

Instruction Manual and Safety Information

Litesizer DIF Series

Litesizer DIF 100, Litesizer DIF 300, Litesizer DIF 500

Find out more



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Original instructions

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1 Safety instructions



Read the documentation

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

1.1 General safety instructions

General

- Read and adhere to this manual as well as the manual of the dispersion unit(s). Do not start to use the product before you have read and understood all safety instructions!
- The documentation is a part of the product. Keep it for the complete working life of the product and make it easily accessible to all persons involved with the product. If you receive any additions or revisions from Anton Paar, these must be treated as part of the documentation.

Liability

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

General precautions

- Observe and adhere to your national safety regulations regarding the handling of all substances associated with your measurements (e.g. use safety goggles, gloves, respiratory protection, etc.).
- Substances used must be labeled. The corresponding material safety data sheets must be observed and made available near the measuring setup.

- Samples and cleaning liquids that have been used in the measuring system are not suited for human consumption after use.
- Check the wetted parts of the product for chemical resistance to all samples and cleaning liquids.
- Take care that samples, cleaning liquids and gases are chemically compatible when they come into contact with each other. They must not react exothermally or produce hazardous substances.

Installation

- The installation procedure shall only be carried out by authorized personnel who are familiar with the installation instructions.
- Never use the product outside the specified ambient conditions and specifications.
- Use only accessories, consumables, or spare parts supplied or approved by Anton Paar.
- Do not expose the product to direct sunlight for extended periods of time.

Using the product

- Ensure that all operators have been trained beforehand to use the product safely and correctly.
- Ensure that the product is sufficiently supervised during operation.
- In case of damage or malfunction, stop operating the product. Do not operate the product under conditions that could result in damage to goods or injuries or loss of life.
- If you suspect that spilled substances got into the product, disconnect the product from the electrical supply and have it checked for electrical safety by a service technician authorized by Anton Paar.
- If compressed gas from a gas bottle is used to operate the product, ensure that the operator is properly trained in the use of compressed gas bottles, and that all safety instructions of the gas bottle supplier are adhered to.

Operator's skills

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

Precautions for flammable samples and cleaning agents

- Keep potential sources of ignition, like sparks or open flames, at a safe distance from the product.
- Store only the minimum required amount of sample, cleaning liquids, and other hazardous materials near the product.
- Place the product and all samples in a fume hood of adequate capacity.
- Do not spill sample/cleaning liquids or leave their containers uncovered. Immediately remove spilled sample/cleaning liquids.
- Ensure that the setup location is sufficiently ventilated. The environment of the product must be kept free from flammable gases and vapors.
- Provide fire-extinguishing equipment.

Operation in areas with risk of explosion

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

Service and repairs

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



Disposal

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





1.2 Conventions of safety messages and typography

Conventions for safety messages

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

 <p>WARNING</p> <p>Description of risk Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.</p>
 <p>CAUTION</p> <p>Description of risk Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</p>
<p>NOTICE</p> <p>Description of risk Notice indicates a situation which, if not avoided, could result in damage to property.</p>

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

 <p>Wear safety gloves</p> <p>Wear protective gloves when handling the product.</p>
 <p>Wear safety goggles</p> <p>Wear safety goggles when handling the product.</p>
 <p>Wear ear protection</p> <p>Wear ear protection when handling the product.</p>
 <p>Use protective clothing</p> <p>Wear protective clothing when handling the product.</p>

Typographical conventions

The following typographical conventions are used in this instruction manual:

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

1.3 Safety signs on the instrument

NOTICE

It is imperative that the warning signs remain clearly legible.

Laser warning

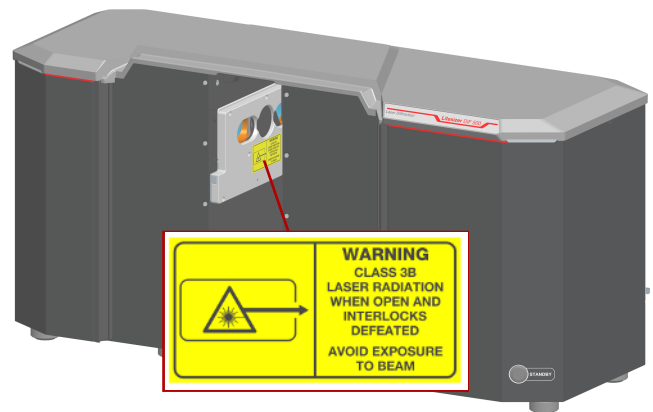


Fig. 1: Laser warning on the instrument

WARNING

Laser radiation

The product is equipped with a laser of the laser class 3B. Visible or invisible laser radiation when open and interlocks defeated. Avoid exposure to the laser beam.

The built-in laser is protected by the instrument's casing and the mechanical laser shutter. When using Litesizer DIF in its intended use, the instrument is a laser class 1 product (refer to Section 1.4 [▶ 7]). When using Litesizer DIF in its intended purpose, no protective goggles or protective gear need to be worn by the user.

Safety sign on the rear of the instrument (For the use with a Liquid Flow dispersion unit only)

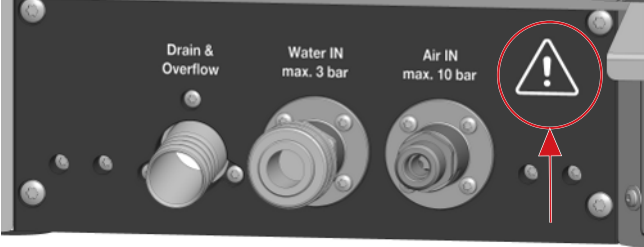


Fig. 2: Safety sign on the rear of the instrument

WARNING

Risk of injuries and damage

The instrument must not be operated at pressures exceeding 3 bar and a maximum flow rate of 5 L/min. It is designed for use exclusively with water with a max. temperature of 40 °C. Using other liquids or exceeding the specified limits may result in damage to the device and create hazardous conditions.

1.4 Laser safety

Also refer to Section 1.3 [▶ 6].

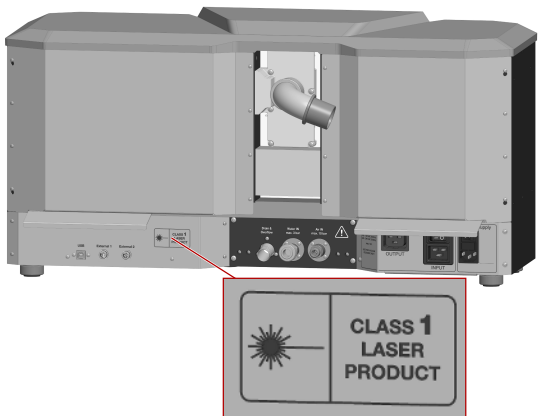


Fig. 3: Laser information on the rear of the main unit

CAUTION

Laser radiation

The product is equipped with a laser of the laser class 3B. The laser installed in the product can only be operated in the additionally delivered protective casing and therefore conforms to the laser class 1. Follow your national safety regulations.

WARNING

Laser radiation

The built-in laser is protected by the instrument's casing and a mechanical laser shutter. Only use the instrument for its intended purpose. Never open the casing of the instrument. Contact your Anton Paar representative if you need help with the instrument.

