Anton Paar

Instruction Manual and Safety Information

# RapidOxy 100
# RapidOxy 100 Fuel

Oxidation stability tester

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# 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.

**NOTICE**

**All safety instructions and general instructions in this manual apply to both the RapidOxy 100 and the RapidOxy 100 Fuel if not otherwise stated.**

In this chapter the term "RapidOxy 100" refers to both RapidOxy 100 and RapidOxy 100 Fuel.

## 1.1 General safety instructions

### General

- Refer to the Reference Guide for a comprehensive description of the instrument.
  Download Anton Paar documents for free from the Anton Paar website: https://www.anton-paar.com
- 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.
- The proper function of the instrument's protective devices is only guaranteed when operated correctly within the specified scope of applications.
- The use of a standard may involve hazardous materials, operations and equipment. A standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to take appropriate measures for protection of the safety and health of the personnel prior to application of this standard, to check whether statutory requirements exist for this purpose and to fulfill these requirements.

### 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.).
- Substances used must be labeled. The corresponding material safety data sheets must be observed and made available near the measuring setup.
- Samples and cleaning liquids that have been used in the measuring system are not suited for human consumption after use.
- Check the wetted parts of the product for chemical resistance to all samples and cleaning liquids.
- Take care that samples, cleaning liquids and gases are chemically compatible when they come into contact with each other. They must not react exothermally or produce hazardous substances.

### 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 should only be carried out by authorized personnel who are familiar with the installation instructions.
- We make these recommendations under the assumption that a regular function and safety check is performed at least every two years.
- Never use the product outside the specified ambient conditions and specifications.
- Use only accessories, consumables, or spare parts supplied or approved by Anton Paar.
- Do not expose the product to direct sunlight for extended periods of time.
- Before connecting the instrument to the mains, make sure that the voltage/ frequency ranges indicated on the RapidOxy 100 type plate correspond to the local specifications.
- Install RapidOxy 100 only in a corrosion-free atmosphere.
- The RapidOxy 100 is an instrument with protective earth connection class I. Proper earthing of the device has to be ensured by on-site installation, according to the normal rules and should be regularly checked.
- When the instrument is set up, care should be taken to choose an adequate distance from sources of heat or smoke and from electrical or

magnetic disturbances, and that the device is not subjected to excessive electrostatic discharges (ESD). The surface of the workspace must be level. In order to prevent influence of the volume acquisition, the device is not allowed to be subjected to any vibrations.

– When connecting the oxygen make sure that the pressure line is placed away from hot surfaces and ignition sources.

**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.
– 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.
– If compressed gas from a gas bottle is used to operate the product, ensure that the operator is properly trained in the use of compressed gas bottles, and that all safety instructions of the gas bottle supplier are adhered to.
– Do not open the instrument casing as this would uncover live parts.
– If the safety hood and/or the screw cap and/or the test chamber shows deformations or can no longer be closed tightly, there is an increased risk of pressure leakage resulting in a possible safety risk. Do not continue to operate the RapidOxy 100 unless an authorized Anton Paar Service engineer has checked the instrument.
– In order to prevent humidity damage upon delivery of the device (such as condensation on the electronic circuits as a result of fluctuating temperatures), you should store the device for 24 hours at room temperature prior to commissioning.
– The operation of the pressure vessel may be liable to individual national regulations. The operator is responsible for the correct installation, handling and service of the pressure vessel and for sufficient training of the operating staff.
– Never carry out synthesis in the RapidOxy 100.
– RapidOxy 100 has a protection rating of IP 20. It is protected against the insertion of fingers or similar objects. It has no liquid ingress protection.

**Operator´s skills**

– All personnel involved in the operation and/or maintenance of the product must be qualified or properly instructed in its use.
– Operators must be able to read and understand the instructions within the manual.
– It is the owner's responsibility that all operators are sufficiently trained in the correct and safe use of the product.
– Operators must be able to judge dangerous situations and take the right measures to prevent accidents, injury and damage.
– Operators must have knowledge of chemistry and its rules.

**Precautions for flammable samples and cleaning agents**

– Keep potential sources of ignition, like sparks or open flames, at a safe distance from the product.
– Store only the minimum required amount of sample, cleaning liquids, and other hazardous materials near the product.
– Place the product and all samples in a fume hood of adequate capacity.
– Do not spill sample/cleaning liquids or leave their containers uncovered. Immediately remove spilled sample/cleaning liquids.
– Do not store containers with flammable reagents or other ignitable materials (e.g. soaked cleaning tissues) close to the instrument or on the instrument.
– 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.
– In areas with risk of explosion, only operate products marked with an Ex sign (Ex).

**Moving the instrument**

– Before you move or lift the RapidOxy 100, make sure that the test chamber is empty and that the instrument is free of chemicals.
– Only transport the RapidOxy 100 horizontally.
– Do not lift or carry the instrument by its safety hood. Lift and carry the instrument gripping the base at the right and left side.

**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 Special safety instructions

- The RapidOxy 100 has been developed as a testing instrument for the oxidation of oil- and fat-containing samples from the food, cosmetics, flavors & fragrances and lubricating industry.
- The oxidation stability of spark ignition fuels and all kinds of diesel fuels ranging from pure diesel (B0) and diesel with FAME/blends (B1 - B99) to pure biodiesel (B100) is the typical application for the RapidOxy 100 Fuel.

**DANGER**

**Risk of fire**

If the RapidOxy 100 is used for other test media, including the testing of new or modified additives, it is the responsibility of the user to determine in advance and prevent any risks that could result from oxygen reacting with the test media at high temperatures. This includes explosive reactions, which may occur either due to the test media reacting with oxygen or high temperatures. The forming of potentially-toxic reactive products cannot be ruled out.

**DANGER**

**Danger of explosion**

In this test method, the sample is exposed to pure oxygen at high temperature and high pressure. Due to the risk of highly exothermic decomposition of the sample and the associated sharp rise in pressure, tests must be carried out below the respective decomposition temperature of the sample. This must be ensured by suitable preliminary tests.

**DANGER**

**Risk of fire**

Always close the oxygen supply and remove the pressure line when the instrument has finished the filling procedure during a measurement.

When a measurement has finished reconnect the pressure line and reconnect the oxygen supply for purging. After purging, close the oxygen supply again.

- Prior to commissioning, as a general rule, the connections and oxygen pressure line must be checked for leak tightness.
- The instrument may never be operated above the permissible final pressure of 18 bar or be filled to an excessive initial pressure. Only use the original Anton Paar ProveTec oxygen filling line.

**DANGER**

**Danger of explosion**

Manipulation of the pressure line is strictly prohibited. Any resulting leakage may result in the release of highly flammable oxygen.

- Manipulation on the safety hood is strictly prohibited.
- The maximum allowed (and therefore limited) test temperature is 180 °C.
- Make sure that the test chamber does not come into excessive contact with any combustible liquids or any other flammable substances, including packaging material.
- A standards-compliant and safe testing configuration is to be observed.
- A release of combustible liquid can only occur in case of unintended operation, i.e. in a malfunction, caused by an apparatus defect or by an operator error. Ensure the correct filling quantity according to standard and do not overfill the sample receptacle.
- The recommended and maximum amount of a fluid sample is 5 mL.
- When working with the RapidOxy 100, handling liquids (in particular, samples that are flammable or contain solvents), care should be taken to wear suitable rubber gloves and protective glasses.
- It should also be taken into consideration that the final pressure of slightly-volatile test substances may be significantly higher than with materials having low vapor pressure. For this reason, the filling pressure may only be 500 kPa (or less) for volatile solvents.
- For other tests, a filling pressure of up to 800 kPa is permissible. The typical pressure is 700 kPa.

**NOTICE**

Interactions involving the above-mentioned test parameters (filling pressure, test temperature, sample amount, type of sample) must be taken into consideration.

- The instrument is not suitable for warming up food. This instrument is only to be deployed for its intended use.

**Setup location**

- The instrument is only allowed to be connected to a power supply, as specified on the instrument and in the operating instructions.
- Please undertake action to ensure that because of its radiating heat, the RapidOxy 100 stands alone and no flammable objects are in the immediate vicinity.
- Based on safety considerations, the placement of the instrument should proceed (e.g. through building measures) in such a manner that improper op-

eration, unknown sample material or defects cannot cause any hazard to personnel or objects. The following is to be observed in finding a location for the instrument:

  - The basic area of 1.4 m × 1.4 m (approx. 2 m²) must be made out of a fireproof surface.
  - Above the RapidOxy 100, no flammable materials are allowed within 2 m.
  - Always ensure sufficient safety clearance to other flammable objects. In particular, the statutory regulations for storing combustible working materials or sample materials are to be observed.
  - For safety reasons, a laboratory fume hood is recommended.
- The relevant regulations for handling compressed gases must be observed.
- Even small oxygen supply containers require secure installation to prevent them from falling over at the operating site.
- Oxygen has a hazardous effect in larger volumes! It is important to ensure the use of adequate equipment for this product. In case of doubt, consult your industrial gas supplier.

### Cleaning, care and maintenance

- Please clean the test chamber regularly after each test with a soft cloth and a recommended or approved appropriate cleaning solvent.
- No acetone or other solvents aggressive towards Viton® are allowed to be used to clean the test chamber. There is a risk that the Viton® O-rings may expand, resulting in malfunction of the instrument.
- Please keep a cleaning logbook, in order to ensure regular cleaning.

## 1.3 Conventions of safety messages and typography

### Conventions for safety messages

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

**DANGER**

**Description of risk**

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

**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.

**Wear safety gloves**

Wear protective gloves when handling the product.

**Wear safety goggles**

Wear safety goggles when handling the product.

**Use protective clothing**

Wear protective clothing when handling the product.

### 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. |

## 1.4 Safety signs on the instrument

**CAUTION**

**Hot surface**

This sign calls attention to the fact that the respective **surface can get very hot**. Do not touch this surface without adequate protective measures.

**Read the instructions**

Read and understand the Instruction Manual and all other safety instructions before using this instrument.

# 2 Instrument overview

RapidOxy 100 and RapidOxy 100 Fuel are automatic testing instruments for the quick and reliable determination of the oxidation stability of various samples.

Refer to

- RapidOxy 100 on Section 2.1 [▶ 7]
- RapidOxy 100 Fuel on Section 2.2 [▶ 7]

***Fig. 1:*** *RapidOxy 100/RapidOxy 100 Fuel*

## 2.1 RapidOxy 100

RapidOxy 100 fully complies to ASTM D8206, the standard test method for the Oxidation Stability of Lubricating Greases - Rapid Small-Scale Oxidation Test (RSSOT).

RapidOxy 100 was developed to evaluate the oxidation stability of various products, e.g. in the food, cosmetics, flavors & fragrances and pharmaceutical industry. Testing the oxidation stability is a necessary requirement for shelf-life investigations or quality control of incoming goods or during product development.

### 2.1.1 Intended use of the instrument

RapidOxy 100 consists of a highest-quality stainless steel test chamber in which the sample is tested applying pure oxygen, pressure and heat. The evaluation of the test result focuses on the time until a specified pressure drop is measured due to oxygen uptake of the sample.

RapidOxy 100 allows accelerated oxidation stability tests on raw materials and finished products directly on the whole sample. The oxidation stability of natural oils and fats, cosmetics, flavors & fragrances, or products containing any of these is the typical application for the RapidOxy 100.

**NOTICE**

The RapidOxy 100 instrument offers a huge range of possible applications not only in the food, cosmetics, flavors & fragrances industry but also in the grease and lubricant sector.
RapidOxy 100 allows you to create your own specific correlations between the test results and real-time spoiling or expiring of your products or samples to be tested.

**Typical samples to be measured**

- edible oils and fats, food emulsifiers, oil- and fat-containing food
- cremes, lotions, emulsions, vegetable oils, cosmetics emulsifiers
- flavors and fragrances
- lubricating oils
- lubricating greases (in accordance with ASTM D8206)

**Unknown samples**

For unknown or potentially hazardous samples, the instrument should be placed under a suitable exhaust outlet. Please refer to Section 1 [▶ 3] for safety instructions in this regard.

**Sample handling**

Depending on the sample type, the sample is either filled directly into the test chamber or glass dishes are used for easy cleaning. For light samples with a large volume, the sample amount might differ.

**Table 1:** RapidOxy 100 sample handling

| Consistency | Amount | Application |
|---|---|---|
| Solid or semi solid | 4 g | Fill/weigh sample into supplied glass dish. Place dish into test chamber. |
| Liquid | 5 mL | Use a clean measuring pipette to measure and fill sample directly into test chamber. |

## 2.2 RapidOxy 100 Fuel

RapidOxy 100 Fuel fully complies to ASTM D7525, ASTM D7545, EN 16091 and IP 595.

