requirements in your country.

## 1.2 Conventions of safety messages and typography

### Conventions for safety messages

The following conventions for safety messages are used in this document:

**WARNING**

**Description of risk**

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

**CAUTION**

**Description of risk**

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

**NOTICE**

**Description of risk**

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 |
|---|---|
| *Names for physical buttons*<br>*Labels for tabs, buttons etc. in the software* | The names and labels are written in *italic*. |
| *Menu Level 1 > Menu Level 2* | Menu paths are written in *italic*. The menu levels are connected using a closing angle bracket. |

# 2 Overview

***Fig. 1:*** *Alex 501*

Alex 301/501 is an alcohol and extract meter for determination of alcohol, density and extract values in various types of alcoholic beverages.

It simultaneously measures the alcohol content using NIR (near infrared) measurement technology and the density of the sample using the oscillating U-tube method.

From these two parameters, other parameters such as extract, calories and degree of fermentation can be calculated.

Moreover, you can monitor the fermentation process graphically for each particular product in fermentation monitor mode based on density measurement.

Alex 501 comes with an additional integrated switching valve which enables filling of sample and e.g. water with a single movement.

## 2.1 Intended use of the instrument

Alex 301/501 is capable of determining the alcohol content in clear alcoholic beverages.

Alex 301/501 come with measurement products including mathematical models for the correct alcohol determination in certain beverage groups:

- beer
- wine
- cider
- spirits
- clear liqueurs

**IMPORTANT:** *Some sample type (e.g. hard seltzers) may require offsets as no specific models are available.*

**Restrictions and exclusions**

- The mathematical models have been determined using standard samples. Some sample groups e.g. hard seltzers contain a large variety of different drinks. Therefore, offsets might be necessary to fit reference analysis.

  Samples, which are not part of the sample groups listed above have not been included in the mathematical models and therefore cannot be analyzed with Alex 301/501 e.g
  - plant based alcoholic beverages
  - protein shakes, cocktails etc.
  - samples containing fruit pulp or tomato juice
  - Table 1 [▸ 8] gives an overview of samples that can be analyzed with Alex 301/501 and samples that are not measurable.
- Do not leave beverage samples longer than necessary in the measuring cell because the sugar content will leave residues on the inner surface of the glass cuvette.
- Do not fill a sample if you do not know which cleaning liquid removes this sample.
- Do not fill and test liquids that attack the instrument's materials.
- Do not use hydrofluoric acid as a cleaning agent as it attacks the glass of the measuring cell.
- Do not fill substances that may harden inside the measuring cell.
- Do not mix substances inside the measuring cell if these substances may react chemically.

**Table 1:** Beverage types that can be analyzed with Alex 301/501 and limitations

| Samples that can be analyzed | Samples that cannot be analyzed |
|---|---|
| – all kinds of beers containing alcohol<br>– all kinds of beer mixtures containing alcohol<br>– red wines<br>– white wines<br>– rosé wines<br>– sparkling wines<br>– port wine<br>– sherry<br>– cider<br>– sake<br>– must<br>– hard seltzers<br>– spirits<br>– clear liqueurs (without turbidity) | – all kinds of non-alcoholic beers<br>– all kinds of non-alcoholic beer mixtures<br>– Spätlese (late harvest) wines with a high content of polyhydric alcohols (e.g. glycerol)<br>– turbid liqueurs and cream liqueurs<br>– non-alcoholic wine<br>– non-alcoholic spirits & liqueurs<br>– Mocktails<br>– Cocktail concentrates |

There is no specific mathematical model for the analysis of hard seltzers. Therefore, higher deviations from reference values may occur. It is recommended to perform a reference analysis and apply an offset if necessary.

**IMPORTANT:** *The turbidity of samples causes incorrect alcohol readings. Whenever you are going to measure a turbid sample (beer, wine, cider or sake), first treat the sample with kieselguhr and filter it properly before measurement. Strictly follow the procedure in Section 10.1.2 [▸ 23].*

## 2.2 Functional components

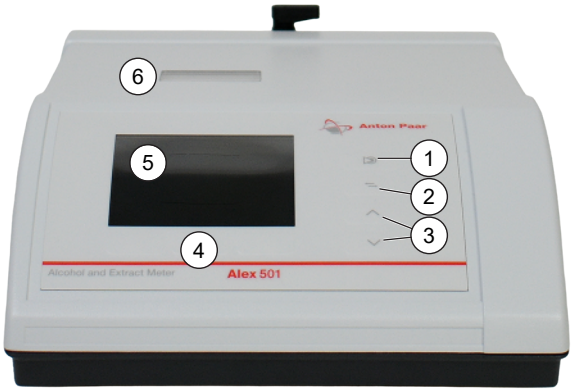


***Fig. 2:*** *Front view - example Alex 501*

1 *Start/Stop key*
2 *Mode key*
3 *Arrow keys*
4 *Softkeys*
5 *Display*
6 *Inspection window for the density measuring cell*

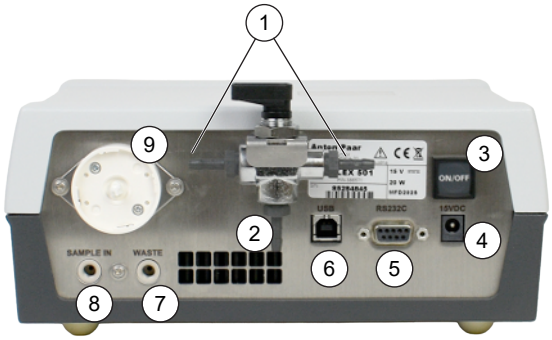


***Fig. 3:*** *Rear view - example Alex 501*

1 *Switch valve inlets (switch valve is only available with Alex 501)*
2 *Switch valve outlet*
3 *Power on/off switch*
4 *Power supply socket*
5 *RS-232 interface*
6 *USB interface*
7 *Sample outlet*
8 *Sample inlet*
9 *Peristaltic pump*

**Keys on the front**

| | | |
|---|---|---|
|  | *Start/Stop* key | to start and stop a measurement |
|  | *Mode* key | to toggle between measuring modes<br>(standard mode and fermentation monitor mode) |
|  | *Up* arrow key | to move up or down in the quick access area, in menus, or in selection/character lists |
|  | *Down* arrow key | |
| | Softkeys | to activate a softkey function displayed directly above |

# 3 Supplied parts

The product was tested and packed carefully before shipment. However, damage may occur during transport.

– Keep the packaging material (box, foam piece, transport protection) for possible returns and further questions from the transport and insurance company.
– Check the delivery for completeness by comparing the supplied parts to those noted in the table(s) below.
– If a part is missing, contact your Anton Paar representative.
– If a part is damaged, contact the transport company and your Anton Paar representative.

**Table 2:** Supplied parts

| | Qty. | Article description | Mat. no. |
|---|---|---|---|
|  | 1 | Alex 301<br>Alcohol and Extract Meter<br><br>or | 386570 |
| | | Alex 501<br>Alcohol and Extract Meter | 386571 |
| | 1 | Instruction manual English | 389397 |
|  | 1 | Power adapter 15 V DC / 2.6 A | 108584 |
| | 1 | Power cable | |
|  | 1 | USB cable | 94228 |
|  | 1 | Roller cassette Novoprene tubing<br>for pump mat. no. 183352 | 188236 |
|  | 1 | Waste vessel 500 mL | 6210 |

**Table 3:** Supplied parts – accessory kit Alex

| | Qty. | Article description | Mat. no. |
|---|---|---|---|
| | 1 | Accessory kit Alex<br>*(coming only with Alex 301)* | 154456 |
| containing: | | | |
|  | 2 | Adapter UNF 1/4"–Luer male | 64793 |
|  | 2 m | Hose 3x5 silicone | 50814 |

**Table 4:** Supplied parts – accessory kit Alex 501

| | Qty. | Article description | Mat. no. |
|---|---|---|---|
| | 1 | Accessory kit Alex 501<br>*(coming only with Alex 501)* | 389562 |
| containing: | | | |
|  | 2 | Adapter UNF 1/4"–Luer male | 64793 |
|  | 2 m | Hose 3x5 silicone | 50814 |

| | Qty. | Article description | Mat. no. |
|---|---|---|---|
|  | 2 m | hose 2.5x4.5 Novoprene | 100297 |
|  | 1 | Wash bottle 250 mL | |
|  | 1 | Wash bottle 500 mL | |

**Table 5:** Supplied parts – sample preparation kit Alex

| | Qty. | Article description | Mat. no. |
|---|---|---|---|
| | 1 | Sample preparation kit Alex | 165008 |
| | | containing: | |
|  | 2 | Erlenmeyer flask 500 mL | |
| | 1 | Rubber stopper | |
| | 1 | Beaker 400 mL | |
| | 1 | Funnel | |
| | 2 | Spoon | |
| | 1 pkg | Folded paper filters 5–8 µm, 100 pcs | 157200 |
| | 1 pkg | Diatomaceous earth 1 kg | 164788 |
| | 1 | Dust mask | |
| | 1 | Instructions | |

**Table 6:** Optional accessories and consumables

| Article description | Mat. no. |
|---|---|
| Hose 2.5x4.5 Novoprene | 100297 |
| Printer CMP-20BT Bluetooth/RS-232C | 97154 |
| Printer paper for printer CMP-10 | 88373 |
| CMP-10 printer paper long life | 95404 |
| Printer paper 57 mm long life | 166605 |
| Carrying case for Alex | 168236 |

# 4 Installation

## 4.1 Installation requirements

Read the Safety Instructions in Section 1 [▸ 5].

Find all Technical Data in Appendix A [▸ 30].

Allow the equipment to reach ambient temperature before installation. This is very important if the equipment has been stored or transported at lower temperatures.

**NOTICE**

High humidity or a measuring temperature that is significantly below the ambient temperature may lead to condensation in the measuring cell. Do not use the instrument at an ambient temperature higher than 32 °C (89 °F).

**The right place**

The instrument is designed for operation under typical laboratory benchtop conditions.

The setup location and surroundings must meet the minimum requirements specified under “Operating conditions” in the Technical Data (Appendix A [▸ 30]).

