

Measure what is measurable and make measurable that which is not.

Galileo Galilei (1564-1642)

Reference Guide

Multiwave 5000

Instrument Instructions

Instrument Software Version 1.12 (Original Instructions)

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Further information

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Multiwave 5000

Instrument Instructions

Instrument Software Version 1.12 (Original Instructions)

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1 Safety Instructions

Pay special attention to the safety instructions and warnings in the manual and on the product. The **safety instructions of the rotors and vessels** are covered in the **additional manuals**, supplied with the specific rotors.

Read and adhere to the according safety instructions.

WARNING! Do not start to use the instrument before you have read and understood the safety instructions which are ONLY mentioned in the beginning of the manual!

1.1 Conventions for Safety Messages

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



DANGER

Description of risk.

Danger indicates a hazardous situation which, if not avoided, <u>will</u> result in <u>death or serious</u> injury.



Description of risk.

Warning indicates a hazardous situation which, if not avoided, <u>could</u> result in <u>death or serious</u> injury.



CAUTION

Description of risk.

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

NOTICE

Description of risk.

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

1.2 Using the Manual

- Read the manual at hand before using Multiwave 5000. Follow all hints and instructions contained in this manual to ensure the correct use and safe functioning of Multiwave 5000.
- This manual contains important information on operating and handling the instrument. You are therefore required to keep the manual with the instrument, especially when transferring the instrument to other persons. When passing Multiwave 5000 to other users, also hand over documentation and manual materials.

1.3 Liability

- The manual at hand does not claim to address all safety issues associated with the use of the instrument and samples. It is your responsibility to establish health and safety practices and determine the applicability of regulatory limitations.
- Anton Paar GmbH only warrants the proper functioning of Multiwave 5000 if no modifications have been made to the mechanics, electronics, and firmware.
- Only use Multiwave 5000 for the purpose described in this manual. Anton Paar GmbH is not liable for damages caused by incorrect use of Multiwave 5000.

1.4 Operator's Skills

- All personnel involved in the operation and / or maintenance of Multiwave 5000 must be 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 Multiwave 5000.
- 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.

1.5 Moving the Instrument

- Before you move or lift Multiwave 5000, make sure that the cavity is empty and that the instrument is free of chemicals.
- Only transport Multiwave 5000 horizontally.
- Do not lift or carry the instrument by its door. Lift and carry the instrument only with 4 people by gripping the base at the right and left side.
- Never leave a rotor inside the Multiwave 5000 oven when transporting the instrument. This could damage the microwave cavity or the door.

1.6 Installation and Use

- Risk of damage to the instrument or components by improper installation or operation. The installation has to be carried out by qualified personnel who are able to read, understand and apply these instructions.
- Multiwave 5000 is not an explosion-proof instrument and therefore must not be operated in areas exposed to explosion hazards.
- The instrument must only be used in a corrosive-free atmosphere.
- Allow Multiwave 5000 to become acclimatized to ambient temperature before switching on the instrument (e.g. after transportation or storage in winter season).
- Do not use any sensors, accessories, consumables or wearing parts with Multiwave 5000 other than those supplied by Anton Paar GmbH as this might result in serious damage to the instrument or injuries of users.
- Do not use any foreign parts (e.g. damp cloths, spatula, laboratory glassware, etc.) in Multiwave 5000 as this might result in serious damage to the instrument or injuries of users.
- Do not operate the instrument under conditions which could result in damage to property and/or injuries and loss of life.
- Check the instrument, vessels and vials for contamination and clean them, if necessary. Check the vessels and vials for leakage, do not use them if there is any visible damage.
- Supervise Multiwave 5000 at all times during operation.
- In case of damage or malfunction, do not continue operating Multiwave 5000.

- Keep a safe distance of approx. 1 m from Multiwave 5000 while a run is in progress.
- Do not operate Multiwave 5000 if a fault is suspected.
- Do not store containers with flammable reagents or other ignitable materials (e.g. soaked cleaning paper) close to the instrument or on the instrument.
- Do not handle pressure vessels or vials without proper safety measures, as this could result in injury. Always wear goggles, protective gloves and appropriate protective clothing, and keep the vessels or vials in a vented area.
- Make sure that the exhaust unit is always connected to port 4 and 5 (see fig. 5). Do not connect any other instruments to port 4 and 5.
- Follow any special national safety regulation.

1.6.1 Installation of the Exhaust Hose

 The exhaust hose deducts the produced acid vapors safely from the instrument to your exhaust system. In case of a vessel breakage high pressure will be built up and the exhaust hose could be loosened.

WARNING! In case of a loosened exhaust hose toxic substances could be released or splinters be spread. Make sure that the clip of the hose is tightened properly. To do so fix the exhaust hose with the hose clip to the flange of the exhaust of Multiwave 5000.

Multiwave 5000, if used for digestion (with or without Safety Module SOLV), has to be connected to an external exhaust system with a minimum power rate of 300 m³/h.
 Multiwave 5000 with Safety Module SOLV, if used for synthesis and extraction applications, must be installed in a fume hood with a minimum exhaust power rate of 300 m³/h.

It is the responsibility of the owner to ensure that the exhaust system is working properly. A non-working exhaust system will not be able to draw off the amount of hazardous gases escaping in case of a safety disk breakage.

DANGER! In case of a safety disk breakage hazardous gases will be released. While the instrument is working do not perform lab work in the same fume hood which is used for the exhaust hose of the instrument.

- Do not reduce the air flow of the exhaust system during operation of Multiwave 5000.
- Install the hose in such a radius that it won't be squeezed or bent.
- Route the exhaust hose as near as possible to the exhaust intake of the external exhaust system or fume hood and ensure that it can blow freely. In no way vapors must be sucked by the instrument.
- Ensure that there is a bypass between the hose of Multiwave 5000 and the exhaust system to avoid overruling of instrument settings.

1.7 Electrical Hazards

- Before connecting the mains cable, make sure that the local mains supply and frequency correspond to the values on the type plate of the instrument (AC 230 V ± 10 %, 50 Hz or AC 230 V ±10 %, 60 Hz).
- Multiwave 5000 has to be connected to an approved standard socket with protective conductor (TN-C or TN-C-S power supply necessary)! The approved wall outlet must be provided near the place of installation.
- Additionally we recommend a residual current circuit breaker Typ AC, A or B to be installed.
- The mains plug has to be freely accessible and on the outside of the fume hood, so that you can immediately disconnect the plug in the case of an emergency.
- Only use the supplied mains and sensor cables which are designed for the high power input of the instrument.

DANGER! Using a defective cable (e.g. with damaged insulation) can result in an electric shock.

Always check the mains cable for any signs of damage prior to connecting the instrument to the mains supply.

WARNING! Operating the instrument in a humid and/or corrosive atmosphere can result in an electric shock.

Ensure that the installation conditions and requirements are fully met.

In case that liquid accidentally enters the instrument, immediately switch off the instrument and disconnect the mains supply. If corrosive liquid has entered the instrument, call an authorized Anton Paar service engineer. Do not continue to use the instrument.

1.8 Microwave Radiation

The design of Multiwave 5000 ensures that no microwave radiation can leak to the outside as long as the microwave cavity and door have not been damaged. In case of a vessel breakage during a run a damage to the cavity or door can occur.

DANGER! Increased risk of microwave leakage if the door of the instrument is deformed and cannot be closed tightly. Microwave radiation can leak due to a damaged door or microwave cavity and cause damage to eyes or other body tissues. Note that the plastic cover of the door may hide a deformation of the material interior.

Do not operate the instrument if you suspect that the intactness of the rotor, rotor lid, door or cavity could be compromised. Contact an authorized Anton Paar service engineer. In case of a vessel breakage a microwave leakage test must be performed.

WARNING! Danger of microwave leakage if the perforated plates on the left side of the cavity and under the turntable are damaged or corroded.

Do not use the instrument if you detect any deformations or damage.

The instrument has to be checked and tested for microwave leakage by an authorized Anton Paar service engineer.

WARNING! Leakage of microwave radiation.

Ensure that no items are located between instrument cavity and safety door during operation.

CAUTION! Conductive contamination (e.g. pencil marks) may lead to local overheating and destruction of vessels/rotors.

Do not mark any parts of pressure vessels or rotors of Multiwave 5000 with pencils or markers containing conductive ink. A line of electrically conductive substance on the surface of a plastic part may interact with the microwave field, leading to local overheating of the plastic material up to destruction of vessels / rotors.

CAUTION! Danger of damage to rotor parts due to insufficient load.

Never operate Multiwave 5000 without sufficient load as surplus microwave energy may heat rotor parts and damage them. Observe the appropriate loading patterns and minimum filling volumes (see the respective rotor manuals). Never use fewer vessels than in the loading pattern. Follow the recommendations given for the appropriate microwave power.

WARNING! Never try to open the door during a running program.

If you abort a program, wait until the vessels have cooled down to a safe temperature and the safety lock of the door has been released.

1.9 Magnetic Fields

 During operation (microwave energy "ON") a magnetic field is generated by two transformers. Strong magnets are built into the Multiwave 5000.

WARNING! The magnetic field can provoke the heart or central nervous system and can destroy data storage medium, electronic or mechanical components.

- People with pacemakers shall keep a distance of at least 50 cm and during operation 1 m to the instrument to ensure maximum safety.
- Avoid to contact the inner side of the door directly in the area of the door hooks due to the built in magnets.
- Keep credit cards or other cards with a magnetic read-write band away from the instrument. These might be damaged (e.g. if carried in the operator's pocket).

1.10 LED

• The instrument cavity is equipped with bright light emitting diodes (LED). Do not look directly into the light with optical instruments.

1.11 Pressure and Temperature

• Exothermic reactions may result in an uncontrollable pressure increase which can lead to a vessel breakage.

WARNING! In case of a sudden pressure build-up the safety disk or vessel might break and noxious reaction gases may be released.

- The instrument will show an error message and start to cool down.
- Tap "Restart Instrument".
- Follow the instructions on the screen. The instrument will stop the safety cooling after 30 minutes.
- Clean the instrument and rotor parts carefully and inspect them for visual damage.
- Start with a small initial weight for unknown samples and increase the initial weight only after insurance that the sample is not highly reactive.
 - Observe the restrictions on use given in the appendix C.
- In case of a sudden pressure build-up inside the cavity (opening of a safety disk, vessel breakage) the door will slightly open for less than a second and noxious reaction gases may be released.
 - WARNING! In case of a safety disk or vessel breakage the door slightly opens and noxious reaction gases may be released. Do not lean against the instrument or the door. To ensure maximum safety of the operator, Anton Paar recommends keeping a safe distance of approx.1 m from Multiwave 5000 during operation, especially when handling mixtures which contain hydrofluoric acid.
- In case of an explosion inside the oven cavity (e.g. caused by a vessel breakage) rotor parts could get damaged and become unsafe to use.

WARNING! Damaged rotor parts after an explosion inside the oven cavity. Do not operate rotor parts with deformations or damages or fissures.

• The safety disk is there to release overpressure, to prevent the vessel from breaking. If the safety disk responds, the door will slightly open for less than a second and a bang will be heard. WARNING! You might be scared by the bang during a safety disk breakage.

Do not carry out dangerous lab work while the instrument is running.

CAUTION! During an experiment the exhaust hose and exhaust unit become hot. Do not touch the exhaust hose and/or unit without special safety gloves until the safety cooling has finished.

 In case of a power failure or failure of the temperature measurement the vessels inside the microwave cavity could be hot.

WARNING! Risk of burns due to hot vessels in case of power failure or failure of temperature measurement.

- In case of a power failure wait at least six hours before opening the door.
- In case of a failure of the temperature measurement verify the current temperature of the rotor and vessels before removing from the microwave cavity.
- Always wear goggles, protective gloves and appropriate protective clothing, and keep the vessels or vials in a vented area.
- In case of an interrupted airflow a toxic and/or explosive atmosphere due to pressure activated venting can build up inside the instrument.

WARNING! Toxic and/or explosive atmosphere inside the instrument if the fan fails.

- Pay attention to unusual noise, smell and error messages.
- In case of failure of the cooling, switch off the instrument and wait in a safe distance until the vapors are removed.
- Air the laboratory.
- Do not use Multiwave 5000 for applications with flammable organic solvents without having the Safety Module SOLV installed.
- Regularly check the instrument for its cooling performance. A significant increase of the cooling time may indicate the

beginning of a fan failure. In that case contact an authorized Anton Paar service engineer.

WARNING! Danger of vigorous exothermic reactions.

- Start digestions with small sample weights.
- Let samples and reagent react prior to vessel closure.
- With reactive samples use diluted reagents, if applicable.
- Select an appropriate heating program with adequate heating ramp.
- Do not digest pure organic solvents.
- Follow the recommendations given in the Application Guide of MW PRO/5000.

DANGER! Risk of injury due to flames. In the unlikely case of fire inside the oven cavity (e.g. due to local overheating caused by contamination) the instrument will prevent spreading of the fire as long as the door is kept closed.

Never try to open the door in case of fire inside the microwave cavity! The activation of the safety cooling and the small opening of the locked door will provide fresh oxygen and thus kindle the fire. The emitted flue gas will cause the fire to die out rapidly.

- Switch off the instrument as soon as you detect flames inside the instrument. Do not try to open the door!
- If applicable, switch off the fume hood or the exhaust system where the instrument is connected to. This will avoid further air supply to the fire. Typically the fire will cease within a few minutes.
- Due to the possibility of escaping fumes it is recommended to leave the lab. Look after the instrument temporarily.
- As a precaution keep a fire extinguisher ready or call for corresponding assistance.
- After the fire has extinguished wait at least six hours before opening the door. Waiting six hours ensures that rotor and vessels are cooled down sufficiently and overpressure is diminished.
- The operation of the pressure vessels may be liable to individual national regulations. The operator is responsible for the correct installation, handling and service of the pressure vessels and for sufficient training of the operating staff.

1.12 Chemical Hazards

- Observe and adhere to your national safety regulations for handling the chemicals (e.g. use of safety goggles, protective gloves, respiratory protection).
- During handling of the vessels and instrument on routine basis you might get into contact with hazardous chemicals, depending on your performed applications.

WARNING! Risk of injuries due to hazardous chemicals.

Do not work without proper safety measures. Always wear personal protective equipment (safety goggles, protective gloves and appropriate protective clothing).

- During normal operation, acidic condensate may accumulate inside the exhaust hose. Use personal protective equipment when handling or cleaning the exhaust hose.
- Vent the pressure vessels either inside the microwave cavity of Multiwave 5000 with the exhaust unit activated or under a fume hood. Always point the vent of a vessel (e.g. syringe connector, vent opening of the screw cap) away from the operator. Unhealthy gaseous reaction products, such as nitrous gases, may escape.
- Do not digest pure, undiluted organic solvents or flammable liquids. Carefully read and follow the Restrictions on Use in Appendix C of the Instruction Manuals of the respective rotors.

1.13 Multiwave 5000 for Solvent Extractions/Synthesis

• The Safety Module SOLV ensures that in case of unwanted solvent release from a vessel (e.g. leakiness) any released solvent vapors are removed via the exhaust system to the outside of the instrument.

Performing synthesis or extraction reactions in an instrument without Safety Module SOLV could lead to an explosion inside the oven cavity.

WARNING! Risk of explosions inside the oven cavity when performing a synthesis or extraction without installed Safety Module SOLV.

Do not use Multiwave 5000 for synthesis or

extraction applications with flammable organic solvents without having the Safety Module SOLV installed.

- If you use materials with poor microwave absorption properties (e.g. blank samples with non-polar solvents), heating elements in all vessels (see appendix D) have to be used.
- Stop the experiment if you observe insufficient microwave absorption (e.g. not reaching the set temperature, inadequately high microwave power output in combination with a low vessel temperature, even after prolonged reaction times).
- Do not exceed the predefined power (depending on the number of vessels) when using low-absorbing solvents since surplus microwave energy may heat rotor parts which can lead to damage of instrument parts!
- During synthesis and extraction applications ignition sources must not be located in the fume hood.

