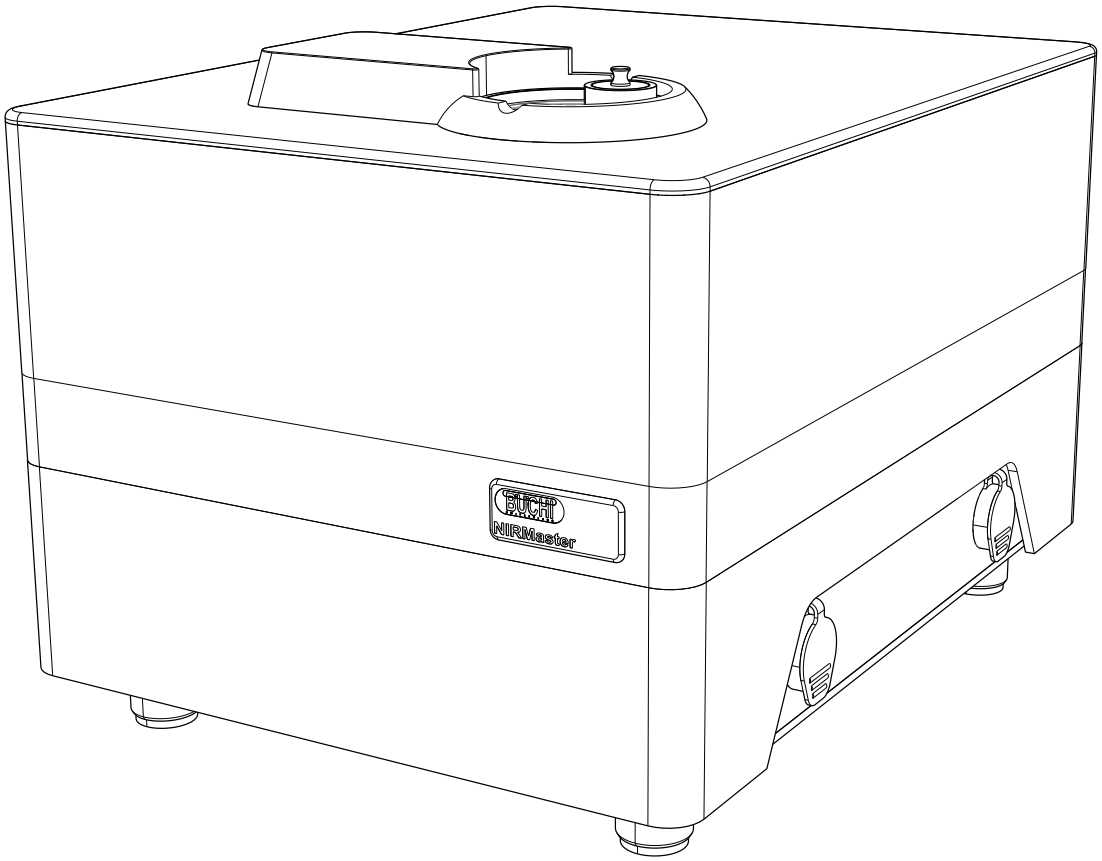
NIRMaster™
Operation Manual



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1 About this document

This operation manual is applicable for all variants of the instrument.
Read this operation manual before operating the instrument and follow the instructions to ensure safe and trouble-free operation.
Keep this operation manual for later use and pass it on to any subsequent user or owner.
BÜCHI Labortechnik AG accepts no liability for damage, faults and malfunctions resulting from not following this operation manual.
If you have any questions after reading this operation manual:

▶ Contact BÜCHI Labortechnik AG Customer Service.

https://www.buchi.com/contact

1.1 Mark-ups and symbols

NOTE

This symbol draws attention to useful and important information.

☑ This character draws attention to a requirement that must be met before the instructions below are carried out.

▶ This character indicates an instruction that must be carried out by the user.

⇨ This character indicates the result of a correctly carried out instruction.

Mark-up	Explanation
Window	Software Windows are marked-up like this.
Tab	Tabs are marked-up like this.
Dialog	Dialogs are marked-up like this.
[Button]	Buttons are marked-up like this.
[Field names]	Field names are marked-up like this.
[Menu / Menu item]	Menus or menu items are marked-up like this.
Status	Status is marked-up like this.
Signal	Signals are marked-up like this.

1.2 Trademarks

Product names and registered or unregistered trademarks that are used in this document are used only for identification and remain the property of the owner in each case.

1.3 Connected devices

In addition to these operating instructions, follow the instructions and specifications in the documentation for the connected devices.

2 Safety

2.1 Proper use

The instrument is designed and built for laboratories and production environments (at-line). It serves to determine the concentration of selected constituents contained within a substance.
The instrument can be used for the following tasks:

- Determination of quantifiable product properties.

2.2 Use other than intended

Use of any kind other than that described in Chapter 2.1 "Proper use", page 7 and any application that does not comply with the technical specifications (see Chapter 3.6 "Technical data", page 15) constitutes use other than that intended.
In particular, the following applications are not permissible:

- Use of the instrument in rooms which require Ex-protected instruments.
- Use of samples, which can explode or inflame (example: explosives, etc.) due to shock, friction, heat or spark formation.