CAUTION

Laser radiation

The mechanical laser shutter of this class 3B laser must be inspected annually by a qualified inspector. Make sure the laser is inspected annually to ensure safe and compliant operation.

2 Overview

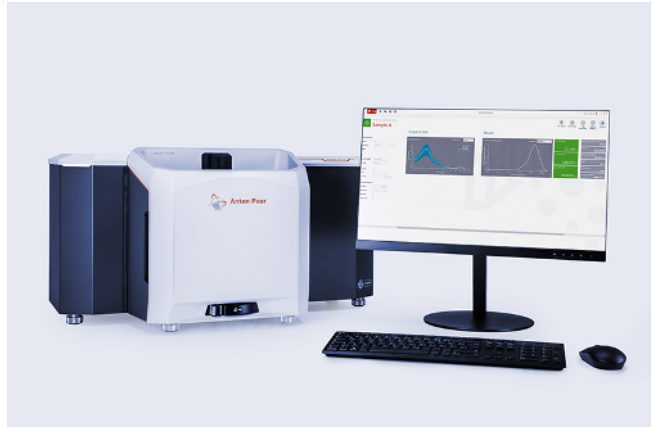


Fig. 4: Litesizer DIF

2.1 Measuring principle

The measurement principle is based on laser diffraction. Dispersed sample is directed through laser light, and the light gets diffracted. Angle of diffraction depend on particle size, i.e. the overall diffraction pattern depends on particle sizes present in the sample. The diffraction pattern is detected and compared to theoretical data. By this comparison the relative amount of each particle size is calculated. The results are processed in the software Kalliope, on a computer running a Windows® operating system.

2.2 Intended use of the instrument

Litesizer DIF is designed to measure the size of particles ranging from 10 nm to 3.5 mm. The sample can be in liquid or dry state, and for the measurement it gets dispersed in liquid or air.

2.3 Functional components of the main unit

Front view

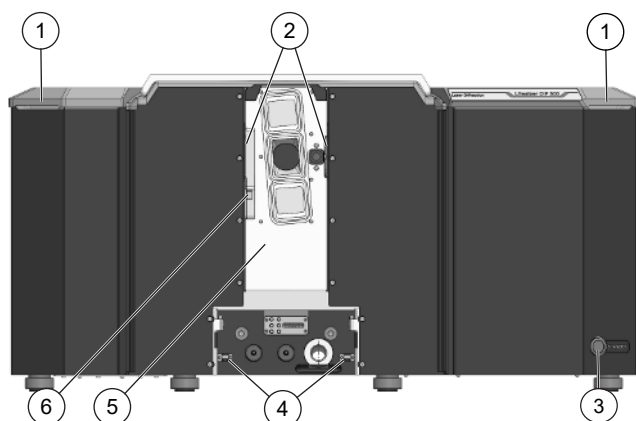


Fig. 5: Front view of the main unit

- 1 Status light
- 2 Laser safety glasses
- 3 Standby button
- 4 Guiding rail for dispersion unit
- 5 Docking port for dispersion unit
- 6 Laser safety shutter

TIP: Avoid any contact with the two laser safety glasses within the docking port for the dispersion unit.

NOTICE

Damage to the docking port

Always use gloves when operating at the docking port to avoid contamination of the laser safety glasses which will result in inaccurate measurement results.

Rear view

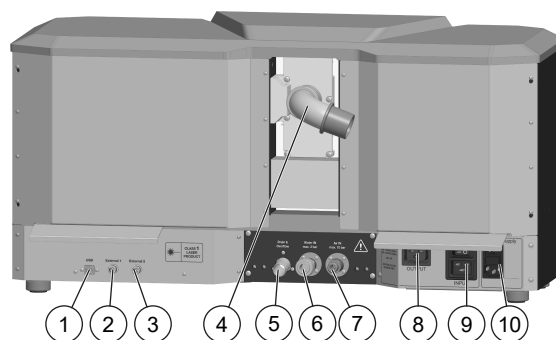


Fig. 6: Rear view of the main unit

- 1 USB socket
- 2 External pump 1 connection
- 3 External pump 2 connection
- 4 Connector to the vacuum cleaner
- 5 Drain and overflow (liquid outlet)
- 6 Water inlet
- 7 Compressed air inlet
- 8 Power supply for vacuum cleaner (Output)
- 9 Power supply and power switch for vacuum cleaner (Input)
- 10 Power supply and power switch

3 Supplied parts

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

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

Table 1: Supplied parts

Qty.	Description	Mat. No.
1	Litesizer DIF 500 main unit or	261784
1	Litesizer DIF 300 main unit or	261783
1	Litesizer DIF 100 main unit	317920
Includes:		
	– 1# Textile cover	185417

Qty.	Description	Mat. No.
	<ul style="list-style-type: none"> – 1# Power cable according to country <ul style="list-style-type: none"> – CEE (52112) – UK (61865) – USA (52656) – China (27011) – Switzerland (93408) – Thailand (79730) – Brazil (130117) 	
	– 2# Water shield	250331
	– 1# USB 2.0 cable 2 m	168165
	– 1# Sample and cleaning kit	264542
	– 1# Coupling socket for water	264369
	– 1# Quick connector air	46291
	– 1# Cover for vacuum cleaner connection	266586
	– 1# USB flash drive 4 GB	87093
	– 1# Scientific poster for Litesizer DIF	317916
	– 1# Litesizer DIF Instruction Manual and Safety Information in English	

Table 2: Additional required parts

Qty.	Description	Mat. No.
1	Kalliope Professional or	166116
1	Kalliope Professional Unlimited	170678

Table 3: Accessories (optional)

Qty.	Description	Mat. No.
1	Litesizer AUTOSAMPLER Accessory for all Litesizer DIF instruments: <ul style="list-style-type: none"> – Enables automatic measurements of up to 60 dry or liquid samples – Use with Polystyrene Vials 10 ml (Mat. No. 199937) 	184479

4 Installation

The installation environment should fully comply with the rules and regulations of your country. Obey safety rules for handling products, solvents, etc.

Read the safety instructions. Find all technical data in Technical data.

4.1 Installation requirements

4.1.1 Environmental requirements

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

Place the instrument on a stable, flat bench which is free of vibrations and level it with the adjustable feet to ensure accurate measurements. Refer to the installation video in Section 4.4 [► 12].



WARNING

Flammable and/or toxic samples or solvents

It is necessary to install an active extraction system above the instrument, or to place the instrument under an extraction hood when operating with flammable and/or toxic samples or solvents. Provide an adequate extraction system (draining system).

Ensure proper ventilation and comply with applicable safety regulations.

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

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

NOTICE

Risk of damage to the laboratory

The waste water line or the tank inlet must be located at least 30 cm (11.8") below the instrument's overflow outlet to ensure an appropriate drainage system.