**NOTICE**

**No spray water protection**

Consider that the instrument is not protected against spray water.

Place the instrument on a stable, flat bench which is free of vibrations and away from vibrating equipment.

To ensure temperature stability and trouble-free measurement, do **not** position your instrument:

- next to a heating facility
- in a drafty place (e.g., near an air conditioning, ventilation system, or an open window)
- in direct sunlight

**NOTICE**

**Do not inhibit heat dissipation**

A strong built-in cooling fan dissipates heat through the bottom and rear of the instrument. Ensure that the air flow is not blocked and provide for a minimal distance of 10 cm (4 in) to walls behind and beside the instrument.

The instrument requires an electrical outlet nearby:

- 100–240 V~, 50/60 Hz, fluctuation ±10 %

**NOTICE**

**Possible damage due to wrong voltage**

- Before you switch on the instrument, make sure that the correct line voltage and line frequency are available (AC 100–240 V, 50/60 Hz).
- If large voltage fluctuations are to be expected, we recommend using a constant voltage source (UPS).

## 4.2 Mounting the adapters

1. Take two adapters UNF 1/4" Luer male from the accessory kit.
2. Screw them into the openings designated *SAMPLE IN* and *WASTE* on the rear of the instrument (below the peristaltic pump).

   Tighten with your fingers only, do not use any tools.

## 4.3 Mounting the roller cassette of the peristaltic pump

The supplied roller cassette with Novoprene hose has to be mounted to make the peristaltic pump operable.

1. Align the roller cassette, hose ends pointing to the left, with the motor shaft on the rear of the instrument.
2. Turn the roller cassette clockwise until it is fixed.

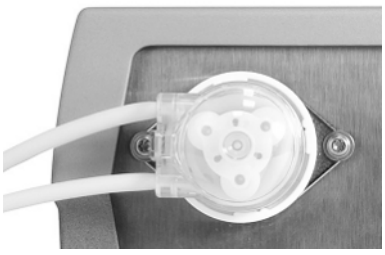

***Fig. 4:*** *Roller cassette mounted*

## 4.4 Connecting the pump hose

1. Attach the lower end of the pump hose (going through the roller cassette) to the adapter mounted at the sample inlet (designated “SAMPLE IN”).
2. Where appropriate, pull carefully at the upper (open) end of the hose to shorten the part leading to the sample inlet.

   The upper end of the pump hose is used to aspirate the sample directly from a beaker.

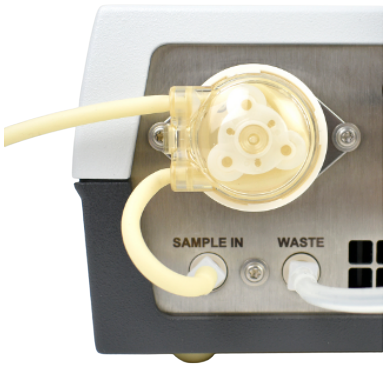


***Fig. 5:*** *Hoses connected*

Check the pump hose regularly for abrasion, and exchange the hose before it becomes leaky (refer to Section 13.6 [▶ 27]).

**CAUTION**

**Possible leakage of dangerous liquids**

Dangerous liquids leaking from the instrument may cause injuries or risk of fire.

- Use only the supplied hoses and waste vessel if their materials are resistant to your samples and cleaning liquids.
- If the supplied parts are not suitable, use other marts made of an appropriate material.

## 4.5 Connecting the waste vessel

1. Cut a piece of approx. 25 cm (10 in) length from the silicone hose in the accessory kit.
2. Attach one end of the silicone hose to the adapter mounted at the sample outlet (designated *WASTE*, on the rear of the instrument).
3. Lead the other end of the hose through the hole in the cap of the closed waste vessel.

***Fig. 6:*** *Alex 301 - all hoses properly connected*

## 4.6 Connecting sample bottles (only applicable for Alex 501)

1. Connect the upper end of the pump hose to the outlet of the switch valve.
2. For each bottle:
   - Cut a piece of the delivered Novoprene hose.
   - Insert one end into the sample bottle and attach the other side to one of the inlets of the valve.
3. To switch between bottles, switch the handle on top of the valve so that the arrow is pointing towards the bottle you want to withdraw sample from.

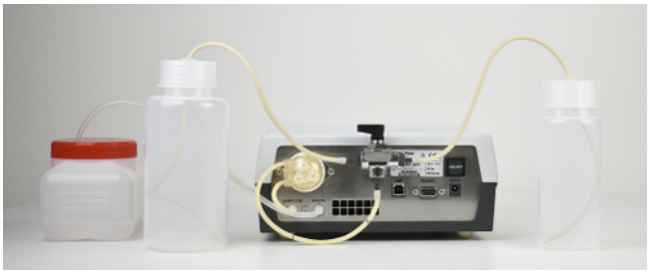

***Fig. 7:*** *Alex 501 – all hoses properly connected*

## 4.7 Switching the instrument on/off

**NOTICE**

**Possible damage due to wrong voltage**

- Before you switch on the instrument, make sure that the correct line voltage and line frequency are available (AC 100–240 V, 50/60 Hz).
- If large voltage fluctuations are to be expected, we recommend using a constant voltage source (UPS).

**NOTICE**

- Ensure that the power plug and the power switch are always easily accessible so that the instrument can be easily disconnected from the mains supply at any time.
- Make sure the instrument is placed at constant ambient temperature and switched on for at least one hour prior to use.

1. Connect the power adapter to the instrument and the power cable to the power adapter.

   Then connect the power cable to your mains supply.
2. To switch the instrument on, use the power switch on the rear.
3. Wait until the instrument's temperature is stable and the instrument is ready for measurements.

   The status bar will show *Equilibration finished*.
4. To switch the instrument off, use the power switch on the rear.

**IMPORTANT:** *Ensure that the measuring cell is filled with ultra-pure water. A message will remind you of that accordingly.*

# 5 Operation

## 5.1 The main screen

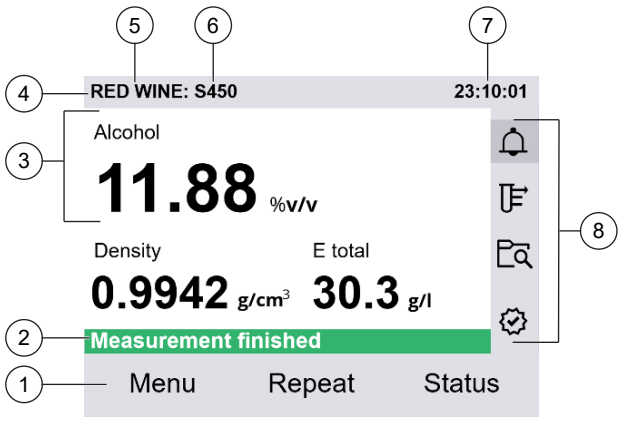


***Fig. 8:*** *Example main screen (standard mode)*

1 *Softkey functions*
2 *Status bar*
3 *Output fields*
4 *Header*
5 *Method*
6 *Sample ID*
7 *Current time*
8 *Quick access area*

### Header

On the left of the header, you find information on the currently used method, the sample ID, the number of stored data sets, or the index of the currently shown data set, depending on the active mode and function.

On the right of the header, the current time is shown.

### Output fields

You can select 2–5 sample parameters to be simultaneously displayed on the main screen in standard mode, refer to Section 8.2.1 [▶ 19] and Section 8.4 [▶ 20]. Each parameter is shown in an output field. In fermentation monitor mode, a graphical representation of the monitored process is displayed instead.

### Status bar

The status bar shows the status of the instrument or a measurement. If applicable, a progress bar will show the progress of activities.

### Quick access area

Use the ^ and v keys to select a quick access function. Activate the function with the right softkey. The following quick access functions are available:

| Icon | Function |
|---|---|
|  | *Status* function<br>Use it to check for warnings and error messages. |
|  | *Sample* / *Sample ID* function<br>Use it to select a measuring method (only in standard mode) and a sample ID for the next measurement. |
|  | *Data* function<br>Use it to view measurement and check data stored in the data memory. |
|  | *Check* function<br>Use it to initiate a check, an adjustment (only in standard mode), or rinsing of the measuring cell. |

## 5.2 Softkey functions

The softkey functions correspond to the softkeys below the display (the assignment of keys adapts to the active selection). The following softkey functions are available:

| Function | Description |
|---|---|
| All Pts. | Deletes or prints all points of a monitored process. |
| Back | Leaves the menu and goes to the next higher menu level. |
| Cancel | Aborts an operation. |
| Check | Activates the “Check” function of the quick access area. |
| Data | Activates the “Data” function of the quick access area. |
| Delete | Initiates deleting a value, or deletes the next character to the left. |
| Done | Finishes an entry. |
| Edit | Switches into editing mode allowing you to enter values or change the current selection. |
| Enter | Enters a character. |
| Last Pt. | Deletes or prints the last point of a monitored process. |
| Menu | Opens the main menu. |
| New | Initiates entering a new value. |
| Next | Continues with a procedure, or selects the next item to the right. |
| No | Rejects a proposition. |
| OK | Confirms a selection, or finishes a procedure. |
| Prev | Selects the next item to the left. |
| Print | Prints data. |

| Function | Description |
|---|---|
| Repeat | Starts the next measurement without a new filling procedure. |
| Sample | Activates the “Sample” function of the quick access area (standard mode). |
| Sample ID | Activates the “Sample ID” function of the quick access area (fermentation monitor mode). |
| Save | Saves adjustment data. |
| Start | Starts a procedure. |
| Status | Activates the “Status” function of the quick access area. |
| Yes | Accepts a proposition. |

## 5.3 Navigating the instrument

– Use the ^ and v keys for navigation and to select an item.

– Once a selection is made, use the softkeys to trigger selection-specific activities.

## 5.4 Entering text or numbers

After you have switched into editing mode, you see a selection bar on the right side of the screen:

1. Use the ^ and v keys to select the next character/digit to enter. Keep the key pressed to scroll through the selection bar fast.