The main application of the RapidOxy 100 Fuel is the product optimization and product release of fuels according to the above given standards and specifications.

Product optimization includes the investigation of the oxidation stability of fuels from different feed stock for FAME, or with different additives like antioxidants or ignition improvers.

### 2.2.1 Intended use of the instrument

RapidOxy 100 Fuel consists of a high-grade gold-plated aluminum test chamber in which the sample is tested applying pure oxygen, pressure and heat. The evaluation of the test result focuses on the time until a specified pressure drop is measured due to oxygen uptake of the sample.

RapidOxy 100 Fuel allows accelerated oxidation stability tests on raw materials and finished products directly on the whole sample. The oxidation stability of spark ignition fuels and all kinds of diesel fuels ranging from pure diesel (B0) and diesel with FAME/ blends (B1 - B99) to pure biodiesel (B100) is the typical application for the RapidOxy 100 Fuel.

**Typical samples to be measured**

- fuels
- gasoline
- diesel
- FAME
- diesel/FAME blends

**Unknown samples**

For unknown or potentially hazardous samples, the instrument should be placed under a suitable exhaust outlet.

**Sample handling**

With RapidOxy 100 Fuel **only liquid samples** are allowed to be tested.

**Table 2:** RapidOxy 100 Fuel sample handling

| Consistency | Amount | Application |
|---|---|---|
| Liquid | 5 mL | Use a clean measuring pipette to measure and fill sample directly into test chamber. |

**NOTICE**

**Never use glass dishes or any other dishes in RapidOxy 100 Fuel!**

Always fill the sample directly into the test chamber. Using glass dishes will distort the measuring results and irrevocably damage the gold plating in the test chamber!

## 2.3 Measuring principle

Both the RapidOxy 100 and RapidOxy 100 Fuel measure the induction period of a sample under accelerated oxidation conditions. A typical test is conducted with a small sample volume of 5 mL or 4 g. The sample is filled or placed into a test chamber that is charged with oxygen to 500 kPa or 700 kPa at a starting temperature of 15 °C to 25 °C. The measurement begins by heating the test chamber to the defined target temperature and lasts until the break point is reached, which is a pressure drop of a defined percentage (e.g. 10 %) below the maximum pressure of the test run. The induction period, which can be used as a measure of the oxidation stability, is specified as the time elapsed between starting the heating procedure of the test chamber and the break point ($p_{max}$ minus defined percentage), which is commonly measured in minutes (refer to the figure below).

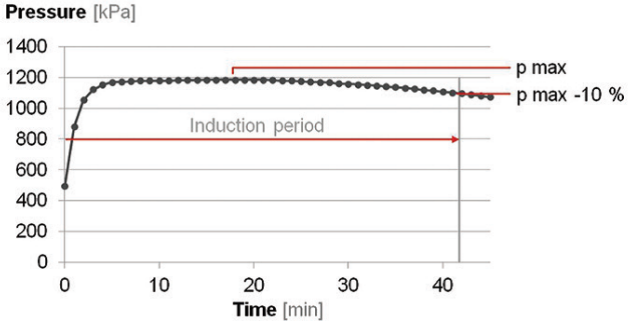


*Fig. 2: Induction period*

**Definitions**

**Break point:**

Moment, when the formation of oxidation products rapidly increases, which is indicated by a certain pressure drop.

Pressure in the test chamber which is a defined percentage (e.g. 10 %) below the maximum pressure of the test run.

**Induction period:**

Time elapsed between starting the heating procedure of the test chamber and the break point.

## 2.4 Optional OxyLogger 100 software

The optional PC software OxyLogger 100 is used to analyze your measurement results comfortably at your PC.

- Measurement results can be exported as Microsoft® Excel or PDF file, further evaluation files can be exported as PDF.
- Measurements and comparisons can be displayed **graphically**.
- **Integral functions** allow the calculation of the area underneath the pressure curve in pressure × seconds.
- **Various tangents** can be displayed to show the gradient and the tangent equation at any point of the pressure curve.
- **Intermediate results** can be automatically calculated for existing measurement data. This is useful when analyzing long measurements to determine an optimal test setup.
- The "**Oxidation Induction Time**", or abbreviated OIT, can be determined as the point on the pressure curve at which the pressure drop shifts significantly. This is an additional evaluation technique to e.g. monitor antioxidant consumption.

– **Oxygen consumption** can be calculated as additional information on the interaction of the measured samples with oxygen during the interval between the time when the maximum pressure is reached and a given point on the time axis.
– When comparing measurement results of an identical sample at different temperatures, the **Arrhenius graph** showing the dependence of the oxidation rates on temperature can be automatically calculated and displayed. This leads to even more highly beneficial information:
  – **Estimated shelf life** for this sample at 20 °C, 25 °C, 40 °C and further user-defined temperature values can be automatically calculated and displayed.
  – **Activation Energy** for this sample is automatically calculated and displayed.

**NOTE:** *The data analyzed in OxyLogger 100 must first be exported in RAW format (refer to Section 6.3 [▸ 21]) from the RapidOxy 100 instrument and transferred to a specific folder (via USB stick or FTP connection) from where the user can open it in the OxyLogger 100 environment. This data transfer does not take place automatically or in real time.*

For more information about the installation and operation of the OxyLogger 100 software, please refer to the relevant Reference Guide.

## 2.5 Functional components

***Fig. 3:*** *Front and side view of the RapidOxy 100/RapidOxy 100 Fuel*

1 *Screw cap*
2 *Touchscreen*
3 *Test chamber*
4 *Locking pins of the safety hood*
5 *Safety hood*
6 *Safety hood handle*
7 *USB socket*

***Fig. 4:*** *Rear view of the RapidOxy 100/RapidOxy 100 Fuel*

1 *LAN connector*
2 *USB socket*
3 *Power switch*
4 *Oxygen inlet (marked with IN)*
5 *Oxygen outlet (marked with OUT)*
6 *Fuse drawer*
7 *Power inlet*

# 3 Installation

**NOTICE**

All installation instructions in this chapter apply to both RapidOxy 100 and RapidOxy 100 Fuel unless otherwise stated.

In this chapter the term "RapidOxy 100" refers to both RapidOxy 100 and RapidOxy 100 Fuel.

In order to avoid any damage to the device by moisture during delivery (e.g. by condensation as a result of different temperatures), especially damage to the electronic equipment, you should store the device for 24 hours at room temperature before putting it into operation.

## 3.1 Installation requirements

Observe the following requirements to ensure trouble-free operation and exact measurements.

### 3.1.1 Environmental requirements

The setup location and surroundings should meet the requirements of a typical laboratory.

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

Place the instrument on a stable, flat lab desk which is free of vibrations.

To ensure temperature stability and trouble-free measurement never locate your instrument:

- next to a heating facility
- near an air conditioning, ventilation system or an open window
- in direct sunlight

Keep the instrument away from magnetic fields.

Read the safety instructions in Section 1 [▶ 3].

For technical details refer to Appendix A [▶ 28].

### 3.1.2 Electrical requirements

Only use the supplied cable to connect RapidOxy 100 to the mains.

If the original cable is damaged or lost, replace it with an original spare cable from Anton Paar.

**WARNING**

**Danger of electric shock**

RapidOxy 100 must only be connected to an approved standard socket with protective conductor. Before plugging the cable, make sure that the local mains supply and frequency correspond to the values on the type plate of the instrument.

### 3.1.3 Oxygen supply

Commercially available extra-dry oxygen of not less than 99.5 % purity is required for the operation of the RapidOxy 100.

If you use a filling pressure of 700 kPa (7 bar), a 10 l oxygen bottle will last for approximately 180 measurements.

The inlet pressure must not exceed 800 kPa (8 bar).

**WARNING**

**Risk of fire**

Keep the oxygen pressure line away from hot surfaces and ignition sources.

For safety reasons always close the oxygen supply unless you are running a measurement.

**DANGER**

**Risk of fire**

Always close the oxygen supply and remove the pressure line when the instrument has finished the filling procedure during a measurement.

When a measurement has finished reconnect the pressure line and reconnect the oxygen supply for purging. After purging, close the oxygen supply again.

## 3.2 Installation procedure

The RapidOxy 100 instrument is delivered in a fully assembled state.

Additional assembly work to install components is not required.

### 3.2.1 Connecting the oxygen supply

1. A pressure regulator must be supplied by the customer and connected to the oxygen supply.
2. Set the pressure regulator to limit the pressure to 10 bar.

**WARNING**

**Risk of injury**

The pressure at the oxygen source must be limited to 10 bar. If the pressure at the primary oxygen source is set to a higher value, there is a risk that parts might burst, leaks may occur, or parts of the instrument may be damaged. If the maximum pressure is exceeded, expanding gas can cause mechanical hazards (e.g. parts flying off).

**WARNING**

**Risk of fire or harmful substances**

Oxygen is highly flammable, therefore keep the oxygen supply and the pressure line away from heat or ignition.

If you use oxygen bottles, they must be secured to prevent them from tipping over.

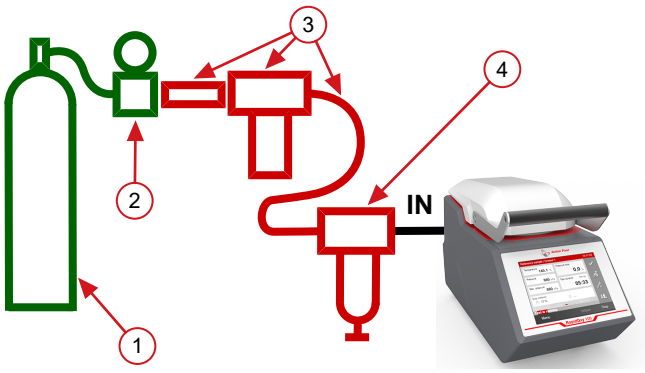


***Fig. 5:*** *Connecting the oxygen supply*

1 *Oxygen supply (customer)*
2 *Pressure regulator, 10 bar (customer)*
3 *Flashback arrestor, pressure reducer and pressure line (supplied)*
4 *Particle filter (supplied)*

3. When the pressure regulator ② has been connected to the oxygen supply ① and adjusted, use the supplied pressure line with pressure reducer (pressure reducing to 8 bar) and flashback arrestor ③ to connect the oxygen supply with regulator to the RapidOxy 100 instrument:

   Connect the threaded end of the oxygen pressure

line with the pressure reducer and the flashback arrestor ③ to the oxygen supply with regulator. Then connect the other end of the pressure line to the particle filter ④ and the whole assembly to the oxygen inlet which is marked with IN at the rear side of the instrument (refer to Fig. 6 [▸ 11]). This filter prevents particles from entering the instrument through the oxygen supply, thus preventing damage to the valve.

**NOTICE**

For safety reasons, it is mandatory to use the set "Pressure line with pressure reducer and flashback arrestor for oxygen" supplied with the instrument.

***Fig. 6:*** *Connecting the particle filter*

# 4 Operating the RapidOxy 100

**NOTICE**

All operating instructions in this chapter apply to both RapidOxy 100 and RapidOxy 100 Fuel unless otherwise stated.

In this chapter the term "RapidOxy 100" refers to both RapidOxy 100 and RapidOxy 100 Fuel.

This chapter will guide you through the basic operation of the RapidOxy 100.

**NOTICE**

Only operate the RapidOxy 100 with original parts from Anton Paar.

## 4.1 Switching on and off

The RapidOxy 100 is switched on or off using the switch at the back of the instrument.