4.1.2 Lab bench requirements

Lab bench dimensions

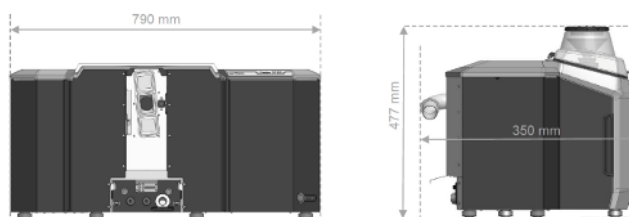


Fig. 7: Dimensions of Litesizer DIF instruments

The figure above shows the instrument with a mounted Dry Jet dispersion unit, which represents the Litesizer DIF minimal bench space requirements:

- Width: 790 mm (31.1")
(main unit with attached dispersion unit)
- Depth: 350 mm (13.8")
(including water shield and vacuum cleaner attachment)
- Height
Main unit: 404 mm (15.9")
Liquid Flow dispersion unit: 404 mm (15.9")
Liquid Flow Chemical dispersion unit: 404 mm (15.9")
Liquid Flow Imaging dispersion unit: 404 mm (15.9")
Dry Jet dispersion unit: 477 mm (18.8")

Anton Paar strongly recommends providing a larger lab bench than the dimensions given above since extra clearance is required to access the switches and connectors in the back of the instrument, to easily exchange the dispersion units, and to add sample into the tank or funnel.

Recommended bench space for comfortable work as following:

- Width: 1700 mm (66.9")
(For the comfortable storing and exchange of two dispersion units on the benchtop. Add additional 400 mm when using all available dispersion units.)
- Depth: 900 mm (35.4")
- Height clearance: 1000 mm (39.4")

Ground clearance must be sufficient to enable the waste tank inlet to be placed at least 30 mm (1.18") below the instrument's overflow outlet connection, refer also to the instruction manual of the Liquid Flow dispersion unit. This is necessary to prevent liquid waste from flowing back to the instrument. Make sure the drain hose never is lifted above the level of the outlet connection.

Make sure there is plenty of space for the PC and monitor on the bench or on a table next to the bench.

Other bench requirements

Weight rating:

- Litesizer DIF main unit: 42.3 kg (93 lb)
- Liquid Flow dispersion unit: 17 kg (37.5 lb)
- Liquid Flow Chemical dispersion unit: 17 kg (37.5 lb)
- Liquid Flow Imaging dispersion unit: 20.1 kg (44.3 lb)
- Dry Jet dispersion unit: 22 kg (48.5 lb)

The bench must have a weight rating significantly above the instrument weight and all dispersion units mounted and/or placed next to it in order to carry the filled instrument as well as all the accessories.

The bench surface should be resistant to the samples, solvents, and other chemicals used with Litesizer DIF.

4.1.3 Computer requirements

There is no PC within the basic scope of supply for Litesizer DIF.

The recommended minimal configurations are:

- Intel Core i5 better
- 8 GB RAM (Windows® 10 - 64 bits) or better
- Windows 10 Pro 64bit
- 50 GB of free space on the hard disk
- Minimum 1 free USB port

NOTICE

Backing up data

The user is responsible for backing up and long-term safeguarding of the data.

NOTICE

Malfunctioning of the instrument

If the computer provided does not meet the above requirements, Anton Paar is not liable for inaccurate measurements, software performance and stability or data presentation..

4.1.4 Electrical requirements



WARNING

Risk of electrical shock

To avoid electrification, all sockets must have a protective ground connection and the AC network power supplies must be fitted with a 30 mA RCD device.



WARNING

Risk of injury and damage

Ensure easy access to mains for disconnecting the power supply (mains adapter or mains connection) in case of emergency.

TIP: *The instrument warms up at the point where it is connected to the power supply. This is not a malfunction. Always remember to use the power switch to turn off the instrument.*

The following power sockets are required:

- 1 x for personal computer
- 1 x for monitor
- 1 x for Litesizer DIF: 10 A, 100-240 V, 50/60 Hz socket
- 1 x for the vacuum cleaner - if Dry Jet dispersion unit is installed. Contact your Anton Paar representative for special requirements in your country.

4.2 Setting up the instrument



Use protective clothing

Use protective clothing when handling Litesizer DIF.



WARNING

Risk of injuries

Do not step under the transport pallet during transport.



CAUTION

Injury and damage to the instrument

Litesizer DIF main unit is heavy (approx. 42.3 kg (93.2 lb)), therefore adequate lifting is required to prevent injuries and instrument damage. Do not attempt to lift or carry it alone. To prevent personal injury or equipment damage, always use two people when lifting or transporting the instrument.

- Always lift the instrument by reaching below the baseplate.

The Litesizer DIF instrument is delivered in a box on a pallet. Do not tilt or stack the boxes.

Litesizer DIF and the dispersion units must be transported and stored in their original packagings at all times and protected from weather and outside influences.

It is recommended to use a forklift or pallet truck for transporting the packed device.

4.2.1 Unpacking the instrument



CAUTION

Injury and damage to the instrument

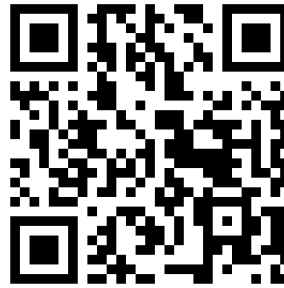
Litesizer DIF main unit is heavy (approx. 42.3 kg (93.2 lb)), therefore adequate lifting is required to prevent injuries and instrument damage. Do not attempt to lift or carry it alone. To prevent personal injury or equipment damage, always use two people when lifting or transporting the instrument.

- Always lift the instrument by reaching below the baseplate.

NOTICE

Risk of damage

- Never use the docking port for the dispersion units to lift the instrument.
- Always lift the instrument by reaching below the baseplate.



Find a video on how to unpack the Litesizer DIF main instrument on the delivered USB stick, go to the link on <https://youtu.be/FIxoAXa2Bgo>, or scan the QR code to the left.

Remove the packaging as listed below:

NOTICE

Risk of damage

Allow the equipment to reach ambient temperature before installation. This is very important if the equipment has been stored or transported at lower temperatures as this may cause electrical damage due to air humidity condensation.

1. Open the box by removing the straps.
2. Lift the lid and find the accessories.
3. Remove the surrounding packaging.
4. Remove the accessories and the foam packaging.
5. 2 persons are needed to lift the instrument from the transport plate.
6. Place the instrument main unit on an even and stable bench and remove the polymer foil.
7. Balance the main unit using the spirit level if necessary. Make sure the height of the main unit is neither too high nor too low to connect to the dispersion unit.

TIP: Make sure Litesizer DIF is placed on a leveled bench. Unleveled placing may lead to problems with sample feeding and dispersion during measurements, will influence the background and will lead to incorrect measurement results. Note that all feet of the Litesizer DIF main unit are adjustable. The feet of the dispersion units are not adjustable.

TIP: The dispersion unit slights in easily. Make sure the feet of the dispersion unit no longer touch the table, refer to Section 4.4.1 [► 12].

8. Store the original packaging for transporting the instrument.

4.3 Connecting the instrument

4.3.1 Electrical connections



WARNING

Risk of injuries and damage

- Make sure that the socket for the instrument and the vacuum cleaner is connected to a main line protected with a residual current circuit breaker.
- Ensure easy access to means for cutting the power supply (mains adapter or mains connection) in case of emergency.
- Never exchange mains cables with other cables. Always use the mains cables supplied. Contact your Anton Paar representative if you need a replacement.