   Select the red left arrow ◂, if available, to edit the previous position (one character to the left).

   Select the red left arrow with shaft ←, if available, to delete the last character.

2. Press *Enter* to enter the selected character at the current position.

   Press *Prev*, if available, to move the current position one character to the left.

   Press *Delete*, if available, to delete the character left of the current position.

   The editing line will show the whole current text/number.

**TIP:** *To enter a negative number, you need to delete all digits first. Only then will the negative sign “–” be available.*

3. Press *Done* to finish character entry and to confirm the entered text/number.

   Press *Cancel* at any time to abort character entry and to discard the entered text/number.

   Both keys switch back from editing mode into normal operation.

## 5.5 Selecting from a list

After you have switched into editing mode, you see a selection list folded out:

1. Use the ^ and v keys to select your choice.
2. Press *OK* to confirm the selected value.

   Press *Cancel* to abort selection.

   Both keys switch back from editing mode into normal operation.

# 6 Instrument settings

## 6.1 Setting the language

1. Press *Menu* and select *Setup* > *Language*.
2. Press *Edit*.
3. Select the preferred language:
   – English
   – Deutsch
4. Press *Back* repeatedly to return to the main screen.

## 6.2 Setting date and time

Date and time are automatically saved with measurement and check data. During operation, the current time is displayed on the right of the header.

**To set the date or time**

1. Press *Menu* and select *Setup* > *Date and Time* > *Date and Time*.
2. Select *Date* or *Time* and press *Edit*.
3. Enter the current date or time, respectively.
4. Press *Back* repeatedly to return to the main screen.

**To set the date or time format**

1. Press *Menu* and select *Setup* > *Date and Time* > *Date and Time Format*.
2. Select *Set the date format* or *Set the time format* and press *Edit*.
3. Select one of three date formats (DD=day, MM=month, YYYY=year):
   – DD.MM.YYYY
   – YYYY-MM-DD
   – MM/DD/YYYY
4. Select one of two time formats (24 hour clock or 12 hour clock):
   – 24h
   – AM/PM
5. Press *Back* repeatedly to return to the main screen.

## 6.3 Setting PIN protection

You can protect access to the menu by a PIN (personal identification number). After you have set PIN protection, you can still use all functions of the quick access area (performing measurements, selecting methods and sample IDs, etc.) without the need for entering a PIN.

**To activate PIN protection**

1. Press *Menu* and select *Setup* > *PIN Settings*.
2. Select *Set PIN protection* and press *Edit*.
3. Select *On* from the selection list.
4. Select *New PIN* and press *Edit*.
5. Enter your 4-digit PIN.
6. Select *Confirm new PIN* and press *Edit*.
7. Repeat the PIN that you have entered before.
8. Press *Back* repeatedly to return to the main screen.

Every time you press *Menu* while PIN protection is activated, you will have to enter the active PIN and confirm it with *OK* to be able to continue.

**NOTICE**

Be sure to remember the set PIN as you will not be able to deactivate PIN protection without it.

**To deactivate PIN protection**

1. Press *Menu* and enter the active PIN.
2. Select *Setup* > *PIN Settings*.
3. *Active PIN* is preselected.
4. Press *Edit* and enter the active PIN.
5. Select *Set PIN protection* and press *Edit*.
6. Select *Off* from the selection list.
7. Press *Back* repeatedly to return to the main screen.

**To change the active PIN**

1. Press *Menu* and enter the currently active PIN.
2. Select *Setup* > *PIN Settings*.
3. *Active PIN* is preselected.
4. Press *Edit* and enter the currently active PIN.
5. Select *New PIN* and press *Edit*.
6. Enter the new PIN.
7. Select *Confirm new PIN* and press *Edit*.
8. Repeat the PIN that you have entered before.
9. Press *Back* repeatedly to return to the main screen.

## 6.4 Interface settings for printer connections

You need to set up the instrument for a connection to a printer.

1. Press *Menu* and select *Setup* > *Interface Settings*.
2. Press *Edit*.
3. Select *Bluetooth Printer* to set up the instrument for wireless printing over Bluetooth.
4. Select *Serial Printer* to set up the instrument for printing over a serial cable.
5. Select *None* to disable printing.
6. Press *Back* repeatedly to return to the main screen.

## 6.5 Reset to factory settings

1. Press *Menu* and select *Setup* > *Reset to Factory Settings*.

   The settings listed in Table 7 [▶ 17] will be reset.

   Check data and measurement data from measurements in standard mode will remain in the data memory. Measurement data from measurements in fermentation monitor mode which have been assigned deleted sample IDs will be deleted, however.
2. Press *Yes* to reset to factory settings.
3. Press *No* to cancel the reset operation.
4. Press *Back* repeatedly to return to the main screen.

**Table 7:** Factory settings

| Setting | Factory setting |
|---|---|
| PIN | 0000 |
| PIN protection | On |
| Language | English |
| Interface connection | None |
| Date format | DD.MM.YYYY |
| Time format | 24h |

| Setting | Factory setting |
|---|---|
| Sample ID | “ID”<br>(All other sample IDs will be deleted.) |
| Methods | “BEER”, “RED WINE”, “WHITE & ROSE”, “CIDER”, “SAKE”, “SPIRITS” fn:1<br>(All other methods will be deleted.) |
| Method settings (output fields) | *For the beer method:*<br>Alcohol (% v/v)<br>Density (g/cm³)<br>Original Extract (°Plato)<br><br>*For wine method:*<br>Alcohol (% v/v)<br>Density (g/cm³)<br>Total Extract (g/L)<br><br>*For the cider method:*<br>Alcohol (% v/v)<br>Density (g/cm³)<br><br>*For the sake method:*<br>Alcohol @15 °C (% v/v)<br>Nihonshu-do (°)<br>Ekisu (°)<br><br>*For spirits method:*<br>Alcohol (% v/v)<br>Density (g/cm³)<br>Total Extract (g/L) |

# 7 Measuring modes

Alex 301/501 features two measuring modes, “standard mode” and “fermentation monitor mode”.

- Use “standard mode” for single measurements benefiting from the full scope of measurement parameters the instrument is able to deliver.
- Use “fermentation monitor mode” to monitor a fermentation process by density measurements over a period. This enables you to document the decrease of density during fermentation.

## 7.1 Switching modes

To toggle between “standard mode” and “fermentation monitor mode”, use the *Mode* key ⇆.

**TIP:** *The ⇆ key is only operative when the main screen is on display.*

## 7.2 Standard mode

The main screen of the “standard mode” shows the latest measurement results in output fields according to the parameters selected by you with the method settings, refer to Section 8.2.1 [▶ 19] and Section 8.4 [▶ 20].

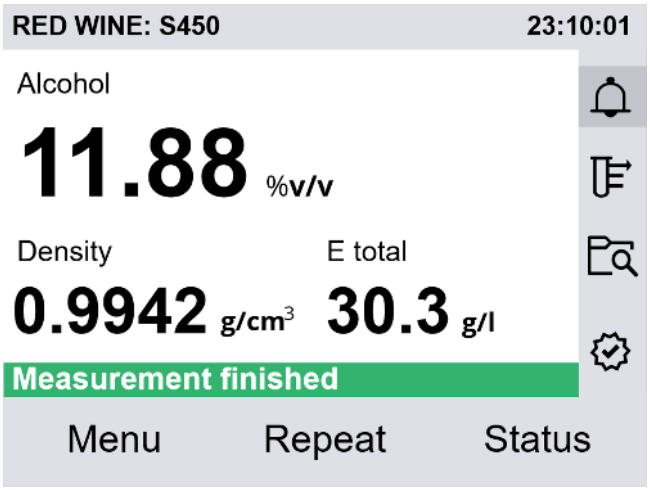


***Fig. 9:*** *Example main screen in “standard mode”*

## 7.3 Fermentation monitor mode

The main screen of the “fermentation monitor mode” shows a graphical representation of the monitored process.

The horizontal axis represents the time between measurements [days].

The vertical axis represents the selected measurement parameter, refer to Section 8.5 [▶ 20].

The last point of the graph corresponding to the latest measurement result is marked and its parameter value prominently displayed.

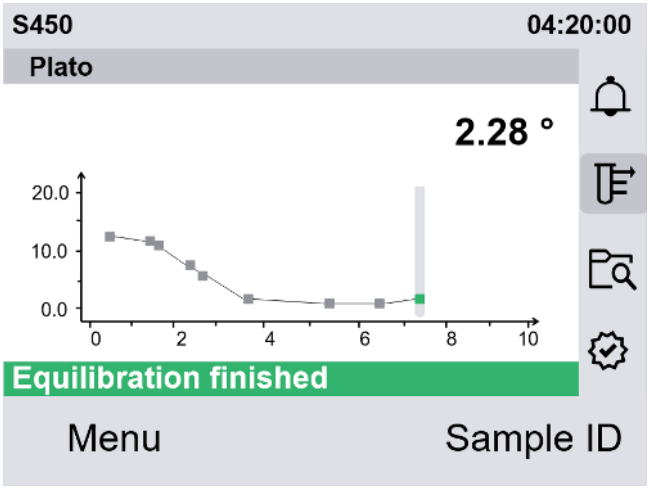


***Fig. 10:*** *Example main screen in “fermentation monitor mode”*

For example, to monitor the fermentation process of your sample, you would start the first measurement of your sample in fermentation monitor mode. This will enter the first measurement result in the graph as the initial value at day 1.

Subsequent measurements of the same sample (in fermentation monitor mode), e.g. one measurement per day, will automatically add points to the graph, thus representing the progress of the fermentation process over a period, e.g. one week.

# 8 Measurement settings

To set up a measurement, you need to specify a method (in standard mode) or a measurement parameter (in fermentation monitor mode) and a sample ID.

– A method is a set of measurement settings, with the exception of the globally defined filling time.
– Sample IDs identify your sample varieties, e.g. your product varieties, fermentation tanks, etc.

## 8.1 Filling and rinsing time

The sample is filled into the measuring cell by the integrated peristaltic pump. To avoid sample carry-over, fill at least 40 mL sample into the measuring cell with each filling. You control the filled-in sample volume by the filling time setting.