## 4.2 Input alternatives

You can operate the RapidOxy 100 by

- tapping the elements on the touchscreen
- using the on-screen keyboard
- using a USB mouse to click on the elements on screen
- using an external USB keyboard to enter input into text boxes

## 4.3 Using the touchscreen

Using the RapidOxy 100 touchscreen is easy and intuitive:

- tap elements such as buttons or menu items to select them
- if a scroll bar is shown, you can swipe the screen or menus up and down

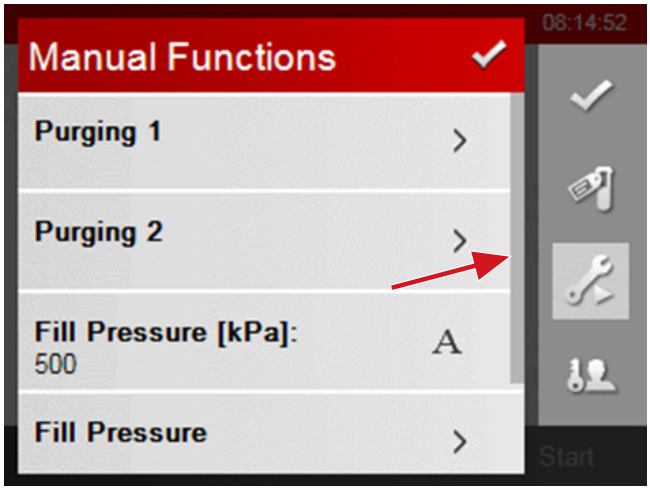


***Fig. 7:*** *The scroll bar shows that you can swipe the menu up to get more options*

- some screens can be swept left and right to scroll between screens or data records

***Fig. 8:*** *Scroll bar and icons to show you can swipe*

- in screens with a selection bar, swipe the screen up or down until the object you wish to select is shown in the selection bar, then tap the appropriate button for the desired action

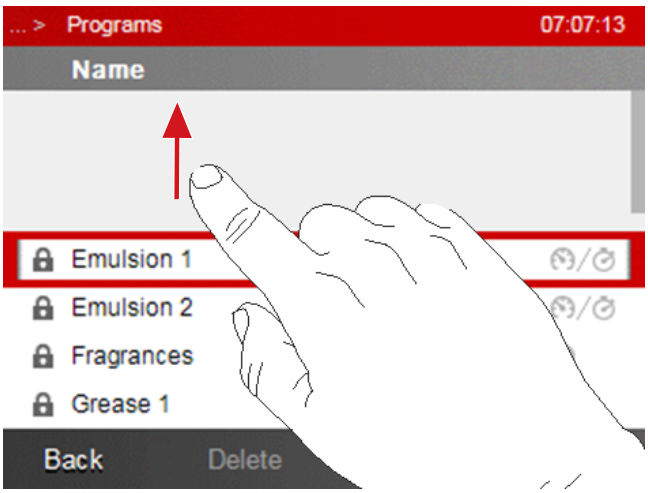


***Fig. 9:*** *Swipe upwards to move an element into the selection bar (example shows test programs of RapidOxy 100 which differ from the programs in RapidOxy 100 Fuel)*

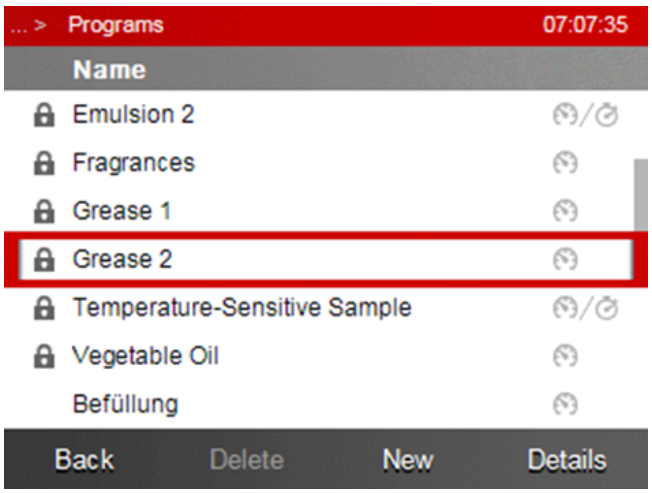


***Fig. 10:*** *When the element is shown in the selection bar you can tap the button for your desired action*

– buttons which are grayed out cannot be selected

**NOTICE**

To ensure long lifetime of the touchscreen:

– Never use any sharp objects.
– Operate the touchscreen with gentle fingertip-pressure only.

## 4.4 Elements on the start screen

Your RapidOxy 100 start screen shows the following elements:

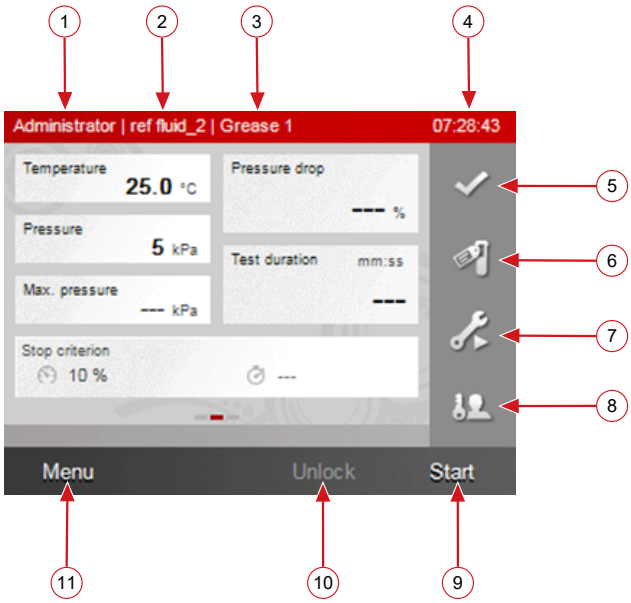


***Fig. 11:*** *Elements on the start screen*

1 *Name of the logged-in user*
2 *Sample name of the next measurement*
3 *Program of the last measurement (also preset for the next measurement unless changed)*
4 *Current time*
5 *Status messages*
6 *Quick Settings: "Sample Name", "Program", "Instrument Settings"*
7 *Manual Functions: "Purging 1", "Purging 2", "Fill Pressure" amount, "Fill Pressure", "Release Pressure"*
8 *Login/user management*
9 *Start/Stop a measurement*
10 *Button to unlock the instrument (disabled in this screen)*
11 *Menu*

## 4.5 Elements on the run screen

When a test is running, the following items are shown on the display:

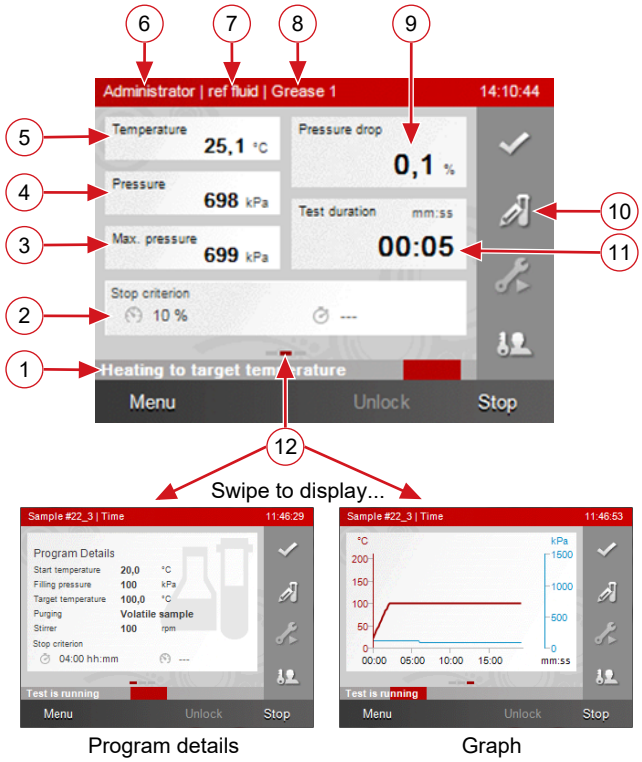


*Fig. 12: Elements on the run screen*

1 *Status of the measurement*
2 *Stop criterion*
3 *Maximum pressure during measurement*
4 *Current pressure*
5 *Current temperature*
6 *Name of the logged-in user*
7 *Sample name*
8 *Current program*
9 *Difference between maximum and current pressure*
10 *Edit target temperature, test duration and pressure drop during test*
11 *Test duration*
12 *Icon to show that you can swipe to the left and right to display the "Program Details" and the graph*

## 4.6 User management

A factory-set or freshly updated RapidOxy 100 is freely accessible without password and the administrator is automatically logged on.

**NOTICE**

The factory-set administrator password is *administrator*

If user accounts are created and passwords are set, you have to pass a logon procedure.

If you forget the administrator password, tap the question mark icon in the login screen to generate a token and contact Anton Paar.

### To log on

1. Tap on the user group indicator on the bottom right side of the start screen.
2. Select your *User name*.
3. Enter your *Password*. Note that passwords are case-sensitive. In case you did not set a password, you need to clear the contents in the *Password* text box.
4. Tap ✔ to confirm your settings.

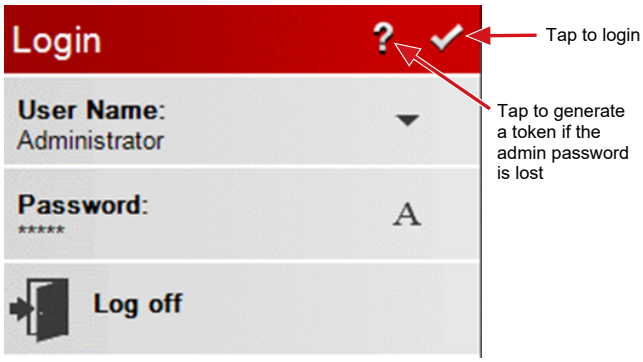


*Fig. 13: Login*

### To log off

1. Tap on the user group indicator at the right bottom side of the start screen.
2. Tap *Log off*.
   You are logged off and the auto logon user is logged on automatically (if activated).

### 4.6.1 Creating and editing user accounts

You need administrator rights to create, edit or delete user accounts.

Up to 50 user accounts can be created.

There are three user account groups with different levels of user rights. Menu structure shows the different access rights for each user group.

If the user account is deactivated, the user account cannot be selected for log on. You can only log on with active user accounts. With *Auto Logon*, there is no logon procedure. All instrument functions are freely accessible according to the user rights of the auto logon user.

If no password is set, users can log on via selecting their user name from the user list and by tapping *OK*. In case you did not set a password, you need to clear the contents in the *Password* text box.

Please note that passwords are case-sensitive.

## 4.7 Unlocking the RapidOxy 100

If a test is aborted without releasing the pressure in the test chamber or the RapidOxy 100 instrument is switched off while the test chamber is still pressurized, the RapidOxy 100 will be locked and the safety hood cannot be opened.

**NOTICE**

Do not use any force trying to open a locked safety hood!

You could damage the instrument.

If the safety hood is locked, the pressure must be discharged as described below.

To unlock the RapidOxy 100:

1. If the instrument is locked, tap the *Unlock* button at the bottom of the display.

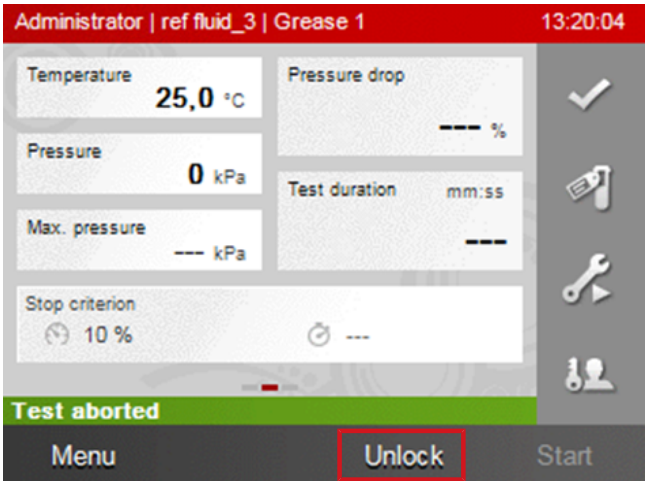


***Fig. 14:*** *Unlock button*

2. You will be prompted to release the pressure. Tap *Yes* to confirm.

Wait until the pressure is completely released. You will hear an unlocking sound. The start screen will be displayed and the *Unlock* button is dimmed again and cannot be selected. You can now open the lid and the screw cap of the test chamber.

## 4.8 Manual functions

With the manual functions you can perform some direct actions on the RapidOxy 100 instrument. These actions can be used for cleaning purposes but also to check these hardware features.

To open the *Manual Functions* menu tap

To close the *Manual Functions* menu tap

### 4.8.1 Purging

The purging feature flushes oxygen through the ducts and/or the test chamber of the RapidOxy 100 instrument.

This flushing feature removes any sample traces in the instrument and guarantees that all ducts and the pressure line are actually filled with oxygen.

To manually start the purging feature, select *Purging 1* or *Purging 2* from the *Manual Functions* menu.

**Purging 1**

Oxygen is conducted into the oxygen inlet and out of the oxygen outlet. No oxygen is conducted into the test chamber, the respective valve is closed. This ensures that the ducts and pressure line are actually filled with oxygen.

**Purging 2**

Oxygen is conducted through the pressure inlet of the test chamber.

For cleaning purposes, the screw cap and the cover are kept open during *Purging 2*.

**WARNING**

**Danger of injury**

During the purging process, sample residues can be blown out of the test chamber!

Place a cloth over the test chamber.

Do not lean over the test chamber!