Before connecting the instrument, compare the voltage and current values of the power supply system to be used.

Instruments with electronic components require a stable supply voltage. For weak or non-interference free main supplies (voltage peaks through inductive load changes or switched-mode power supplies), it is recommended connecting a voltage stabilizer and filter.

4.4 Installing the main unit



Find a video on how to install Litesizer DIF on the delivered USB stick, go to the link on YouTube: https://youtu.be/k8irQG_dHoA, or scan the QR code to the left.

TIP: Make sure Litesizer DIF is placed on a leveled bench. Uneveled placing may lead to problems with sample feeding and dispersion during measurements, will influence the background and will lead to incorrect measurement results. Note that all feet of the Litesizer DIF main unit are adjustable. The feet of the dispersion units are not adjustable.

4.4.1 Adjusting the feet height of the main unit

All directions in the instructions below are referenced from above the instrument.

1. Rotate all feet counterclockwise (left) into the device until they are fully seated.
2. Rotate the outer feet clockwise (right) by one full turn.
3. Use the spirit level to determine which foot is the highest. Do not adjust this foot any further.

4. Fine-tune the remaining feet
5. Adjust the other three feet to achieve a balanced position as indicated by the spirit level.
6. Rotate the two inner feet clockwise (right) until they are in contact with the lab bench surface.
7. Test the setup by sliding the dispersion unit into position. It should move approximately halfway along the lab bench, then lift slightly so that, when fully inserted, the dispersion unit feet no longer touch the lab bench.
 - ⇒ If this behavior is not achieved, return to Step 2, rotate the outer feet one full turn clockwise, and repeat Steps 3 to 6.

The feet of the main unit are adjusted correctly, when the spirit level is centered and the feet of the fully inserted dispersion unit do not touch the lab bench.

4.4.2 Installing a dispersion unit

The instrument supports three different dispersion units to enable flexible measurement capabilities based on the sample type and application:

- Liquid Flow / Liquid Flow Chemical dispersion unit
- Dry Jet dispersion unit
- Free Fall dispersion unit

General installation instructions

Before beginning installation, ensure the instrument is powered off and disconnected from any power sources. Choose the appropriate dispersion unit based on your sample characteristics and measurement requirements.

Ensure the selected dispersion unit is securely attached and properly aligned before initiating a measurement. For cleaning and maintenance, refer to the respective dispersion unit's manual.

Liquid Flow / Liquid Flow Chemical dispersion unit

This dispersion unit is designed for wet dispersion of particles in water (Liquid Flow) or in compatible chemicals (Liquid Flow Chemical).

1. Carefully mount the unit according to the alignment guides provided.
2. All connection details — including tubing, couplings, and flow paths — are outlined in the instruction manual for the Liquid Flow dispersion unit.
3. Ensure the liquid reservoir and waste container are positioned securely to allow proper flow.
4. Observe the maximum allowed operating pressure of 3 bar and a maximum flow rate of 5 L/min.

Dry Jet dispersion unit

Used for dry powders, the Dry Jet dispersion unit requires compressed air and vacuum connections for proper particle dispersion.

1. Attach the dispersion unit firmly to the designated interface on the main instrument.
2. Refer to the Dry Jet dispersion unit manual for air pressure and vacuum cleaner connection details.
3. Ensure the diffuser pipe and funnel are correctly positioned for optimized particle flow.

Free Fall dispersion unit

Designed for coarser or non-agglomerating particles, the Free Fall dispersion unit operates purely by gravity.

1. Simply mount the unit onto the main instrument as described in its setup guide.
2. No external connections (air, vacuum, or liquid) to the rear side of the main unit are required.
3. Adjust the funnel height and feed rate settings as needed for optimal particle stream.

4.5 Power on the instrument

After a successful installation as described in Section 4.4 [► 12], power on the instrument with the power switch on the back of the instrument (refer to Fig. 6 [► 8]).

The instrument goes into standby mode when:

- Pressing the standby button (refer to Fig. 5 [► 8]).
- Closing Kalliope software.
- The instrument is being idle for more than two hours.

Reactivate the instrument by pressing the standby button.

4.6 Status lights on the instrument

There are status lights in the upper left and upper right corner of the instrument (refer to Fig. 5 [► 8]).

The lights indicate different instrument status:

Light color	Instrument status
No light	Powered off Standby
White	<ul style="list-style-type: none"> – Constant – Ready for operation – Pulsating – Busy – Flashing – Interaction required
Green	Measurement finished
Yellow flashing	Warning (refer to the message displayed in the software)
Red flashing	Error (refer to the message displayed in the software)

For further warnings and error handling refer to Warnings and error handling.

4.7 Installing Kalliope software

Make sure to configure the network adapter of the PC before installing Kalliope software.



Find a video on how to install Kalliope on the delivered USB stick, go to the link on YouTube: <https://youtu.be/kcW3luyzyz4>, or scan the QR code to the left.

The Kalliope software can be found on the USB hard flash drive delivered within the scope of supply of the instrument.

Connect the USB hard drive to the instrument and follow the steps as described below:

1. Double click on the Kalliope icon in the file list of the flash drive.
2. Follow the installation instructions in the wizard.
3. Start Kalliope by selecting *Program > Kalliope* in the windows start menu or use the shortcut on the desktop.

TIP: There are two software packages, refer to Table 2 [► 9] for description.

TIP: When updating to a new version of the software, the instrument must be switched off.

TIP: With a software activation, your copy (i.e. your license) of Kalliope is installed and registered on a single personal computer (PC) or laptop using the license code. The activation is bound to the PC or laptop, irrespective if and how many times Kalliope is un-installed or re-installed. Note, that operating system or hardware-level changes to a computer may invalidate an activation and hence lead to a loss of the activation.

4.7.1 Activating the software license

When Kalliope is started for the first time, a license code is requested, as shown in the following figure. Kalliope's license can be activated either online or manually.

For both, a valid license code is required.

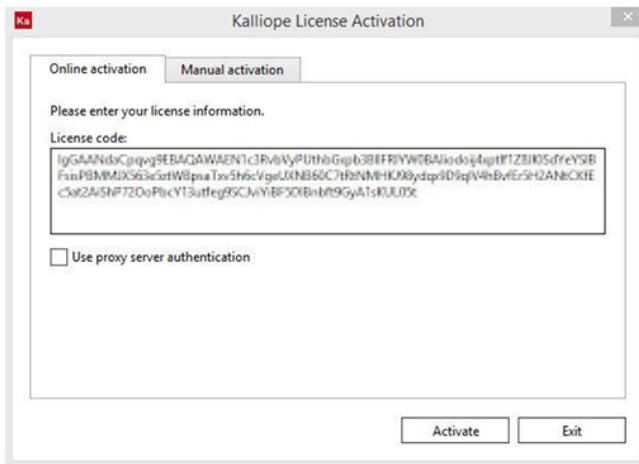


Fig. 8: Entering the software license code

4.7.1.1 Online license activation

For online activation, an Internet connection is required.