2.3 Staff qualification

Unqualified persons are unable to identify risks and are therefore exposed to greater dangers.
The device may only be operated by suitably qualified laboratory staff.
These operating instructions are aimed at the following target groups:

Users

Users are persons that meet the following criteria:

- They have been instructed in the use of the device.
- They are familiar with the contents of these operating instructions and the applicable safety regulations and apply them.
- They are able on the basis of their training or professional experience to assess the risks associated with the use of the device.

Operator

The operator (generally the laboratory manager) is responsible for the following aspects:

- The device must be correctly installed, commissioned, operated and serviced.
- Only suitably qualified staff may be assigned the task of performing the operations described in these operating instructions.
- The staff must comply with the local applicable requirements and regulations for safe and hazard-conscious working practices.
- Safety-related incidents that occur while using the device should be reported to the manufacturer (quality@buchi.com).

BUCHI service technicians

Service technicians authorized by BUCHI have attended special training courses and are authorized by BÜCHI Labortechnik AG to carry out special servicing and repair measures.

2.4 Warning notices in this document

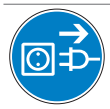
Warning notices warn you of dangers that can occur when handling the device. There are four danger levels, each identifiable by the signal word used.

Signal word	Meaning
DANGER	Indicates a danger with a high level of risk which could result in death or serious injury if not prevented.
WARNING	Indicates a danger with a medium level of risk which could result in death or serious injury if not prevented.
CAUTION	Indicates a danger with a low level of risk which could result in minor or medium-severity injury if not prevented.
NOTICE	Indicates a danger that could result in damage to property.

2.5 Warning and directive symbols

The following warning symbols are displayed in this operation manual or on the instrument.

Symbol	Meaning
	General warning
	Dangerous electrical voltage
	Laser beam
	Laser class 1
	Avoid exposure to laser beam
	Hot surface
	Device damage
	Breakable items

Symbol	Meaning
	Magnetic field
	Unplug device
	Wear safety goggles
	Wear protective gloves
	Heavy weight, lifting requires more than one person

2.6 Residual risks

The instrument has been developed and manufactured using the latest technological advances. Nevertheless, risks to persons, property or the environment can arise if the instrument is used incorrectly.
Appropriate warnings in this manual serve to alert the user to these residual dangers.

2.6.1 Glass and acrylic breakage

Broken glass and acrylic can cause severe cuts.
Broken glass or acrylic can enter production.

- ▶ Handle the Petri Dishes and other glass and acrylic components carefully and do not drop them.
- ▶ Always visually inspect glass and acrylic components for damage every time they are to be used.
- ▶ Do not continue to use glass and acrylic components that are damaged.
- ▶ Always wear protective gloves when disposing of broken glass and acrylic.

2.6.2 Faults during operation

If a device is damaged, sharp edges or exposed electrical wires can cause injuries.

- ▶ Regularly check device for visible damage.
- ▶ If faults occur, switch off the device immediately and inform the operator.
- ▶ Do not continue to use devices that are damaged.

2.6.3 Data loss

In the event of a power failure, e.g. due to lightning or interruption of power supply, measurement data may be lost.

- ▶ Carry out regular data backup.

2.7 Personal protective equipment

Depending on the application, hazards due to heat and/or corrosive chemicals may arise.

- ▶ Always wear appropriate personal protective equipment such as safety goggles, protective clothing and gloves.
- ▶ Make sure that the personal protective equipment meets the requirements of the safety data sheets for all chemicals used.

2.8 Modifications

Unauthorized modifications can effect safety and lead to accidents.

- ▶ Use only genuine BUCHI accessories, spare parts and consumables.
- ▶ Carry out technical changes only with prior written approval from BUCHI.
- ▶ Only allow changes to be made by BUCHI service technicians.

BUCHI accepts no liability for damage, faults and malfunctions resulting from unauthorized modifications.

3 Product description

3.1 Description of function

The instrument is a benchtop Fourier Transformation Near Infrared spectrometer (FT-NIR) to identify and quantify analytes of interest. It generates an invisible near infrared interferogram beam which interacts with the mole- cules of a sample, generating a characteristic feedback. The feedback is picked up via a measurement cell by a detector and mathematically processed via Fourier transformation into a spectrum. This spectrum is charac- teristic for a given sample and allows identification as well as quantification of its components.

How the interferogram is generated

An interferogram is an interference pattern of phase-shifted beams. The instrument is a single-beam polarization interferometer, generating its interferogram in four steps:

1. Polarization of the light source output

   The polarizer ② generates a well-defined polarization output of the undefined polarized light, emitted by the light source ①. Thus, only diagonally polarized light is transmitted.