**TIP:** *On rare occasions there may be filling problems after testing water-containing samples because of persistent sample traces left in the instrument. To avoid this, perform one or two additional manual Purging 2 after testing water-containing samples.*

### 4.8.2 Filling

The filling feature loads the test chamber with oxygen to a defined filling pressure. This feature can be used to test the filling functionality itself and also for leak testing.

1. Insert a new O-ring, close the screw cap of the test chamber and the lid.
2. Tap to open the *Manual Functions* menu.
3. Tap *Fill Pressure [kPa]* and enter the desired filling pressure. The value range is between 0 kPa and 1000 kPa.
4. Tap *Fill Pressure*. The RapidOxy 100 fills the test chamber with oxygen. A screen shows the buildup of pressure. When the set pressure is reached, the *Manual Functions* menu is displayed again. The test chamber is pressurized.
5. To release the pressure manually, refer to Section 4.8.3 [▸ 14].

### 4.8.3 Releasing pressure

To release the pressure from a pressurized test chamber:

1. Tap to open the *Manual Functions* menu.
2. Scroll down and tap *Release Pressure*.
3. The RapidOxy 100 releases the pressure safely from the test chamber in a controlled manner. When the pressure has been fully released, the *Manual Functions* menu is displayed again.

# 5 Performing a measurement

**NOTICE**

In this chapter the term "RapidOxy 100" refers to both RapidOxy 100 and RapidOxy 100 Fuel.

### Typical oxidation stability test procedure

The following diagram gives a brief overview of the steps involved when performing a measurement.

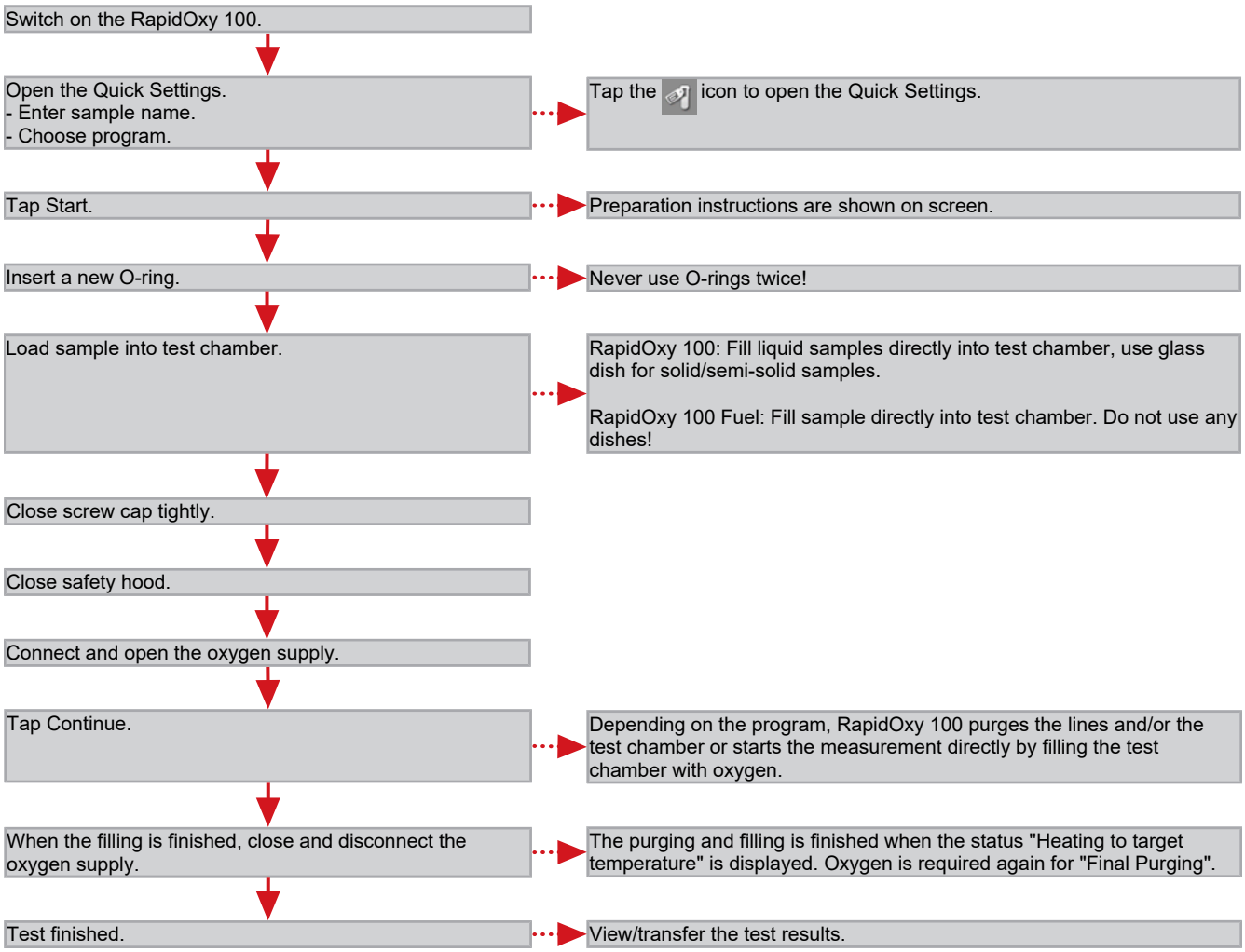


***Fig. 15:*** *Measurement procedure*

### Time line

The following diagram shows the sequence of actions during the execution of a measurement.

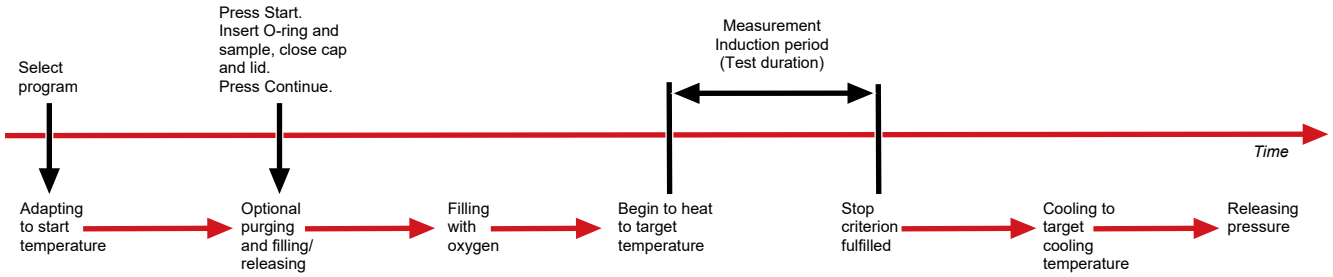


***Fig. 16:*** *Time line of a measurement*

## 5.1 Steps to perform a measurement

Follow these steps to set up and perform a measurement:

1. Tap the icon to open the *Quick Settings*.

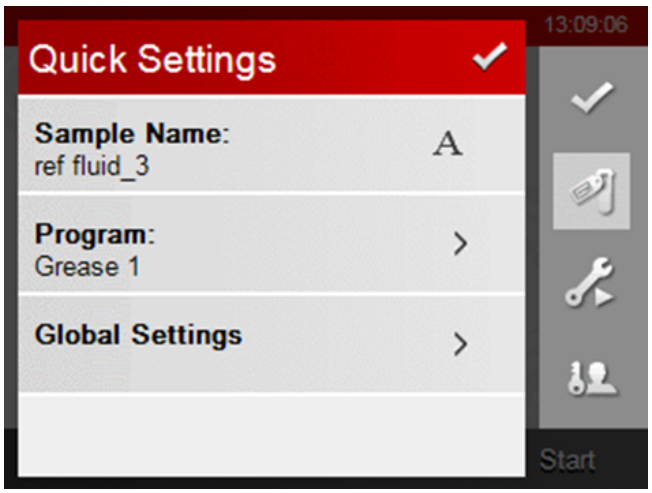


*Fig. 17: Quick Settings*

2. Tap on *Sample Name* to enter a new sample name. If you run another measurement with the same sample name, the RapidOxy 100 will add an underscore and a number to the name and increment it for each measurement.

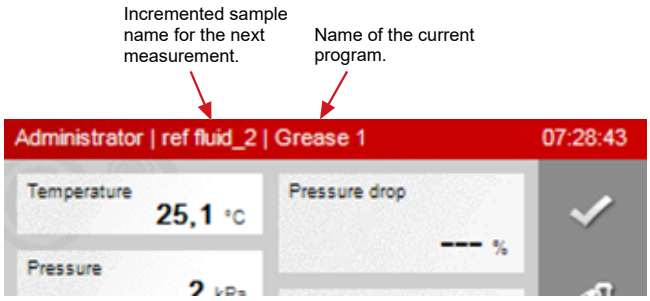


*Fig. 18: Incremented sample name*

3. Tap on *Program* to select a program from the program list.

**NOTICE**

The RapidOxy 100 will now start to adapt the test chamber to the starting temperature which is defined in the selected program.

This is especially important for volatile samples: wait until the chamber is cooled down before filling the sample into the test chamber to avoid losing volatile parts of the sample.

4. Tap on *Instrument Settings*, if you want to change the *Target cooling temperature* or the *Formatting of the test duration* (for more information, refer to Instrument settings).
5. Tap ✔ to confirm your settings and close the *Quick Settings*.
6. Tap *Start* to initiate the test. A quick reminder of the next steps is shown on screen.

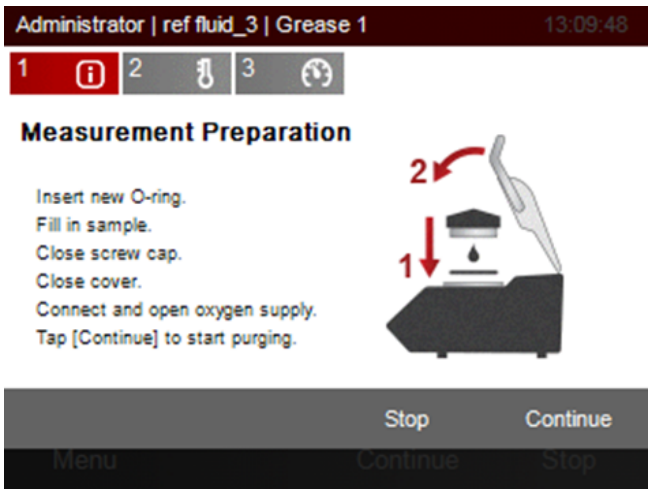


*Fig. 19: Measurement preparations*

7. Insert a new O-ring. The O-ring fits tightly inside the test chamber. It must sit correctly and be flush with the rim.

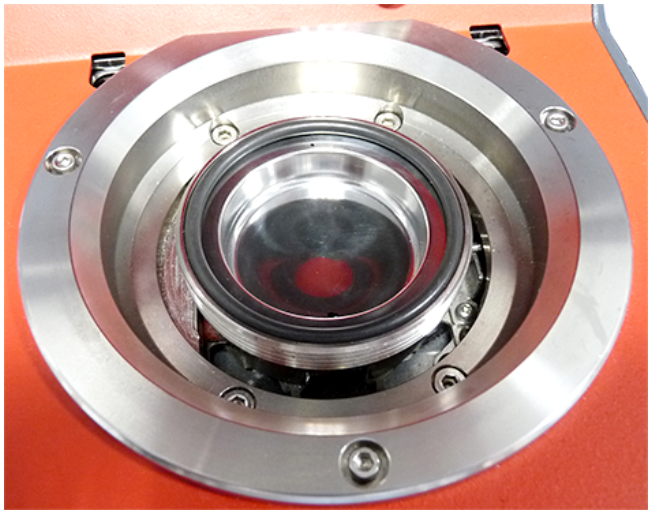

*Fig. 20: Correctly inserted O-ring*

**NOTICE**

Never use an O-ring twice! It is not possible to clean used O-rings. Used O-rings will distort the measuring results and might also not seal the test chamber reliably.

Only use original O-rings from Anton Paar!

8. Load the sample into the test chamber:

**Table 3:** Sample loading - RapidOxy 100

| Consistency | Amount | Filling |
|---|---|---|
| Solid or semi solid | 4 g | Fill/weigh sample into supplied glass dish. Place dish into test chamber. |
| Liquid | 5 mL | Use a clean measuring pipette to measure and fill sample directly into test chamber. |

**Table 4:** Sample loading - RapidOxy 100 Fuel

| Consistency | Amount | Filling |
|---|---|---|
| Liquid | 5 mL | Use a clean measuring pipette to measure and fill sample directly into test chamber.<br>Do not use any dish! |

9. Close the screw cap tightly by hand.
10. Close the cover.
11. Connect and open the oxygen supply.
12. Tap *Continue*.
    If the defined starting temperature is not reached, yet, the following message is displayed. Either wait until the start temperature is reached or tap *Continue* to skip this step.