In the *Kalliope License Activation* dialog box, open the *Online activation* tab and enter the valid license code provided with the delivery.

Click *Activate*, then click *Exit* and restart the software.

4.7.1.2 Manual license activation

If the PC that controls your instrument is offline, you need to activate the Kalliope license manually.

1. In the *Kalliope License Activation* dialog box, open the *Manual activation* tab.

Note down the machine code.

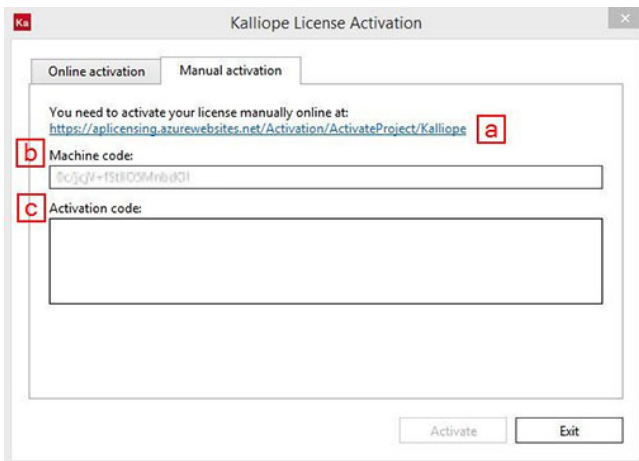


Fig. 9: Manual software license activation

2. On a PC with an active Internet connection, go to the Anton Paar licensing web page (<https://aplicensing.azurewebsites.net/Activation/ActivateProject/Kalliope>).

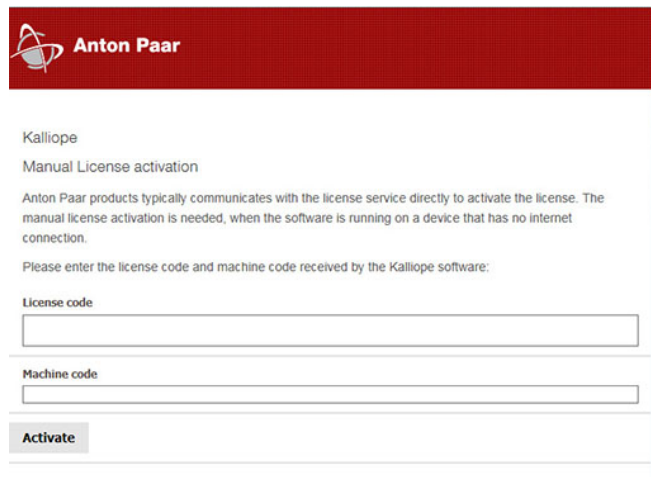


Fig. 10: Retrieving the activation code for manual license activation at the Anton Paar licensing web page

3. Enter the license code from the USB flash drive and the machine code you noted down, then click *Activate*.

Note down the generated activation code.

4. Go back to the off-line PC on which Kalliope is installed, and enter this activation code in the relevant field.
5. Click *Activate*, then click *Exit* and restart the software

4.7.1.3 Removing the license key

In some cases, the existing Kalliope license must be removed and replaced, e.g. when a license extension or module has been acquired after the initial Kalliope installation.

1. Open Kalliope's main menu by clicking on the *Ka* icon at the top left of the screen.
2. Open the *About* tab on the bottom left.
3. Click on the *Delete license* button.
4. Restart Kalliope.
5. Proceed as described in Section 4.7.1 [▶ 13] using your new license key.

5 Operation

NOTICE

Risk of injury

The sound pressure development depends on the sample setup. Measure the sound pressure at a distance of 1 m from the device in your laboratory during sample measurement.

Use the prescribed protective equipment for the corresponding sound pressure levels.

Turn on the instrument using the switch on the back of the instrument (refer to Fig. 6 [▶ 8]), insert the dispersion unit.

Restart Kalliope after license activation, refer to Section 4.7.1 [▶ 13].

A small green check mark on the top right of the user interface indicates that the computer and the software are connected to the instrument.

If the instrument is not connected, an exclamation mark icon is displayed, labeled *Offline* (refer to Fig. 11 [▶ 15]).

If the instrument is offline, make sure the instrument is switched on and is connected to the PC correctly (refer to Section 4.3.1 [▶ 12] for details).

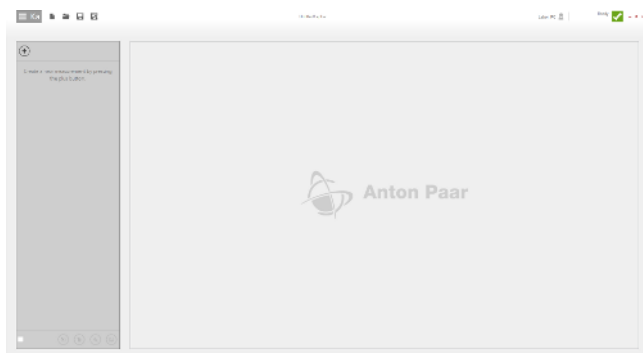


Fig. 11: Kalliope user interface

5.1 Performing a validation measurement

When your Litesizer DIF is installed for the first time, an Anton Paar representative may perform an instrument validation in order to check the instrument's functionality.

The instrument is validated by means of a certified reference material in accordance with the ISO 13322-2 standard.

This procedure will also be performed during the yearly maintenance. Refer to Section 8 [▶ 20] for further information.

Repeat a validation measurement at any time you feel it is necessary (see list below).

In the following cases, validation is strongly recommended:

- When the instrument was moved to another bench, or laboratory, or location. The longer and/or the more complex the transport procedure is, the more stringent is the need for validation.
- When the instrument was in storage or not used for long periods of time.
- If your quality control practices require periodic validation of the instrument (e.g. pharmaceutical industry).

Materials needed for validation

To validate your instrument, you need to order one or more of the following validation materials according to ISO 13322-2.

Validation materials

- **For all Liquid Flow dispersion units:**
 - PS 414 (10 - 100 µm), mat. no.: 264870

- **For Dry Jet dispersion unit:**

- PS 415 (10 - 100 µm), mat. no.: 266062

The stated size may change according to the supplier batch.

Each kit includes 10 vials of the relevant Whitehouse Scientific reference material together with the material's Certificate of Analysis, which is batch-specific. Contact your Anton Paar representative for details.

TIP: Use deionized water for Liquid Flow validation as air bubbles and tap water contaminants might interfere with the validation.

Instrument validation is considered successful when the result of a particle size measurement performed on a sample of reference material is within the validation range. Validation range calculation according to ISO 13322-2:2021.

In Kalliope's validation methods, this validation range is calculated automatically by the software from the material's certified values (certified mean particle size and corresponding uncertainty, for D_{10} , D_{50} and D_{90}). This calculation follows the formulas given by the ISO 13322-2, using a coverage factor (CF) of 3.