2. Beam splitting and orthogonal polarization

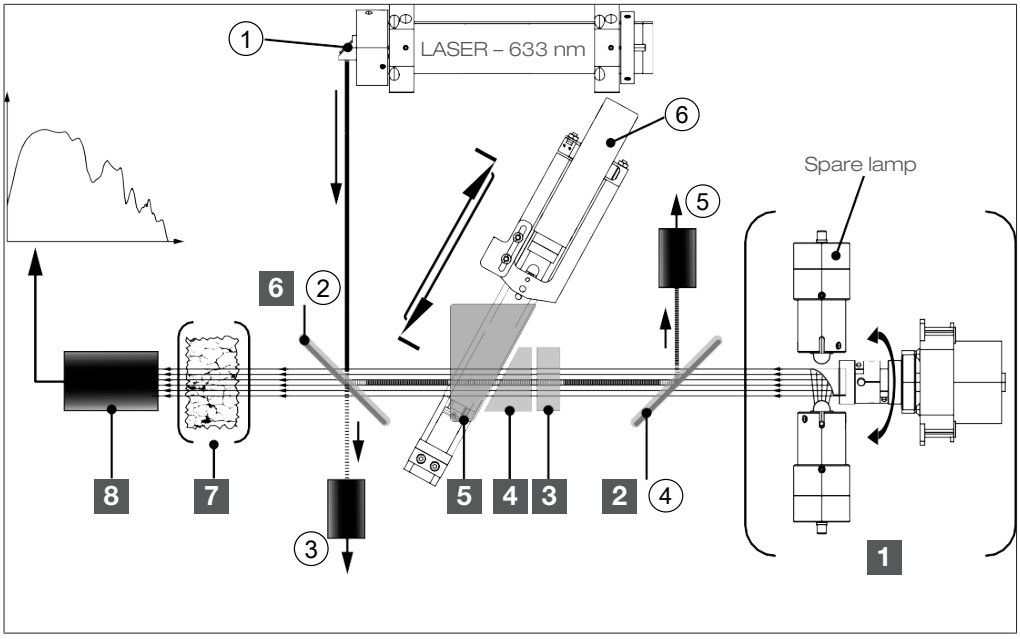
   The polarized light enters a double refracting block (comparator) ③. Here, the light is broken down into two, orthogonally polarized components with a small, static phase shift.

3. Generating the ongoing phase shift

   An assembly of two double refracting wedges is arranged after the comparator. Wedge ④ is stationary, while wedge ⑤ is constantly shifted back and forwards by a fast linear-drive. The movement and the geometric arrangement provides a change of thickness in the light path. This leads to an ongoing phase shift between the light beams.

4. Beam recombination and interferogram output

   A second polarizer ⑥ converts the phase shifted beams into a single light output with intensity variation – the interferogram



3.1.1 Effective NIR light path

Number	Explanation
1	NIR light source assembly with spare lamp and motorized parabolic reflector
2	First polarizer
3	Comparator (double refracting block)
4	Stationary double refracting wedge
5	Moving double refracting wedge
6	Second polarizer
7	Sample
8	Interferogram detector

3.1.2 Reference laser signal path

Number	Explanation
①	Laser output window
②	Second polarizator (works as a beam splitter for the laser)
③	Laser output-power sensor
④	First polarizer
⑤	Laser feedback detector
⑥	Linear motor for wedge movement

3.1.3 NIRWare software suite

NIRWare is the interface program suite between the instrument and the operator. All program parts need to be hosted on a separate PC.

All measurements are performed using the NIRWare Operator. The NIRWare Operator includes the following program elements by default:

- Operator interface(s)
- Administrative tools
- Report templates
- Software to run routine analysis
- Comprehensive database with analysis data and other

Advanced software and system management is done with the NIRWare Management Console tool.
The NIRWare Management Console combines various software modules

- NIRWare Application Designer to define NIRWare Operator applications.
- NIRWare Sample Manager to administrate all samples and reference values.
- NIRWare Administrative Tools for applications and calibrations interchange and other administrative tasks.
- NIRWare Security Designer to define users and user groups according to custom security policies.
- The BUCHI Database Manager is used for any database operations.

Optional:.

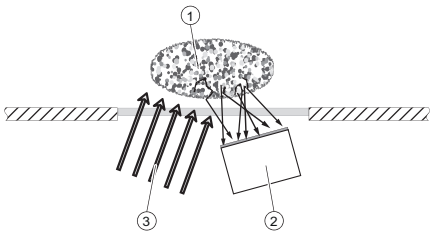
- NIRWare LIMS to import and export sample information and measurement data.
- NIRWare Library Designer is a powerful software module for substance identity control using full spectral comparison. It is designed for the development of spectral libraries tailored to individual user requirements

To connect the instrument with a PC see Chapter 5.5 "Setting up the network connection between Computer and instrument", page 23.

3.2 Measurement modes

3.2.1 Diffuse reflection mode

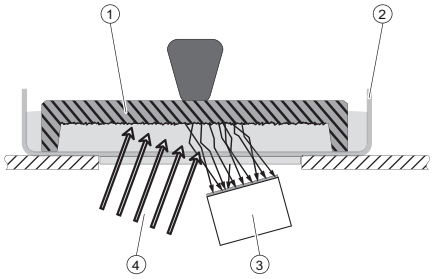
Non-translucent materials can be analyzed via diffuse reflection.
NIR light penetration is limited by the sample material. It interacts with the sample, is refracted and diffusely reflected into the sensor. The reflected rays contain the spectral information of the sample.