To fill 40 mL sample, set a filling time of approx. 70 seconds. If this setting causes too much or too little sample to be filled, adjust the filling time as appropriate.

**To set the filling time**

1. Press *Menu* and select *Measurement Settings* > *Filling and Rinsing Time*.
2. Press *Edit*.
3. Enter the filling time [s].

   The filling time can be in the range 0–300 s.
4. Press *Back* repeatedly to return to the main screen.

**To set the rinsing time**

1. Press *Menu* and select *Measurement Settings* > *Filling and Rinsing Time*.
2. Press *Edit*.
3. Enter the rinsing time [s].

   The rinsing time can be in the range 0–300 s.
4. Press *Back* repeatedly to return to the main screen.

## 8.2 Methods

Methods are preset measurement settings, which you can simply assign to a measurement by the method name.

The instrument comes with five predefined methods named after the predefined method types (refer to Section 8.2.1 [▶ 19]).

**TIP:** *You do not assign a method to a measurement in fermentation monitor mode.*

### 8.2.1 Method settings

A method comprises the following method settings:

– Method Name

  Choose arbitrarily.

– Method Type

  The predefined method types determine how the measured values will be interpreted (depending on the respective sample type) so that the instrument may give correct results.

  Choose a method type which most closely accords with your sample.

| Method type | Sample type |
|---|---|
| Beer[1] | various types of beer |
| White and Rosé Wine[2] | various kinds of white and rosé wines |
| Red Wine[2] | various kinds of red wine |
| Cider[3] | various types of cider and hard seltzers |
| Sake | various types of sake |
| Spirits | various types of spirits or liqueurs (with/ without color, without turbidity) |

– Parameter 1–5

  Select the parameters (at least 2, up to 5) to be displayed on the measuring screen. The default setting of the parameters depends on the method type and can be changed as needed. See the parameter overview in appendix B.1 for possible choices.

  If you select "None", the parameter will not be displayed.

[1] When you are going to measure turbid or dark beers, it is absolutely necessary to prepare the sample properly (with kieselguhr) before the measurement. Strictly follow the procedure in Section 10.1.2 [▶ 23].

[2] With some kinds of late harvest wines, you may not achieve the accuracy of the instrument as stated. In these cases, we recommend to define a sample-specific method offset.

[3] For hard seltzers no specific method type is available. We recommend to measure the samples with the method type "Cider" and to define sample-specific method offsets if necessary

### 8.2.2 Method offset

If the instrument's measuring results for alcohol concentration show a constant deviation from your reference value, define an offset which will be automatically added to the measuring result.

The offset can be freely defined in the range from –10.0 % v/v to +10.0 % v/v.

### 8.2.3 Managing methods

**Defining your own methods**

You can create new methods in addition to the preset ones:

1. Press *Menu* and select *Measurement Settings* > *Methods* > *New Method*.
2. Edit the method settings as described below.
3. Press *Back* repeatedly to return to the main screen.

**Editing methods**

1. Press *Menu* and select *Measurement Settings* > *Methods* > *Edit Methods*.
2. Select a method that you want to edit and press *Edit*.
3. Select a method setting that you want to edit and press *Edit*.
4. Enter a value or select it from a list as appropriate.
5. Repeat steps 3–4 for all method settings that you want to edit.
6. Press *Back* repeatedly to return to the main screen.

**Deleting methods**

1. Press *Menu* and select *Measurement Settings* > *Methods* > *Edit Methods*.
2. Select a method that you want to delete and press *Delete*.
3. Press *Yes* to confirm deletion.
4. Press *No* to abort deletion.
5. Press *Back* repeatedly to return to the main screen.

### 8.2.4 Assigning a method to a measurement

1. In the quick access area select and press *Sample* (in standard mode).
2. Select *Method* and press *Edit*.
3. Select the appropriate method from the list.
4. Press *Back* to return to the main screen.

All subsequent measurements in standard mode will use the selected method until you assign a new one.

The assigned method is shown in the header.

## 8.3 Turbidity warning

By default, the turbidity detection is activated. In case a sample is turbid, an appropriate message is displayed.

For the method *SPIRITS*, you can activate or deactivate this feature.

– Press *Menu* and select *Measurement Settings* > *Turbidity Warning*.

## 8.4 Output fields on the main screen

The arrangement of output fields on the main screen depends on the number of parameters to be displayed (which you have made with the method settings, refer to Section 8.2.1 [▶ 19]).

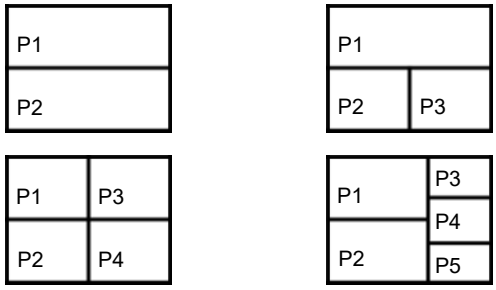


***Fig. 11:*** *Possible arrangements of output fields (P1-5: parameters 1-5, freely configurable)*

In fermentation monitor mode, the output fields on the main screen are replaced by the graphical representation of the monitored process.

## 8.5 Measurement parameters for fermentation monitoring

In fermentation monitor mode, the density of your sample will be measured. Still, you may prefer your measurement results represented in a different form. See the parameter overview in Appendix B [▶ 31] for possible choices of parameters derived from the density value.

– You may change the measurement parameter at any time, and your measurement results will be recalculated accordingly.
– The currently selected measurement parameter applies to all monitored processes. (You can only select one measurement parameter at one time.)

**To select a measurement parameter**

1. Press *Menu* and select *Measurement Settings* > *Fermentation Process*.
2. Press *Edit*.
3. Select the appropriate measurement parameter from the list.
4. Press *Back* repeatedly to return to the main screen.

## 8.6 Sample IDs

Sample IDs serve to tag your measurement results, e.g. with a designation from your product varieties, thus facilitating full traceability of your measurement results.

Up to 40 different sample IDs can be defined.

### 8.6.1 Managing sample IDs

**Defining a sample ID**

1. Press *Menu* and select *Measurement Settings* > *Sample ID*.
2. Press *New*.
3. Press *Edit* and enter a sample ID.
4. Press *Back* repeatedly to return to the main screen.

**Deleting a sample ID**

1. Press *Menu* and select *Measurement Settings* > *Sample ID*.
2. Select a sample ID that you want to delete and press *Delete*.
3. Press *Yes* to confirm deletion.
4. Press *No* to abort deletion.
5. Press *Back* repeatedly to return to the main screen.

**NOTICE**

Deleting the sample ID of a monitored process will also delete all stored data sets associated with the process.

### 8.6.2 Assigning a sample ID to a measurement

**In standard mode**

1. In the quick access area select and press *Sample*.
2. Select *Sample ID* and press *Edit*.
3. Select the appropriate sample ID from the list.
4. Press *Back* to return to the main screen.

All subsequent measurements will use the selected sample ID until you assign a new one.

The assigned sample ID is shown in the header.

**In fermentation monitor mode**

1. In the quick access area select and press *Sample ID*.
2. Select the appropriate sample ID from the list.

   You will be automatically returned to the main screen, and the monitored process corresponding to the selected sample ID will be displayed.

All subsequent measurements will use the selected sample ID until you assign a new one.

The assigned sample ID is shown in the header.

# 9 Checks and adjustments

Perform a water check every day before you start the measurements to verify that the instrument is measuring the parameters density and alcohol with adequate accuracy.

If you only perform measurements in fermentation monitor mode, a water check for density measurements, in short “water check density”, is sufficient.

Perform a zero adjustment if the water check or water check density advises you to do so.

**IMPORTANT:** *Water of poor quality and/or containing dissolved gases creates bubbles in the measuring cell during checks and adjustments rendering the measurement results unusable. Degas the water properly before checks and adjustments if you notice any gas bubbles, refer to Section 10.1.1 [▸ 22].*

## 9.1 Performing a water check

Use ultra-pure water for the water check.

1. Switch to standard mode.
2. In the quick access area select and press *Check*.
3. Select *Water Check* and press *OK*.
4. Press *Start* to start the filling procedure.
5. If the measuring cell is already filled with ultra-pure water, press *Edit* to skip filling.
6. Press *Edit* again to toggle between the selection *Yes* or *No*.
7. Press *Next* to proceed with the water check.
8. After the procedure has finished, you will see the check results for the parameters *Alcohol*, *Density*, and *SG sample*.

   Status indicators are set according to the deviation from the target values (3 blue boxes, 2 blue boxes, 1 blue box).

   Target values for the parameters:

   – Alcohol: 0.00 % v/v

   – Density: 0.9982 g/cm³, 998.2 kg/m³, 8.3307 lb/gal *(depending on the selected unit for the parameter)*

   – SG sample: 1.0000
9. Press <*OK*>.
10. If the deviations from the target values exceed defined limits, you will see a recommendation to perform a zero adjustment.
11. Press <*OK*>.
12. Press <*Back*> to return to the main screen.

## 9.2 Performing a water check density

Use ultra-pure water for the water check density.

1. Switch to fermentation monitor mode.
2. In the quick access area select ⚙ and press *Check*.
3. Select *Water Check Density* and press *OK*.
4. Press *Start* to start the filling procedure.
5. If the measuring cell is already filled with ultra-pure water, press *Edit* to skip filling.

   Press *Edit* again to toggle between the selection *Yes* or *No*.
6. Press *Next* to proceed with the water check density.
7. After the procedure has finished, you will see the check results for the parameters *Density* and *SG sample*.

   Status indicators are set according to the deviation from the target values (3 blue boxes, 2 blue boxes, 1 blue box).

   Target values for the parameters:
   - Density: 0.9982 g/cm³, 8.3307 lb/gal
   - SG sample: 1.0000
8. Press *OK*.
9. If the deviations from the target values exceed defined limits, you will see a recommendation to perform a zero adjustment. In this case perform a density adjustment, see section 9.4.

   Press *OK*.
10. Press *Back* to return to the main screen.

## 9.3 Performing a zero adjustment

Perform a zero adjustment if the water check or water check density advises you to do so.