WARNING! Risk of explosion inside the oven cavity due to formation of explosive vapors.

Heating poorly absorbing solvents to high temperatures can cause sparks, thermal deformation and other damage to the instrument parts, thus resulting in leaking of vessels.

 If explosive mixtures are ignited inside the cavity of Multiwave 5000 for solvent extractions, a reduced explosion pressure of up to 18 mbar can occur inside the cavity. In case of a vessel rupture, a maximum reduced explosion pressure of up to 574 mbar can occur inside the cavity.

WARNING! Risk of injury due to hot pressurized vessels.

Always let the vessels cool down to an internal temperature below the boiling point of the used solvent before removing the rotor. Also adapt the limit of the vessel surface temperature (IR) accordingly.

For temperature limits of the employed solvents with regard to the pressure limit of the rotor in use, see appendix D.

WARNING! Risk of injury due to darting flames and/or noxious gases. In case of a fire inside the instrument, darting flames and/or noxious materials may escape. The fume hood needs to be closed while performing an experiment in order to prevent that hazardous substances are emitted from the instrument. To avoid opening the fume hood during operation, no other instrument or equipment shall be operated during an experiment in this fume hood. No containers with flammable reagents or other ignitable materials must be stored in the fume hood where the instrument is installed.

• To avoid accumulation of solvents and to reduce the risk of formation of potentially explosive mixtures it is not allowed to use the exhaust silencer together with Multiwave 5000 with Safety Module SOLV.

1.14 Cleaning, Maintenance and Service

- Proper cleaning and maintenance of all instrument parts is vital to extend the service life and to ensure proper functioning of the instrument.
- Perform maintenance and cleaning routines regularly during standard operation.
- Before you clean the instrument switch off the instrument and disconnect the mains plug.
- During cleaning and maintenance you might get into contact with hazardous chemicals, depending on your performed applications.

WARNING! Risk of injuries due to hazardous chemicals.

Do not perform cleaning or maintenance procedures without proper safety measures. Always wear goggles, protective gloves and appropriate protective clothing.

 After a vial rupture glass or ceramic splinters could fall out of the rotor when removing it from the microwave cavity.

CAUTION! Risk of injuries due to splinters after a vessel breakage.

Do not perform cleaning or maintenance procedures without proper safety measures. Always wear goggles, protective gloves and appropriate protective clothing.

- Do not open the instrument casing, as this would uncover live parts. Service procedures must be carried out by authorized personnel or by Anton Paar GmbH.
- Installation, service and repair procedures will only be carried out if the "Safety Declaration for Instrument Repairs" form (available on the Anton Paar Website) has been filled out and passed on to the authorized Anton Paar service engineer.
- In case of an instrument damage do not continue to operate the instrument. Call an authorized Anton Paar service engineer.

1.15 Disposal

Concerning the disposal of Multiwave 5000 observe the legal requirements in your country.

1.16 Warning Signs on the Door of Multiwave 5000



Fig. 1: Warning signs on the door of Multiwave 5000



WARNING

The symbols on the door of Multiwave 5000 call attention to the fact that:

- Improper handling and unexpected operation conditions of the instrument can cause injuries.
- In case of a malfunction darting flames and/or noxious gases may escape.
- Read the reference guide before using the instrument.
- Keep a safe distance of approx. 1 m from Multiwave 5000 while a run is in progress.
- Do not open the door of the instrument and refer to the manual in case of unexpected operation conditions.

1.17 Warning Sign on the Exhaust Unit



Fig. 2: Warning sign on the exhaust unit



WARNING

Danger of hot surface.

The exhaust unit might get hot. Do not touch the exhaust unit during and/or immediately after work.

2 Multiwave 5000 - an Overview

2.1 Intended Use



Fig. 3: Multiwave 5000

Multiwave 5000 is a versatile and modular microwave digestion platform as well as an instrument for microwave-assisted parallel synthesis and scale-up.

The instrument supports various rotor types for fast and complete closed vessel digestion under high pressure and temperature and extraction of organic and inorganic samples as well as the preparation of numerous compounds in pharmaceutical, biomedical and other organic-chemical synthesis laboratories.

Find a list of the available rotor types with the according vessels and main applications in section 2.5.

2.2 Features

2.2.1 Microwave Power

Two standard magnetrons of 1000 W deliver up to 2000 W microwave power. To increase the lifetime of the magnetron, the output power is limited by the software to 1800 W in an unpulsed mode over the full power range.

The sophisticated software prevents thermal overshoots and the design of the microwave applicator provides utmost field density with a high homogeneity, which allows efficient heating. Two different kind of temperature sensors are permanently controlling the magnetrons and the dissipated exhaust air. Together with the constant cooling during operation, the instrument provides maximum safety.

2.2.2 Exhaust and Cooling System

The exhaust unit of Multiwave 5000 is programmable in four intensity steps and permanently removes the reaction heat and any escaping gases during operation to extend the durability of the used materials. After a finished run the vessels are cooled down automatically. The door only opens after all vessels have reached the previously set cooling temperature (safety cooling).

2.2.3 Rotor Detection

The sensor system of Multiwave 5000 allows automatic detection of the rotor type and rotor lid and therefore ensures that the applied rotor matches the selected method.

2.2.4 Hands-free Door Opener

The door opens by a simple touch on the right side of the door. It is not necessary to put the rotor aside to open the door. This feature is available for loading the instrument, but is disabled during the run for safety reasons. To unlock the door after a run a recessed safety release button was implemented, to ensure that the door cannot be opened accidentally, in the case all other safety measures fail.

2.2.5 Safety Locks on the Door

Permanent magnets effectively support the opening and closing mechanism of the door. The instrument door is equipped with two strong safety hooks that allow the door to open only a little slit. In case of overpressure in the microwave cavity the door is opened slightly to release the overpressure and immediately closed by the magnets.

2.2.6 SmartLight

A LED bar on the front of the instrument shows the current status of the instrument.

- White light on standard condition, instrument is ready for processing
- White flashing light instrument is waiting for user interaction (e.g. experiment has finished)
- Red flashing light- an error has occurred, instrument is waiting for user interaction
- Red light on "fail-safe", instrument needs to be restarted

2.2.7 IR Temperature Measurement

By default, the instrument comes with one IR sensor, which is installed at the bottom of the microwave cavity. It measures and records the surface temperature at the bottom of the pressure vessels (Rotor 8, Rotor 16) and prevents overheating.

With HVT vessels it controls the internal temperature (in combination with a temperature model), thus providing accurate and user-friendly temperature control in all vessel positions.

NOTICE

For Rotor 41HVT56 a second optional IR sensor for the inner circle is required.

TIP: It is recommended to check and, if necessary, adjust the IR temperature sensor(s) at least once a year.

The IR temperature sensors can be retrofitted by an authorized Anton Paar service engineer.

2.2.8 SmartTemp

Due to its special design, SmartTemp allows contactless temperature measurement inside the pressure vessels, thus providing a more accurate temperature measurement with shorter response times and faster reaction control.

SmartTemp is an option for Rotor 12HVT50, 24HVT50, 24HVT80 and 41HVT56. When installed, it will be used by default for these rotors.

NOTICE

SmartTemp is required for operation of Rotor 20SVT50!

TIP: It is recommended to check and, if necessary, adjust the SmartTemp at least once a year.

The SmartTemp can be retrofitted by an authorized Anton Paar service engineer.

2.2.9 Sensor Supply

The optional Sensor Supply provides wireless power supply and data transfer between Multiwave 5000 and an internal temperature or pressure sensor, thus allowing full rotation of the rotors.

NOTICE

The Sensor Supply is required for operation of Rotor 8 and for the optional p/T- Sensor and p-Sensor of Rotor 16.

The Sensor Supply can be retrofitted by an authorized Anton Paar service engineer.

2.2.10 SmartVent Detection

SmartVent Detection is an optical sensor which is placed in the exhaust air duct.

If venting gases (especially NO_x) are released (e.g. during pressure-activated venting), SmartVent Detection will detect these gases. If a certain response level (which can be set by the user) is exceeded, the exhaust unit will be briefly activated in order to draw off the released gases in order to enhance the corrosion resistance of the instrument, without having the need to shut down the microwave power and ending the run. In addition, a status message will be shown.

The SmartVent Detection is an option for the following rotors: 12HVT50, 24HVT50, 24HVT80, 41HVT56 and 20SVT50.

The SmartVent Detection can be retrofitted by an authorized Anton Paar service engineer or by the customer.

2.2.11 Safety Module SOLV

Besides acid digestion Multiwave 5000 offers the opportunity to perform solvent extraction and chemical synthesis.

When using organic solvents the installation of Safety Module SOLV is required.

It is installed underneath the cavity and monitors the exhaust airflow in order to prevent the formation of dangerous concentrations of solvent vapors inside the instrument. In case of an insufficient or interrupted airflow the microwave power is switched off immediately.

The Safety Module SOLV can be retrofitted by an authorized Anton Paar service engineer.

2.2.12 Magnetic Stirrer Accessory

The optional Magnetic Stirrer Accessory mixes the vessel content by the help of magnetic stir bars inside the closed pressure vessels. The Magnetic Stirrer Accessory is mounted on the bottom of the instrument.

Depending on the application, stirring helps to obtain better recoveries or to attenuate spontaneous reactions by avoiding local overheating inside the vessels. Typical applications requiring stirring:

- Homogeneous leaching of soils and ashes
- Solvent extraction
- Chemical synthesis
- Floating samples (e.g. polymers, oil samples)

NOTICE

- The Magnetic Stirrer Accessory has to be installed by an authorized Anton Paar service engineer.
- When using Rotor 8N with a T-Probe: If a stir bar is used, only use T-Probe S and the shorter immersion tube.
- Do not use the Magnetic Stirrer Accessory with quartz vessels for digestion applications as the surface of the vessels may be damaged.

TIP: Some of the features described above are optional:

- IR temperature inner sensor
- SmartTemp sensors
- Sensor Supply
- SmartVent detection
- Safety Module SOLV
- Magnetic Stirrer Accessory

There are two ways to find out which items are installed into your Multiwave 5000:

- In the Multiwave 5000 software go to Menu > System Information.
 The installed items will be listed there.
- The run data files in the Data Explorer contain a configuration entry consisting of 8 binary digits, e.g. 'Configuration: 01101011' (0...not installed, 1...installed).
 - The digits stand for:
 - (place holder)
 - magnetic stirrer
 - SmartTemp
 - Safety module SOLV
 - SmartVent
 - SmartTemp inner circle
 - SmartTemp outer circle
 - IR sensor inner circle

2.3 Functional Components

Front and side views



Fig. 4: Side view of Multiwave 5000

- 1 Touchscreen
- 2 Safety release button
- 3 Door with integrated hands-free door opener
- 4 Air inlet rotor cooling and exhaust
- 5 Air inlet magnetron cooling



- 6 Connection for Lead Through EVAP (optional)
- 7 Mains switch
- 8 Air inlet
- 9 Two USB ports
- 10 One USB port and one Ethernet port

Rear view



Fig. 5: Rear view of Multiwave 5000

- 1 Fitting for the exhaust hose
- 2 Exhaust unit
- 3 Port signal SmartVent Detection
- 4 Port signal exhaust unit
- 5 Port mains cable exhaust unit
- 6 Port mains cable

2.4 Interfaces

2.4.1 USB Ports

Three USB ports can be used for connecting different accessories:

- A USB storage device for immediate data export.
- A mouse for navigation on the screen.
- An alphanumeric keyboard for simplified data input.
- A local printer for instant printing of reports.
- A WiFi module (optional) for connection to wireless networks.

TIP: Do not connect the USB storage device until Multiwave 5000 has completed the startup procedure.

If more than three accessories are required, a USB hub can be connected.

2.4.2 Ethernet Port

The Ethernet port provides a possibility for integration of Multiwave 5000 in laboratory network systems. Both manual and automatic printing with LAN printer is supported.

2.5 Rotors, Vessels and Sensors

TIP: The rotors can be ordered in various configurations, according to the used vessel- or vial-type. Refer to the Product Description List for the ordering information.



Fig. 6: Rotor Family

Different rotor types according to the typical application

Potor	Digestion	Extraction ¹	Synthesis ¹
	Digestion		
Sample Preparation & Synthesis			
Rotor 12HVT50	х	-	-
Rotor 24HVT50	х	-	-
Rotor 24HVT80	х	-	-
Rotor 41HVT56	х	-	-
Rotor 20SVT50	х	х	-
Rotor 8NXF100	х		x
Rotor 8NXQ80	х		x
Rotor 16MF100	х		x
Rotor 16HF100	х		x
Rotor 16SOLV MF100	-	х	
Rotor 16SOLV HF100	-	х	
Rotor 64MG5	х		-
Synthesis			
Rotor 4x20 MGC	-	х	x
Rotor 4x24 MG5	-	х	х

x) typical application

-) not applicable

Blank fields - not recommended

¹) Multiwave 5000 must be equipped with Safety Module SOLV



3 Checking the Supplied Parts

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

NOTICE

Check the instrument for visible damage before installation!

In case of any damage, further operation is not allowed since leakage of microwave radiation cannot be excluded. Contact the transport company and your Anton Paar representative.

- Keep the packaging material (box, foam piece, transport protection) for possible returns and further questions from the transport and insurance company.
- There are many small parts distributed throughout the packaging - please retain all packaging materials until installation is complete and all parts are accounted for.
- Check the delivery for completion by comparing the supplied parts to those noted in the table 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.

Pcs.	Article Description	Mat. No.
1	Multiwave 5000 50 Hz 60 Hz	222110 222111
1	Power cable according to the destination	
1	Hose clip	74904
1	Air exhaust hose antistatic	184269
1	Air exhaust hose antistatic (for Multiwave 5000 with safety module SOLV only)	184889
	Final inspection certificate	

Table 1: Supplied Parts

4 Installation



WARNING

Before you start with the installation of Multiwave 5000 carefully read and follow the safety instructions (see section 1)!

NOTICE

The installation must be performed by a qualified and authorized Anton Paar representative.

4.1 Installation Requirements

To ensure trouble-free processing:

- Never place Multiwave 5000:
 - next to a heating facility, like a water bath, sand bath or a hot plate.
 - near an air conditioning, ventilation system or an open window.
 - in direct sunlight.
- Multiwave 5000 must be placed on a fire resistant surface.
- Do not keep any flammable substances (e.g. solvents) near the instrument when performing extractions.
- · Keep the instrument away from magnetic fields.
- Avoid vibrations.
- The surrounding environment of the instrument must be kept clean.
- A distance of additionally 15 cm on all sides is required to ensure proper venting of Multiwave 5000.
- The instrument has to be easily accessible for operation.
- Any spills of chemicals, solvents etc. have to be removed immediately using appropriate equipment.
- The valid Laboratory Safety Regulations and Occupational Safety Regulations must be observed.

4.2 Unpacking and Packing Multiwave 5000

For packing the instrument perform the following steps in reverse order.

NOTICE

Do not use metal clamps to avoid scratches on the surface of the instrument. Transport Multiwave 5000 only in the original packaging to avoid transport damage.

- 1. Loosen the belts on the transportable pallet.
- 2. Remove the adhesive tapes that seal the carton.
- 3. Remove the cardboard sleeve around the unit (see fig. 7).



- Fig. 7: Cardboard sleeve around the instrument
- 4. Remove the L-foam piece on the top of the exhaust unit at the rear side of the instrument.



Fig. 8: L-foam piece

5. Remove the top foam piece from the instrument (see fig. 9).



Fig. 9: Multiwave 5000 with top and bottom foam piece

6. Lift the instrument out of the bottom foam piece and transportable pallet.



CAUTION

Do not lift Multiwave 5000 by the instrument door. Lift and carry the instrument only with at least 4 people by gripping the base at the right and left side

- 7. Take the power cable from the top of the instrument and connect the cable to the port of the mains cable (see fig. 5).
- 8. Connect the instrument to the power supply.
- 9. Switch on the instrument.
- 10. Open the door of the instrument and remove the supplied carton out of the microwave cavity of Multiwave 5000.
- 11. Remove all parts additional to the main instrument such as the exhaust hose and hose clip out of the supplied carton.