① Sample
② Sensor
③ Light

3.2.2 Transflectance mode

Translucent and opaque liquids can be analyzed via transflectance mode. The light penetrates the liquid, is diffusely reflected by the reference plate and passes through the sample a second time. The transflected rays contain the spectral information of the sample.



① Transflectance cover
② Sample cup
③ Sensor
④ Light

3.3 Configuration

3.3.1 NIRMaster instrument

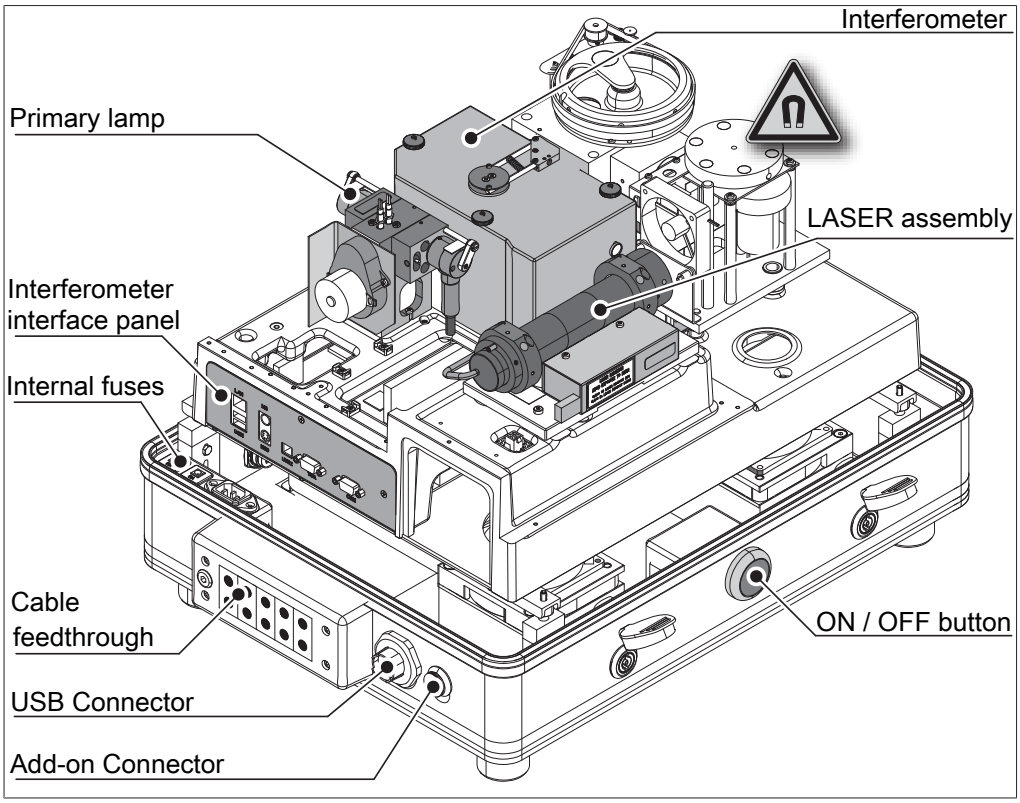


Fig. 1: Shows the main components of the instrument at open housing.

3.4 Scope of delivery

NOTE

The scope of delivery depends of the configuration of the purchase order.

Accessories are delivered as per the purchase order, order confirmation, and delivery note.

3.5 Type plate

The type plate identifies the instrument. The type plate is located at the rear of the instrument.

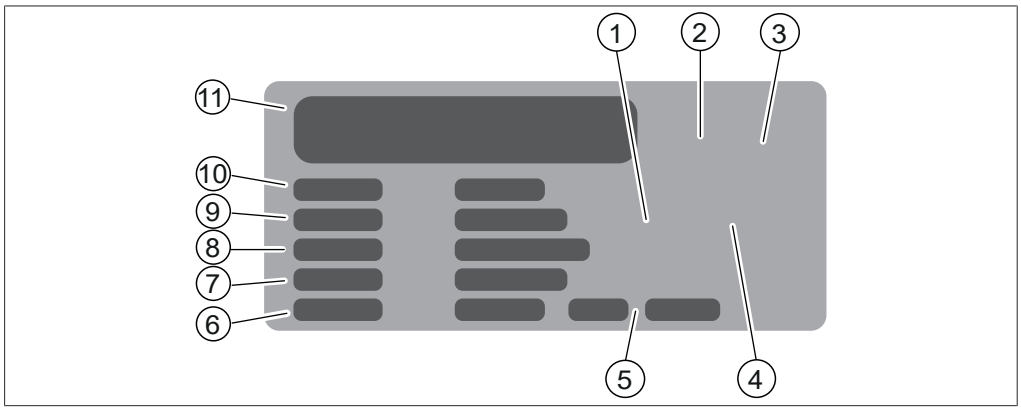


Fig. 2: Type plate

1	Symbol for "electronics recycling"	2	Initial product code
3	Approvals	4	Symbol for "Do not dispose of as household waste"
5	Year of manufacture	6	Power consumption maximum
7	Frequency	8	Input voltage range
9	Serial number	10	Instrument name
11	Company name and address		