Use ultra-pure water for the zero adjustment.

1. Switch to standard mode.
2. In the quick access area select ⚙ and press *Check*.
3. Select *Zero Adjustment* and press *OK*.
4. Press *Start* to start the filling procedure.
5. If the measuring cell is already filled with ultra-pure water, press *Edit* to skip filling.

   Press *Edit* again to toggle between the selection *Yes* or *No*.
6. Press *Next* to proceed with the zero adjustment.
7. After the procedure has finished, press *Save*.
8. Press *Back* to return to the main screen.

**TIP:** *In the fermentation mode, the zero adjustment can be accessed via Menu > Adjustments > Zero and Density Adjust..*

## 9.4 Resetting the adjustment data to factory adjustment

This function resets all adjustments to factory adjustment.

– Press *Menu* and select *Adjustments* > *Reset to Factory Adjustment*.

# 10 Measuring in standard mode

## 10.1 Sample preparation

**CAUTION**

**Formation of dust!**

Kieselguhr may pollute the air due to improper handling or insufficient ventilation. This may cause irritations of the eye and dryness of the upper respiratory tract and skin.

– Avoid formation of dust.
– Provide sufficient ventilation or use appropriate respiratory protection.
– Open and handle the package with care.
– Keep the package closed and store it so as to prevent accidental bursting.
– After inhalation: Move to fresh air.
– After contact with skin: Wash with plenty of water.
– After contact with eye: Rinse cautiously with water for several minutes.

**IMPORTANT:** *Samples containing dissolved $CO_2$ create bubbles in the measuring cell rendering the measurement results invalid. Degas the sample properly before measurement, refer to Section 10.1.1 [▸ 22].*

**IMPORTANT:** *The turbidity of samples causes incorrect alcohol readings. Treat the sample with kieselguhr and filter it properly before measurement. Strictly follow the procedure in Section 10.1.2 [▸ 23].*

**Equipment for the sample preparation**

*(coming with the instrument)*

– Erlenmeyer flask with a rubber stopper
– a funnel
– folded paper filters (pore size 5–8 µm)
– suitable beakers or flasks
– kieselguhr / diatomaceous earth (necessary for turbid samples, refer to Section 10.1.2 [▸ 23])

### 10.1.1 Step 1: Degassing samples that contain $CO_2$

If your sample contains $CO_2$, degas it as follows:

1. Fill the sample into a flask up to max. 1/3.

The sample temperature should be between 20 °C and 25 °C.

2. Seal the flask with a stopper.
3. Alternately shake the flask and release the pressure until no pressure is built up anymore.

### 10.1.2 Step 2: Additional treatment of turbid samples (enhanced sample preparation)

Even if your sample is only slightly turbid, it is absolutely necessary to prepare it as follows:

1. Fill 100 mL $CO_2$-free sample into a suitable container (e.g. into a beaker).
2. Add 1 g kieselguhr and stir with a spoon at least 30 seconds until the kieselguhr is well mixed with the sample.

**TIP:** *The most important specification for the clarification performance of kieselguhr (or diatomaceous earth) is called "Darcy" describing the permeability. The lower the number, the higher the clarification performance. Use only kieselguhr with 0.07 Darcy or lower.*

**TIP:** *The instrument features an automatic turbidity detection. If turbidity is detected during the measurement, a pop-up window will inform you accordingly and propose to prepare the sample as described in Section 10.1.2 [▸ 23], and to repeat the measurement.*

### 10.1.3 Step 3: Filtering the sample

1. Filter the mixture through a folded paper filter (pore size 5–8 µm).

   Cover the filter to prevent loss of alcohol.
2. Fill the filtered sample into a glass container.

   Seal the glass container if you are not going to analyze the sample immediately.

## 10.2 Measurement procedure

Before you start a measurement, check that

- all hoses and the waste vessel are connected properly (refer to Section 4 [▸ 13]),
- the waste vessel is big enough for the sample amount, you have assigned the proper method (refer to Section 8.2.4 [▸ 20]),
- the assigned method is properly set up (refer to Section 8.2.1 [▸ 19]),
- you have assigned the proper sample ID (refer to Section 8.6.2 [▸ 21]),
- the filling time is set correctly (refer to Section 8.1 [▸ 19]),
- the sample's temperature is between 5 and 40 °C (41–104 °F).

**Measurement procedure**

1. Insert the sample hose into the sample vessel.
2. Switch to standard mode.
3. Press the *Start/Stop* key on the instrument.

   The sample will be filled into the measuring cell by the integrated peristaltic pump.

**TIP:** *The Start/Stop key is only operative when the main screen is on display.*

4. Use the inspection window to check for bubble-free sample filling.

   After filling is finished, the sample is measured automatically, and the parameters selected for the output fields are stored in the internal data memory.

**TIP:** *Press the Start/Stop key once again to abort the measurement.*

5. To repeat measuring the same sample again without a new filling procedure, press *Repeat*.

# 11 Monitoring a fermentation process

## 11.1 Preliminaries

1. For each fermentation process to be monitored define a sample ID, refer to Section 8.6.1 [▸ 21].

   You can define up to 40 different sample IDs, so you can monitor up to 40 processes. (Mind that the limit holds for the total of sample IDs, i.e. for standard mode and fermentation monitor mode measurements.)
2. Select a measurement parameter for the representation of the measurement results, refer to Section 8.5 [▸ 20].

## 11.2 Measurement procedure

**TIP:** *Remember to perform a water check density every day before you start the measurements for fermentation process monitoring.*

Before you start a measurement, check that

- all hoses and the waste vessel are connected properly (refer to Section 4 [▸ 13]),
- the waste vessel is big enough for the sample amount, you have assigned the proper method (refer to Section 8.2.4 [▸ 20]),
- the assigned method is properly set up (refer to Section 8.2.1 [▸ 19]),
- you have assigned the proper sample ID (refer to Section 8.6.2 [▸ 21]),
- the filling time is set correctly (refer to Section 8.1 [▸ 19]),
- the sample's temperature is between 5 and 40 °C (41–104 °F).

**Measurement procedure**

1. Prepare your sample as described in Section 10.1 [▶ 22].
2. Insert the sample hose into the sample vessel.
3. Switch to fermentation monitor mode.
4. Assign the proper sample ID to the measurement, thus adding the measurement to the corresponding monitored process, refer to Section 8.6.2 [▶ 21].
5. Press the *Start/Stop* key on the instrument.

   The sample will be filled into the measuring cell by the integrated peristaltic pump.

**TIP:** *The Start/Stop key is only operative when the main screen is on display.*

6. Use the inspection window to check for bubble-free sample filling.

   After filling is finished, the sample is measured automatically, and the measurement results are stored in the internal data memory.

**TIP:** *Press the Start/Stop key once again to abort the measurement.*

7. To repeat measuring the same sample again without a new filling procedure, press *Repeat*.

Each measurement will be added to the monitored process, and a point will be added at the end of the representing graph.

**TIP:** *The number of measurement results per monitored process is limited to 100.*

**TIP:** *You cannot add data from a standard mode measurement to a monitored process, even though the sample ID may be the same. Standard mode measurement data are stored separately.*

# 12 Measurement / check data in the data memory

Measurement data (including graphs for monitored processes) as well as check data are stored automatically in the data memory.

All stored data include date and time of the measurement or check.

Data measured in standard mode are stored separately from data measured in fermentation monitor mode.

In standard mode, only the parameters selected for display in the output fields are stored.

The data memory can hold a total of 1000 data sets.

## 12.1 Viewing data

**Viewing standard mode data**

1. Switch to standard mode.
2. In the quick access area select and press *Data*.
3. Use the and keys to browse through the data sets of standard mode measurement data and water check data in the data memory.

   The index of the currently displayed data set is shown in the header.

   Measurement data are shown with gray background, check data with blue background.
4. Press *Back* to return to the main screen.

**Viewing fermentation monitor mode data**

1. Switch to fermentation monitor mode.
2. In the quick access area select and press *Data*.
3. Use the and keys to browse through the monitored fermentation processes and water check density data in the data memory.

   The index of the currently displayed fermentation process is shown in the header.

   As water check density data are always on top of the list, you can quickly access them by pressing the key directly after accessing the data memory. The header shows the number of checks stored.

   Measurement data are shown with gray background, check data with blue background.
4. Use the function keys *Prev* and *Next* to browse through the measurement data within a monitored process or through the water check density data.

   The index of the currently displayed measurement is shown in the subhead.

   The index of the currently displayed check data set is shown in the header.
5. Press *Back* to return to the main screen.

**TIP:** *You can change the form of data representation for the monitored processes by changing the setting for the measurement parameter, refer to Section 8.5 [▶ 20].*

## 12.2 Printing data

You need to properly set the interface settings for printer connections to be able to print, refer to Section 6.4 [▶ 17].

Be sure to connect and switch on your printer.

**Printing all standard mode data**

1. Press <*Menu*> and select *Data Memory* > *Single Measurement* > *Print All*.
2. Press *Yes* to confirm printing.
3. Press *No* to abort printing.

4. Press *Back* repeatedly to return to the main screen.

**Printing fermentation monitor mode data**

1. Press *Menu* and select *Data Memory* > *Fermentation Process* > *Print ...*.
2. Select a monitored process that you want to print (or *CHECK* for water check density data).
3. Press *All Pts.* to print all data sets of the selected process (or all check data).
4. Press *Last Pt.* to print the last data set of the selected process (or the last check data).
5. Press *Yes* to confirm printing.
6. Press *No* to abort printing.
7. Press *Back* repeatedly to return to the main screen.

## 12.3 Exporting data to a PC

1. Switch on both a PC and the instrument.
2. Plug one connector of the supplied USB cable into a USB socket on the PC.
3. Plug the other connector of the USB cable into the USB socket on the rear of the instrument.
4. The PC will automatically recognize the instrument as the removable disk named “ALEX”.