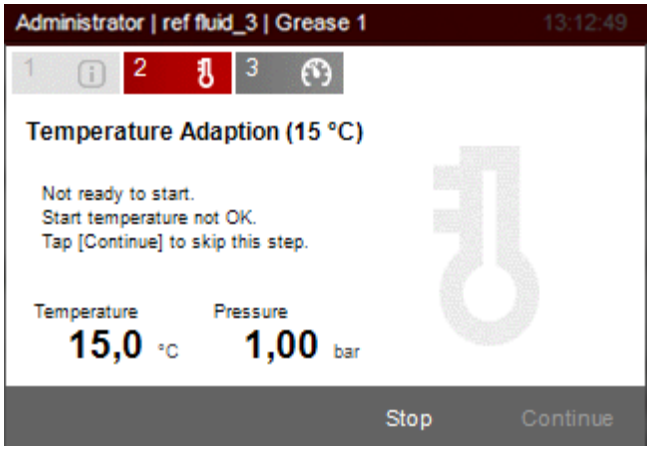


***Fig. 21:*** *Start temperature not reached*

Depending on the program settings, the RapidOxy 100 will then continue to purge the oxygen lines and the test chamber or begin directly to fill the test chamber with oxygen.

13. When the filling has finished, close the oxygen supply and remove the pressure line.

**DANGER**

**Risk of fire**

Always close the oxygen supply and remove the pressure line when the instrument has finished the filling procedure during a measurement.

When a measurement has finished reconnect the pressure line and reconnect the oxygen supply for purging. After purging, close the oxygen supply again.

**TIP:** *During the test you can change the test target temperature, test duration and pressure drop. Just tap and change the value of these parameters as required. Note that you can only set a temperature which is higher than the current test temperature!*

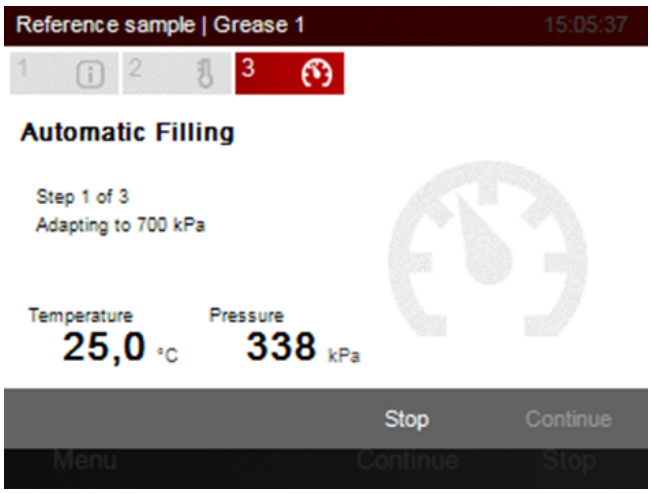


***Fig. 22:*** *Filling the test chamber with oxygen*

14. While the test is running, the RapidOxy 100 main screen is displayed.

**Intermediate test results**

In case you selected *Test duration and pressure drop* as stop criterion or defined a *Follow-up time*, you can display the first test result while the test is still running.

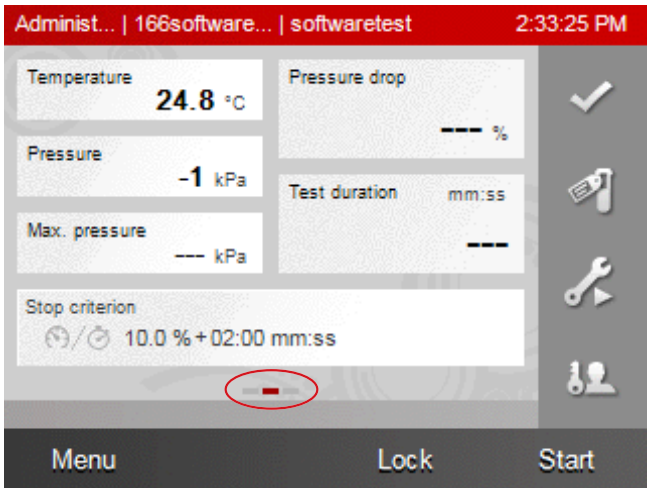


***Fig. 23:*** *Intermediate result screen*

Simply swipe to the intermediate result screen.

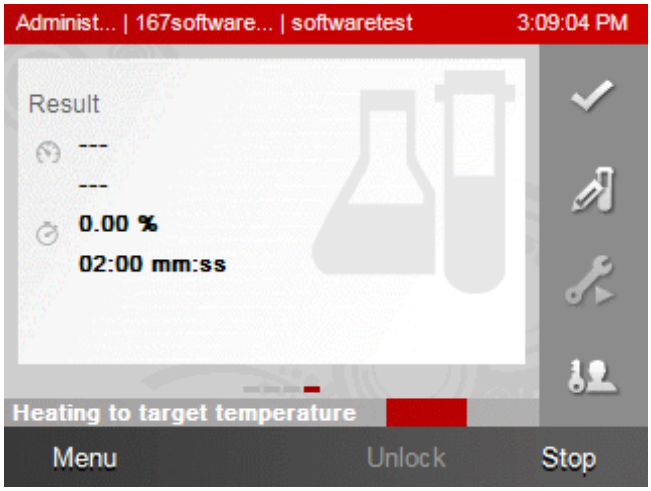


***Fig. 24:*** *Result screen*

If one the stop criteria is fulfilled, the result is displayed. In the example above, the 10 % pressure drop has not been reached, yet.

15. When the stopping criterion is reached, the instrument cools the test chamber to the *Target cooling temperature*. You can skip this step if you want. Note, however, that in this case the test chamber and the lid may still be hot! The pressure will be discharged and a short result screen is displayed.

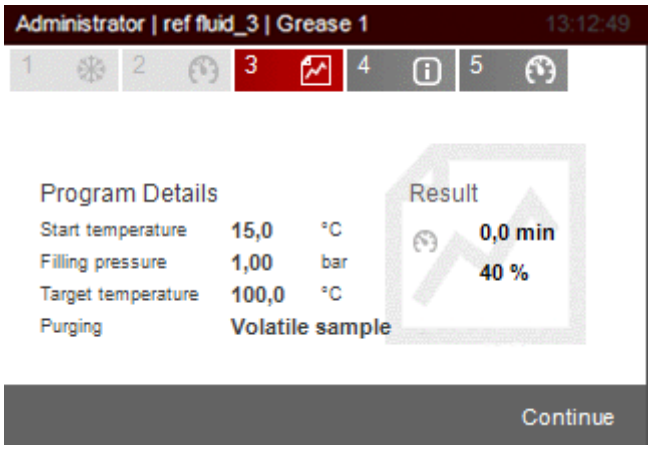


***Fig. 25:*** *Short result screen*

16. Tap *Continue*.

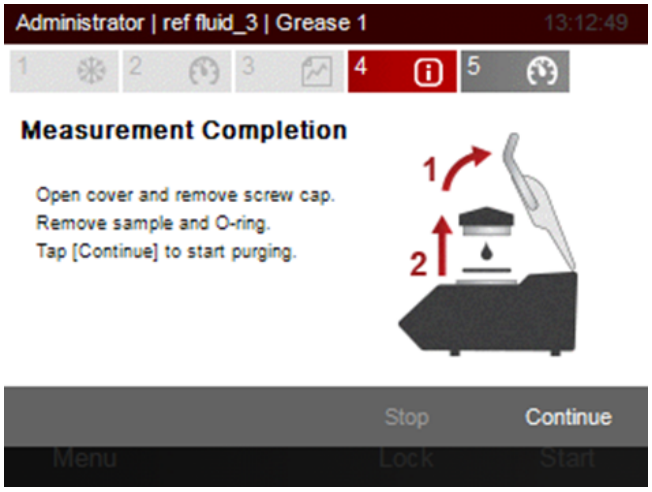


***Fig. 26:*** *Steps to complete the measurement*

17. Open the safety hood, remove the screw cap. Remove the sample (or glass dish, if used) from the test chamber. Remove and discard the O-ring.
18. Reconnect and open the oxygen and tap *Continue*.

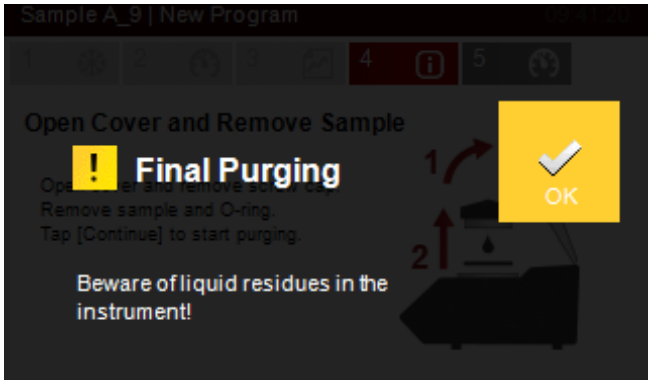


***Fig. 27:*** *Warning before final purging*

The RapidOxy 100 will purge the tubes, ducts and valves to the test chamber with oxygen to remove any sample residues. You can place a cloth or tissue over the opening in the test chamber to catch any residues which are blown out.

**NOTICE**

The final purging is very important as otherwise sample residues might remain in the instrument and distort the result of subsequent measurements.

**WARNING**

**Danger of injury**

During the purging process, sample residues can be blown out of the test chamber!

Place a cloth over the test chamber.

Do not lean over the test chamber!

19. Tap *OK*. The RapidOxy 100 will purge the tubes and the test chamber. You can tap *Skip* to forgo this step, however, this is not recommended and may affect subsequent measurement results. After purging, wipe out the test chamber.

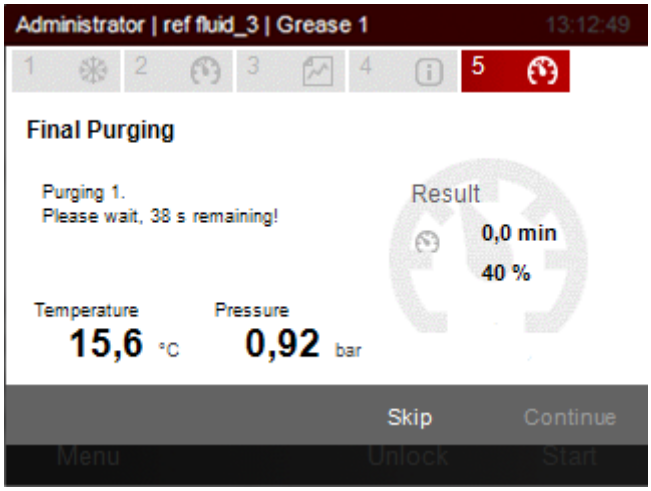


***Fig. 28:*** *Final purging*

20. When the purging is finished, you return to the main screen. To display the detailed test results select *Menu* > *Data Memory* > *Test Results*.

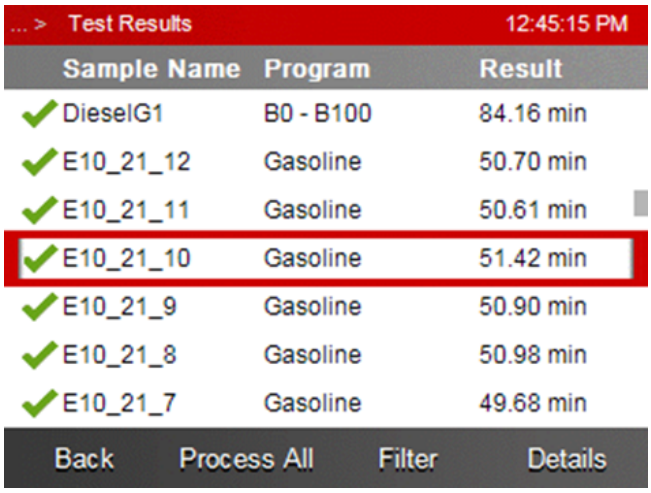


***Fig. 29:*** *Selecting the results of the last test (example shows test results of RapidOxy 100 Fuel)*

21. By default, the newest result is highlighted. Tap *Details* to display the detailed results.
    For further information refer to Section 6 [▸ 19].
22. Clean the test chamber, the screw cap and (if used) the glass dish. Refer to Section 8 [▸ 24].

**NOTICE**

If you have tested a volatile sample or a sample with high water content, we recommend that you additionally manually purge the RapidOxy 100 after the measurement to make sure that no sample residue remains in the instrument.