4.3 Installing Multiwave 5000

- 1. Unpack Multiwave 5000 (see section 4.2).
- 2. Check the instrument for visible signs of damage.
- 3. Make sure that the door can be closed properly and the sealing surface of the door is not damaged.

NOTICE

If the instrument has been transported at low temperatures, let it adjust to room temperature before switching it on.

- 4. Check the proper installation of the foam seal between tube and exhaust unit (see fig. 64).
- 5. Position the foam piece as shown in fig. 10.



Fig. 10: Correctly placed foam piece and attaching the exhaust hose to the exhaust unit

- 6. Attach the exhaust hose to the flange of the exhaust unit.
- 7. Tighten the clip to properly fix the exhaust hose to the exhaust unit.
- 8. Lead the open end of the exhaust hose into the fume hood or an external exhaust system.



Fig. 11: Schematic representation of an incorrectly attached exhaust hose without bypass (A) and correctly attached exhaust hose with bypass (B)

4.4 Installing the Antistatic Hose (Mandatory When Safety Module SOLV is Installed)

To avoid electrostatic discharges, the standard hose is replaced by a hose made of antistatic material. The antistatic hose is equipped with a wire connected to the metal support of the hose to draw off any static charge of the hose material. This wire has to be connected to metal or housing of the instrument to ensure that any static charge is guided to the ground. To do so the wire is equipped with a lug and can be fixed to the housing of the exhaust unit.



Fig. 12: Antistatic hose

- 1. Attach the end of the hose with the wire onto the flange of the exhaust unit.
- 2. Tighten the clip to properly fix the exhaust hose to the exhaust unit (see fig. 13).



Fig. 13: Connecting the hose and tightening the clip

3. Remove the right screw on the bottom of the exhaust unit (Torx screwdriver size TX20 required) (see fig. 14).



Fig. 14: Removing the screw

4. Put the cable lug onto the screw (see fig. 15).



Fig. 15: Putting the cable lug onto the screw

5. Screw in the screw and fix the cable lug tightly to the housing of the exhaust unit (see fig. 16).



Make sure that the screw is tightly fixed - as the interconnection to ground is made by pressing the screw onto the cable lug. Without proper interconnection the static charge cannot be



removed from the hose.

Fig. 16: Tightly fixed screw

6. Remaining installation procedure has to be performed as described in section 4.3.

4.5 Installing the SmartVent Detection

- 1. Switch off the instrument.
- 2. Turn Multiwave 5000 to the back side and loosen the two nuts and ribbed washers which fix the safety bracket.



Fig. 17: Loosening the fixing nuts of the safety bracket

3. Remove the safety bracket and the cover from the exhaust channel.



Fig. 18: Removing the safety bracket and cover

4. The SmartVent Detection has a small notch on the surface.



Fig. 19: SmartVent Detection with notch

TIP: The SmartVent Detection is delivered with cable as standard.

5. Install the SmartVent Detection with the notch pointing down.



Fig. 20: Correctly inserted SmartVent Detection

6. Put on the Safety Bracket 5000 and fix it with the nuts.



Fig. 21: Fixing the Safety Bracket 5000 with the nuts

7. To ensure that the SmartVent Detection seals completely, the detector is screwed on with the black screw until there is no gap between detector and exhaust channel.



Fig. 22: Fixing the SmartVent Detection with the screw



Incorrect with gap

Correct without gap

Fig. 23: Correctly and incorrectly installed SmartVent Detection

8. Connect the cable of the SmartVent Detection to the instrument.



Fig. 24: Cable connection of the SmartVent Detection

- 9. Switch on the instrument.
- 10. Set the threshold of the SmartVent Detection (see section 7.6.1).
- 11. The SmartVent Detection is now ready to use.

5 Sensor Calibration



WARNING

Risk of burns due to hot calibration insert.

The calibration insert becomes very hot (up to 220 $^{\circ}\text{C}$) during calibration.

• Wait at least 20 minutes after calibration before touching the calibration insert.



WARNING

Risk of burns due to wrong positioning of the Calibration Unit

- Do not use the calibration insert in Rotor 16 to perform a calibration. Parts of the rotor could melt.
- Do not start calibrations while the Calibration Unit is still outside the instrument. The calibration insert becomes very hot.

Anton Paar recommends annual calibration of the IR sensor(s), SmartTemp Sensor(s), the optional wireless sensor accessories (p/T-Sensor Accessory for Rotor 16 and T-Probe for Rotor 8) and the microwave power.

The following table shows the required tools for calibration and the recommended calibration intervals.

NOTICE

When using the Calibration Unit from Multiwave PRO you have to upgrade it with the Alignment Calibration Unit MW5000 (Mat. No. 226476).

Table 2: Calibration - required tools and intervals

Sensor/ Function	Required Tools	Calibration Interval
T-Probe	Calibration Unit, Rotor 8, 3 empty pressure vessels	Annually
p/T Sensor Accessory	Calibration Unit	Annually

Table 2: Calibration - required tools and intervals

Sensor/ Function	Required Tools	Calibration Interval
IR Sensor outer circle inner circle	Calibration Unit	Annually
SmartTemp outer circle inner circle	Calibration Unit	Annually
Microwave Power	Thermometer, 1 kg water, beaker with approx. 190 mm in diameter	After installation and semi- annually

TIP: The Calibration Unit is an optional accessory. The calibration can also be carried out by an authorized Anton Paar service engineer. Contact your local Anton Paar representative for further information.

5.1 Calibration of Temperature Sensors

- 1. Before calibration, clean the temperature sensor with a damp cloth or cotton bud.
- 2. Prepare the Calibration Unit according to the desired calibration procedure (see chapter 5.1.1 to 5.1.3).
- 3. Connect the cable of the Calibration Unit to the instrument.
- 5. Select the desired calibration.
 - T-Sensor¹
 - IR Outer Sensor / T-Sensor¹
 - IR Inner Sensor²
 - IR Outer Sensor
 - SmartTemp Inner²
 - SmartTemp Outer²

¹⁾...only displayed on screen when Sensor Supply installed

²⁾...only displayed on screen when installed

6. Start the calibration and follow the instructions on the screen.

- 7. After the calibration has been finished choose between the **following options**:
- Confirm:

the actual measurement will be stored, but does not affect the original calibration

• Extend:

the validity of the original calibration will be extended for one year from now on

- Apply: the original calibration will be replaced by the actual calibration
- 5.1.1 Inserting the Alignment Calibration Unit MW5000

The Alignment Calibration Unit MW5000 is necessary to position the Calibration Unit correctly into the cavity for the following calibration procedures:

- IR Outer Sensor (+/- p/T-Sensor)
- IR Inner Sensor
- SmartTemp Outer Sensor
- SmartTemp Inner Sensor

SmartTemp Inner SmartTemp Outer



IR Inner

IR Outer

Fig. 25: Location of the different sensors

- 1. Remove the turntable and drive star from the cavity.
- 2. Insert the Alignment Calibration Unit MW5000 (see fig. 26, fig. 27, fig. 28 and fig. 29).



Fig. 26: Positioning for the SmartTemp Outer Sensor



Fig. 27: Positioning for the SmartTemp Inner Sensor



Fig. 28: Positioning for the IR Outer Sensor



Fig. 29: Positioning for the IR Inner Sensor

5.1.2 Preparing the Calibration Unit for SmartTemp Sensors, IR Sensors and p/T-Sensor Accessory



Fig. 30: Schematic representation of the Calibration Unit

- 1 Positioning screws for the sensor accessory
- 2 Metal support
- 3 Lock II
- 4 Lock I
- 5 Connection cable
- 6 Calibration insert
- 7 Calibration insert holder
- 8 Front side
- 9 Counter weight
- 1. Pull lock I to the rear (fig. 31).
- 2. Lift the metal support to stop position (fig. 31).



Fig. 31: Pulling lock I and lifting the metal support to stop position

- 3. Place the calibration insert into the calibration insert holder (see fig. 32).
- 4. Lift the lock II (see fig. 32).

5. Place the holes of lock II directly onto the screws of the calibration insert (see fig. 32).

NOTICE

Ensure that the 2 screws of the calibration insert are fitting into the corresponding holes of lock II.



Fig. 32: Inserting the calibration insert and fixing it with lock II

Additional steps for calibrating the p/T-Sensor Accessory

- Insert the p/T-Sensor Accessory into the Calibration Unit (fig. 33).
- Place the p/T-Sensor Accessory between the positioning screws on top of the metal support (fig. 33).



Fig. 33: Inserting the p/T-Sensor Accessory and placing it between the positioning screws on top of the metal support

6. Put the Calibration Unit onto the Alignment Plate.



Fig. 34: Inserting the Calibration Unit for the calibration SmartTemp and IR Sensor(s)



Fig. 35: Inserting the Calibration Unit for the calibration *p*/T-Sensor Accessory

7. Connect the Calibration Unit to the instrument.

NOTICE

Risk of damage of connection cable.

Do not close the door of Multiwave 5000 as this could damage the connection cable of the Calibration Unit.



Fig. 36: Connected cable

8. Start the calibration procedure and follow the instructions on the screen.

5.1.3 Preparing the Calibration Insert for T-Probe/T-Probe S

The calibration of the T-Probe/T-Probe S requires the calibration insert, spacer and centering jacket from the optional Calibration Unit, Rotor 8N with three (empty) pressure vessels, the immersion tube with seal and the centering pin.



Fig. 37: T-Probe with calibration insert

- 1 Protective cap
- 2 Immersion tube with seal
- 3 Spacer
- 4 Cable of the calibration insert
- 5 Calibration insert
- 6 Centering jack
- 1. Put the calibration insert into the centering jacket.
- 2. Place the spacer on top of the calibration insert (see fig. 38).

NOTICE

Ensure that the 2 screws of the calibration insert fit into the pits of the spacer.





Fig. 38: Putting the calibration insert into the centering jacket and placing the spacer onto the calibration insert

- 3. Insert the immersion tube with seal into the calibration insert (see fig. 39).
- 4. Place the protective cap of the pressure vessel onto the seal (see fig. 39).







Fig. 39: Inserting the immersion tube with seal, placing the protective cap onto the seal and complete vessel assembly

- 5. Insert the complete vessel assembly into Rotor 8N on position No. 1.
- 6. Insert three empty vessels into Rotor 8N in positions 3, 5 and 7.
- 7. Check the proper positioning with the centering pin of the T-Probe/T-Probe S (see fig. 40).

NOTICE

- If there is resistance when inserting the centering pin, adjust the vessel and try again. Repeat the procedure until there is no resistance anymore.
- Do not insert the T-Probe/T-Probe S unless the vessel is correctly positioned and the rotor is closed properly. Otherwise the thermometer capillary may break.
- 8. Carefully insert the T-Probe/T-Probe S through the hole of the upper plate into the vessel assembly with the calibration insert.



Fig. 40: Entering the vessel, checking the proper positioning with the centering pin and inserting the T-Probe

9. Enter the rotor without lid into the microwave cavity and place it onto the turntable.



Fig. 41: Loaded rotor without lid

10. Connect the cable of the calibration insert to the instrument.

NOTICE

Risk of damage of connection cable.

Do not close the door of Multiwave 5000 as this could damage the connection cable of the Calibration Unit.

11. Start the calibration procedure and follow the instructions on the screen.

5.2 Performing a Microwave Power Calibration

Required tools:

- 2 L glass beaker (Ø approx. 190 mm)
- Thermometer with
 - resolution of 0.1 °C
 - range of 15 to 45 °C
- 2. Select "Microwave Power".
- Fill a beaker with 1000 g tap water with approx. 20 °C.
- 4. Enter the desired target power.

TIP: With values up to 1000 W a calibration can be carried out, with values above 1000 W only a power check can be carried out.

- 5. Check the amount of water and fill in the correct value.
- 6. Open the door of Multiwave 5000.
- 7. Place the beaker centrically onto the turntable plate.
- 8. Measure the initial water temperature and enter the value.
- 9. Close the door of Multiwave 5000.
- 10. Tap Start Heating.
- 11. Open the door of Multiwave 5000 when the heating time has elapsed.
- 12. Measure the water temperature.

TIP: Stir the water when measuring its temperature to achieve a homogeneous temperature distribution.

- 13. Fill in the Final Temperature.
- 14. Tap <Next>. The microwave power factor is now displayed.
- 15. Choose one of the following options:
 - **Confirm:** the actual measurement will be stored, but does not affect the original calibration
 - Extend: the validity of the original calibration will be extended for one year from now on
 - **Apply:** the original calibration will be replaced by the actual calibration
- 16. Remove the beaker.

6 Operating the Instrument

6.1 Basic Operation and Input Devices

IMPORTANT: All instructions in this manual relate to touchscreen operation.

6.1.1 Touchscreen

Basically, you can operate your instrument like a smartphone. The touchscreen of the instrument accepts the following finger movements.

Тар

Tap on any functional element, and it will do whatever its purpose is: a button will initiate an action, a switch will change its state, a drop-down box will fold out a selection list etc.

Tap on an item to select it.

Hold

Tap and hold your touch a little longer. Holding a screen element may pop up options depending on the context. E.g., on the onscreen keyboard (see section 6.1.2), holding some keys will open a box with more options to select from (if available).

Drag

Holding and dragging a screen element will move it up, down, left, right, if the operation is available.

Slide

Slide a finger on the screen in one direction. The operation is similar to dragging.

To access the MyData view, slide up the current screen (provided it is not modal). To return, slide down the MyData view.

To **scroll** information that does not fit on the screen, slide it up/down or left/right (if available). To scroll items in a list, slide up/down in the list. In these cases a slider will appear (and after some time disappear again) beside (for up/down) or below (for left/right) the text.

TIP: Sometimes it may not be clear whether portions of an information are out of screen. Simply try scrolling this part of the screen to make sure.

6.1.2 Onscreen Keyboard

If you tap on an input field, an onscreen keyboard will slide in so that you can type text or numbers.

You may see variants with a subset of characters, depending on reasonable options for the particular input field.

- Tap on characters to enter them at the cursor position in the input field.
- Some keys of the onscreen keyboard (upper row on the alphabetic keyboard) provide multiple character options to select from:
 - a. Hold the key until a character selection box folds out (see example in fig. 42).

	¢	ĉ	3	é	è
1	q	² w	0	4 r	⁵ t



- b. Then tap on one of the keys in the selection box to enter it at the cursor position in the input field.
- Some keys (the ones that are not white) have special functions. See table 3 for their meaning.

Table 3: Function keys on the onscreen keyboard

Hides the onscreen keyboard.
reappear.)
¹²³ Switches between alphabetic and numerical keyboard.
Shifts the next letter to upper case. (Disabled on the numerical keyboard.)
Moves the cursor (entry point for the next
character) left/right.
Deletes the character left of the cursor.

6.1.3 USB Mouse (Optional)

If you connect a USB mouse to one of the instrument's USB sockets you can use it in addition to the touchscreen.

The mouse will be detected and installed automatically when plugged in.

Touchscreen operations translate to mouse operations as follows:

- A mouse **click** is equivalent to a touchscreen tap.
- A mouse **click and hold** is equivalent to a touchscreen hold.
- A mouse **drag** is equivalent to a touchscreen drag.
- There is no mouse equivalent for a touchscreen slide.
 However, you can also access the MyData view by a click operation.
 A mouse scroll (with a scroll wheel) is equivalent to a touchscreen scroll. You can also drag with the mouse to scroll.

6.1.4 USB Keyboard (Optional)

If you connect a USB keyboard to one of the instrument's USB sockets you can use it in addition to the touchscreen for data input.

The keyboard will be detected and installed automatically when plugged in.

Set the keyboard layout according to your USB keyboard so that the correct characters will be entered, see section 7.1.

• Select any input field and type on the keyboard to enter text or numbers.