   The instrument will display a USB symbol and stay inoperable as long as the connection is established.
5. Browse through “ALEX” and copy files from it like you would from any external disk.
6. You will find three files on “ALEX”:
   - *SingleMeasurementLog.csv*
     containing all standard mode data (measurement and check data)
   - *FermentationProcessLog.csv*
     containing all fermentation monitor mode data (measurement and check data)
   - *ServiceLog.csv*
     containing service data (serial number, software version, hardware version, adjustment data)

     These files can simply be opened with a text editor or, e.g., with Microsoft® Excel.

     Refer to Appendix D [▶ 36] for example data files.
7. Disconnect the USB cable from the instrument when you are finished.

   The main screen will return, and the instrument will be operable again.

## 12.4 Deleting data

**Deleting the last standard mode data set**

1. Press *Menu* and select *Data Memory* > *Single Measurement* > *Delete Last*.
2. Press *Yes* to confirm deletion.
3. Press *No* to abort deletion.
4. Press *Back* repeatedly to return to the main screen.

**Deleting all standard mode data**

1. Press *Menu* and select *Data Memory* > *Single Measurement* > *Delete All*.
2. Press *Yes* to confirm deletion.
3. Press *No* to abort deletion.
4. Press *Back* repeatedly to return to the main screen.

**Deleting fermentation monitor mode data**

1. Press *Menu* and select *Data Memory* > *Fermentation Process* > *Delete ...*.
2. Select a monitored process for the operation (or *CHECK* for water check density data).
3. Press *All Pts.* to delete all data sets of the selected process (or all check data).
4. Press *Last Pt.* to delete the last data set of the selected process (or the last check data).
5. Press *Yes* to confirm deletion.
6. Press *No* to abort deletion.
7. Press *Back* repeatedly to return to the main screen.

**NOTICE**

Deleting the sample ID of a monitored process will also delete all stored data sets associated with the process.

# 13 Upkeep and cleaning

## 13.1 Rinsing the measuring cell

1. In the quick access area select ⚙ and press *Check*.
2. Select *Rinse* and press *OK*.
3. Press *Start* to start the rinsing procedure.
4. For Alex 501:
   - Rinse the first line.
   - Switch the handle of the valve.
   - Rinse the second line.
5. After the procedure has finished, press *OK*.

   Always leave water in the measuring cell.

6. Press *Back* to return to the main screen.

## 13.2 Cleaning routines

### 13.2.1 Cleaning immediately after measuring

If sample residues remain in the cell after a measurement, deposits may develop which are hard to remove.

Therefore, the most important recommendation for simple and efficient cleaning is:

**Clean at once after each measurement** unless the next measurement is performed immediately afterwards.

- For samples such as beer, beer mixtures, or wine: Use ultra-pure water for cleaning the measuring cell. Rinse 1-2 times.
- For wort samples: Clean the measuring cell with warm tap water (rinse at least 2 times); rinse with ultra-pure water afterwards 1 time to avoid that scale forms within the measuring cell.

After cleaning leave the ultra-pure water in the cell until the next measurement.

### 13.2.2 Cleaning at the end of a measuring day

Always clean the measuring cell at the end of the measuring day with a customary laboratory cleaner such as Mucasol®, Alconox®, Extran or RBS 50. Adhere to the product information concerning the cleaning agent's impact period and concentration. Strong alkaline laboratory cleaners (pH above 10.5) should only be applied for a maximum of 10 minutes at temperatures below 25 °C because these cleaners corrode the glass surfaces of the measuring cell when applied for longer periods of time. Do not use cleaners with abrasives.

**NOTICE**

After cleaning with alkaline laboratory cleaners rinse with ultra-pure water at least 2-3 times.

Leave the ultra-pure water in the measuring cell until the next measurement.

**TIP:**

- *Rinse the measuring cell with an approx. 10 % ethanol/water solution before starting a new measurement to decrease the surface tension. This avoids the formation of air bubbles in the measuring cell. After this rinsing cycle, rinse 1 time with ultra-pure water to avoid carry-over effects.*
- *For Alex 501: The sample bottles can be cleaned and filled with a suitable cleaning agent, allowing the instrument to be efficiently rinsed from the bottle.*

### 13.2.3 Weekly cleaning

Clean the measuring cell once a week with a cleaner containing NaOCl (chlorine bleach) and NaOH (sodium hydroxide) or KOH (potassium hydroxide).

Prepare an aqueous solution of 0.5 % NaOCl and 0.5 % NaOH (or KOH).

Alternatively, also commercially available cleaning solutions may be used. Suitable cleaners containing NaOCl and NaOH (or KOH) are, e.g.:

- "Winepress Cleaner PM Membrane Presses", Cat. No. 409004, by Wigol®,
- "TM Desana" by Thonhauser, 3 % solution.

**NOTICE**

Do net let the cleaner soak in for more than 10 minutes.

In case the above mentioned products are not available, choose similar ones and dilute to a concentration that does not exceed the above mentioned hypochlorite and hydroxide values.

**NOTICE**

After cleaning rinse with ultra-pure water at least 2-3 times.

Leave the ultra-pure water in the measuring cell until the next measurement.

**TIP:**

- *Rinse the measuring cell with an approx. 10 % ethanol/water solution before starting a new measurement to decrease the surface tension. This avoids the formation of air bubbles in the measuring cell. After this rinsing cycle, rinse 1 time with ultra-pure water to avoid carry-over effects.*
- *For Alex 501: The sample bottles can be cleaned and filled with a suitable cleaning agent, allowing the instrument to be efficiently rinsed from the bottle.*

## 13.3 Cleaning housing and display

If sample has been spilled over the instrument housing, always wipe it off immediately.

1. Clean the instrument housing and the display with a soft tissue and (warm) water.
2. Dry with a soft and dry tissue.

## 13.4 Storing

Leave the measuring cell filled with ultra-pure water during storage of the instrument to prevent forming of deposits on the surface of the measuring cell.

For long term storage, storage in cold areas, or for shipment of the instrument fill non-denatured ethanol > 60 % v/v.

**NOTICE**

The measuring cell may break at low temperatures (e.g. during shipment) if ultra-pure water is filled.

## 13.5 Exchanging the roller cassette of the peristaltic pump

**To mount the roller cassette**

1. Align the roller cassette, hose ends pointing to the left, with the motor shaft on the rear of the instrument.
2. Turn the roller cassette clockwise until it is fixed.

***Fig. 12:*** *Roller cassette mounted*

**To dismount the roller cassette**

– Turn the roller cassette counterclockwise and pull it off the motor shaft.

## 13.6 Exchanging the hose of the peristaltic pump

Check the pump hose regularly for abrasion, and exchange the hose before it becomes leaky.

**Required part:**

– 1 hose 2.5x4.5 Novoprene, mat. no. 100297

1. Dismount the roller cassette as described in Section 13.5 [▶ 27].
2. Pull off the hose completely.

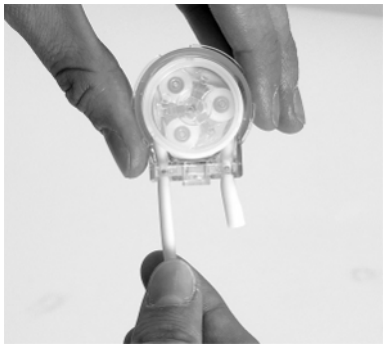

***Fig. 13:*** *Removing the hose*

3. Take out the roller carrier of the cover.

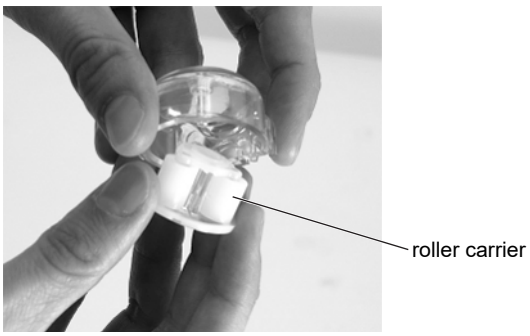


***Fig. 14:*** *Removing the roller carrier*

4. Remove the clip of the hose lock.
5. Guide the new hose around the roller carrier and place the roller carrier into the cover.

***Fig. 15:*** *Mounting the new hose*

6. Fix the hose with the clip of the hose lock (see fig. 15).

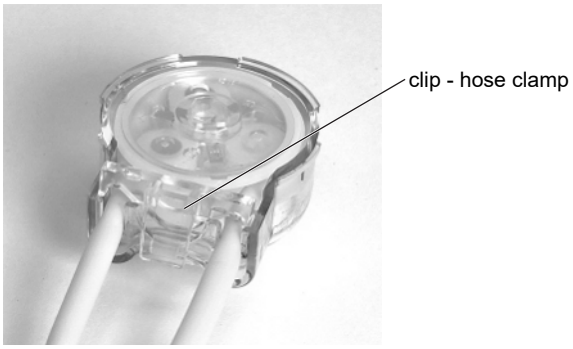


***Fig. 16:*** *Fixing the hose*

7. Remount the roller cassette as described in Section 4.3 [▶ 13].

## 13.7 Software update

Your Anton Paar representative will inform you when a new software update for the instrument is available.

**TIP:** *Data in the data memory will not be affected by a software update.*

After you have received the update file you can install the update on the instrument:

1. Switch on both a PC with the update file and the instrument.
2. Plug one connector of the supplied USB cable into a USB socket on the PC.
3. Plug the other connector of the USB cable into the USB socket on the rear of the instrument.

4. The PC will automatically recognize the instrument as the removable disk named “ALEX”.

   The instrument will display a USB symbol and stay inoperable as long as the connection is established.
5. Copy the software update file (with file extension “.afp”) onto “ALEX”.
6. Disconnect the USB cable from the instrument.

   The main screen will return, and the instrument will be operable again.
7. Switch the instrument off.
8. Switch the instrument on again.

   The software update will be automatically installed now.
9. Perform a zero adjustment after the update, refer to Section 9.3 [▶ 22].

**New methods**

New methods introduced by a software update will not be generated automatically so as to leave your setup untouched.