3.6 Technical data

3.6.1 NIRMaster™ Essential

Specification	NIRMaster™ Essential
Dimensions (W x D x H)	420 x 560 x 360 mm
Weight	43 kg
Minimum clearance on all sides	150 mm
Connection voltage	100 – 240 VAC ± 10 %
Frequency	50 / 60 Hz
Power consumption	150 W
IP Code	54
Internal fuse	4A / 240V
Type of interferometer	Polarisation interferometer with TeO2 wedges
Spectral range	800 – 2500 nm 12 500 – 4000 cm–1
Resolution (with boxcar apodization)	8 cm–1
Wavenumber accuracy (at an ambient temperature of 25°C ± 5°C)	± 0.2 cm–1

Specification	NIRMaster™ Essential
Signal-to-noise ratio	10000 (peak-to-peak noise of a linear corrected base- line between 5600−6000 cm-1)
Number of scans/sec.	2 - 4
Illumination spot diameter	9 mm
Analog digital converter	24 bit
Lamp type	Tungsten-halogen
Average life (lamp)	6000 h
Type of laser	12 VDC HeNe, wavelength at 632.992 nm
Connection voltage	100 – 240 VAC ± 10 %
Detector	Extended range InGaAs (temperature controlled)
Internal reference	Gold plate
External reference	Spectralon®
Sample rotation	Easy-spin drive, a magnetic spinner is included for high performance measurement of inhomogeneous sample

3.6.2 Ambient conditions

For indoor use only.

Max. altitude above sea level	2000 m
Ambient temperature	5 - 40 °C (25 °C)
Maximum relative humidity	80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C
Storage temperature	max. 45 °C

3.6.3 Materials

Component	Material of construction
Spectrometer base	Aluminum
Wedges	TeO_2
Polarizers	Glass
Upper housing part	PMMA, food grade
Lower housing part	Stainless steel, food grade 1.4301
Spinner	PETP, stainless steel 1.4305 / 1.4301
XL add-on	Stainless steel 1.4305, glass

Component	Material of construction
External reference	Aluminum, glass inlay, PTFE inlay
Transflectance adapter	Stainless steel 1.4435
Detector	InGaAs
Magnets	NdFeB

3.6.4 Installation site

- The installation site allows that the power supply can be disconnected at any time in an emergency.
- The installation site has a firm, level and nonslip surface.
- The installation site has a fume hood.
- The installation site has an own mains outlet socket for the instrument.
- The installation site has enough space that cables / tubes can be routed safely.
- The installation site has no obstacles (e.g. water taps, drains, etc.).
- The installation site is not exposed to external thermal loads, such as direct solar radiation.
- The installation site is not located near vibration-sensitive devices.
- The installation site meets the requirements for the connected devices. See related documentation
- The installation site meets the requirements of the safety data sheets for all solvents and samples used.
- The installation site meets the safety requirements. See Chapter 2 "Safety", page 7
- The installation site meets the specifications according to the technical data (e.g. weight, dimension, etc.). See Chapter 3.6 "Technical data", page 15

4 Transport and storage

4.1 Transport

NOTICE

Risk of breakage due to incorrect transportation

- ▶ Make sure that all parts of the device are safely packed in such a way as to prevent breakage, ideally in the original box.
- ▶ Avoid sharp movements during transit.

- ▶ After transportation, check the device for damage.
- ▶ Damage that has occurred in transit should be reported to the carrier.
- ▶ Keep packing for future transportation.

4.2 Storage

- ▶ Make sure that the ambient conditions are complied with (see Chapter 3.6 "Technical data", page 15).
- ▶ Wherever possible, store the device in its original packaging.
- ▶ After storage, check the device for damage and replace if necessary.