6.1.5 USB Barcode Reader (Optional)

If you connect a USB barcode reader to one of the instrument's USB sockets you can use it in addition to the touchscreen for data input.

IMPORTANT: The barcode reader has to be configured as "USB Keyboard HID" (see the manual of the barcode reader).

If you encounter reading problems, refer to the manual of the barcode reader, further settings may be necessary.

The barcode reader will be detected and installed automatically when plugged in.

• Select any input field and scan a barcode to enter text or numbers.

6.2 Functional Screen Elements

6.2.1 Common Screen Elements

- *Menu* button:
- opens the menu
- MyData View button: accesses the MyData views

6.2.2 Header

The header at the top of the screen always keeps you informed on instrument settings.

- Tap on an element in the header to have a control panel slide in showing more details or associated operations or a selection of settings that you can change on the fly.
- Tap anywhere outside the control panel to close it.

6.2.3 System Notifications

System notifications are collected in the header under ₱. A number beside the symbol shows the number of collected notifications. Colors indicate the notification category.

Table 4: Notification categories

4	<i>Error:</i> A severe problem has occurred, which needs to be solved before you continue with your experiments.
	<i>Warning:</i> A minor problem (may be temporary) or a reminder requires your attention.
	<i>Information:</i> Non-critical message from your instrument.

- Tap I to view all notifications.
- Tap on a notification to see all available details.

6.2.4 Favorites Button

The *Favorites* button adds a link to the current spot on the home screen. It switches between the two states "already added" (\bigstar) and "not yet added" (\bigstar).

Favorites on the home screen give you quick access to the instrument functions that you need every day.

6.2.5 Action Boxes

Action boxes contain tools suited for the context in which they appear.

Tap is to fold out more details of an action box.
 Details include explanations of the icons:



Fig. 43: Example of an action without/with details

Or may reveal more tools:



Fig. 44: Example of a list action without/with details

Action controls

Some actions open action controls. Multiple action controls can be open at the same time.

• An action control consists of three parts:



Fig. 45: Example of an action control for sorting a list

- 1 Icon identifying the action control
- 2 Control part defining the actual function
- 3 Close button of the action control
- Tap on the control part to configure the control function (further settings may fold out).
- Some action controls look like this:

Fig. 46: Example of an action control for selecting and then removing, exporting, or comparing the selected items

In this case even the identifying icon carries a function (select/deselect all items by tapping on the icon).

Tap on one of the icons in the control part to start an activity controlled by the action.

Tap X to close an action control.

6.3 Screens – Navigation, Information, Control

6.3.1 Home Screen - Your Favorites



Fig. 47: Example home screen

- 1 Currently added favorites
- 2 Header
- 3 Menu button
- 4 MyData view button

The home screen (fig. 47) collects your favorites (see section 6.2.4) giving you quick access to the instrument functions that you need every day.

It is the first screen that you see when the instrument has finished its initialization routines, and it is the place where you basically start all operations.

The *Home* button **n** on the instrument always brings you back to the home screen.

You can completely define and arrange the favorites on the home screen as you like:

- Hold a favorite on the home screen, then drag it to a different place.
- Hold a favorite on the home screen, then delete it (tap iii).
- To add new favorites, tap x where available.
 New favorites are marked "New" on the home screen until you first use them.

6.3.2 Menu Screen - All Functions



Fig. 48: Menu screen

The menu (fig. 48) links to all functions available on your instrument.

When you tap \blacksquare , it is superimposed on the current screen as a transparent layer.

- If you tap on a function in the list, you will be taken directly to the spot or to a list for further selections, depending on the function.
- You can filter the list on the right by selecting a category on the left.

Tap on the category again to reset the filter.

• To add/remove functions as favorites on the home screen for quick access, select/deselect them in column 3, fig. 48.

TIP: The availability of the functions depends on the permissions of the current user.

6.3.3 Wizards

Wizards are modal screens that guide you through procedures, e.g. creating a method. The wizard only allows you to follow the procedure to the end - or to cancel the whole procedure.



Fig. 49: Example: Creating a new method

6.3.4 MyData View



Fig. 50: MyData view

The MyData view (fig. 50) serves to monitor your experiments.

- Slide the bottom of the current screen up or tap
 to access the MyData view.
- Slide the screen of the MyData view left or right to get additional information.
- Slide the top of the MyData view down or tap the button in the top left corner to return to the current screen.

6.4 Data Explorer

The data explorer is your tool to access and manage all saved data, be it experiment data, calibration data, audit trail, manuals and video data.

Depending on the used rotor type, Multiwave 5000 can store between 1600 and 5000 h of experiment data. The instrument will ask for removal of experiment data if only 45-140 H of runtime storage are left. If the memory is full, no more experiments can be performed.

- 1. Select **a** *Data explorer* in the menu to access data in the data memory.
- 2. Then tap on one of the available data categories, e.g. *Experiment Data*.

You will see a list of the available data sets in this data category.

- You can sort and filter the list of data sets by various properties:

Use the actions in the action box.

The following data categories are available:

Experiment data

Allows you to open, export/print and remove experiment data. You can also add the sample documentation as long as the data file has not been exported (or electronically signed).

If electronic signature is enabled, you can also check and electronically sign the data.
Calibration data

Allows you to open, export/print and remove calibration data. Note that the most recent calibration cannot not be removed.

Method overview

A simple listing of all methods, which allows you to open, modify, copy and remove methods. Note that the initially installed Anton Paar methods can neither be modified nor removed.

Audit trail

If the audit trail is enabled, you can filter, export and remove audit trail entries. Note that you can remove audit trail entries only which have been exported already.

Manual browser

This section contains all instruction manuals of Multiwave 5000 as PDF files, which can be downloaded on a USB memory device or a network share.

Video browser

The Video browser contains the Video Manual of Multiwave 5000, showing you correct operation and handling of the instrument and its accessories.

Actions available in the data explorer

Depending on its context, an action box in the data explorer may include any of the following actions:

Table 5: Actions in the data explorer

T	<i>Filter</i> Opens an action control where you can specify criteria, which items shall be shown in the list.
	 Select Opens an action control and enables you to select items in the list. While the action control is present: Tap on an item to select it. Tap on an item again to deselect it. Tap on the action control icon related to select all items. Tap on the action control icon related to deselect all items.
£	<i>Sort</i> Opens an action control where you can specify properties, by which the items in the list shall be sorted.

6.4.1 Exporting or Printing Single Data Sets

Tap on a data set in the list to access it.

The corresponding report will be shown.

- Tap in the action box to print the report (see section 7.8).
- Tap S in the action box to export the data set onto a connected USB memory device or one of the registered network shares (see section 7.7.4).
 You can export the data as a PDF file or a XLS file.

TIP: Export the result data only using a USB storage device with FAT32 formatting, in order to ensure an error-free export. When using USB storage devices with FAT16 or older formatting the export could be canceled before the USB storage device has reached its capacity.

TIP: Do not remove the USB storage device until a message appears that the data export has been completed successfully.

6.4.2 Exporting or Removing Multiple Data Sets

1. Select one or more data sets that you want to export or remove (see table 5).

TIP: If your list of data sets is very long, filter the list before making your selections. This way you get a conveniently short list.

- 2. In the action control of the *Select* action, select the desired activity:
 - Tap 🛐 to export the selected data sets.
 - Tap 🔚 to print the selected data sets.
 - Tap Im to remove the selected data sets.

7 Instrument Settings

7.1 Language and Regional Settings

- 1. Select 🏟 Settings in the menu, then under System select 🔯 Time & language.
- 2. Set *Language* to a language that you prefer.
- Set the number format (decimal symbols etc.) and the date and time formats by setting *Format* according to your requirements.
- 4. Select the keyboard layout for the onscreen keyboard and the keymap for an optional USB keyboard by setting *Keyboard layout* and *HW keyboard keymap* appropriately.

7.2 Time Settings

Set the system time correctly so that the time stamps of experiments and system events are correct and traceable:

- 1. Select 🏟 Settings in the menu, then under System select 🔯 Time & language.
- 2. Set *Region* and *City* to your time zone.

Daylight saving time will be calculated automatically.

- To set date and time **manually**:
 - Set Date to the current date.
 - Set Time to the current time.
- · Alternatively, set date and time via time server:
 - a. Configure a network connection first, see section 7.7.
 - b. Switch Use time server to "Yes". The *Time servers* input field replaces the input fields *Date* and *Time*.
 - c. The *Time servers* setting depends on your network settings.
 - If you have set up an **automatic** network configuration, you can leave the *Time servers* input field empty.
 - If you have set up a **manual** network configuration, or if you want to specify a time server anyway:
 - Specify the address(es) of your time server(s) in the *Time servers* input field.
 Put each time server in a new line.
 Do not separate addresses by commas or semicolons etc.
 - d. It depends on your time server when the system time will be synchronized. It may also be necessary to restart the instrument.

7.3 Display Brightness

- Select Settings in the menu, then under System select Instrument settings.
- 2. Drag the slider to adjust the Display brightness.

7.4 Wireless Sensor

Before using your sensor accessory for Rotor 16 (por p/T-Sensor) and Rotor 8 (T-Probe) for the first time, you must activate it. It is necessary to register the optional sensor accessory with its serial number and the supplied calibration constants. Note that pressure sensors are activated with their serial number only.

You can choose between adding a new sensor accessory or importing an already existing sensor accessory (e.g. from another Multiwave 5000).

Adding a new sensor accessory

- 1. Select 🏟 Settings in the menu, then under System select 🎎 Wireless sensor.
- 1. Tap and select the appropriate sensor accessory (T-Probe, p- or p/T-Sensor).
- 2. Click onto the button of the desired sensor accessory and enter *Serial Number, Factor A* and *Factor B* of the used sensor accessory (values will be found on the calibration certificate of the sensor).
- 3. Tap Save to store your input.

Importing a new sensor accessory

Tap 🔟 and select the storage location of your sensor accessory.

7.4.1 Rotor

Before using your rotor for the first time, you must activate it.

- 1. Select 🏟 Settings in the menu, then under System select 🥝 Rotor.
- 2. Select the rotor(s) you are using from the list and activate it by clicking onto the check box.

TIP: Only methods of the activated rotors are available in the method library.

7.5 System Security and User Management

System security on your instrument serves to guarantee data integrity and includes a user and role management enabling a fine-tuned access control for functions and data on the instrument.

IMPORTANT: All system security rules are only enforced after they have been activated. They are not applied retroactively.

7.5.1 Logging In/Out

You can only get access to the instrument by logging in.



Fig. 51: Login screen

Logging in

Auto login is activated per default, with the Administrator user set as auto login user, see section 7.5.2.

• On the login screen, enter a user name and the corresponding password, then tap *Login*.

The (automatically generated) initials of the currently logged in user are shown as a user identification in the header.

🔹 12:58 PM 📮 💽 user identification

Fig. 52: Example user identification in the header

Logging out

1. To log out, tap on the user identification in the header (see fig. 52).

A control panel slides in showing the available user operations:



Fig. 53: Example control panel with user operations

2. Tap LOG OUT.

The login screen will appear.

TIP: When you log out, operations that you have started will continue to run until finished.

NOTICE

For safety reasons it is possible to abort a run even if no user is logged in (if audit trail is activated, this event will be logged with the user "System").

7.5.2 Auto Login

The administrator user is automatically logged in per default when you switch on the instrument, see section 7.5.3.1 for details on login settings.

Setting an auto login

- 1. Select 🏟 Settings in the menu, then under System security select 😪 Login settings.
- 2. Switch *Auto login* to "activated/deactivated" as required.
- 3. Select one of the users as the auto login user.

TIP: Be aware that anybody who has access to the instrument will be granted the same permissions as the auto login user.

7.5.3 User and Role Management

The instrument comes with three preset user accounts with different permissions according to their assigned roles.

Administrator Default password: administrator	This user group has access to all functions of Multiwave 5000. An administrator can create and change the general settings of the instrument and control panel and perform software updates.
--	---

Chemist	This user group can perform,
Default	generate and modify
password:	experiments and methods,
chemist	and can perform calibrations.
Operator Default password: operator	This user group can perform experiments and calibration checks.

TIP: We recommend to change the default password when you set up your user management.

TIP: To create new users or new roles you require administrator rights.

To set up a user and role management according to your requirements

- Define the **login settings**. These include the rules for user names and passwords. See section 7.5.3.1.
- Define the **roles** available on the instrument. These are sets of permissions. See section 7.5.3.3.
- Add individual **user accounts**. See section 7.5.3.4.

7.5.3.1 Login settings

- 1. Select 🔅 Settings in the menu, then under System security select 😪 Login settings.
- 2. Auto login is activated per default, with the Administrator user set as auto login user.

Deactivate or change the user as required.

- 3. Set the minimum length of user names (default: min. 6 characters).
- 4. Specify whether passwords are required (default: no) and set appropriate rules.
 - Only when you specify that passwords are required, password rules are available for editing:
 - Set the minimum length (default 8 characters).
 - Password **history** specifies how often you have to change a password until you can use a former password again.
 - Set whether the password should **expire** and after what period. After the set period expires, passwords must be changed.
 - Specify mandatory characters.
 - Restrict characters by the use of whitelists.

- You can specify that **failed authentications** will be tracked. In this case a user account will be deactivated after a specified number of consecutive attempts to enter a wrong password.

IMPORTANT: Be aware that all unsaved data and settings on the instrument will be lost if all users have locked themselves out. There is no backdoor.

IMPORTANT: Since login settings are not applied retroactively:

- Rules for the user name only hold for user accounts added after rule definition. Already existing user accounts will not be affected.
- If new password rules conflict with existing passwords, affected users will be prompted to set a new password when they log in the next time. They cannot log in with their existing password.
 Factory presets are given in table 6.

Table 6: Factory default login settings

User name	minimum length	6 char.
Password	required	no

7.5.3.2 Logout Settings

- 1. Select of Settings in the menu, then under System security select of Logout Settings.
- 2. Activate or deactivate the auto logout function and define the time after which the user will be logged out.

7.5.3.3 Roles

Roles are sets of permissions, which you can assign to a user account as a whole.

The instrument comes with three predefined roles (administrator, chemist, operator) together with the predefined user accounts to which the roles have been assigned.

The default roles can be edited or removed.

Role management

- 1. Select 🏟 Settings in the menu, then under System security select 🔒 Roles.
- 2. In role management:
 - Tap on an existing role to see its definition and assigned user accounts, to edit, copy or remove the role.
 - Tap 🚺 to add a new role.

Defining or (re-)activating a role

Define role settings when you add a new role, copy an existing one, or edit an existing one. The wizard is subdivided in three tabs:

- Under *Common settings* you specify the name of the role and activate or deactivate the role.
- Under *Permissions* you set the permissions for the role: activate or deactivate the checkboxes beside the list of functions to grant or withdraw a permission.

TIP: You cannot withdraw your own permission "System: login settings/roles/users". This prevents locking yourself out.

• Under *User assignment* you can assign the role to users: activate the checkboxes beside the list of users (or deactivate a checkbox to withdraw the role).

TIP: Alternatively you can assign roles to a user in the user management (see section 7.5.3.4).

• Finally tap Save to save all settings.

7.5.3.4 Users Accounts

User accounts allow to personalize the home screen and, through the assignment of roles, to control the personal access to functions, data and settings.

User management

- 1. Select 🔅 Settings in the menu, then under System security select 🎳 Users.
- 2. In user management:
 - Tap on an existing user account to see user details and assigned roles, to change the password, to edit, copy, or remove the user account.
 - Tap 🚺 to add a new user account.

Defining or (re-)activating a user account

Define user account settings when you add a new user account, copy an existing one, or edit an existing one. The wizard is subdivided in two tabs:

• Under *Common settings* you specify the name of the account (**User name**) and activate or deactivate the account.

The initials of the user are automatically generated from the **Full name**. They are used as the user identification in various places.

When you create a new user account you can also specify an **initial password** and whether it has to be changed on the first login. • Under *Role assignment* you can assign roles to the user account: activate the checkboxes beside the list of roles (or deactivate a checkbox to withdraw the role).