Lower validation border = Certified Mean Size - $3 \cdot \sqrt{([\text{Uncertainty}/2]^2 + [\text{Certified Mean Size} \cdot x]^2)}$

Upper validation border = Certified Mean Size + $3 \cdot \sqrt{([\text{Uncertainty}/2]^2 + [\text{Certified Mean Size} \cdot x]^2)}$

- D_{10} ("Cumulative Percent Undersize - 10" in the certificate of analysis): $x = 0.025$
- D_{50} ("Cumulative Percent Undersize - 50" in the certificate of analysis): $x = 0.015$
- D_{90} ("Cumulative Percent Undersize - 90" in the certificate of analysis): $x = 0.025$

1. Click on the **+** button in the Kalliope user interface to create a new measurement.

An overlay appears where you can select the measurement mode.



2. Select *Validation*.
3. Click on *Add new batch*.
You will be guided automatically to the Kalliope's main menu. Here you can create a new batch by copying the current validation.. The batch number and the exact values for D_{10} , D_{50} and D_{90} can be typed in.
4. Now go back to the start screen. Click again on *Plus* and select validation.

**WARNING****Risk of flammable vapors**

Vapors may escape from the tank.

Always use the cover to close the tank to limit vapors escaping.

**WARNING****Risk of crushing**

Never reach into the tank when the stirrer is running to avoid crushing.

**WARNING****Risk of burns**

Never reach into the tank when the ultrasound is on or was in use as solvents might get hot and therefore might cause injuries.

Always put the lid on the tank before starting a measurement.

**WARNING****Risk of injuries and damage to the instrument**

Always monitor the temperature regarding the solvents' partial vapor pressure point as well as the boiling point.

Vapors might be harmful.

Make sure the tank is always filled when using the pump and / or the ultrasound.

7. Automatic filling:

- Select *Automatic* or *Automatic custom* as filling mode.
- In *Automatic custom* mode, select the filling volume: max., half or min.
- Click *Fill > On*.
This fills the system with solvent coming from the liquid supply system.
Filling takes approx. 10 seconds. Observe the tank. Once the liquid reaches the max. mark, the system is filled.
- Filling is deactivated automatically as soon as the system is filled.

TIP: In case of low water pressure in your laboratory, the filling might take longer than 10 seconds.

TIP: To stop all draining and filling, click the red *Stop all* button.

8. For manual filling and draining refer to Section 6.1.1 [▶ 17].
9. After a successful background measurement, the pre-measurement panel opens again.
10. Insert a dispersing agent if required.
11. Insert the sample.

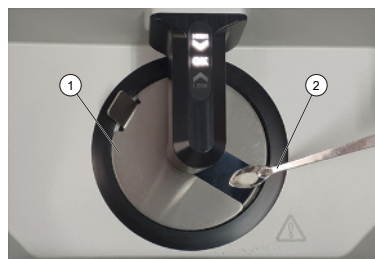


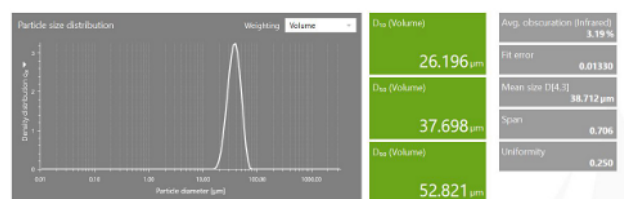
Fig. 12: Sample loading with Liquid Flow dispersion unit

- 1 Tank cover
- 2 Spatula with sample

12. Click on *Continue*.

13. The successful measurement is finished and indicated in green as shown in the Ka workbook overview.

Change the graphic representation and weighting model according to your needs. The values for volumes D_{10} , D_{50} and D_{90} are shown.

Results

14. Post-measurement procedure starts if selected.

NOTICE**Water damage**

After disconnecting the dispersion unit and performing the DRAIN step, a few residual drops of liquid may still escape and drip onto the work surface.

NOTICE**Water damage**

Not closing the water supply to the instrument may lead to water damage of the lab environment.

Always shut the water supply by closing the valve upstream of the instrument, when the instrument is not in use.

NOTICE**Water damage**

If the liquid in the measuring cell overflows, the carrier fluid drains out through the designated outlet at the bottom left side of the dispersion unit.

6.1.1 Manual filling

1. Select *Manual* as filling mode.
2. Remove the tank cover.
3. Fill the tank with max. 600 mL of solvent (water or other).
Make sure the solvent reaches at least the min. mark in the tank (approx. 1/4 of the tank).

4. Activate the pump by selecting slow, medium or fast next to the pump option.
The pump fills the tubing and the measurement cell with solvent by circulating the solvent between the measurement cell and the tank.
This takes approx. 10 seconds.
5. Click *Off* next to *Pump speed* once the system is filled.

6.2 Measuring with Dry Jet dispersion unit



WARNING

Risk of pressure injuries

Always use ear protection when using the Dry Jet dispersion unit as the noise from the high pressure might damage hearing.



WARNING

Risk of not hearing acoustic signals

The Dry Jet dispersion unit might get loud. Surrounding acoustic signals might not be heard. Use visual signals instead.



WARNING

Danger of hand injuries

Never reach underneath the funnel or the chute as long as the instrument is turned on. Keep a safe distance as long as the funnel and chute are still in motion.



WARNING

Danger of inhalation

Samples may be toxic, therefore always wear protective clothing (lab coat, goggles, gloves and mask) when handling samples.

Always close the safety cover of the Dry Jet dispersion unit to minimize inhalation.



Find a video on how to measure with the Dry Jet dispersion unit on the delivered USB stick, go to the link on YouTube: https://youtu.be/xs-TaYmZ_9PY, or scan the QR code to the left.

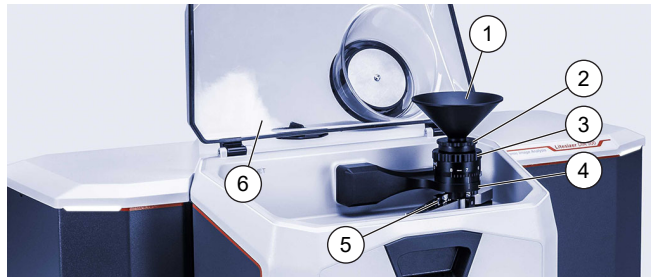


Fig. 13: Top of the Dry Jet dispersion unit

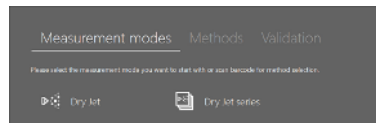
- 1 Funnel
- 2 Funnel clamp
- 3 Clearance adjustment wheel
- 4 Funnel holder
- 5 Chute
- 6 Safety cover

Power up the external vacuum system for measurements with the Dry Jet dispersion unit.

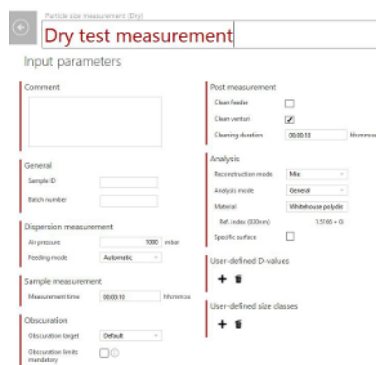
Make sure the vacuum switch on the rear panel of the instrument and the power switch on the vacuum cleaner are both **ON**.