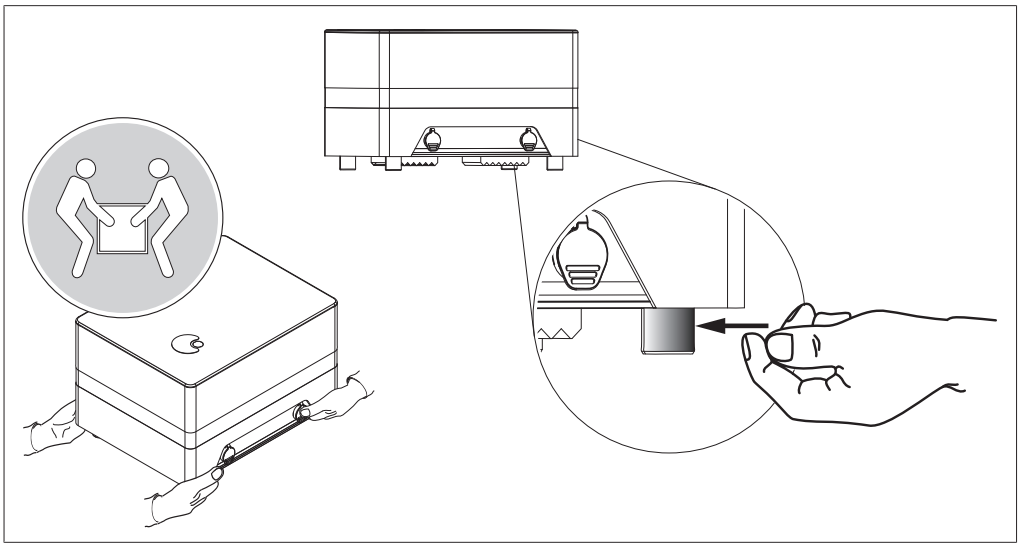
4.3 Lifting the instrument

⚠ WARNING

Danger due to incorrect transportation

The possible consequences are crushing injuries, cuts and breakages.

- ▶ The instrument should be transported by two persons at the same time.
- ▶ Lift the instrument at the points indicated.



4.4 Lock / unlock the transportation lock

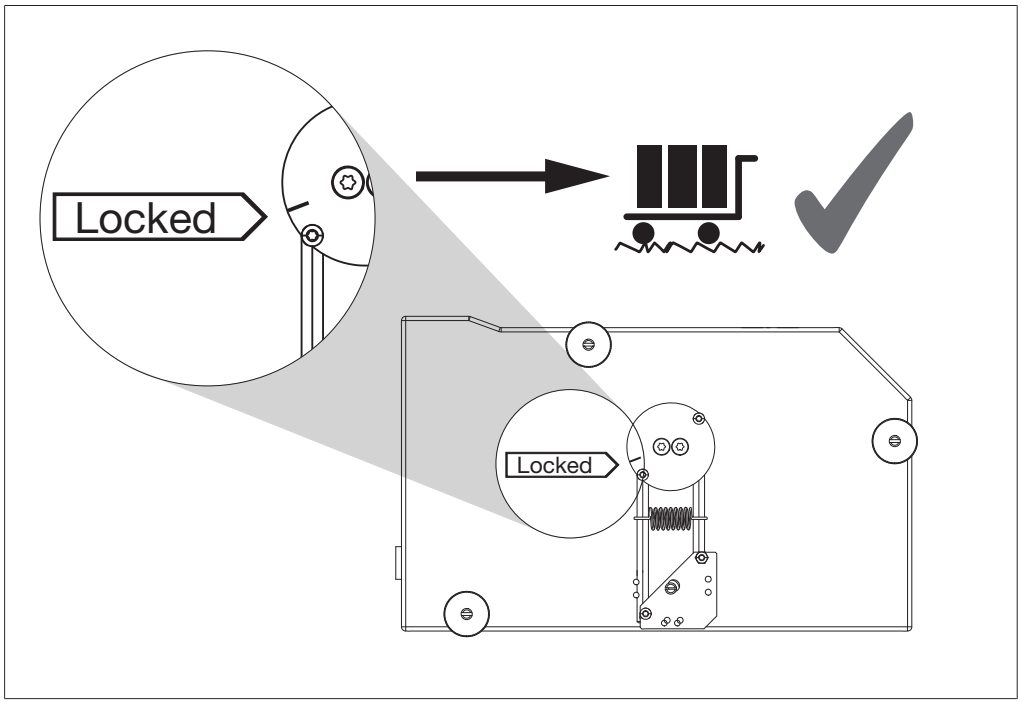
NOTICE

Risk of instrument damage at use with engaged transportation lock.

- ▶ Disengage the transportation lock prior use.

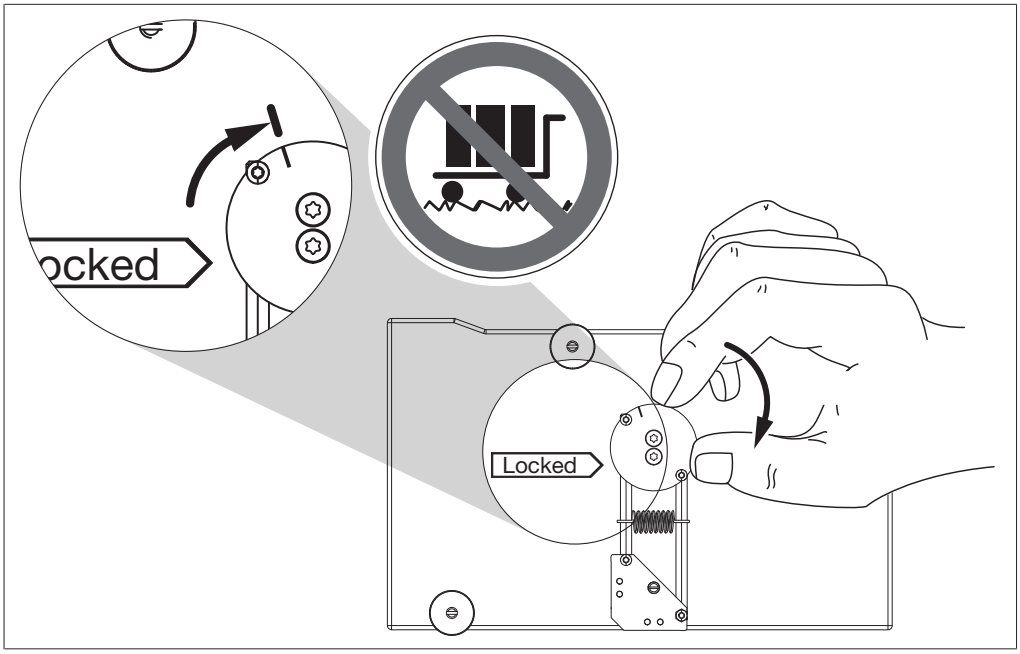
- ▶ Switch off the instrument.
- ▶ Unplug the power cord.
- ▶ Unlock the housing.
- ▶ Lift off the top cover.