A user can be assigned multiple roles.

TIP: Alternatively you can assign a role to users in the role management (see section 7.5.3.3).

• Finally tap Save to save all settings.

TIP: The user name has to be unique. Even if a user has been deleted, its user name remains unavailable for another user.

7.5.3.5 Changing Your Own Password

Every user can change their own password:

1. Tap on the user identification in the header (see fig. 52).

A control panel slides in showing the available operations (see fig. 53).

- 2. Tap CHANGE PASSWORD.
- 3. Enter the old password.
- 4. Enter the new password and repeat it to confirm.
- 5. Tap Change.

7.5.3.6 Forgotten Passwords

An administrator who has the permission for user management can reset a forgotten password:

- 1. Select of Settings in the menu, then under System security select double Users.
- 2. In user management, tap on the account of the user whose password you want to reset.
- 3. Tap P Change password in the action box.
- 4. Set the new password and specify whether it has to be changed on the next login.
- 5. Tap Change.

TIP: If the user account has been deactivated due to failed authentication attempts, the account has to be re-activated (see section 7.5.3.4).

7.5.4 Audit Trail

Activating the audit trail

- 1. Select ☆ Settings in the menu, then under System security select ≫ Audit trail.
- 2. Switch Audit trail to "activated".

After activation of the audit trail the following events in the instrument are logged in the audit trail:

Instrument	• Start
System	BackupRestoreUpdate
System settings (incl. time, language)	Change settings
System connectivity (incl. network, printers)	CreateEditRemoveChange settings
System security	Change login settings
Audit trail	 Activate/deactivate Change settings Export Remove
Electronic signature	Activate/deactivateChange settingsSigning steps
User/role management	CreateEditRemoveChange settings
User authentication	 Login (incl. attempt) Logout Change password
Experiment settings	CreateEditRemoveChange settings
Experiments (incl. calibrations)	 Start Stop (incl. abortion) Confirmed/extended/ applied/
Experiment data	 Print Export Remove

- The audit trail can hold up to 5000 entries.
- The system will warn you when the maximum number of audit trail entries has been reached.
- After the maximum number of audit trail entries has been reached you cannot perform any further actions on the instrument until you have exported and removed the existing audit trail entries.

Viewing and commenting audit trail entries

- 1. In the data explorer, select Audit Trail.
- 2. Tap on any entry in the numbered list of audit trail entries to view it.
- 3. You can comment audit trail entries that have been generated with your user account:
 - Enter a comment in the open audit trail entry, then tap *Add*.
 - Audit trail comments cannot be altered after they have been added. They have become part of the audit trail entry.

Exporting audit trail entries

- 1. In the data explorer, select Audit Trail.
- 2. In the action box, tap *Export* $\overline{\mathbf{N}}$.
- 3. Select a storage location where the audit trail shall be exported: a registered network share or a connected USB memory device.
- 4. Define a file name.
- 5. Tap Save.

All audit trail entries will be exported and marked as exported by $\mathbf{\Sigma}$.

The export itself generates another audit trail entry.

Removing audit trail entries

IMPORTANT: You can remove only audit trail entries that have been exported before.

- 1. In the data explorer, select Audit Trail.
- 2. In the action box, tap *Remove* [1].

All audit trail entries that have been previously exported are removed.

7.5.5 Electronic Signature

Experiment reports can be signed electronically to certify their authenticity.

IMPORTANT: You can only sign the reports of experiments that have been performed after activation of the electronic signature.

Activating and configuring electronic signature

- 2. Switch Electronic signature to "activated".

Requirements when signing

- If you set *Password required* to enabled, signers will have to specify their password when they sign.
- If you set *Comment required* to enabled, signers will have to enter a comment when they sign.

Signing models and signing roles/levels

1. You can choose between 3-step signing and 2step signing.

3-step signing requires 3 roles:

- a. Submitter
- b. Reviewer
- c. Approver

2-step signing requires 2 roles:

- a. Submitter
- b. Approver

Only users who have been granted the permissions for one (or more) of these roles can sign with their role. See section 7.5.3.4 and section 7.5.3.3 for details on user and role management.

TIP: When you assign roles, keep in mind that only users who have performed an experiment can sign as submitter of the corresponding report.

IMPORTANT: Be careful when you switch between 3-step signing and 2-step signing, because the signing model is included in the experiment report, and you cannot change the report retroactively.

Substitute signing

• If you set *Substitute signing* to *activated*, signers with the appropriate permissions can sign for their role and lower-level roles in one go.

E.g., an approver can sign for all the other roles, even if none of them has yet signed the report.

With substitute signing, a comment is always mandatory, irrespective of how the switch *Comment required* has been set.

Signing rules

- Every user can only sign a report with one role (except when substitute signing is activated).
- The signing sequence has to follow the sequence of roles according to their level.

- Only the user who has performed an experiment can sign as submitter. (When substitute signing is activated, signing with a higher-level role may include signing as submitter.)
- Electronic signatures cannot be revoked.

Signing an experiment report

- 1. To sign a report, open it in the data explorer (tap on the experiment in the list).
- 2. In the action box, tap 🐻.
- 3. Fill out the input fields on the signing screen. What you see on the signing screen depends on your settings for electronic signing. All input fields that you see are required fields.
- 4. Tap Sign.

7.6 General Settings

7.6.1 Global Settings

 Select Settings in the menu, then under General Settings select Global Settings.

These settings influence the way how methods are processed:

- Default Cooling Temperature: Temperature used as default cooling temperature when creating new methods.
- Cooling Time (Rotor Dry) Set the time for how long the instrument will cool down at fan level 2 at the end of a drying program.
- Set the units for *Temperature* and *Pressure*.
- HVT/SVT Power Program If you want to run a power program with HVT or SVT rotors (which is not recommended), you have to set this switch to On.
- HVT/SVT Evaluation
 When setting this switch to On, you can set an upper and a lower warning limit within temperature programs for HVT or SVT vessels. Vessels whose maximum temperature exceeded the upper warning limit or did not reach the lower warning limit are then listed in the experiment report.

- Automatic Rotor Detection
 When set to On, the instrument will automatically start the rotor detection procedure after the door has been closed.
- Rotor Detection Delay Time after which rotor detection starts after closing the door.
- Use SmartVent Switch to On to use the optionally installed SmartVent detector.
- SmartVent Threshold: If this value is exceeded, the instrument will switch on the exhaust fan in order to release venting products more efficiently. The default value is 800 (recommended range: 500-4000). Lowering the threshold will increase the sensitivity of SmartVent.

7.6.2 Notification Settings

 Select Settings in the menu, then under General Settings select Notification Settings.

Email notification

Activate the check box "Notification Email" to receive a notification email when the following events occur:

- experiment has been finished successfully
- error has occurred during the experiment
- experiment was aborted by the user

The email is sent to the currently logged in user (if the email settings are defined under *Settings* > *Network & Connection* > *E-mail Settings* and there is an email address stored in the user settings).

Audio signal

Activate the check box "Audio Signal" to get an acoustic signal as soon as your experiment has finished. Define the interval in which the signal is going to be repeated.

Push notification for software updates

When instrument is connected to the Ethernet (see section 7.7.1) and the check box "Check online update" is activated, the instrument automatically checks every six hours whether a new software update is available and, if so, generates a notification with a link to the download.

To view and update the new software follow the link in the notification or go to **9** *System Update* in the menu.

Tap on *Select Package*, and open the folder "Online".

Here you will find the new software and additional information about the version history.

7.6.3 Report Settings

All general data for your report can be changed here. The data entered here will be printed on your experiment reports. You can also replace the default logo with your own.

7.7 Network Settings

All settings in this section are accessed from the *Settings* screen:

7.7.1 Ethernet

If you want to access network resources (like a network printer), you need to set up an Ethernet connection first:

TIP: If you are in doubt about the correct settings, consult your network administrator.

- 1. Make sure that your instrument is connected to the network.
- 2. Select 🏟 Settings in the menu, then under Network & connections select 🖵 Ethernet.
- Switch *Ethernet* to "ON".
 The network configuration settings slide in.
- To edit an already defined configuration: Scroll down to the end of the list and tap *Configure*. Then scroll back up.
- 5. Use the IP Configuration switch to select
 - **Automatic** configuration (recommended) Use automatic configuration if your network server supports DHCP.
 - a. Scroll down to DNS suffixes.
 - b. Enter one or more DNS suffixes in the proper order (your domain names).
 - or **Manual** configuration Use manual configuration to set a fixed IP address for the instrument.

- a. Set the IP address, the subnet mask, and the gateway address according to your local network.
- b. Set the primary (and secondary) DNS name server addresses.
- c. Enter one or more DNS suffixes in the proper order (your domain names).
- 6. Tap Connect.

If you experience problems connecting to the network, verify that your settings are correct.

TIP: You cannot change the shown MAC address. This is a unique address specific for your instrument.

7.7.2 Proxy

TIP: If you are in doubt about the correct settings, consult your network administrator.

- 1. Switch *Proxy* to "ON".The proxy configuration settings slide in.
- 2. Set the Server name and Port number.
- 3. If a password is needed ,activate this function and type in *Username* and *Password*.

7.7.3 WiFi

TIP: If you are in doubt about the correct settings, consult your network administrator.

TIP: The use of the WiFi adapter (mat. no. 194727) available from Anton Paar is recommended, as other WiFi adapters may not work with the instrument.

- 1. Make sure that WiFi is available.
- 2. Set the WiFi switch to "Enabled".
- 3. Select a network from the list.

7.7.4 Network Shares

You can use network shares as storage locations. To make them available for this purpose, register them on the instrument:

TIP: If you are in doubt about the correct settings, consult your network administrator.

- 1. Configure a network connection first, see section 7.7.1.
- Select Settings in the menu, then under Network & connections select Network shares.

- 3. Tap in the action box to add a **new** network share or tap on an existing network share to **edit** its settings.
- 4. Switch *Network Share* to "Enabled" or "Disabled".
 - "Enabled" makes the network share available for use.
 - "Disabled" temporarily disables the network share.
- 5. Define an unique *Display Name* for the network share. You will later be able to identify it by this registered name.
- 6. In the *Server* input field specify the full network path to the network share.

A correct path begins with a double slash character, e.g. //server/share.

Mind to use the correct slash characters for the path. The instrument will not accept backslash characters.

7. Enter the correct authentication data for the network share in the *Username* and *Password* input fields.

IMPORTANT: If you enter incorrect authentication data, you will not be able to transfer data between the instrument and the network share.

- Some configurations require to specify the domain for the authentication explicitly.
 In this case switch *Use domain* to "YES" and specify the domain name.
- 9. Tap *Test connection* to verify that the network path is correct.
- 10. Tap *Add* or *Save* (if you have edited an existing network share) to save the new settings.

After this you can use the network share as a storage location identified by the registered display name.

If you experience problems with writing to or reading from the network share, verify that your settings are correct.

7.7.5 Email Settings

TIP: If you are in doubt about the correct settings, consult your network administrator.

You can set up email on your instrument to send information such as test results from the instrument via email to different recipients and to receive notification emails.

1. Configure a network connection first, see section 7.7.1.

- Select Settings in the menu, then under Network & connections select E-mail Settings.
- 3. Enter Server address and Port.
- 4. Set the *Authentication* switch to Yes and enter *Username* and *Password* for the server, if required.
- 5. In the *Sender* field you can define which name is shown as email sender.
- 6. If you wish to use SSL (Secure Sockets Layer) as an encryption protocol for secure data transfer via the internet set the *Use SSL* switch to "Yes".
- 7. To test the email settings, enter a valid email address into the *Address* field and tap *Send Test Mail*.

If the settings are correct, a test email will be sent from the instrument to the specified email address.

7.7.6 SmartLink

With Virtual Network Computing (VNC) Multiwave 5000 can be operated from an external PC.

Requirements:

- Laptop or PC with an installed VNC viewer (e.g. UltraVNC...)
- IP address of Multiwave 5000

TIP: UltraVNC is a free offer from an external company. Anton Paar has no influence on the proper functioning and availability of UltraVNC.

Follow the instructions below to operate the UltraVNC viewer. In case of operation deviations refer to http://www.uvnc.com.

TIP: If you are in doubt about the correct settings, consult your network administrator.

- 1. Select [™] Settings in the menu, then under Network & connections select [™] SmartLink.
- 2. Switch Allow access to "ON".

The VNC settings slide in.

- The *IP address* and the *Port* number (e.g. 9600) are the connection data needed for the VNC client on the PC.
- 4. The following settings are available:
 - *Password required* Define a password that must be entered when connecting.

- Activated after restart Define if the VNC connection should remain activated after restart.
- Disable local input Locks the screen of the instrument during remote control.
- Manual confirmation
 Set a time period for confirming the connection on the instrument.
 Define whether to automatically accept or reject the connection if the confirmation prompt is left without action.
- 5. Tap Update to save the settings.
- 6. Start the UltraVNC viewer on your laptop or PC.
- 7. Insert the IP address of Multiwave 5000 with the port number as suffix "...9600".
- 8. Click *Connect* to connect the PC with Multiwave 5000.
- 9. If applicable, type in the Multiwave 5000 password from the VNC settings dialog.

7.8 Printer Settings

Register your printer on the instrument to make it available for printing. The following sections describe the printer registration for each of the supported printer types.

Supported printer models:

- Minolta PagePro 6
- all HP printer models up to (and including) HPLIP version 3.16.5 listed in this table: https://developers.hp.com/hp-linux-imaging-andprinting/supported_devices/index.html

7.8.1 Network Printers

- 1. Configure a network connection first, see section 7.7.1.
- 2. Make sure that your printer is connected to the network and switched on.
- 3. Select 🏟 Settings in the menu, then under Hardware select 🖶 Printers.
- 4. Tap **T** in the action box to add a **new** network printer or tap on an existing network printer to **edit** its settings.
- 5. If you add a new network printer: Tap Add network printer.
- 6. Define a unique *Printer Name* for the network printer. You will later be able to identify it by this registered name.

- 7. With the switch you can set the printer as the default printer.
- 8. From the *Model* list select a driver class supporting your printer.
- 9. Specify the *Hostname or IP* of the network printer.

The name or address depends on your network configuration.

- 10. Tap *Print test page* to verify that the network printer has been correctly registered, and that the connection works.
- 11. Tap *Create* or *Save* (if you have edited an existing network printer) to save the new settings.

After this you can use the registered network printer for printing on the instrument.

7.8.2 USB Printers

- Make sure that your printer is connected to one of the USB sockets of your instrument and switched on.
- Select Settings in the menu, then under Hardware select Printers.
- Tap in the action box to add a **new** USB printer or tap on an existing USB printer to **edit** its settings.
- 4. If you add a new USB printer: Tap Add USB printer.
- 5. Define a unique *Printer Name* for the USB printer. You will later be able to identify it by this registered name.
- 6. With the switch you can set the printer as the default printer.
- 7. The field *Available Printers* should show the connected printer detected by the instrument.

TIP: If the field Available Printers is empty, the instrument is not able to detect your printer. In this case contact your IT administrator.

- 8. From the *Model* list select a driver class supporting your printer.
- 9. Tap *Print Test Page* to verify that the USB printer has been correctly registered, and that the connection works.
- 10. Tap *Create* or *Save* (if you have edited an existing USB printer) to save th new settings.

After this can use the registered USB printer for printing on the instrument.

7.9 System Information

Tap ≡ Menu > ♀ System Information.

You will find all relevant information about:

- Software
- Instrument
- Powerboard
- Sensor supply
- SmartVent
- Advanced Information
- Fan Runtime

TIP: The instrument configuration is additionally included in the experiment data as an eight-digit binary number (0...not installed, 1...installed). The digits stand for:

- (place holder)
- magnetic stirrer
- SmartTemp
- Safety module SOLV
- SmartVent
- SmartTemp inner circle
- SmartTemp outer circle
- IR sensor inner circle

7.9.1 Diagnostic Package

Additionally you can **save and mail diagnostic packages** to the Anton Paar support team in case you have any problems with the instrument.