TIP: Activate the vacuum cleaner in the device control in the Kalliope software to test if the vacuum cleaner is powered on.

1. Select *Measurement modes > Dry* to create a single measurement with the Dry Jet dispersion unit.



2. Enter the title.



3. Select the parameters.
For details on the parameters refer to the pdf manual or the manual in Kalliope (*Ka > About > Manuals and Documentation*).
4. Click *Start*.
5. The pre-measurement panel opens.



This panel offers the opportunity to clean the system before the background measurement is performed.

If a background measurement is available click on use last background, otherwise make sure that the system is clean click on *Continue*.



6. Clean the measuring cell with compressed air or with the supplied cleaning accessories. Click *Cleaning > On* to start the cleaning procedure.
7. After a successful background measurement, the pre-measurement panel opens again.
8. Set the funnel to zero position.
9. Insert the sample into the funnel.

TIP: *The quantity of sample necessary for a measurement depends on the density of the product, and can vary from 1 to 300 g or 150 mL respectively.*

10. Check if there is enough sample in the funnel.
11. Set the clearance value to the desired level.
12. Set and activate the air pressure, feeding rate and sample feeding options to start the dispersion.
13. Adjust both parameters (air pressure and feeding) or use automatic sample feeding and regulate the air pressure so that the obscuration reaches a value in the recommended range.

TIP: *Remember that the automatic sample feeding controls only the vibration rate while the air pressure and the clearance between the funnel and feeder have to be set by the user.*

14. Turn the adjustment wheel to expand or to reduce the clearance between feeder and funnel.

TIP: *Click the Start button in the "Live Measurement" section of the pre-measurement control panel to receive a live image of the results.*

TIP: *While the obscuration values tend to be stable in liquid mode, they can vary greatly in dry mode. This is normal and does not mean that the measurement will fail. However, it is strongly recommended to adjust the dispersion parameters so that the obscuration reaches values between 0.5 % and 20 % (size dependent).*

15. If the sample is already consumed during the dispersion adjustment, refill the funnel with sample and continue the procedure.
16. Click on *Measure* to proceed with the measurement.
17. Click on *Continue*.
18. The measurement result window appears, with final results.
19. Post-measurement procedure starts if selected.

7 Upkeep and cleaning

To assure a constant and high accuracy of your measurements, operate and store the instrument under the specified conditions and perform the recommended upkeep tasks regularly.

Make sure that all environmental requirements listed in the installation chapter as well as the specifications chapter are always fulfilled.

Operate the instrument only away from heating, from direct sunlight, and away from open windows.

Always handle the instrument with care. Even minor damage may cause serious measurement errors. Employ a regular optical check for contamination on the outside and inside of the instrument and perform an effective cleaning routine.

The steps described in this chapter might vary depending on your Litesizer DIF configuration. Also make sure to follow the upkeep instructions provided with any third-party products.

7.1 Safety requirements

Carefully read the safety instructions stated in Section 1.1 [► 5] of this manual. The person in charge of upkeep should be trained during installation by an authorized Anton Paar representative. No other person should be authorized to do upkeep operations.



WARNING

Risk of injuries and damage

If any leakage is detected — particularly at the front right side of the dispersion unit or underneath the unit — the instrument must be taken immediately out of operation.

Such leakage is critical for the Liquid Flow Chemical dispersion unit and may indicate internal damage. Safe operation is no longer guaranteed.

Do not attempt to continue using the device. Contact Anton Paar service without delay to arrange inspection and repair. Operating the instrument in this condition may result in damage to the system or pose safety risks.

NOTICE

Damage to the instrument

Every user working with a Litesizer DIF instrument must comply with all safety rules and instructions.

Undertake instrument upkeep in accordance with rules and under the responsibility of your company.

TIP: *For a list of wetted parts refer to the instruction manual and safety information of the Liquid Flow, Liquid Flow Imaging, or Liquid Flow Chemical dispersion unit, if applicable. There are no wetted parts in this instrument unless it is used in connection with the Liquid Flow Liquid Flow Imaging, or Liquid Flow Chemical dispersion unit.*

7.2 Cleaning of the main unit



CAUTION

Health risk

Never blow away powder residue. Do not disperse powder residues into the air. Always use an adequate vacuum cleaner to clean the instrument.

NOTICE

Damage to the instrument, incorrect measurement results

Contaminations on and in the instrument will lead to inaccurate measurement results and will eventually damage the instrument.

Clean the main unit and the dispersion units as soon as measurement results or validation measurement are out of range.

TIP: Always use gloves when cleaning the instrument to avoid contamination.

7.2.1 Cleaning the docking port of the main unit

Clean the port using a vacuum cleaner to remove powder residues.

TIP: Make sure never to touch the laser safety glasses or the docking port to avoid contamination.

7.3 Exchanging the fuses

Litesizer DIF has two main fuses for the power supply that are integrated into the power switch.

Required equipment and spare parts

- Two fuses T 4 AH

Replacing the fuses

1. Turn off the instrument and disconnect it from the power cable.
2. Pull out the fuse tray.
Carefully use a screwdriver to help.
3. Replace the fuses by new ones and insert the fuse tray again

7.4 Software administration

Ensure that the PC connected to the instrument meets the specified requirements. Store the software data storage device delivered with the instrument in a safe place. Install mandatory software and firmware updates as soon as they are provided by your local Anton Paar representative.

TIP: When setting up the PC workstation, remember that you need administrator rights to set up the system.

7.5 Storing and transporting the instrument



CAUTION

Injury and damage to the instrument

Litesizer DIF main unit is heavy (approx. 42.3 kg (93.2 lb)), therefore adequate lifting is required to prevent injuries and instrument damage. Do not attempt to lift or carry it alone. To prevent personal injury or equipment damage, always use two people when lifting or transporting the instrument.

- Always lift the instrument by reaching below the baseplate.

NOTICE

Damage to the instrument

- Never use the docking port for the dispersion units to lift the instrument.
- Never lift the instrument with a dispersion unit attached. Always detach the dispersion unit first, put it in a safe place and then carefully lift and move the main unit by reaching below the baseplate.

Store the instrument under clean conditions that fulfill the ambient conditions provided in Appendix A [► 22].

If the instrument is not in use for a certain time (> one week) use the protective cover to avoid dust contamination.

All liquid and powder residues must be removed before moving or shipping the instrument.

The instrument must be transported in the original package and packed according to the supplier's instructions.

During transport, the instrument must not be exposed to intense shocks or high forces.

8 Maintenance and repair

8.1 Maintenance performed by an authorized Anton Paar representative

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

If the product is no longer performing optimally (e.g., sensor performance), consider ordering product maintenance.

Please contact your local Anton Paar representative for more information about service options (e.g., service, possible warranty extension).