⇨ The locking mechanism is accessible.



- ▶ Turn the knob in clockwise direction.

⇨ The locking mechanism is unlocked and the linear drive of the interferometer is freely moveable.



- Close the top cover.
- Lock all four latches.
- Plug in the power cord.
- Switch on the instrument.

5 Installation

5.1 Before installation

NOTICE

Instrument damage due to switching it on too early.

Switching on the instrument too early after transportation can cause damage.

▶ Climatize the instrument after transportation.

5.1.1 Electrical connections requirement

NOTICE

For safe servicing the instrument it needs to be disconnect from the mains power supply.

Precondition:

☑ The instrument is installed with a locked or secured plug.

☑ The instrument is installed stationary (without power plug).

▶ An external power switch is required.

5.2 Establishing electrical connections

NOTICE

Risk of instrument damage because of not suitable power supply cables.

Not suitable power supply cables can cause bad performance or an instrument damage

▶ Use only BUCHI power supply cables.

Precondition:

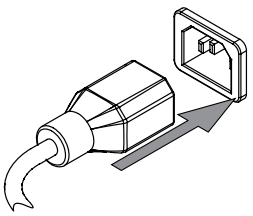
☑ The electrical installation is as specified on the type plate.

☑ The electrical installation is equipped with a proper grounding system.

☑ The electrical installation is equipped with suitable fuses and electrical safety features.

☑ The installation site is as specified in the technical date. See Chapter 3.6 "Technical data", page 15

▶ Connect the power supply cable to the connection on the instrument. See Chapter 3.3 "Configuration", page 14



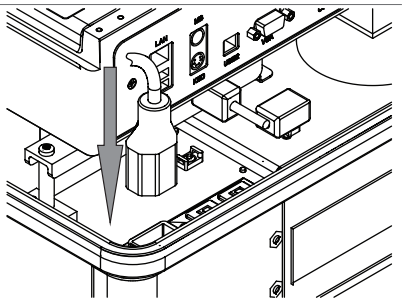
▶ Connect the mains plug to an own mains outlet socket.

5.2.1 Connect the mains cable

Precondition:
☑ The cover is removed.

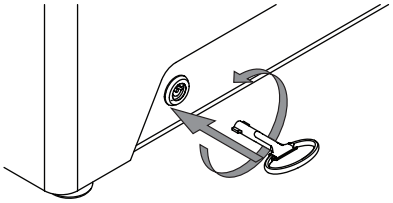
▶ Route the mains cable through the cable gland in the lower chassis.

▶ Connect the cable to the main socket at mounted on the rear of the instrument lower chassis.



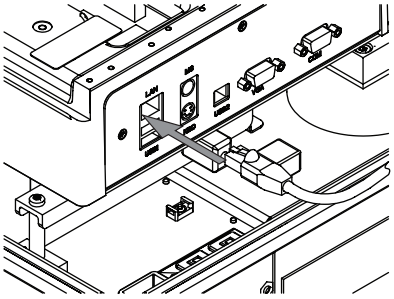
5.3 Connect the instrument to the PC using the supplied ethernet cable

▶ Remove the cover from the top of the instrument with the key provided. (Two fixings on the left hand side, two fixings on the right hand side)



▶ Route the ethernet cable through the cable gland in the lower chassis.

▶ Connect the cable to the ethernet socket on the rear of the cream colored optical bench.



5.4 Install the BUCHI NIRWare software on the computer

Install the BUCHI NIRWare software on the computer

Install BUCHI NIRWare software suite following the instruction in Chapter 4 “Software Installation” of the NIRWare Quick Guide.

Note!

Activate the relevant licences for software and any pre-calibrations that are required.

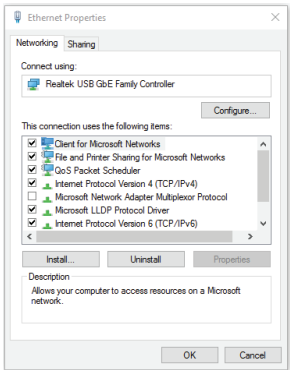
5.5 Setting up the network connection between Computer and instrument

▶ Start the computer, and open the dialog box *Ethernet Properties*.