- 1. Tap in the action box to fold out the action box.
- 2. Press 🖾 to mail your file.

OR

- 3. Tap Save Diagnostics Package in the action box.
- 4. Select a storage location: a connected USB memory device or a registered network share.
- 5. Best leave the File Name as it is.
- 6. Press Save to store your file.

7.10 System Update

TIP: Before you start the system update, make a backup of the system, see section 7.12.

TIP: To receive automatic push notifications when a new software update is available, see section 7.6.2.

1. Save the software update package in the root directory of a USB memory device.

The software update package is a file with a file name extension ".aup". Its file name usually includes a version number that should be higher than that of the software installed on your instrument.

2. Connect the USB memory device to one of the USB sockets of your instrument.

NOTICE

A failed system update may render your instrument unusable.

Do not disconnect the USB memory device during the update process.

- 3. Select **O** System update in the menu.
- 4. Tap *Select Package* and select the software update package on the USB memory device.
- 5. Tap Open.

The version of the software in the package is shown side by side with the currently installed software version. Check that this is the software version that you want to install.

6. Tap *INSTALL* and wait for the installation to finish.

7.11 Video Update

Only administrator users are allowed to update the videos.

- Save the video update package in the root directory of a USB memory device. Connect the USB memory device to one of the USB sockets of your instrument.
- 3. Tap 💽 Video Update.
- 4. Tap *Select Package*, navigate to the location where you have stored it, and select the video update package on the USB memory device.
- 5. Tap Open.
- 6. Tap *INSTALL* and wait for the installation to finish.

7.12 Backup and Restore

IMPORTANT: Audit trail information is not included in a backup.

Reasons for making a backup

- Safety a backup enables you to easily recover settings that may have been modified by mistake.
- Intermediate storage save all settings and experiment data when components of the instrument are to be upgraded or exchanged.
- Standard setup configure the settings on one instrument and replicate them onto further instruments (of the same model).

TIP: We recommend to make a backup of the settings after system installation.

7.12.1 Making a Backup

IMPORTANT: You can only start the backup if no experiment is running.

- Select Settings in the menu, then under System select G Backup and Restore.
- 2. Tap 🖳 Backup.
- Select a storage location where the backup package shall be stored: a connected USB memory device or a registered network share.
- 4. Tap Save to start the backup procedure.

7.12.2 Restoring Data from a Backup

IMPORTANT: You can only restore data from a backup package made on the same instrument model (same or lower software version).

IMPORTANT: Adjustment data are not changed by a restore.

- 1. Select 🏟 Settings in the menu, then under System select 🖙 Backup and Restore.
- 1. Tap 🔁 Restore.
- 2. Open a backup package on a connected USB memory device or a registered network share.
- Select which data shall be restored (experiments, methods, users, settings, all). The selected data will be restored from the backup package:
- 4. Tap *Restore* to start the restore procedure. The instrument is not reset to the factory settings.
- 5. Finally the instrument reboots to load the restored settings.

8 Performing an Experiment



WARNING

Before you start with your experiment carefully read and follow the Safety Instructions (see section 1)!

Performing an experiment with Multiwave 5000 consists of six steps:

- 1. Programming an experiment
- 2. Preparing the pressure vessels
- 3. Preparing sensors
- 4. Loading the rotor
- 5. Running an experiment
- 6. Unloading the rotor

NOTICE

For detailed informations about steps 2,3,4 and 6 read the respective instruction manuals of the rotors.

8.1 Programming an Experiment

Multiwave 5000 offers a library of pre-installed methods, which contain all necessary settings to run an experiment, basically a recipe and a set of programs for different suitable rotors. Depending on the activated rotors and the availability of optional sensor, the instrument will choose the appropriate program. These pre-installed methods can neither be modified nor deleted.

Additionally, you can define user-specific methods for your individual experiments. This can be done either by modifying a copy of a pre-installed method or by creating a new method from scratch.

NOTICE

Before you start with your experiment ensure that the used rotor is activated (see section 7.4.1).

- 8.1.1 Finding a Suitable Method in the Method Library
- 1. Tap **≡** > *Method*s.

2. Enter the name of the sample or sample category you are looking for into the search bar.

BACK		🖨 07:15 💕 🖉
Methods	٩[] *
Define a new method	Recent All Digestion	Durine Lengther
1 2 3 4 .q w e 1	s e 7 t y u	a o o o 💌 💌
a s d	f g h	j k I # ente
∱ z x c	v b n	m , v ·
123 /		

Fig. 54: Search bar

3. The software shows you a list of possible methods that match your search term.

Methods	C Food
Define a new method	Peceri AI Digestion Contention Other Baby food Food 24MVT50 1 24MVT50 AVEFOD 1 16METION
Recent searches	Fact, Feed Feed Feed Feed Feed Feed Feed Fee
	Fats and Oils 24HVT50 24HVT80 16HF100
	Pet food Animal Feed 24HVT50 24HVT80 16HF100
_	Plant Materials 24HVT50 24100 16HF100

Fig. 55: List of possible methods

- 4. Select the appropriate method by tapping on it. The method opens.
- 5. You will find method-related information and recipes for the activated rotors.



Fig. 56: First screen e.g. Food

- By tapping on *More info* you get additional information about the available temperature and/or power programs. By tapping onto *Temperature* or *Power* you can view the respective graph.
- To start your experiment tap START. If more than one rotor is activated, select the rotor and enter the number of vessels used. The instrument automatically switches to the MyData view (see section 8.2).

8.1.2 Creating an Own Method

There are two options to create your own method:

- Create a new method +
- Open and edit an existing method Pre-installed methods cannot be modified, you have to create a copy of this method first.

8.1.2.1 Creating a new method

- 1. Tap **≡** > *Methods*.
- 2. Tap on + *Create Method*, an input window will open.
- 3. Enter a Method Name and a Note (optional).
- 4. Select an *Application Group* from the selection window.
- 5. If you create your own method the *Category* is set to "custom" by default. You can change the category, if desired, by opening the selection window.

The availability of an *Application Group* depends on the instrument configuration and the activated rotors:

Acid digestion	standard, always available
Solvent extraction	only available with Safety Module SOLV
Synthesis	only available with Safety Module SOLV
Oxygen combustion	available with Rotor 8N
Evaporation	available with: Rotor 12HVT50, 24HVT50, 24HVT80 or 41HVT56 requires: 24Evap accessory
Drying	requires Rotor Dry

The *Category* helps you to classify your methods according to sample groups, e.g. Ceramics and Oxides, Food and Feed, etc.

- 6. Tap "Create" to generate the program for your method.
- 7. Select the rotor you want to use. Scroll down the window to see the list of available rotors.
- 8. Enter a *Recipe*.
- Tap Temperature to define a temperature program or tap Power to define power programs.

Defining a temperature / power program

TIP: For HVT and SVT rotors the use of temperature programs is highly recommended.

- Set the required limits. The default limits correspond to the maximum values.
- For HVT and SVT rotor you have to choose a *Temperature Control Mode*: The Temperature Control Mode defines the temperature parameter used for temperature control and is set to "Average" by default.

Temperature Control Mode	Description
Average	Running average temperature of all vessels
Maximum	Temperature of the hottest vessel
Minimum	Temperature of the coldest vessel

3. Tap Next to open the Step Editor.



Fig. 57: Step Editor

- 4. Tap Add Step + Add Step or Delete Step
 Delete Step to add new digestion steps and to remove steps, respectively.
- 5. Define for each step:
 - Temperature / Power
 - Step Type (only for temperature programs)
 - Time and
 - Fan

Step Priority:

Time is reached (set by default)	The heating step will be finished as soon as the set time has been reached, independent from the reached temperature.
Temperature is reached	If 90% of the target temperature is reached within the set time, the next step will start. If the target temperature cannot be reached a warning is generated, but the run will continue.

NOTICE

- For extraction and synthesis applications the cooling temperature has to be below the boiling point of the used solvent.
- Fan level 0 must only be used for inorganic samples in the first heating step of a method. Hold steps with Fan level 0 may lead to overheating and damaged rotor parts.

By clicking on the numbered points in the graph or on the points at the top of the page you can check and modify the set values for each digestion step.

- 6. Tap "Save" to save your method.
- 7. To start your experiment tap *START*. If your method works with more than one rotor, select the appropriate rotor and enter the number of vessels used.

The instrument automatically switches to the MyData view (see section 8.2).

- 8.1.2.2 Editing an existing method
- 1. Select the method you want to edit e.g via the search bar.
- 2. Click onto the method to view all possible rotors for this method.

- 3. Open *More info*, tap ••• and copy the method before you edit it. Pre-installed methods cannot be changed directly, you can only change a copy of the method.
- When copying a method, a timestamp will be added to the previous method name. This is useful when dealing with several versions of one method.
- 5. You can also change the method name as desired.
- 6. Perform the same steps as described in section 8.1.2.1.

8.2 Running an Experiment

- 1. Make sure that all pressure vessels are assembled properly and the rotor is loaded and entered correctly into Multiwave 5000 (see respective rotor manuals).
- 2. Choose an existing method or create a new one (see section 8.1)
- 3. Tap START.

TIP: Wait until the initialization sequence has been finished and the program has started.



Fig. 58: Running the experiment, main view

4. Slide the screen left and right to view all displayed values.

TIP: The field controller state gives you information on the parameter, which controls the power reduction of the instrument. The power reduction ensures a constant power output, according to the chosen method.

Table 7: Controller state	parameters
---------------------------	------------

-	Blank - no power reduction necessary
Р	Power control
р	Pressure limit control

т	Internal temperature control
I	IR-temperature control
0	Overrange (pressure-, temperature- or IR-limit exceeded)
R	Pressure rate alarm
U	User break
r	Pressure rate control
Μ	Magnetron overtemperature
ο	Oil pressure sensor overtemperature or gas pressure sensor overtemperature
S	Supply Limit - Power consumption control
L	IR limiter
F	👷 10:14 AM 👼 🔘
	(a) 204 c. (a) 36 c.

Table 7: Controller state parameters



Fig. 59: Running the experiment, IR graph view

- 5. Switch from the Main Graph to the IR Graph if you want to see the individual vessel temperatures.
- 6. While the experiment is running, individual steps can still be changed by tapping *Step Editing*. You can add or delete steps and change temperature and time of each step.



Fig. 60: Step editing during an experiment

7. The sample documentation can also be entered during the experiment by tapping *Sample Documentation*.

TIP: The sample documentation can also be entered after the run has finished, but only as long as the experiment data have not been exported or printed yet.



Fig. 61: Sample documentation during an experiment

- 8. At the end of the experiment wait until the safety cooling has finished.
- 9. Proceed with unloading the rotor (see respective rotor manuals).

The experiment data are stored and can be viewed and/or exported directly from the *Data Explorer* (see section 6.4).

9 Upkeep and Cleaning



WARNING

Before you start with cleaning and upkeep procedures carefully read and follow the Safety Instructions (see section 1).

In order to ensure proper and safe functioning of Multiwave 5000, perform upkeep and cleaning routines regularly during standard operation.



CAUTION

Risk of injury due to toxic substances Do not perform cleaning procedures without proper safety measures. This could cause injuries due to hazardous chemicals. Always wear goggles, protective gloves and appropriate protective clothing.

NOTICE

- Proper cleaning and upkeep of all instrument parts, especially pressure vessels and rotors, is vital to extend the service life and to ensure proper functioning of the instrument.
- Disregarding the instructions given in this chapter may lead to premature failure and cost-intensive repairs.
- If necessary, use cleaning agents like alcohols (ethanol, isopropyl alcohol) to remove stubborn contaminations. Do not use acetone or other solvents for cleaning instrument parts.
- Cleaning of vessels: if acetone or alcohol are used as cleaning agents, thoroughly rinse them off with water. Remove the solvents completely before starting a new digestion!
- Make sure that after a cleaning procedure all parts are completely dry and correctly reassembled before starting another experiment.

9.1 Cleaning Routines

Find below a list of the required cleaning routines and the intervals at which they must be performed to ensure safe and accurate operation.

Table	8: Cl	eanina	Routines
Tuble	0. 01	curning	rtoutines

Cleaning routine	Cleaning period
Cleaning of the cavity with a water-damp cloth when operating with Rotor 12HVT50, Rotor 24HVT50, Rotor 24HVT80, Rotor 41HVT56 or Rotor 20SVT50	After each working day
Cleaning of the lenses of the IR and SmartTemp sensors	If contaminated, at least every two weeks
Cleaning of the microwave cavity with a damp cloth.	If contaminated
Cleaning of the surface of the instrument with a damp cloth.	If contaminated
Cleaning of the touchscreen with a damp cloth.	If contaminated

9.1.1 Cleaning the Microwave Cavity

NOTICE

- If you detect any residues at the bottom of the microwave cavity, proceed with a thorough inspection of the pressure vessels for signs of leakage.
- If you detect signs of corrosion contact your Anton Paar representative, to ask for a check by an authorized Anton Paar service engineer.
- Do not scratch the coating of the microwave cavity.
- Do not use organic solvents to clean the door.
- 1. Remove the turntable, the drive star and the drive base from the microwave cavity.



Drive base

Fig. 62: Removing the turntable, drive star and drive base

In case of an incident (vessel or vial breakage): Carefully remove splinters and debris from the microwave cavity.

- 2. Inspect the inner wall of the cavity, the cooling air outlet and the perforated plates inside the cavity for residues, damage, deformations and corrosion.
- 3. Clean the microwave cavity and the white PTFE covers with a damp cloth.
- 4. Clean the door with a damp cloth, also the contacting surfaces between door and instrument.
- 5. Clean the lenses of the IR and SmartTemp sensors with a damp cotton bud.



Fig. 63: Cleaning the lenses of the IR and SmartTemp sensors

9.1.2 Cleaning the Exhaust Channel

- Loosen the 2 fixing nuts at the rear of Multiwave 5000 (see fig. 18).
- 2. Remove the safety bracket.

- 3. Remove the cover.
- 4. Remove the foam part.
- 5. Clean the inside of the exhaust channel with a damp cloth and remove any debris and reagent residues.
- 6. Check the proper installation of the foam seal between tube and exhaust unit.



Fig. 64: Checking the proper installation of the foam seal

Reassembling

For reassembling perform the steps described above in reverse order.

NOTICE

Replace the foam part if it is considerably contaminated and install it approx. 10 cm into the exhaust channel, to achieve maximum noise reduction.

9.2 Upkeep Routines

It is recommended to check/calibrate the sensors annually, refer to section 5 for more information about the required tools.

A deferred calibration or not replaced part (e.g. ring shaped foam seal) may influence the proper function of the instrument.

If you do not own these tools (e.g. Calibration Unit with proper alignment plate) you may contact your local Anton Paar organization to get an offer for a service visit by an Anton Paar authorized service engineer, who will perform the necessary calibrations. Such a service visit does not only cover the replacement of the foam parts and all required calibrations, but also includes safety checks (microwave sealing, interlock functionality, etc.) which are documented in a report signed by an certified Anton Paar service engineer.

9.3 Software Administration

To perform backups and updates see section 7.12.

9.4 Storing and Transporting the Instrument

For correct storage of the instrument see section 4.1.

For correct transportation of the instrument see section 1.5.

9.5 Packing the Instrument for Returns

Use the original packaging material (box and foam piece) for possible returns.

Detailed information about the packing procedures can be found in section 4.2.

10 Maintenance and Repair

Multiwave 5000 does not require a periodical maintenance by an authorized Anton Paar service engineer to maintain warranty coverage.

Nevertheless, we do recommend to invest in a yearly service visit to not only have an adjustment performed on the installed sensors, but also to verify the proper function of other relevant parts of the instrument, such as interlock mechanism, and microwave radiation sealing.

Please contact our local service organization for more information about available service offers (e.g. service visits, possible warranty extension, ...).