If you want to be able to choose the new methods from the method list, proceed in one of two ways:

1. Reset the instrument to factory settings (refer to Section 6.5 [▶ 17]).
2. This will generate the predefined methods (including the new ones).
3. However, a lot of other settings (including sample IDs) will be affected.
4. Alternatively, define a new method with a new method type manually (refer to Section 8.2.3 [▶ 20]).
5. New method types are available in the selection list after the software update.

## 13.8 System information

The instrument holds system information comprising:

- instrument type
- serial number
- software version
- hardware version
- number of measurements performed

**Accessing system information**

1. Press *Menu* and select *Service* > *System Information*.
2. Press *Back* repeatedly to return to the main screen.

# 14 Maintenance and repair

## 14.1 Maintenance performed by an authorized Anton Paar representative

The product does not require a periodic maintenance by an authorized Anton Paar representative to retain warranty coverage.

However, optional services are available from your local Anton Paar representative upon request.

**Following parts are generally excluded from the warranty (wear and tear parts)**

- syringes
- hoses
- adapters, connectors, fittings
- pump diaphragms
- filters
- O-rings, seals, gaskets
- cables
- fuses
- batteries
- desiccants
- protection foils and covers
- roller cassette

All parts damaged in consequence of a fall of the instrument are generally excluded from the warranty as well.

## 14.2 Repair performed by an authorized Anton Paar representative

In case your product needs repair, contact your local Anton Paar representative, who will take care of the necessary steps. If your product needs to be returned, request an RMA (Return Material Authorization Number). It must not be sent without the RMA and the filled “Safety Declaration for Instrument Repairs”. Please make sure it is cleaned before return.
Do not return products that are contaminated by radioactive materials, infectious agents or other substances that cause health hazards.

**TIP:** *Find the contact data of your local Anton Paar representative on the Anton Paar website (https://www.anton-paar.com) under “Contact”.*

# Appendix A Technical data

## Appendix A.1 Specifications

| | Alex 301 | Alex 501 |
|---|---|---|
| **Alcohol measurement** | | |
| Measuring range | 0.5–15 % v/v (Beer method)<br>8–20 % v/v (Wine methods)<br>2–10 % v/v (Cider method)<br>5–20 % v/v (Sake method)<br>10–47 % v/v (Spirits method) | |
| Accuracy (compared to distillation) | ±0.25 % v/v (for beer, wine, cider, sake, spirits (total extract < 100 g/L))<br>±0.45 % v/v (for liqueurs with a total extract between 100 g/L and 450 g/L) | ±0.2 % v/v (for beer, wine, cider, sake, spirits (total extract < 100 g/L))<br>±0.4 % v/v (for liqueurs with a total extract between 100 g/L and 450 g/L) |
| Repeatability s.d. | 0.12 % v/v alcohol | 0.1 % v/v alcohol |
| Resolution | 0.02 % v/v | |
| **Density measurement** | | |
| Measuring range | 0.9500–1.2000 g/cm$^3$ | |
| Accuracy | ±0.001 g/cm$^3$ | |
| Repeatability s.d. | 0.0007 g/cm$^3$ | 0.0005 g/cm$^3$ |
| Resolution | 0.0001 g/cm$^3$ | |
| **Measuring temperature** | | |
| Alcohol measuring cell | 20 °C (68 °F) | |
| Density measuring cell | ambient temperature, compensated to 20 °C (68 °F) | |
| Sample filling temperature | 15 °C to 25 °C (59 °F to 77 °F) | 10 °C to 30 °C (50 °F to 86 °F) |
| Sample volume | approx. 40 mL | |

## Appendix A.2 Instrument data and operating conditions

| | |
|---|---|
| **Environmental conditions (EN 61010)** | indoor use only |
| Ambient temperature[a] | +10 °C to +32 °C (+50 °F to +89.6 °F) |
| Air humidity | non-condensing<br>20 °C: < 90 % relative humidity<br>25 °C: < 60 % relative humidity<br>30 °C: < 45 % relative humidity |
| Altitude | max. 3000 m (9800 ft) |
| **Pollution degree** | 2 |
| **Overvoltage category** | II for the supplied AC adapter |
| **Power supply** | 100 to 240 V~, 50/60 Hz, fluctuation ±10 %, 1 A<br>DC 15 V, 2.6 A |
| **Power consumption** | 20 W |

| | |
|---|---|
| **Interfaces** | 1 x Bluetooth™<br>1 x RS-232 (socket 9-pin D-sub)<br>1 x USB (socket type B) |
| **Dimensions**[b] (L x W x H) | 320 mm x 230 mm x 100 mm (12.6 in x 9.1 in x 3.9 in) |
| **Weight** | approx. 2.4 kg (5.3 lbs) |

[a] *Make sure the device is placed at constant ambient temperature and switched on for at least one hour prior to use.*

[b] *Place the device at least 10 cm away from a wall to avoid blockage of the fan.*

## Appendix A.3 Wetted parts

| Material | Part |
|---|---|
| B270 glass | measuring cell |
| Borosilicate glass | measuring cell |
| Chrome plated brass | switch valve |
| EPDM 70 | measuring cell |
| ETFE | adapter |
| FEP | internal hoses |
| Novoprene | pump hose |
| Peek | measuring cell |
| PTFE | adapter |
| Silicone | waste hose |
| Stainless steel 1.4571 | measuring cell |

# Appendix B Parameter overview

## Appendix B.1 Parameters in standard mode

| Parameter designation in the menu | Parameter designation in the output field | Method type |
|---|---|---|
| Alcohol (%v/v) | Alcohol | all |
| Alcohol (%w/w) | Alcohol | all |
| Alcohol @15°C (%v/v) | Alc. at 15°C | all |
| Density (g/cm$^3$) | Density | all |
| Density (kg/m$^3$) | Density | all |
| Density (lb/gal) | Density | all |
| Specific Gravity alcohol | SG alcohol | all |
| Specific Gravity extract | SG extract | all |
| Specific Gravity sample | SG sample | all |
| Original Extract (%w/w) | Orig. Extract | Beer |
| Apparent Extract (%w/w) | Ea | Beer, Cider |
| Original Extract (°Plato) | Orig. Extract | Beer |
| Real Extract (%w/w) | Er | Beer |
| Real Extract (%w/v) | Er | Beer |
| App. degree of ferm. (%) | ADF | Beer |

| Parameter designation in the menu | Parameter designation in the output field | Method type |
|---|---|---|
| Real degree of ferm. (%) | RDF | Beer |
| Original Gravity | OG | Beer |
| Calories (kcal/12oz) | kcal/12oz | Beer, Cider |
| Calories (kcal/100ml) | kcal/100mL | Beer, Cider |
| Calories (kJ/100ml) | kJ/100mL | Beer, Cider |
| Degrees Lost | DL | Beer |
| Present Gravity | PG | Beer, Cider |
| Spirit Indication | SI | Beer |
| Sugar °Plato | Plato | Beer |
| Total Extract (g/l) | E total | White & Rosé Wine, Red Wine, Cider, Spirits |
| Klosterneuburger Mostwaage | KMW | White & Rosé Wine, Red Wine, Cider |
| Sugar °Öchsle (°Oe) | Öchsle | White & Rosé Wine, Red Wine, Cider |
| Sugar °Baumé | Baume | White & Rosé Wine, Red Wine, Cider |
| Sugar °Balling | Balling | White & Rosé Wine, Red Wine, Cider |
| Sugar °Brix | Brix | White & Rosé Wine, Red Wine, Cider |
| °Babo (°) | Babo | White & Rosé Wine, Red Wine, Cider |
| Alcohol @ 15 °C (% v/v) | Alcohol @ 15 °C | White & Rosé Wine, Red Wine, Cider |
| Nihonshu-do (°) | Nihonshu-do | Sake |
| Ekisu (°) | Ekisu | Sake |

## Appendix B.2 Parameters in fermentation monitor mode

| Parameter designation in the menu | Parameter designation on the graph |
|---|---|
| Density (g/cm$^3$) | Density |
| Density (kg/m$^3$) | Density |
| Density (lb/gal) | Density |
| Specific Gravity sample | SG sample |
| Sugar °Brix | Brix |
| Sugar °Plato | Plato |
| Sugar °Balling | Balling |
| Present Gravity | PG |
| Sugar °Öchsle (°Oe) | Öchsle |
| Sugar °Baumé | Baume |
| Klosterneuburger Mostwaage | KMW |
| Sugar °Babo (°) | Babo |

# Appendix C Calculation of parameters

**Alcohol (% w/w)**

$$\%A^{20°C}_{[\%w/w]} = \frac{\%A^{20°C}_{[\%v/v]} \times \rho^{20°C}_{100alcohol}}{\rho^{20°C}_{sample}}$$

$\rho_{100\%alcohol}$(20 °C) = 0.78924 g/cm³

**Specific Gravity alcohol**

$$SG_{alcohol} = \frac{\rho^{20°C}_{alcohol}}{\rho^{20°C}_{water}}$$

**Specific Gravity extract**

$$SG_{extract} = \frac{\rho^{20°C}_{extract}}{\rho^{20°C}_{water}}$$

**Specific Gravity sample**

$$SG_{sample} = \frac{\rho^{20°C}_{sample}}{\rho^{20°C}_{water}}$$

**Calories (kcal/12oz)**

$$Cal[kcal/12oz] = \left[6.9 \times \%A^{20°C}_{\%w/w} + 4 \times (Er[\%w/w] - 0.11)\right] \times SG_{sample} \times 3.55$$

**Calories (kcal/100ml)**

$$Cal[kcal/100mL] = \left[7 \times \%A^{20°C}_{\%w/w} + 3.5 \times Er[\%w/w]\right] \times \rho^{20°C}_{sample}$$

**Calories (kJ/100ml)**

$$Cal[kJ/100mL] = \left(29 \times \%A^{20°C}_{[\%w/w]} + 15 \times Er[\%w/w]\right) \times \rho^{20°C}_{sample}$$

**Apparent degree of fermentation (%)**

$$ADF[\%] = \left(\frac{E_{orig}[\%w/w] - Ea[\%w/w]}{E_{orig}[\%w/w]}\right) \times 100$$

**Real degree of fermentation (%)**

$$RDF[\%] = \left(\frac{2.0665 \times \%A^{20°C}_{[\%w/w]}}{2.0665 \times \%A^{20°C}_{[\%w/w]} + Er[\%w/w]}\right) \times 100$$

**Degrees Lost**

$$DL = \sum_{n=0}^{10} C_n \times SI^n$$

$C_0$ = 0.008

$C_1$ = 4.30003

$C_2$ = –0.2048839

$C_3$ = 0.18080493

$C_4$ = –7.3330484 E–2

$C_5$ = 1.7587605 E–2

$C_6$ = –2.59916898 E–3

$C_7$ = 2.374003555 E–4

$C_8$ = –1.301128748 E–5

$C_9$ = 3.9162206 E–7

$C_{10}$ = –4.9735684 E–9

**Apparent Extract (%w/w)**

Apparent extract is calculated from the sample density by use of the Plato table.