To manually purge the instrument:

a) Open the cover and the screw cap.
b) Open the *Manual Functions* menu.
c) Select *Purging 1*.
d) When *Purging 1* is finished, select *Purging 2*. Beware of residues being blown out of the opening in the test chamber.
e) Repeat steps c and d for as long as necessary.

# 6 Test results

This chapter explains how to display, print, or export test results.

**NOTICE**

All operating instructions in this chapter apply to both RapidOxy 100 and RapidOxy 100 Fuel unless otherwise stated.

In this chapter the term "RapidOxy 100" refers to both RapidOxy 100 and RapidOxy 100 Fuel.

## 6.1 Data memory

The RapidOxy 100 saves up to 100 measurements in the *Data Memory*. For each measurement, the RapidOxy 100 instrument saves a complete data set. This data set contains both information on the measurement settings as well as the test results.

To open the test results list of the *Data Memory*:

1. Select *Menu* > *Data Memory* > *Test Results*.
2. The test results list is displayed. By default, the newest measurement is highlighted.

Each measurement result is marked by an icon to quickly identify the status of the measurement.

**Table 5:** Result status

| Icon | Result status |
|---|---|
| | Measurement was finished successfully. |
| | Measurement finished, but a warning occurred. |
| | Measurement was aborted by the user. |
| | An error occurred during the measurement. |

The buttons at the bottom of the results list screen are used for the following actions:

**Table 6:** Buttons

| Button | Action |
|---|---|
| *Back* | Returns to the menu. |
| *Process All* | Marks all displayed results. The marked results can be exported by selecting *Export*. |
| *Filter* | Allows you to define a filter for the displayed results. |
| *Details* | Displays detailed results for the selected measurement. |

### 6.1.1 Working with filters

You can filter the results in the *Data Memory* to process only those results which fulfill your search criteria.

To filter measurement results:

1. Select *Menu* > *Data Memory* > *Test Results*.
2. Tap *Filter*.
3. Enter your filter criteria:
   - ⇨ *Start date* and *End date* to filter measurements within a certain time frame
   - ⇨ *Sample name* shows only those measurements with samples starting with the string entered here
   - ⇨ *User name* shows only those measurements performed by the specified operator
   - ⇨ *Export state* allows you to filter those measurements which have been exported before or not exported before
4. Tap *Save* to apply the filter. The results list will be filtered to fulfill your criteria. The *Filter* button is underlined in red to show that a filter currently applies. You can now select *Process All* to export or delete all filtered results.
5. To remove a filter, tap *Filter* and *Reset*.

## 6.2 Displaying detailed test results

To select and display a test result:

1. Select *Menu* > *Data Memory* > *Test Results*.
2. A list of all test results is displayed. By default, the newest result is highlighted. Select a test result by moving the result into the selection bar.
3. Tap *Details* to display the detailed results.
4. You can swipe the screen vertically to access all results.
5. Swipe horizontally, or tap on the white arrows at the top of the screen to scroll through the previous and next measurement results (if applicable).

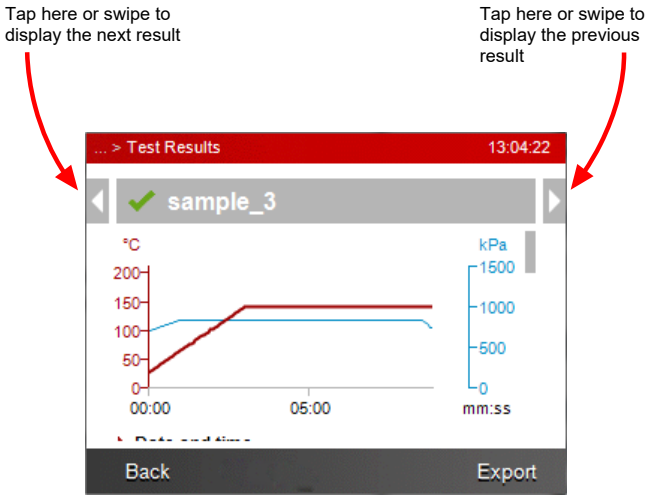


***Fig. 30:*** *Result details, top of screen*

The details of the test results show a graph with the temperature and pressure curves. Swipe the screen to display more information.

## 6.2.1 Result parameters

- Date and time [▸ 20]
- User [▸ 20]
- Program name [▸ 20]
- Program type [▸ 20]
- Start temperature [▸ 20]
- Filling pressure [▸ 20]
- Target temperature [▸ 20]
- Purging [▸ 20]
- Stop criterion [▸ 20]
- Follow-up time [▸ 20]
- Formula name [▸ 20]
- Cooling temperature [▸ 20]
- Status [▸ 21]
- Pressure drop result/Test duration result [▸ 21]
- Condition [▸ 21]
- Emergency [▸ 21]
- Total runtime [▸ 21]
- Average temperature [▸ 21]
- Max. temperature [▸ 21]
- Pressure at start [▸ 21]
- Max. pressure [▸ 21]
- Pressure at stop [▸ 21]

### Date and time

Date and time when the test had been started.

### User

User which had been logged on when the measurement was run.

### Program name

Program that was used for the measurement.

### Program type

*Preset program* - standard program has been used for the measurement

*User program* - custom program has been used

### Start temperature

The RapidOxy 100 tempered the test chamber to this temperature before it began to purge or fill the test chamber with oxygen.

### Filling pressure

The gas pressure (oxygen) the chamber was loaded with.

### Target temperature

After the test chamber had been filled with oxygen, the test chamber was heated to this temperature.

### Purging

Displays the number and type (1 or 2) of purgings prior to the test start.

### Stop criterion

Displays the stop criterion for the measurement.

### Follow-up time

If a follow-up time has been specified, the RapidOxy 100 continued the measurement even after the stop criterion has been reached for the defined time.

### Formula name

This parameter is only displayed if *Custom result processing* had been activated and a *Formula name* defined.

In this case, the formula itself with all defined operands is displayed as well.

Refer also to **Custom result processing** in your RapidOxy 100 Reference Guide.

### Cooling temperature

After the test had been finished, the RapidOxy 100 cooled down to this temperature before discharging the pressure in the test chamber.

**Status**

*OK* - measurement finished successfully

*Aborted* - measurement has been stopped by the operator

*Error* - an error occurred during the measurement

*Warning* - a warning was issued during the measurement

*Power failure* - a power failure occurred during the measurement

**Pressure drop result/Test duration result**

Shows the pressure drop as percentage or absolute value (depending on the setting in the measurement program) and the time until the pressure drop.

If the stop criterion is *Pressure drop* or *Test duration*, the values in these cells are identical.

It the stop criterion is *Test duration and pressure drop*, the values in these cells show time and pressure for each respective event.

**Condition**

In case an error occurred during the measurement, the test is aborted. The instrument cools down and the pressure is released. The error message is saved in the measurement results and displayed in the results table. If you cannot fix the problem, you can use the error message and code displayed here to contact the Anton Paar service.

**Emergency**

In case a critical error occurred during the measurement, the instrument enters the failsafe state and an error message is displayed. The error message is also saved in the measurement results and displayed in the results table. If you cannot fix the problem you can use the error message and code displayed here to contact the Anton Paar service.

**Total runtime**

The *Total runtime* is the test duration plus *Follow-up time* if defined.

**Average temperature**

Shows the average temperature during the measurement.

**Max. temperature**

Shows the maximum temperature during the measurement.

**Pressure at start**

Shows the pressure at the beginning of the heating to the target temperature.

**Max. pressure**

Shows the maximum pressure during the measurement.

**Pressure at stop**

Shows the pressure in the test chamber at the end of the measurement (when the stop criterion was fulfilled).

### 6.2.2 Buttons

The buttons at the bottom of the detailed result screen are used for the following actions:

**Table 7:** Button

| Button | Action |
|---|---|
| *Back* | Returns to the results list screen. |
| *Export* | Exports or prints the displayed results. |

## 6.3 Exporting/printing test results

The export functionality allows you to export or print data from the RapidOxy 100.

In order to print data, printers must be defined (refer to Printer management) and connected.

In order to export data, you require either a USB device or a defined FTP location.

Measurement data can be exported as the following file types:

**Table 8:** Export formats

| File type | Definition |
|---|---|
| CSV | **C**omma **S**eparated **V**alues file. The tabular data of the file is separated by commas. |
| RTF | **R**ich **T**ext **F**ormat. This file format has been developed for interchange with Microsoft® products. |
| RAW | Data which is to be used with the OxyLogger 100 software must be exported as **RAW** file. |

To export or print individual test results:

1. Select *Menu* > *Data Memory* > *Test Results*.
   A list of all test results is displayed.
2. Select a test result by moving the result into the selection bar.
3. Tap *Details* to display the detailed results.
4. Tap *Export*.

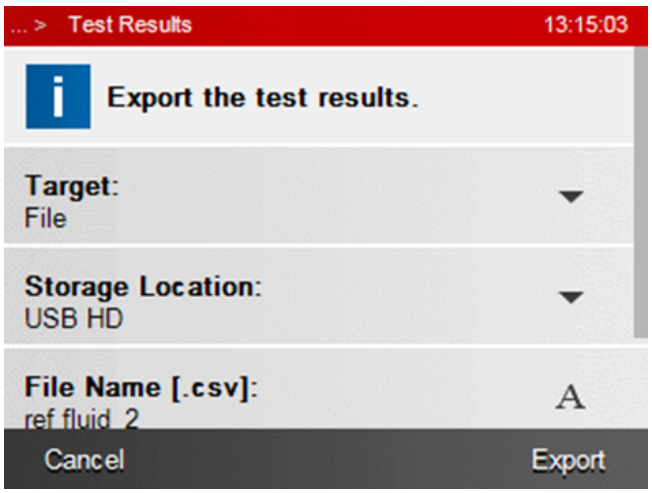


***Fig. 31:*** *Select export options*

5. To print:
   a. Tap *Target* and select *Printer*.
   b. Tap *Printer* and select a defined printer from the list.
   c. Tap *Export* to print.
6. To export the data:
   a. Tap *Target* and select *File*.
   b. Tap *Storage Location* and select either a USB device (if connected) or an FTP location (if defined and available) from the list.
   c. Tap *File Name* and change the file name if desired. The extension will be added automatically depending on the selected format.
   d. Tap *File Type(s)* and select one or more of the available file types (refer to Table 8 [▸ 21]).
   e. Tap *Export* to export the file(s).

### 6.3.1 Data compression in CSV files

You can define whether CSV files are exported in full or apply user-defined data compression settings.

To define data compression settings for the CSV export:

1. Select *Menu* > *Setup* > *Instrument Settings*.
2. Select the check box *Export compressed CSV*.
3. You can define the starting point for the data compression in the field *Compression starting at second*. All data recorded before this point will be exported in full (uncompressed).
4. You can now set the type of compression:
   – Define the *Data interval for compression* in seconds to export data points at a certain interval.
   - or -
   – Select the check box *Lossless data compression* to export only data points that record a change. If this check box is selected the field *Data interval for compression* is not available.

## 6.4 Deleting measurement results

Individual measurement results can only be deleted by Anton Paar service.

However, it is possible to export and delete all measurements on the instrument if *Data memory endless mode* is **not** activated and exactly 100 measurements are reached. In this special case, the RapidOxy 100 administrator will be prompted to export all measurement results. At the same time, the results will be deleted from the instrument.

If the *Data memory endless mode* is activated, RapidOxy 100 will delete the oldest results automatically, when 100 measurements are reached.

# 7 Checking, adjusting and calibrating

Checks and adjustments should be carried out regularly to ensure reliable and accurate test results.

**NOTICE**

All operating instructions in this chapter apply to both RapidOxy 100 and RapidOxy 100 Fuel unless otherwise stated.

In this chapter the term "RapidOxy 100" refers to both RapidOxy 100 and RapidOxy 100 Fuel.

## 7.1 Verification fluids

Measurements with reference fluids should be run regularly to check the results of your instrument against certified expected reference values.

A verification fluid set with certified expected test results can be obtained from Anton Paar.

**NOTICE**

Verification fluids are always filled directly into the test chamber, do **not** use any glass dishes!

Results of measurements with and without glass dishes **cannot** be compared due to the different heat transfer to the sample.

Follow the instructions supplied with the verification fluid. If your measurement results are outside the limits stated with the verification fluid set of Anton Paar, you should have your RapidOxy 100 instrument calibrated. Contact the Anton Paar Service to have your instrument calibrated and leak checked. Under no circumstances should you calibrate the instrument yourself.

## 7.2 Temperature calibration

The RapidOxy 100 allows you to calibrate and adjust the block Pt100 temperature sensor.

The calibration and adjustment are carried out by the Anton Paar service.