10.1 Warranty

Following parts are generally excluded from the warranty (wear and tear parts)¹:

- Filters
- Fuses
- (Quartz) Glass parts
- Hoses
- Lubricants
- O-Rings
- Parts of maintenance kits
- · Seals and gaskets
- Vessels and their components (wetted parts)
- Coating of rotor body
- Foam of rotor body

Exceptions to standard warranty

The standard warranty does not cover the following items:

- (Quartz) glass parts
- Complete pressure vessels

10.2 Repair Performed by an Authorized Anton Paar Representative

In case your instrument needs repair, contact your local Anton Paar representative, who will take care of the necessary steps. If your instrument 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.

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

¹ For detailed information please see the general terms of delivery (GTD) on the Anton Paar website (http://www.antonpaar.com).

Appendix A: Error Handling

Error Code	Error Message	Error Handling
001	Sensor value failure. Restart the instrument. If the problem persists, contact your Anton Paar service engineer.	Restart the instrument.
002	Sensor value is out of range. Restart the instrument. If the problem persists, contact an Anton Paar service engineer.	Check if the sensor is defect. Check the connection of the sensor.
003	Sensor cannot be detected.	Check the positioning of the rotor. Check the IR sensor for proper connection.
004	Sensor without valid adjustment. Please check the sensor and adjustment. If the problem persists, contact your Anton Paar service engineer.	Enter the calibration data. Use the sensor type chosen in the current method. Calibrate the sensor.
005	No communication to sensor. Please check the sensor and the rotor. If the problem persists, contact your Anton Paar service engineer.	Check the positioning of the rotor.
006	Generic error. Restart the instrument. If the problem persists, contact your Anton Paar service engineer.	
007	Communication to sub prints lost. Restart the instrument. If the problem persists, contact your Anton Paar service engineer.	
010	Power calibration factor could not be saved. Restart the instrument. If the problem persists, contact your Anton Paar service engineer.	Restart the instrument.
011	IR calibration data could not be saved. Restart the instrument. If the problem persists, contact your Anton Paar service engineer.	Restart the instrument.
012	Calculation of calibration parameters failed. Check the immersion tube of the sensor accessory. If the problem persists, contact your Anton Paar service engineer.	Check the immersion tube of the sensor accessory.

Error Code	Error Message	Error Handling
013	IR Calibration values out of range. Check the positioning of the Calibration Unit. Clean lens with a soft cloth. If the failure persists, contact your Anton Paar representative.	Check the positioning of the calibration unit. Clean the lens with a soft cloth.
014	Calculation of calibration parameters failed. Please check the Calibration Unit and connection. If the problem persists, contact your Anton Paar service engineer.	Failure on the calibration unit. Failure on the power board. Check the calibration unit and connection.
015	Power calibration process failed. Please check if the door is closed properly. If the problem persists, contact your Anton Paar service engineer.	Check if the door is closed properly.
016	Power limitation during power calibration process detected. Please check the power supply. If the problem persists, contact your Anton Paar service engineer.	Check the power supply.
020	Magnetron 1 too hot. Please check the cooling air inlets. If the problem persists, contact your Anton Paar service engineer.	Check the cooling air inlets.
021	Magnetron 2 too hot. Please check the cooling air inlets. If the problem persists, contact your Anton Paar service engineer.	Check the cooling air inlets.
022	Unexpected door open event. Please check if the door is closed properly. If the problem persists, contact your Anton Paar service engineer.	Check if the door is closed properly.
034	Rotor not detected due to missing magnets within certain time. Please check the rotor. If the problem persists, contact your Anton Paar service engineer.	Use the programmed rotor. Place the programmed rotor in the oven.
035	Malfunction of the position detection. Please check the rotor. If the problem persists, contact your Anton Paar service engineer.	Check the correct positioning of the rotor.
036	Malfunction of the rotor drive. Please check the rotor and rotor drive. If the problem persists, contact your Anton Paar service engineer.	Failure on the power board. Check the rotor drive.

Error Code	Error Message	Error Handling
026	Communication to Powerboard lost. Error occurred on the Generic port!	Contact your Anton Paar service engineer.
037	Protection lid detection failed. Please check the rotor and rotor drive. If the problem persists, contact your Anton Paar service engineer.	Use the programmed rotor. Place the rotor lid on the rotor.
038	Malfunction of the IR sensor. Please check the IR-lens. If the problem persists, contact your Anton Paar service engineer.	Clean the lens with a soft cloth.
039	Connection to the Hall sensor of the protection lid failed. Please close rotor lid correctly and restart the run. If the problem persists, contact your Anton Paar service engineer.	Close rotor lid correctly and restart the run.
3A	Connection to the Hall sensor of the rotor detection failed. Please restart the instrument. If the problem persists, contact your Anton Paar service engineer.	
3C	Wrong rotor was detected. Please check the rotor. If the problem persists, contact your Anton Paar service engineer.	Check the used rotor.
040	Detected rotor does not match with programmed run. Please check the rotor. If the problem persists, contact your Anton Paar service engineer.	Use the programmed rotor.
041	Detection of rotor fails; magnets of rotor no longer detected properly. Please check the rotor. If the problem persists, contact your Anton Paar service engineer.	Check the rotor drive.
100	IR temperature limit has been exceeded significantly. Please adjust the method parameter to the sample and weight. If the problem persists, contact your Anton Paar service engineer.	Adjust the method parameter to the sample and weight.
101	Temperature sensor limit has been exceeded significantly. Please adjust the method parameter to the sample and weight. If the problem persists, contact your Anton Paar service engineer.	Adjust the method parameter to the sample and weight.

Error Code	Error Message	Error Handling
102	Significant Pressure Limit Overrange! The process has to be aborted. The reaction pressure limit has been exceeded significantly during a digestion run. This may lead to damage of the digestion vessels. Please adjust the method parameter to the sample and weight. If the problem persists, contact your Anton Paar service engineer.	Adjust the method parameter to the sample and weight.
103	Low MW current measured although actuating power set. Please check the closing of the door. If the problem persists, contact your Anton Paar service engineer.	Check the instrument placement condition and ambient temperature.
104	Sample temperature inside vessel significantly dropped below the IR temperature! The process has to be aborted. Please check the temperature sensor. The temperature sensor is leaking or defective or IR-temperatures are wrong. If the problem persists, contact your Anton Paar service engineer.	Use a different sensor. Send the defect sensor to Anton Paar for repair. Change the capillary and calibrate the sensor.
105	Temperature did not increase during the last 5 minutes! The process has to be aborted. Please check temperature sensor or adapt programmed method. The sensor is defective. The ramp is too long. Sample and reagents are completely inert to microwave irradiation. If the problem persists, contact your Anton Paar service engineer.	Adjust the method parameter to the sample and weight. Use a different sensor or send the sensor for repair. Check the power output. Change the capillary.
106	The starting pressure is not within the valid range of 2 to 10 bar. Error occurred on the Generic port! If the problem persists, contact your Anton Paar service engineer.	Close Rotor 8N as described in the rotor manual. Check if the rotor has been loaded correctly as described in the rotor manual.
107	The Safety Module SOLV unit does not work properly! Please restart the instrument. If the problem persists, contact your Anton Paar service engineer.	Check the Safety Module SOLV. Check the Safety Module SOLV cable connections.

Error Code	Error Message	Error Handling
108	IR temperature sensor breakdown. Please restart the instrument. If the problem persists, contact your Anton Paar service engineer.	Check the IR sensor.
109	Mains supply frequency synchronization failed. Please restart the instrument. If the problem persists, contact your Anton Paar service engineer.	Check the mains supply.
10A	Heating rate of current step was insufficient. Set temperature cannot be reached. Please check your method and sample. If the problem persists, contact your Anton Paar service engineer.	
10B	Control state machine, sensor data not available. Please Check IR sensor. If the problem persists, contact your Anton Paar service engineer.	Check the IR sensor calibration.
10C	Control state machine, actuator setting failed. Please restart the run. If the problem persists, contact your Anton Paar service engineer.	
10D	Significant pressure loss during sample processing. Please check the vessels and the method. If the problem persists, contact your Anton Paar service engineer.	Check the method and sample. Check the vessels.
10E	Heating rate monitor, sensor data not available. Please check IR Sensor. If the problem persists, contact your Anton Paar service engineer.	Check the temperature sensor.
201	Sensor vessel position driver detected – invalid hall sensor data. Please check the rotor and restart the run. If the problem persists, contact your Anton Paar service engineer.	Check the rotor.
202	Sensor vessel position driver detected – rotor not detected. Please check the rotor and restart the run. If the problem persists, contact your Anton Paar service engineer.	Check the rotor.

Error Code	Error Message	Error Handling
203	Internal Error. Please restart the instrument. If the problem persists, contact your Anton Paar service engineer.	
301	Invalid corresponding SmartTemp Sensor values. Please restart the instrument and the run. If the problem persists, contact your Anton Paar service engineer.	Check the SmartTemp sensors.

Appendix B: Technical Data

Dimensions without unfolded display (W x D x H):	600 x 712 x 633 mm (23.6 x 28.0 x 24.9 inch)
Dimensions with unfolded display (W x D x H):	600 x 712 x 787 mm (23.6 x 28.0 x 30.9 inch)
Cavity Dimension:	450 x 415 x 350 mm (17.7 x 16.3 x 13.8 inch)
Cavity volume:	66 L
Weight:	71.5 kg
Power supply:	AC 230 V ± 10 % 50 Hz AC 230 V ± 10 % 60 Hz
Airborne noise emission (closed fume hood):	< 70 dB (A)
Power consumption:	3680 VA
Installed microwave power:	2000 W, delivered by two magnetrons
Microwave output power:	1800 W (max. power is limited for increased service life of magnetrons)
Microwave power control:	Unpulsed mode over whole power range Adjustable in increments of 1 W
Magnetron frequency:	2455 MHz
Housing material:	Stainless steel, aluminum alloy
Cavity material:	Stainless steel with multilayer fluorpolymer coating
Exhaust unit capacity:	max. 220 m ³ /h adjustable in four steps
Rotor speed:	3 rpm
IR sensor outer circle:	Built-in temperature sensor, measurement of up to 24 vessels. Temperature range: 20–300 °C Uncertainty: ±4 °C
IR sensor inner circle (optional):	Built-in temperature sensor, measurement of up to 17 vessels. Required for Rotor 41HVT56. Temperature range: 20–300 °C
	Uncertainty: ±4 °C
SmartTemp sensor outer circle (optional):	Built-in temperature sensor, measurement of up to 24 vessels. Required for Rotor 20SVT50, optional for Rotor 12HVT50, 24HVT50, 24HVT80, 41HVT56.
	Temperature range: 30–300 °C Uncertainty: ±2 °C
SmartTemp sensor inner circle (optional):	Built-in temperature sensor, measurement of up to 17 vessels. Optional for Rotor 41HVT56.
	Temperature range: 30–300 °C

Environmental conditions (EN 61010):	Indoor use only
Altitude:	0 - 2000 m
Ambient temperature:	15 - 35 °C
Air humidity:	Min. relative humidity: 10 % Max. relative humidity: 80 % (non-condensing) up to 31 °C decreasing linearly to 66 % at 35 °C
ISM group:	2 HF-energy for the treatment of material is intentionally generated as electromagnetic radiation in the instrument.
ISM class:	B The instrument is designed to be operated in residential areas and those areas which are directly connected to a low-voltage suitable power supply.
Pollution degree:	2
Overvoltage category:	II
Protection class:	I, according to VDE 0106
Protection degree:	IP 20, according to IEC 60529
Touchscreen user interface:	10.1" Display; 1280 x 800 pixel
System control:	i.MX 6 processor (Dual Core) Memory 1 GB RAM 4 GB Flash 32 GB SATA
Interfaces:	3 x USB port 2.0 Ethernet (10 / 100 / 1000 Mbit/sec) Calibrator, 15 pin SUB-D; female
Fume hood:	Displacement volume > 300 m ³ /h
Fuses:	T16A thermal (in the mains switch) T4A / 250 V T1A / 250 V 6 x T1A / 125 V T 500 mA / 250 V F 200 mA
Complies with:	EN 61010-1:2010 EN 61010-2-010:2014 EN 61010-2-081:2015 Machinery Directive (2006/42/EC) Electromagnetic Compatibility Directive (2014/30/EU) Low Voltage Directive (2014/35/EU) RoHS Directive (2011/65/EU) EN ISO 12100-1:2010 EN 61326-1:2013

Appendix C: Restrictions on Use

TIP: Detailed application information can be found in the Application Guide Acid Digestion (D19IB016).

General restrictions for digestions

Take special care when digesting samples with potentially **high reactivity** (see the table below).

- Start the digestion with small sample amounts (100–300 mg) depending on the rotor.
- We strongly recommend to start with a slow microwave power/temperature ramp of 6-8 °C/min.

Potentially highly reactive samples (list of examples, not exhaustive

Sample type	Examples
Petroleum	e.g. fuels, raw oil, marine fuels
Fat	e.g. oil, fat, grease
Polymers	e.g. PE, PP
Carbohydrates	e.g. sugar, starch, cellulose
Organic solvents	e.g. alkanes, alcohols, ethers
Alcoholic beverages	e.g. wine, spirits



WARNING

Do not digest explosives or pure organic solvents in Multiwave 5000 as they can react vigorously with or without oxidizing agents.

Safety Module SOLV

• Due to safety reasons, performing experiments with organic solvents without the Safety Module SOLV are not allowed.

 Due to safety reasons it is not allowed to use pure, non-polar solvents (tan delta < 0.05) without heating elements in Multiwave 5000 with Safety Module SOLV.



Take care when using perchloric acid!

Be sure that you understand the reaction(s) that can occur when using perchloric acid (commercially available usually in a concentration of 70–72%):

- Perchloric acid up to 50% increases the fire hazard in contact with oxidizable materials.
- Perchloric acid above 50% is potentially explosive when heated.
- Perchloric acid with more than 50% but less than 72% is extremely reactive and oxidizing, and reacts so violently with oxidizable substances that some of them ignite without any further source of ignition. There is also the danger of an explosive reaction with many substances, such as organic materials, reducing agents, metals, etc. (see corresponding safety data sheet).

Due to this potential danger:

- Perchloric acid must never be used alone for digestion but only as a minor component in mixtures with other acids.
- Always use perchloric acid together with nitric acid, which will destroy easily oxidizable matter first.
- Mix the sample with the other acids first, add perchloric acid at the end.
- Always program a longer heating ramp (at least 25-30 min) when using perchloric acid.
- HVT and SVT vessels: perchloric acid may be concentrated in the vessel when the other acids evaporate due to strong venting. Do not exceed the given temperature limits.
- Do not heat pure water due to possible "superheating", which might lead to vessel breakage. The addition of a small amount of acid (e.g. 1 mL HNO₃ per 100 mL H₂O) greatly

(e.g. 1 mL HNO₃ per 100 mL H₂O) greatly reduces the risk.