Table 4: Maintenance and repair

Component	Action	Interval	Classification
Litesizer DIF Laser-Shutter	Check	12 months	Mandatory

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

- Glass parts
- Hoses
- Adapters, connectors, fittings
- Filters & vacuum cleaner filters
- O-rings, seals, gaskets
- Cables
- Fuses

To fulfill requirements of regulatory authorities e.g. FDA 21 CFR 211.67, PIC/S 023-2 (5.5), Anton Paar offers services for compliant preventive maintenance and requalification for qualified Anton Paar instruments in case of software update, repair, and location change.¹

8.2 Repair performed by an authorized Anton Paar representative

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

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

¹ For detailed information, please refer to general terms of delivery (GTD) on the Anton Paar website (<https://www.anton-paar.com>).

Appendix A Technical data

Table 5: Technical specification of Litesizer DIF Series

Feature	Litesizer DIF 500	Litesizer DIF 300	Litesizer DIF 100
Measurement principle	Laser Diffraction (Mie and Fraunhofer scattering)		
Measurement range	0.01 μm - 3500 μm	0.1 μm - 2500 μm	0.1 μm - 1000 μm
Size classes	144 (user adjustable)	114 (user adjustable)	104 (user adjustable)
Accuracy ^a	better than ± 0.5 % variation ^b		
Repeatability	better than ± 0.5 % variation ^b		
Reproducibility ^c	better than ± 1 % variation ^b		
Typical measurement duration	<10 sec		
Data acquisition rate	16 kHz		
Light source 1			
Type	Fiber coupled laser diode		
Optical arrangement	Reverse Fourier setup		
Wave length	830 nm, infrared		
Power	10 mW		
Light source 2		--	
Type	Diode laser		
Optical arrangement	Tilted relative to IR laser		
Wave length	blue 450 nm		
Power	25 mW		
Detectors			
Type	Log-spaced photo diode array and single diodes for side and back-scattering		
Angular range	0.01° - 170°	0.01° - 155°	
Focal length	300 mm		
Alignment	Automatic		
Compatible dispersion units			
Liquid Flow dispersion unit	Dispersion using a liquid carrier, mixing, and ultrasonication		
Liquid Flow Imaging dispersion unit	Dispersion using a liquid carrier, mixing, and ultrasonication	Not compatible with Litesizer DIF 100	
Liquid Flow Chemical dispersion unit	Dispersion using a liquid carrier, mixing, and ultrasonication		
Dry Jet dispersion unit	Dispersion via compressed air		
Instrument data			
Dimensions	400 mm x 790 mm x 290 mm (H x W x D) ^d		

Feature	Litesizer DIF 500	Litesizer DIF 300	Litesizer DIF 100
Weight	42.3 kg (93.2 lb) ^d		
Compressed air supply	5 - 10 bar (72 - 145 psi)		
Water supply	min. 0.1 bar to max. 3 bar at max. 40 °C (min. 1.5 psi to max. 43.5 psi at max. 104 °F)		
Voltage			
Power supply	100 V to 230 V ±10 %		
Power connection	Protection class I with protective earth		
Frequency	50 Hz to 60 Hz		
Power consumption	200 W		
Fuse	T 4 AH		
Connections			
Electrical	Analyzer AC network, vacuum cleaner system AC network, vacuum cleaner system supply		
Pneumatic	Vacuum cleaner system outlet, air inlet (dry mode) ^e , water inlet (liquid mode), water outlet, overflow outlet ^f		
Environmental conditions (EN 61010)			
Temperature	10 °C – 35 °C		
Humidity	35 - 80 % r.h. not condensing		
Altitude	up to 3000 m		
Over-voltage category	II		
Degree of pollution	2		
IP protection class	41		
Indoor/outdoor	Indoor use only		
Compliance			
Compliant with	ISO 13320:2020, USP 429, ASTM B822 – 20, ASTM D4464 - 15(2020) ASTM E2316 - 14(2019)		

^a Defined for a monomodal latex standard and accounting for manufacturer's uncertainty of standard size.

^b Sample and preparation dependent. Defined for liquid dispersion measurements.

^c Defined for D_{50} of a polydisperse standard.

^d Without PC and dispersion units

^e For the use with Dry Jet dispersion unit

^f For the use with Liquid Flow dispersion unit

For technical data of the dispersion units, refer to the respective chapter in the instruction manual and safety information of the dispersion unit.

Appendix B Warnings and error handling

Status lights and recommended actions

Follow the instructions of the table below to handle status indicated by the status light.

Light color	Instrument status	Detailed reason	Recommended action
No light	Powered off or in standby	No power or the instrument is in standby mode	Refer to Section 4.5 [▶ 13]. If the instrument does not power up: check the power source, power cabling and fuse (refer to Section 7.3 [▶ 20]). If the problem persists, contact your Anton Paar representative.
White constant	Ready for operation	Ready for operation	Set up a measurement, refer to Section 5 [▶ 14] and Performing a measurement.
White pulsating	Busy	Measurement is ongoing	No interaction required. Wait until the light is no longer white pulsating.
White flashing	Interaction required	Instrument awaits adding the sample	Add the sample and confirm in Kalliope software. Refer to Performing a measurement.
Yellow flashing	Warning	Disconnected during measurement	Check the connection between the dispersion unit and the main unit. Check the cables connecting the instrument and the PC. If the problem persists restart the instrument and software. If the problem persists, contact your Anton Paar representative.
		Instrument is not calibrated	Refer to Section 5.1 [▶ 15].
		Firmware / software version mismatch	Contact your Anton Paar representative to update the firmware/software.
Red flashing	Error (refer to the message displayed in the software)	Hardware error (electronics error within the instrument)	Restart the instrument and software. If the problem persists, contact your Anton Paar representative.
		Instrument parameters are not available (serial number, ...)	Contact your Anton Paar representative.
		Software error	Restart the instrument and software. If the problem persists, contact your Anton Paar representative.

Appendix C Declaration of conformity

DocuSign Envelope ID: 6129DA84-5E0A-4083-857F-99DC7B84B11A

EU Declaration of Conformity

(original)



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

Product designation:	Litesizer DIF 500, Litesizer DIF 300, Litesizer DIF 100 Liquid Flow Dispersion Unit Liquid Flow Imaging Dispersion Unit Liquid Flow Chemical Dispersion Unit Dry Jet Dispersion Unit
Model:	Litesizer DIF 500, Litesizer DIF 300, Litesizer DIF 100 Liquid Flow Dispersion Unit Liquid Flow Imaging Dispersion Unit Liquid Flow Chemical Dispersion Unit Dry Jet Dispersion Unit
Material number:	261784, 261783, 317920, 261786, 261790, 324920, 261787

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

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

Applied harmonised standard:

- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
- EN 60825-1:2014+A11:2021

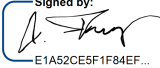
Electromagnetic Compatibility (2014/30/EU, OJ L 96/79 of 29.3.2014)

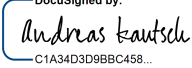
Applied harmonised standard:

- EN 61326-1:2013

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

Place and date of issue: Graz, 13 August 2025

Signed by:

 E1A52CESF1F84EF...
Alfred Freiburger
 Business Unit Manager
 Business Unit Characterization

DocuSigned by:

 C1A34D3D9BBC458...
Dr. Andreas Kautsch
 Head of Particle Analysis and Surface Charge
 Business Unit Characterization

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E27IB026EN-D