**NOTICE**

An adjustment is only required if the result of a test using verification fluid is outside the permissible range and the tightness of the pressure chamber is ensured.

## 7.3 Pressure calibration

The RapidOxy 100 allows you to calibrate and adjust the pressure sensor.

The calibration is carried out by the Anton Paar service.

## 7.4 Leak testing

The RapidOxy 100 can easily be tested for leak tightness.

For this test, use nitrogen (not oxygen). Create a user-defined program and start a measurement with the RapidOxy 100 which will run for 10 hours, e.g. overnight. Finally, you check the decrease in pressure.

Follow these steps to create a new program and start the leak test:

1. Connect nitrogen supply to the RapidOxy 100.
2. Create a new program with these parameters:
   - *Start temperature*: 25 °C
   - *Filling pressure*: 700 kPa
   - *Target temperature*: 180 °C
   - *Purging*: Volatile sample
   - *Stop criterion*: Test duration, 10 hours
3. Select the program you have just created and start a measurement.
4. The test chamber must be empty, clean and dry.
5. Insert a new O-ring.
6. Close the test chamber tightly by hand.
7. After 10 hours with the above parameters the pressure decrease should be < 50 kPa. If you find a greater pressure decrease, contact your Anton Paar service.

## 7.5 Displaying calibration results

To select and display test results:

1. Select *Menu* > *Data Memory* > *Calibration Results*. The calibration data of the last temperature and pressure calibration is displayed.

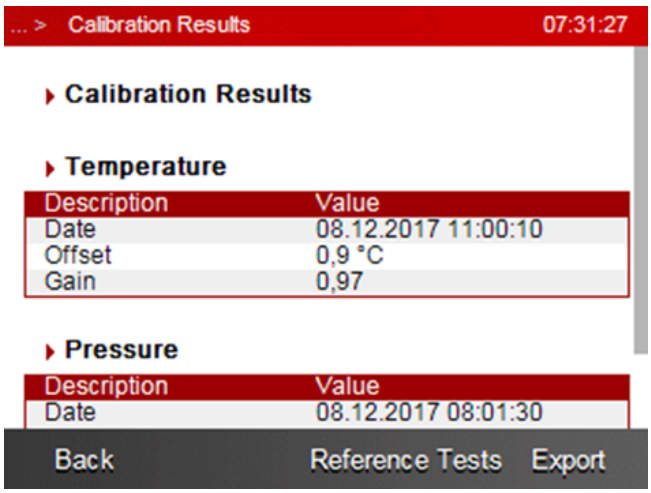


***Fig. 32:*** *Calibration results*

2. Tap *Back* to return to the previous screen, or *Export* to export or print the calibration data.
3. To obtain a calibration report, refer to the next section.

### 7.5.1 Creating a calibration report

To document a full and successful calibration of your instrument, follow these steps:

1. Perform a temperature calibration.
2. Perform a pressure calibration.
3. Run several measurements with verification fluid until the RapidOxy 100 results are in line with the certified values.
4. Select *Menu* > *Data Memory* > *Calibration Results*.
5. Tap *Reference Tests*.
6. Select those verification fluid tests which document conformity with the certified results. Tap *Add* for each test you wish to select.

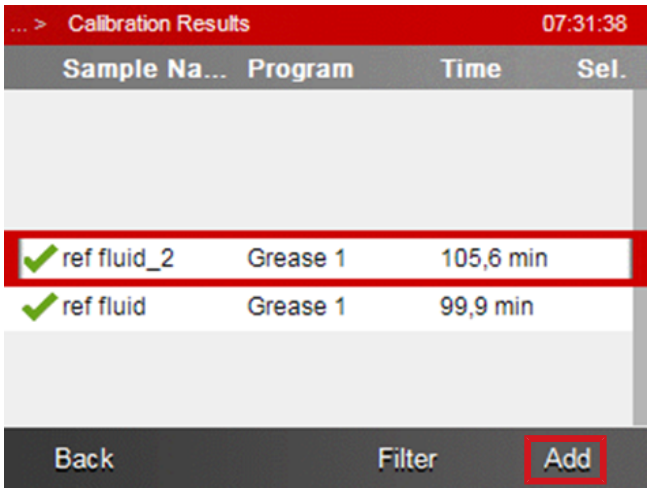


***Fig. 33:*** *Select a measurement and tap Add*

7. When you have selected the reference tests, tap *Back* to return to the calibration results screen.
8. Tap *Export*.
9. Select the export target (*File* or *Printer*), the printer, or the file name, location and format.

10. Tap *Export* again to print or export a full calibration report.

# 8 Upkeep and cleaning

In order to ensure proper and safe functioning of the RapidOxy 100 instrument, perform maintenance and cleaning routines regularly during standard operation.

**NOTICE**

All instructions in this chapter apply to both RapidOxy 100 and RapidOxy 100 Fuel unless otherwise stated.

In this chapter the term "RapidOxy 100" refers to both RapidOxy 100 and RapidOxy 100 Fuel.

**WARNING**

**Risk of injury due to toxic substances.**

Do not perform cleaning procedures without proper safety measures. This could cause injuries due to hazardous chemicals.

**RISK OF INJURY DUE TO HARMFUL SUBSTANCES:** *Wear safety goggles when handling samples or cleaning agents.*

**RISK OF INJURY DUE TO HARMFUL SUBSTANCES:** *Wear protective gloves when handling samples or cleaning agents.*

## 8.1 Cleaning the instrument

Make sure that all equipment used is completely clean and undamaged.

**NOTICE**

Always use a new clean pipette to transfer the sample to be measured.

Never use O-rings twice. O-rings cannot be cleaned and re-used. Only use original O-rings supplied by Anton Paar.

### 8.1.1 Cleaning the test chamber and the screw cap

**When to perform:**

– After each test run

**Required tools:**

– Soft tissues
– Ethanol

**NOTICE**

The test chamber of the RapidOxy 100 Fuel is made of gold-plated aluminum. The surface is highly resistant to fuels but not scratch-resistant.

**Never use**

– abrasive cleaning material
– metal spatulas or similar items to clean the test chamber

**Procedure:**

1. Remove any remaining sample and the O-ring from the test chamber. Discard the O-ring - never use O-rings twice!
2. Wipe the chamber and the screw cap with a dry soft tissue first.

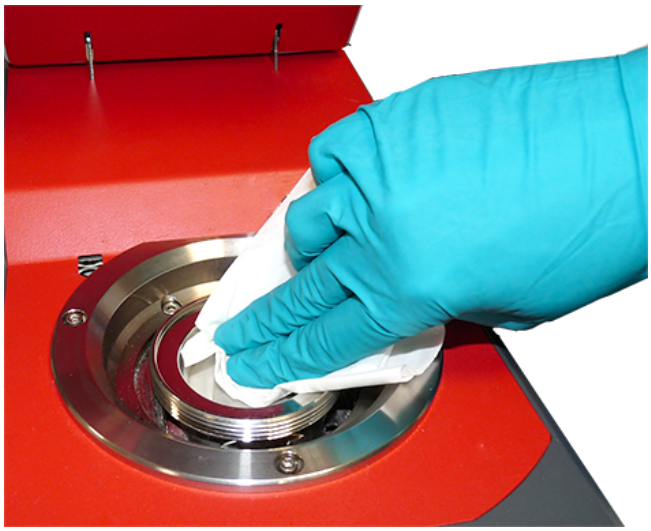

***Fig. 34:*** *Cleaning the test chamber*

3. Soak a clean tissue with ethanol and wipe the chamber and the screw cap. Do not rinse or immerse the screw cap into any liquid!
4. Let all parts dry completely.

### 8.1.2 Cleaning the sample dishes

Only applicable for RapidOxy 100. Never use any dishes with RapidOxy 100 Fuel!

**When to perform:**

– After each test run (if used)

**Required tools:**

– Soft tissues
– Cleaning liquid (ethanol, suitable solvent, or mild detergent) depending on the samples and their oxidized products

**Procedure:**

1. Remove any remaining sample with a cloth or a spatula from the sample dish.
2. Clean the dish with a cleaning liquid and some tissues.

3. Let the dish dry completely.

### 8.1.3 Cleaning the instrument housing

**When to perform:**

– When required

**Required tools:**

– Clean cloth
– Some water

**Procedure:**

1. Cut off the electric supply to the RapidOxy 100 or remove the power cable.
2. Dampen a clean cloth with some water.
3. Wipe the RapidOxy 100 housing first with the damp cloth, then with a dry one.

### 8.1.4 Purging

In addition to the purging cycle during the test run, residues in the ducts of the instrument can be removed by purging with water- and oil-free compressed air, oxygen or nitrogen.

**When to perform:**

– When required, e.g. insufficient filling, residues still spilling.
– Regularly when samples with high water content (> 10%) are tested.

**Required tools:**

– Soft tissues
– Compressed air (water- and oil-free), oxygen or nitrogen

**WARNING**

**Danger of injury**

During the purging process, sample residues can be blown out of the test chamber!

Place a cloth over the test chamber.

Do not lean over the test chamber!

**Procedure:**

1. Connect compressed air, oxygen or nitrogen to the instrument.
2. Keep the lid and the screw cap of the test chamber open. You can place a cloth or a tissue over the test cell to avoid sample residues to be blown out into the room.
3. Select *Purging 2* from the *Manual Functions* menu.
4. After the purging is finished, clean the test chamber with a tissue and some ethanol.
5. Let the test chamber dry completely.

### 8.1.5 Purging using a syringe

During tests with certain (mainly aqueous) samples some sedimentation may occur in the line system and the valves of the RapidOxy 100. This sedimentation may cause the magnetic valves to stick.

This manifests itself in such a way that the instrument no longer reaches the filling pressure of 700 kPa and the final pressure level upon filling jumps back and forth and does not reach a constant reading. It is also possible, that the test times are affected (either longer or shorter test times).

In this case (or to prevent this from happening), you can purge the instrument with a syringe and some ethanol.

**When to perform:**

– When required

**Required tools:**

– Soft tissues
– Disposable syringe with needle
– Ethanol

**WARNING**

**Danger of injury**

Please remove the oxygen pressure line before purging with a syringe!

**Procedure:**

1. Remove the oxygen pressure line from the instrument.
2. Place some tissues or an appropriate vessel under the **Out** valve at the back of the instrument to collect the ethanol when it flows out.
3. Fill the syringe with ethanol.
4. Insert the syringe into the pressure line opening of the test chamber.

*Fig. 35: Inserting the syringe into the opening*

5. Inject the ethanol into the line system.
6. Remove the syringe.
7. Place some tissues over the test chamber.
8. Open the *Manual Functions* and select *Purging 2*. This will open the valves and allow the ethanol to permeate the line system.
9. Allow the ethanol to remain in the line system for about 10 minutes.
10. Repeat opening the *Manual Functions* and selecting *Purging 2*.
11. Reconnect the oxygen pressure line.
12. Purge the line system using the manual function *Purging 2* twice.

**CAUTION**

Ethanol might leak out of the rear oxygen inlet/outlet and the pressure line opening in the test chamber!

**WARNING**

**Danger of injury**

During the purging process, sample residues can be blown out of the test chamber!

Place a cloth over the test chamber.

Do not lean over the test chamber!

**NOTICE**

Make sure that no traces of ethanol remain in the instrument, as this would affect the results of subsequent measurements.

We recommend that you let the test chamber heat up for a short while and/or let it dry overnight (without screw cap and with open cover).

## 8.2 Wetted parts

The following table lists all wetted parts and the material they are made of.

**Table 9:** Wetted parts

| Part | Material |
|---|---|
| Test chamber | RapidOxy 100:<br>Stainless steel, 1.4529<br>RapidOxy 100 Fuel:<br>Aluminum, gold-plated |
| Screw cap:<br>- inside of cap | <br>RapidOxy 100:<br>Stainless steel, 1.4529<br>RapidOxy 100 Fuel:<br>Aluminum, gold-plated |
| - threaded side | Aluminum alloy, AL Mg4.5 Mn0.7 |
| - outside top | PEEK (polyaryletheretherketone) |
| Oxygen connector/line system | Stainless steel, 1.4305, 1.4310, 1.4401 |
| Seal | FKM (fluorocarbon rubber) |
| Microsol valve | Stainless steel, PPS (polyphenylene sulfide), NBR (nitrile butadiene rubber), FPM (fluorinated propylene monomer), PA 6/6 (polyamide 6/6) |
| Chipsol valve | Stainless steel, HNBR, PPS (polyphenylene sulfide) |
| Glass dishes (large + small) | RapidOxy 100 only:<br>Borosilicate glass 3.3 ISO 3585 |
| O-ring | Viton® |

## 8.3 Maintenance

In regular intervals check the following items for damage or wear and replace if required:

– oxygen pressure line
– screw cap
– power cable
– instrument fuses

**WARNING**

**Risk of serious injury or death**

Never operate the RapidOxy 100 instrument with damaged power cable, oxygen pressure lines, screw cap, or safety hood.