Appendix D: Properties of Common Laboratory Solvents

Operational Temperature Limits of Low Boiling Solvents

• = heating elements necessary

O = heating elements recommended

Solvent	Boiling Point [°C] @ 1013 bar	Heating Elements	Loss tangent [tan delta]	Temperature [°C] @ 20 bar*	Temperature [°C] @ 30 bar*
Acetic acid	118		0.174	249	274
Acetone	56	О	0.054	180	205
Acetonitrile	81		0.062	214	240
1-Butanol	118		0.571	231	263
Chlorobenzene	132		0.101	292	325
Chloroform	61	•	0.091	193	220
Cyclohexane	81	٠	n.d.	226	255
1,2-Dichlorobenzene	179		0.280	359	398
1,2-Dichloroethane	84		0.127	221	246
Dichloromethane	40	٠	0.042	163	185
Dimethoxyethane	84		n.d.	218	245
Dimethylacetamide	165		n.d.	325	358
Dimethylformamide	154		0.161	325	351
Dimethyl sulfoxide	189		0.825	310**	329
1,4-Dioxane	101	۲	n.d.	242	270
Ethanol	78		0.941	181	200
Ethyl acetate	77	О	0.059	208	232
Ethylene glycol	197		1.350	337	365
Formic acid	101		0.722	230	252
<i>n-</i> Hexane	69	٠	0.020	207	240
Methanol	65		0.659	166	185
Nitrobenzene	210		0.589	387	416
Nitromethane	101		0.064	236	263
N-Methylpyrrolidone	204		0.275	375	408
2-Propanol	82		0.799	187	208
Tetrachloromethane	77	۲	n.d.	222	250
Tetrahydrofuran	65	О	0.047	200	225
Toluene	111		0.040	263	293
Water	100		0.123	213	234
o-Xylene	140	•	0.018	299	330

*pressure limit for standard rotors (for pressure limits of individual rotors see appendix C)

**DMSO decomposes thermally at elevated temperatures, therefore heating to higher temperatures is not recommended

Appendix E: Permission and Role Management

Category	Permission	De	fault roles	
		Administrators	Chemists	Operators
Menu	Menu - Backup and Restore	х		
Menu	Menu - Hardware Control	x		
Menu	Menu - Method Search	x	х	
Menu	Menu - System Information	x	x	x
Menu	Menu - System update	x		
Methods	Allow Method Favorites	x	х	x
Methods	Methods - Create, Edit or Remove	х	х	
Data Explorer	Allow Audit Trail Comments	х		
Data Explorer	Data Explorer - Audit Trail Data	х		
Data Explorer	Data Explorer - Calibration Data - Remove	Х	х	
Data Explorer	Data Explorer - Calibration Data - View	х	х	x
Data Explorer	Data Explorer - Experiment Data - Export	Х	х	
Data Explorer	Data Explorer - Experiment Data - Remove	х	х	
Data Explorer	Data Explorer - Experiment Data - View	Х	х	х
Data Explorer	Data Explorer - Manual Browser	х	х	x
Data Explorer	Data Explorer - Methods Overview	Х	х	
Data Explorer	Data Explorer - Video Browser	х	х	x
Data Explorer	Data Explorer - Video Browser Update	Х		
Calibration	Calibration - Accept Calibration	х	х	
Calibration	Calibration - Perform Calibration	х	х	х
Settings	Electronic Signature - Approve	х		
Settings	Electronic Signature - Review	х		
Settings	Electronic Signature - Submit	х		
Settings	General Settings - Global Settings Administration	x	х	
Settings	General Settings - Global Settings Experiment	x	х	
Settings	General Settings - Notification Settings	x	x	
Settings	General Settings - Report Settings	x		

Table 9: Permission and Role Management

Category	Permission	De	fault roles	
		Administrators	Chemists	Operators
Settings	Hardware - Printer Settings	х		
Settings	Network - Email Settings	x		
Settings	Network - Ethernet Settings	х		
Settings	Network - Network Shares	х		
Settings	Network - Proxy Settings	х		
Settings	Network - VNC Settings	х		
Settings	Network - WiFi	х		
Settings	System - Device Settings	х		
Settings	System - Rotor Settings	Х		
Settings	System - Time and Language Settings	х		
Settings	System - Wireless Sensor Administration	х	х	
Settings	System Security - Audit Trail Administration	х		
Settings	System Security - Logout Settings	х		
Settings	System Security - User Administration	x		

Table 9: Permission and Role Management (cont.)

For each role, there is a predefined user with the same name (e.g. the user 'Administrator' has the permissions of the role 'Administrator').

If 'Electronic Signature' is activated, three additional roles will become available:

Category	Permission	De	fault roles	
		Submitter	Reviewer	Approver
Settings	System Security - Roles - Submitter	x		
Settings	System Security - Roles - Reviewer		x	
Settings	System Security - Roles - Approver			x

Appendix F: EU Declaration of Conformity

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(original)



The manufacturer Anton Paar GmbH, Anton-Paar-Str. 20, A-8054 Graz, Austria - Europe, hereby declares that the machinery described below:

Description:	Microwave sample preparation / synthesis system
Model:	Multiwave 5000
Material number:	222110, 222111
Serial number:	

complies with all the relevant provisions of the Machinery Directive (2006/42/EC, OJ L 157/24 of 9.6.2006) and the regulations transposing it into national law,

complies with all the relevant provisions of the Electromagnetic Compatibility Directive (2014/30/EU, OJ L 96/79 of 29.3.2014),

complies with all the safety objectives of the Low Voltage Directive (2014/35/EU, OJ L 96/357 of 29.3.2014), complies with all the relevant provisions of the RoHS Directive (2011/65/EU, OJ L 174/88 of 1.7.2011), complies with the provisions of the following harmonized standards:

•	EN ISO 12100:2010	Safety of machinery - General principles for design - Risk Assessment and Risk Reduction
•	EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use EMC requirements - Part 1: General requirements

The product is classified as a class B equipment and is not intended for the use in industrial area.

complies with the provisions of the following technical standards:

•	EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
•	EN 61010-2-010:2014	Part 2-010: Particular requirements for laboratory equipment for the heating of Materials
•	EN 61010-2-081:2015	Part 2-081: Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes

This declaration relates exclusively to the machinery in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user. The manufacturer compiles the technical file according to 2006/42/EC Annex II.

Place and date of issue: Graz, 2022-05-02

DI Dr. Christopher Fradler, MBA Executive Director **Business Unit Solutions**

DocuSigned by Peter Kettisch E1EC53A40C0A491

Ing. Peter Kettisch Head of Analytical & Synthetic Chemistry **Business Unit Solutions**

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Appendix G: UK Declaration of Conformity

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UK Declaration of Conformity



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

Product designation:	Microwave sample preparation / synthesis system
Model:	Multiwave 5000
Material number:	222110, 222111
Serial number:	

is in conformity with all the relevant UK legislation

Supply of Machinery (Safety) Regulations 2008, 2008 No. 1597

Electromagnetic Compatibility Regulations 2016, 2016 No. 1091

Restriction of Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, 2012 No. 3032

is in conformity with all the UK safety objectives of the

Electrical Equipment (Safety) Regulations 2016, 2016 No. 1101

complies with the designated standards:

- EN ISO 12100:2010
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
- EN 61010-2-010:2014
- EN 61010-2-081:2015
- EN 61326-1:2013

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Importer: Anton Paar Ltd., Unit F, The Courtyard, Hatfield Rd., St. Albans AL4 OLA, United Kingdom

Place and date of issue: Graz, 2022-05-02

un

DI Dr. Christopher Fradler, MBA Executive Director Business Unit Solutions

DocuSigned by: Peter Kettisch

-ETEC53A40C0A491

Ing. Peter Kettisch Head of Analytical & Synthetic Chemistry Business Unit Solutions

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Appendix H: Certificate of Compliance with the Product Safety Law

	CERTIFICATE	
(т	EST CERTIFICATE IN COMPLIANCE WITH THE	ISICHERHEITSGESETZ PRODUCT SAFETY LAW)
Bescheinigungs-Nr. (Certifi	cate No.): 20KFS2293-01	Gültig bis (valid until): 2026-01-24
Das Produkt entspricht der leistung von Sicherheit und Die Kennzeichnungspflicht (The product is in complian	n Anforderungen des Produktsicherheitsges d Gesundheit und entspricht den derzeit ane en des Produktes gemäß §6 ProdSG sind ein ce with the judicial requirements of the Prod	etzes (ProdSG) § 21 (1) hinsichtlich der Gewähr- erkannten Regeln der Technik. zuhalten. uct Safety Law (ProdSG) § 21 (1) and the currently
accepted rules of technolog	gy. The marking requirements of the product	based on §6 ProdSG have to be observed)
Bescheinigungsinhaber	Anton Paar GmbH	
(Certificate Holder)	Anton-Paar Str. 20	
	Austria	
Markenname (Brandname)	Anton Paar	
Fertigungsstätte	Anton Paar GmbH	
(Manufacturing Site)	Anton-Paar Str. 20	
C	8054 Graz	
	Austria	
Produkt (Product)	Laborwärmegeräte (Mikrowellenaufschlu Laboratory equipment for the heating of	iss-System) materials (Microwave digestion system)
Typbezeichnung (Type)	Multiwave 5000	
Beschreibung	230Vac, 50Hz, 3680VA	deorüfte
(Description)	230Vac, 60Hz, 3680VA	Sicherheit
Prüfbericht-Nr.	2234649KAU-004:2020-12-02	
Geprüft nach	EN 61010-1:2010+A1:2019	
(Tested according to)	EN 61010-2-081:2015	
	EN 61010-2-010:2014	
	PAR-Amorderung für GS (PAn requiremen	it for GS) ATPS GS 2019:01 PAK
0	(Treb)	
0/11	Deuconand Enge	
1). Ull	(intertal)	
Intertek Deutschland Cml	Deutschland	
Billing Bulling Barrier	ank Inter	
DiplIng. Bernhard Miedt	Sen All	geprome Sicherheit
DiplIng. Bernhard Miedt Datum (Date): 2021-01-25	0.70771 Leinte	Seite (page) 1/

Anhang 1 zur Bescheinigung Nr. (Annex 1 to Certificate No.): 20KFS2293-01 Seite (page) 2/2

Hinweise

Der Bescheinigungsinhaber bzw. sein für die Herstellung Verantwortlicher verpflichtet sich, sein Produkt in Übereinstimmung mit dem geprüften Baumuster herzustellen, die Festlegungen zur Bereitstellung von Produkten auf dem Markt nach § 3 und § 6 ProdSG einzuhalten und Intertek Kontrollmaßnahmen zur Überwachung der Herstellung und rechtmäßigen Verwendung des GS-Zeichens nach § 22 Abs. 1 ProdSG zu ermöglichen. Am Produkt oder in der zugehörigen Dokumentation sind der Name und die Kontaktanschrift des Herstellers oder – sofern dieser nicht im europäischen Wirtschaftsraum ansässig ist – des Bevollmächtigten oder des Einführers in den europäischen Wirtschaftsraum gemäß § 6 Abs. 1 Ziff. 2 ProdSG anzugeben. Diese Baumusterprüfbescheinigung berechtigt den Bescheinigungsinhaber alle mit dem oben bezeichneten Baumuster identischen Geräte mit dem abgebildeten GS Zeichen zu versehen.

Die Bescheinigung wird ungültig, wenn der Inhaber seinen oben genannten Verpflichtungen nicht nachkommt oder sich die Voraussetzungen nach § 21 des ProdSG geändert haben.

Diese Bescheinigung ist nur für den Gebrauch durch Intertek-Kunden bestimmt und wird gemäß der vertraglichen Vereinbarung zur Verfügung gestellt. Intertek übernimmt keine Haftung zu jedweder Partei außer gegenüber dem Kunden gemäß vertraglicher Vereinbarung für irgendeinen Verlust, Unkosten oder Beschädigung, die durch den Gebrauch dieser Bescheinigung verursacht werden. Nur der Kunde ist autorisiert, diese Bescheinigung zu kopieren oder zu verteilen und dann nur in ihrer Gesamtheit. Die Benutzung des Intertek-Prüfzeichens ist an die vertraglichen Vereinbarungen gebunden. Jegliche weitere Verwendung des Intertek-Namens zum Zwecke des Verkaufs oder der Bewerbung des geprüften Materials, Produktes oder des Services bedarf einer vorherigen schriftlichen Genehmigung durch Intertek. Erstund Folgebesichtigungen der Fertigung dienen der Sicherstellung der vertraglich vereinbarten Prüfzeichenbenutzung und dienen nicht dem Zweck einer vollständigen Kontrolle der Produktionsqualität gemäß der Herstellerverantwortung und sie entbinden nicht den Kunden von seinen Verpflichtungen.

Notes

The certificate holder or his designated representative commit themselves to manufacture the product in accordance with the tested samples to meet the requirements on providing products in the market according to § 3 and § 6 ProdSG and to enable intertek to monitor the manufacturing process and the lawful use of the GS certification according to § 22 Para 1 ProdSG. The name and the contact address of the manufacturer or – if the manufacturer is not based in the European Economic Area – of the importer to the European Economic Area or his representative have to be applied at the product or the documentation according to § 6 (1) 2. ProdSG. This type examination certificate entitles he certificate holder to mark all devices that are identical to the above-designated sample with the logo as shown below.

This certificate becomes invalid if the holder does not meet the commitments described above or the requirements according to § 21 of the ProdSG are changed.

This Certificate is for the exclusive use of Intertek's client and is provided pursuant to the certification agreement between Intertek and its client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this certificate. Only the Client is authorized to permit copying or distribution of this certificate and then only in its entirety. Use of Intertek's certification mark is restricted to the conditions laid out in the agreement. Any further use of the Intertek name for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. Initial Factory Assessments and Follow up Services are for the purpose of assuring appropriate usage of the certification mark in accordance with the agreement, they are not for the purposes of complete production quality control in the manufacturers responsibility and do not relieve the Client of their obligations in this respect.

> Dem Zertifikat liegen die Allgemeinen Geschäftsbedingungen der Intertek Deutschland GmbH zu Grunde. The General Business Conditions of Intertek Deutschland GmbH is an integral part of this certificate. Intertek Deutschland GmbH, Stangenstraße 1, 70771 Leinfelden-Echterdingen Tel.: +49 711 27311-0 E-Mail: gs@intertek.com web: www.intertek.de/zeichen

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Appendix I: ETL Certificate

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AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized To Apply Mark.

Applicant: Address: Country: Contact: Phone: FAX: Email:	Anton Paar GmbH Anton-Paar-Str. 20 8054 Graz Austria Mr. Harald Rössl +43 316 257 3625 - harald.roessl@anton	-paar.com	Manufacturer: Address: Country: Contact: Phone: FAX: Email:	Anton Paar GmbH Anton-Paar-Str. 20 8054 Graz Austria Mr. Stefan Fischer +43 316 257 3610 - stefan.fischer@anton-paar.com
Party Authorized To Apply Mark: Report Issuing Office: Control Number: 3047470		Same as Manufacture Kaufbeuren Authorized by:	Leeoz De Mi	
		ศ	for L. Mat	thew Snyder, Certification Manager



This document supersedes all previous Authorizations to Mark for the noted Report Number.

This Authorization to Mark is for the exclusive use of Interfek's Clent and is provided pursuant to the Certification agreement between Interfek and its Client. Interfek's responsibility and liability are limited to the terms and conditions of the agreement. Interfek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Authorization to Mark. Only the Client is authorized to permit copying or distribution of this Authorization to Mark and then only in its entirety. Use of Interfek's Certification mark is restricted to the conditions laid out in the agreement and in this Authorization to Mark. Any further use of the Interfek name for the sale or advertisement of the tested material, product or service must first be approved in writing by Interfek. Initial Factory Assessments and Follow up Sarvices are of the purpose of assuring appropriate usage of the Certification mark in accordance with the agreement, they are not for the purposes of production quality control and do not relieve the Client of their obligations in this respect.

> Intertek Testing Services NA Inc. 545 East Algonquin Road, Arlington Heights, IL 60005 Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

ATM for Report 2238569KAU-006

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ATM Issued: 15-Dec-2020 ED 16.3.15 (15-Oct-20) Mandatory

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AUTHORIZATION TO MARK

Standard(s):	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements [UL 61010-1:2012 Ed.3+R:19Jul2019]
	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1: General Requirements (R2017) [CSA C22.2#61010-1-12:2012 Ed.3+U1;U2;A1]
	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 2- 010: Particular Requirements for Laboratory Equipment for the Heating of Materials [UL 61010-2- 010:2019 Ed.4]
	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 2-010: Particular Requirements for Laboratory Equipment for the Heating of Materials [CSA C22.2#61010-2- 010:2019 Ed.4]
	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2- 081: Particular Requirements for Automatic and Semi-Automatic Laboratory Equipment for Analysis and other Purposes [UL 61010-2-081:2019 Ed.3]
	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2- 081: Particular Requirements for Automatic and Semi-Automatic Laboratory Equipment for Analysis and other Purposes [CSA C22.2#61010-2-081:2019 Ed.3]
Product:	Microwave digestion system
Brand Name:	Anton Paar
Models:	Multiwave 5000

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ATM Issued: 15-Dec-2020 ED 16.3.15 (15-Oct-20) Mandatory