**Original Extract (%w/w or °Plato)**

The original extract is calculated according to Balling's formula:

$$E_{orig}[\%w/w \text{ or } °Plato] = \frac{\left(2.0665 \times \%A^{20°C}_{[\%w/w]} + Er[\%w/w]\right) \times 100}{1.0665 \times \%A^{20°C}_{[\%w/w]} + 100}$$

**Real Extract (%w/w)**

Real extract is calculated from the extract density (determined by the Tabarié formula[4]) by use of the Plato table.

$$Er[\%w/w] = \sum_{n=0}^{4} B_n \times \left(\rho^{20°C}_{extract}\right)^n$$

**Real Extract (%w/v)**

$$Er[\%w/v] = \frac{Er[\%w/w] \times \rho_{extract}}{\rho^{4°C}_{water}}$$

$\rho_{water}$(4 °C) = 0.999972 g/cm³

**Original Gravity**

$$OG = (SG_{extract} - 1) \times 1000 + DL$$

**Present Gravity**

$$PG = (SG_{extract} - 1) \times 1000$$

**Spirit Indication**

$$SI = (1 - SG_{alcohol}) \times 1000$$

**Sugar °Plato**

The calculation is based on density and temperature. The basis is the work of Bettin & Spieweck, PTB-Mitteilungen 100 (5/90).

[4] Tabarié formula: $\rho_{extract} = \rho_{sample} + \rho_{water} - \rho_{alcohol}$

**Total Extract (g/l)**

Total extract is calculated from the sample density and the alcohol content [% v/v] measured by the instrument:

A polynomial function is used to calculate the density of alcohol from the alcohol content, and from the extract density (determined by the Tabarié formula[4]), total extract is calculated by use of another polynomial function.

**Klosterneuburger Mostwaage**

Calculation for the standard mode:

$$KMW = 1.2 \times \%A^{20°C}_{[\%v/v]} + 0.075 \times E^{20°C}_{total}[g/L] + 2.5$$

Calculation for the fermentation monitor mode:

For the KMW calculation in the fermentation monitor mode, a polynomial function of 4th order is in use. The input parameters are density and temperature.

**Sugar °Öchsle (°Oe)**

$$Öchsle = \left(SG_{sample} - 1\right) \times 1000$$

**°Babo (°)**

$$°Babo = 1.2 \times \%A^{20°C}_{[\%v/v]} + 0.075 \times E^{20°C}_{total}[g/L] + 2.5$$

**Sugar °Baumé**

$$°Be = 145 - \frac{145}{SG_{sample}}$$

**Sugar °Balling**

The calculation is based on density and temperature. The basis is the work of Bettin & Spieweck, PTB-Mitteilungen 100 (5/90).

**Sugar °Brix**

The calculation is based on density and temperature. The basis is the work of Bettin & Spieweck, PTB-Mitteilungen 100 (5/90).

Alcohol @ 15 °C

Alcohol content in % v/v at 15 °C. Calculated from the value at 20 °C by use of the OIML table.

**Nihonshu-do (Sake meter value)**

Calculated from the density value at 15 °C by use of the following formula:

$$Nihonshu\text{-}do = \frac{1443}{SG\left(\frac{\rho^{15°C}_{sample}}{\rho^{4°C}_{water}}\right) - 1443}$$

$\rho_{water}(4°C) = 0.99997\ g/cm^3$

Reference: Nation Tax Agency directive No. 1, 1961 January 11, 2011, section 3.3.2

**Ekisu (extract)**

Calculated from the Nihonshu-do value and the alcohol value.

$$Ekisu = (Nihonshu\text{-}do - A) \times 260 + 0.21$$

A is the specific gravity (15/15 °C) calculated from the measured alcohol content.

Reference: National Tax Agency directive No. 1, 1961 January 11, 2011, section 3.7 and table 2.

# Appendix D Example data files

**SingleMeasurementLog.csv**

```
Alex 500 - Alcohol and Extract Meter;;;;;;;;;
;15.12.2014;;;;;;;;
;13:36:06;;;;;;;;
SN;81627615;;;;;;;;
SW;1.000.036;;;;;;;;
HW;1.000.001;;;;;;;;
;;;;;;;;;
;;;Methode;Proben-ID;Alkohol [%v/v];Dichte [g/cm3];Stammwuerze [Plato];;Status
12.12.2014;11:01:31;1;BEER;PILS;5,56;1,0066;12,59;;OK
;;;Methode;Proben-ID;Alkohol [%v/v];Dichte [g/cm3];Stammwuerze [Plato];;Status
15.12.2014;08:16:23;2;BEER;BOCK;8,17;1,0131;18,51;;OK
;;;Methode;Proben-ID;Alkohol [%v/v];Dichte [g/cm3];Stammwuerze [Plato];;Status
15.12.2014;08:16:34;3;BEER;WEIZEN;4,97;1,0057;11,33;;OK
;;;Methode;Proben-ID;Alkohol [%v/v];Dichte [g/cm3];Stammwuerze [Plato];;Status
15.12.2014;08:16:50;4;BEER;RADLER;2,56;1,0209;10,58;;OK
15.12.2014;09:00:48;5;BEER;CHECK;0,01;0,9982;--;;OK
```

**FermentationProcessLog.csv**

```
Alex 500 - Alcohol and Extract Meter;;;;;
;15.12.2014;;;;
;13:36:07;;;;
SN;81627615;;;;
SW;1.000.036;;;;
HW;1.000.001;;;;
;;;;;
;;;;Proben-ID;Dichte [g/cm3]
15.12.2014;11:44:37;1;;TANK 1;1,0533
15.12.2014;11:49:32;2;;TANK 1;1,0315
15.12.2014;11:52:42;3;;TANK 1;1,0194
15.12.2014;11:57:13;4;;TANK 1;1,0127
15.12.2014;11:58:39;5;;TANK 1;1,0107
15.12.2014;11:59:59;6;;TANK 1;1,0103
15.12.2014;12:01:40;7;;TANK 1;1,0099
```

# Appendix E Troubleshooting

| Problem | Solution |
|---|---|
| The instrument delivers unsatisfying results. | – Verify that you have selected the correct method.<br>– Check if you receive better results (compared to a reliable reference measurement) by selecting a different method.<br>– Check if you can find a constant offset for this very sample (compared to the reference measurement). |
| Measurement results show a constant deviation from your reference measurement. | Create a new method and specify the observed deviation as the offset. |
| The instrument shows *Alc. conc. adj. missing*. | – Select *Adjustments* > *Reset to Factory Adjustments* and confirm with *Yes*.<br>– Perform a zero adjustment. |

**Table 8:** Turbidity-related error messages

| Error | Cause | Corrective action |
|---|---|---|
| Turbidity Timeout | This message occurs after 10 minutes and indicates that turbidity prevented stable measurement signals. | Prepare your sample according to Section 10.1.2 [▶ 23]. |
| Turbidity Error | This message occurs when turbidity causes the alcohol value to fall below –0.5 % v/v. | |

# Appendix F Menu tree

| | | |
|---|---|---|
| Measurement Settings | Filling and Rinsing Time | |
| | Methods | Edit Methods |
| | | New Method |
| | Turbidity Warning | |
| | Sample ID | |
| | Fermentation Process | |
| Data Memory | Single Measurement | Print All |
| | | Delete Last |
| | | Delete All |
| | Fermentation Process | Delete ... |
| | | Print ... |
| Adjustments | Zero and Density Adj. | |
| | Reset to Factory Adjustments | |
| Setup | PIN Settings | |
| | Interface Settings | |
| | Language | |
| | Date and Time | Date and Time |
| | | Date and Time Format |
| | Reset to Factory Settings | |
| Service | System Information | |
| | Live Raw Data | |

# Appendix G Declarations of conformity

Docusign Envelope ID: B127A833-1006-4972-AFC5-B393055B9CC8

## EU Declaration of Conformity

(original)

The Manufacturer **Anton Paar GmbH,** Anton-Paar-Str. 20, 8054 Graz, Austria – Europe hereby declares that the product listed below

| | |
|---|---|
| Product designation: | **ALEX 301 ALCOHOL AND EXTRACT METER**<br>**ALEX 501 ALCOHOL AND EXTRACT METER** |
| Model: | **ALEX 301, ALEX 501** |
| Material number: | 386570, 386571 |

is in conformity with the relevant European Union harmonisation legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.

**Radio Equipment Directive (2014/53/EU, ABl. L153/62 of 22.5.2014)**

Applied harmonised standards:

- EN 300 328 V2.2.2

**Safety objectives of the Low Voltage Directive (2014/35/EU, OJ L 96/357 of 29.3.2014)**

Applied harmonised standard:

- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
- EN IEC 61010-2-010:2020

**Essential requirements of the Electromagnetic Compatibility (2014/30/EU, OJ L 96/79 of 29.3.2014)**

Applied harmonised standard:

- EN 61326-1:2013

**RoHS Directive (2011/65/EU, OJ L 174/88 of 1.7.2011)**

Place and date of issue: Graz, 3 July 2025

Signed by:
17130DDD5260426...
Steffen Riemer
Executive Director
Business Unit Measurement

DocuSigned by:
66833374CFAF464...
Dr. Wolfgang Baumgartner
Head of Lab Density & Concentration
Business Unit Measurement

C97IB006EN-A

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