In case of damage, replace these parts immediately with original spare parts, only!

## 8.4 Storing/carrying the instrument

If the instrument is not used for some time, clean it thoroughly and close the screw cap loosely. Store the instrument in a dry and clean place.

Should you need to lift the instrument, remove all cables, accessories, and the oxygen line first. Close the cover and lift the instrument with both hands under the housing.

**NOTICE**

Never lift the RapidOxy 100 by the cover handle!

# 9 Maintenance and repair

## 9.1 Maintenance performed by an authorized Anton Paar representative

A preventive maintenance service carried out by an Anton Paar Certified Service Representative will ensure stable and compliant operation, reliable and accurate measuring results, and ongoing warranty support for your product.[1]

Under certain conditions, if you miss a maintenance service, your warranty is invalidated.[2]

The mandatory and recommended services for your specific product can be found in the following table:

**Table 10:** Maintenance and repair

| Component | Action | Interval | Classification |
|---|---|---|---|
| Sample chamber | Check | 12 months | Mandatory |
| Instrument valves | Check | 12 months | Mandatory |
| Tubing system | Check | 12 months | Mandatory |
| Touch display | Check / Adjust | 12 months | Mandatory |
| Safety cover detection and lock | Check / Adjust | 12 months | Mandatory |
| Leakage | Check | 12 months | Mandatory |
| Temperature adjustment | Check / Adjust | 12 months | Mandatory |
| Pressure adjustment | Check / Adjust | 12 months | Mandatory |
| Flashback arrestor for oxygen | Replace | 12 months | Mandatory |

To fulfill requirements of regulatory authorities e.g. FDA 21 CFR 211.67, PIC/S 023-2 (5.5), Anton Paar offers services for compliant preventive maintenance and requalification for qualified Anton Paar instruments in case of software update, repair, and location change.

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

- Glass dishes
- Disposable syringes
- Pipettes
- Cleaning tissues
- O-rings
- Verification fluid
- Packaging set
- Recalibration of temperature indicator
- Fuses
- Fittings

## 9.2 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”.*

[1] Please contact your Anton Paar representative to schedule preventive maintenance.

[2] For detailed information, please refer to general terms of delivery (GTD) on the Anton Paar website (https://www.anton-paar.com).

# Appendix A Technical data

**Table 11:** Technical data

| Item | Description |
|---|---|
| Power supply | 220 V - 240 V AC, 50/60 Hz<br>100 V - 120 V AC, 50/60 Hz |
| Apparent power | 690 VA |
| Heating power | 500 W (2 × 250 W) |
| Overvoltage category | II |
| Fuses | AC 220 - 240 V: T 3.15 A H, 250 VAC, 5 × 20 mm<br>AC 100 - 120 V: T 6.3 A H, 250 VAC, 5 × 20 mm |
| Protection class | I, according to VDE 0106 |
| Airborne noise emission | < 57 dB(A) |
| EMC radiated emission | Class B |
| Thermal fuse | Cut out for interruption of the heater circuit<br>Temperature threshold max. 216 °C<br>Max. nominal current 10 A @ 250 V |
| Barometric pressure sensor | Max. error 0.6 % full scale |
| Pressure sensor | Measuring range: 0 bar – 20.68 bar (300 psi)<br>Admissible working range: 0 bar – 18 bar<br>Max. error ± 3 % FSS |
| Sample temperature sensor | Pt100, class 1/3 DIN B, EN 60751<br>Measuring range: 0 °C to +180 °C<br>Admissible working temperature range: Room temperature up to 180 °C<br>Error (class 1/3B) = ± (0.1 + 0.0017 × T(°C))<br>Error: 150 °C ± 0.36 °C, 100 °C ± 0.27 °C |
| Oxygen connection | Quick-acting closure coupling<br>NW 5<br>Plug-in nipple at the instrument<br>Input max. 8 bar by connected pressure-reducing part in the original pressure line<br>Gas supply primary pressure: 10 bar<br>**NOTICE**<br>Use only commercially available extra-dry oxygen of not less than 99.6 % purity |
| Data output | 1 × USB at the front/right side<br>1 × USB at the back of the instrument<br>1 × LAN |
| Memory | 100 measurements |
| Touchscreen user interface | Illuminated LCD capacitive touchscreen, 320 × 240 pixel |

**Table 12:** Dimensions and weight

| Item | Description |
|---|---|
| Dimensions (W × D × H) | approx. 200 mm × 410 mm × 250 mm |
| Weight | approx. 8.6 kg |

**Table 13:** Environmental conditions

| Item | Description |
|---|---|
| Ambient temperature | 10 °C - 35 °C<br>**NOTICE**<br>Before putting into operation, the instrument should have been stored at room temperature for at least 24 hours! |
| Relative air humidity | Min. 10 %; max. 80 % (non-condensing). Up to 31 °C decreasing linearly to 66 % at 35 °C |
| Altitude | 0 m - 2000 m |
| Pollution degree | 2 |
| Environmental conditions (EN 61010) | Indoor use only |
| Operating environment | Laboratory bench / laboratory environment |

# Appendix B Error handling

The RapidOxy 100 is an extremely reliable instrument.

In case of errors, follow the instructions on screen.

## Appendix B.1 Safety shut offs - Over-temperature and over-pressure shut off

If the pressure or temperature shut off is applied inform your Anton Paar representative immediately.

These safety measures of the instrument come in place e.g. if strong radical reactions of the tested sample cause a strong raise in pressure or temperature. For safety reasons, the functional components of the instrument have to be checked prior to further use.

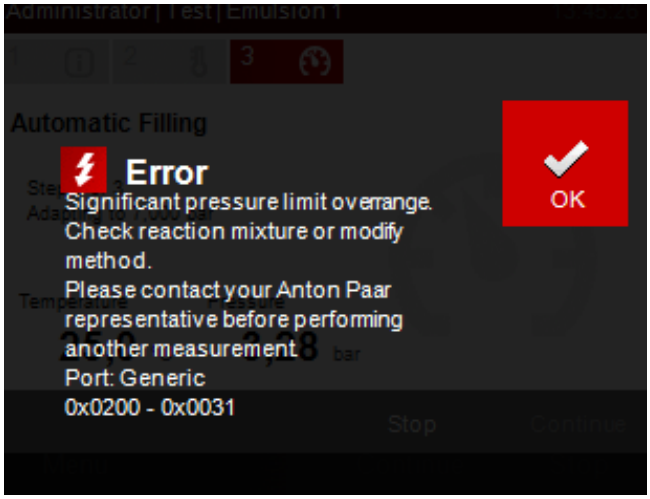


*Fig. 36: Error message: Over-pressure*

**WARNING**

**Risk of serious injury, death, fire, or explosion.**

Never operate the RapidOxy 100 instrument after an automatic safety shut-off without consulting your Anton Paar representative first. An over-pressure can cause damage to oxygen pressure lines, screw cap, and valves. In case of damage, replace these parts immediately with original spare parts, only!

## Appendix B.2 Sample pressure sensor error

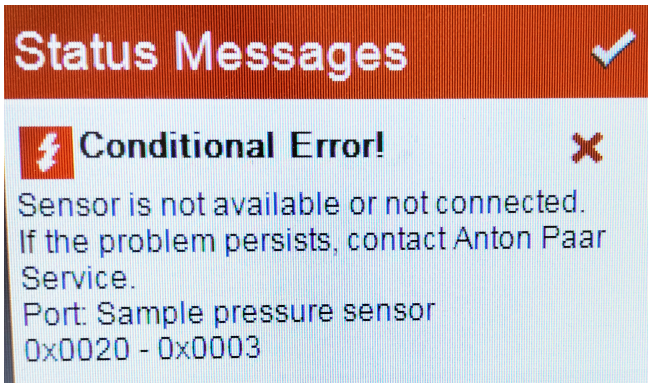


*Fig. 37: Conditional error: Sample pressure sensor*

If this conditional error is displayed, get in touch with your Anton Paar representative. Never operate the RapidOxy 100 instrument after this conditional error without consulting your Anton Paar representative first.

## Appendix B.3 RapidOxy 100 is locked

### Possible reasons

If a power failure occurs or the instrument is turned off during a measurement, the RapidOxy 100 will remain pressurized and the cover is locked for safety reasons and cannot be opened.

**NOTICE**

Do not use any force trying to open a locked cover! You could damage the instrument.

If the cover is locked, the pressure must be discharged as described below.

### Remedy

To unlock the RapidOxy 100:

1. If the instrument is locked, tap the *Unlock* button at the bottom of the display.

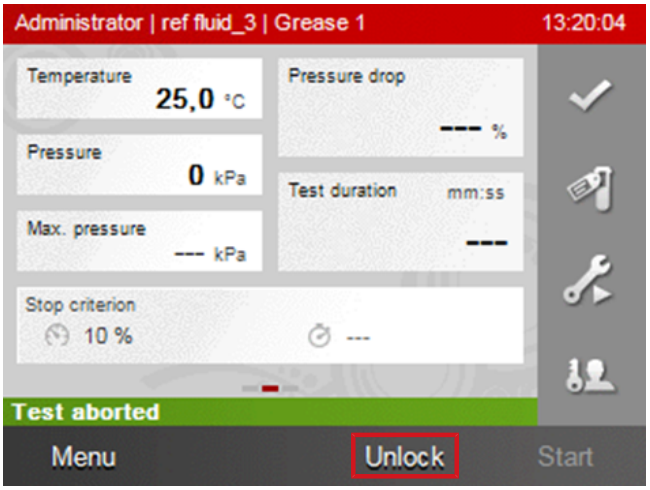


***Fig. 38:*** *Unlock button*

2. You will be prompted to release the pressure. Tap *Yes* to confirm.
3. Wait until the pressure is completely released. You will hear an unlocking sound. The start screen will be displayed and the *Unlock* button is dimmed again and cannot be selected.
   You can now open the cover and the screw cap of the test chamber.

## Appendix B.4 Pressure filling problems

In case you encounter problems during the pressure filling procedure check the following points.

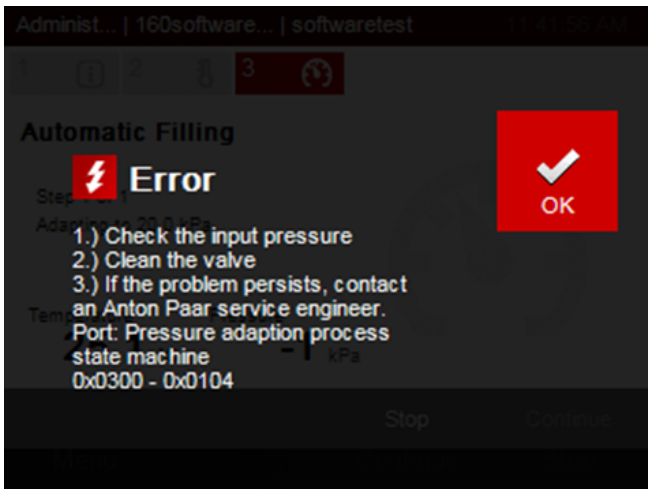


***Fig. 39:*** *Error message: Pressure filling*

To solve this problem:

1. Is the oxygen supply correctly connected?
2. Are the valves of the oxygen supply open?
3. Is there enough oxygen left and is the pressure sufficient (10 bar at the regulator)?

If you can rule out these possible causes, clean the pressure valve and line system of the RapidOxy 100 as described under Section 8.1.5 [▸ 25].

If the problem still persists, contact Anton Paar Service.

# Appendix C Declaration of conformity

Docusign Envelope ID: E9CF9F4F-A083-4F5F-B688-B50C5E4820F4

## EU Declaration of Conformity

(original)

The Manufacturer **Anton Paar ProveTec GmbH**, Ludwig-Erhard-Ring 15, 15827 Blankenfelde-Mahlow, Germany – Europe hereby declares that the product listed below

| | |
|---|---|
| Product designation: | **Oxidation Stability Tester** |
| Model: | **RapidOxy 100, RapidOxy 100 Fuel** |
| Material number: | **222093, 188198** |

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

**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

**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: Blankenfelde-Mahlow, 22 July 2025

Signiert von:
Joerg Essmann
BB21318EBE024BE...

Dr. Jörg Eßmann
General Manager
Anton Paar ProveTec

Signed by:
ppa. S.
49906B99DB9A4C7...

ppa. Dr. Sören Gehne
Product Lines Manager
Anton Paar ProveTec

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