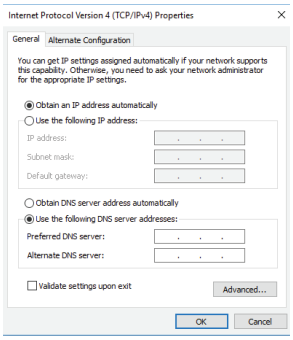
▶ Highlight the option *[Internet Protocol Version 4 (TCP/IPv4)]* from the list.

▶ Click the button *[Properties]*.

⇨ The dialog box *Internet Protocol Version 4 (TCP/IPv4)* open.



▶ Activate the radio button next to *[Use the following IP address]*.

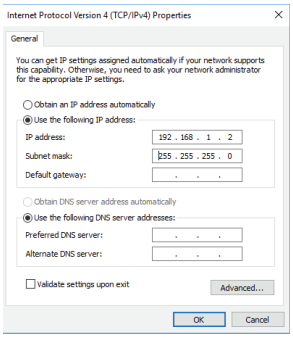


▶ Enter the following values.

- IP address: 192.168.1.2
- Subnet mask: 255.255.255.0

▶ Click the button *[OK]*.

⇨ The dialog box *Internet Protocol Version 4 (TCP/IPv4)* close.



▶ Click the button *[OK]*.

⇨ The dialog box *Ethernet Properties* close.

The network settings are now correctly set up so communication between the instrument and computer is possible.

Start NIRWare operator software and verify that the Computer is correctly connected to the instrument.

6 Operation

6.1 Initializing the instrument

▶ To start the instrument press the green power button on the left side of the instrument for 1 – 3 seconds.

⇨ The indicator light at the housing front will light up yellow, to indicate the bootup process.

▶ Switch on the PC with the installed NIRWare software suite.

⇨ The instrument is ready to log in when the indicator light will change from yellow to green, after approximately 60 seconds.

6.1.1 System warm-up

When cooled down below working temperature, the spectrometer needs a warm-up time of approx. 15 min. The warm-up time starts as soon as the instrument is switched on.**NOTICE! Insufficient warm-up time can influence the quality of measurement. A longer warm-up time might be required at low environmental temperature.**

6.2 System Suitability Test

NOTE

Frequent tests should be performed to minimize the risk of erroneous measurements.

The System Suitability Test (SST) serves as an internal functionality and performance test of the spectrometer. A SST has do be done after each restart of the instrument to monitor and verify the system performance.
The following SST values are tested:

- Internal system temperatures (e.g. Laser, interferometer, detectors)
- Linearity
- Signal-to-noise ratio
- Wavenumber stability

At the end of each SST a report protocol will be generated. The test results are compared to values ex factory and inform the user about the system condition.
The report protocol is stored in the internal database for service and quality control in XML-format..
The time between two SST requests can be set with the NIRWare Application Designer. The recommended standard value between two tests is 24 hours, a test-run takes approximately 5 min. If the instrument is used in continuous operation, a longer checking interval might be suitable.

6.2.1 Temperature tests

The instrument is equipped with a number of sensors to monitor internal temperatures. Correct operation of the instrument is ensured when the measured internal temperatures are within specified ranges.

▶ Check if all actual temperature values are within the limits.

▶ Mind the ambient temperature data as listed in Chapter 3.6.2 "Ambient conditions", page 16

Precondition:
☑ If temperature is too low:

▶ Let system warm up sufficiently.

Precondition:
☑ If temperature is too high:

▶ Clean filters and provide sufficient airflow.

6.2.2 NIR linearity test

The linearity of the NIR detector is tested by presenting five filters with known absorbance to the instrument. The measured absorbance is compared to the known reference value.
To pass this test, all absorbance factors must be within the tolerance.

6.2.3 Signal-to-noise ratio determination

With this test the ratio of signal power to noise power is determined. A high flux (maximum intensity) and a low flux (10 % intensity) beam is being analyzed for a number of wavenumber intervals.
To pass these test, the average and the minimum values must be within the tolerance.

6.2.4 Wavenumber stability test

The wavenumber stability of the instrument is checked by presenting a PMMA filter to the instrument. The measured spectra is compared to a known reference spectra. To pass the test the measured spectra should be within the wavenumber tolerance limits of the reference spectra.

6.3 Reference measurements

Frequent reference measurements compensate for environmental effects, which might influence the spectra. A combination of internal and external reference measurements provides best result quality and measurement stability.

6.3.1 External reference

NOTE

External referencing needs user interaction.

In order to measure the reflectance of a sample, the measured intensity spectrum of the sample is divided by a reference spectrum. The reference spectrum is generated by a white standard in the sample position.
See Chapter 6.3.3 "Performing a reference measurement", page 26.

6.3.2 Internal reference

NOTE

Internal referencing is performed by the instrument automatically.

The internal referencing is used to minimize the need for external referencing and user interaction. The interval between two tests can be set via the NIRWare Application Designer.

6.3.3 Performing a reference measurement

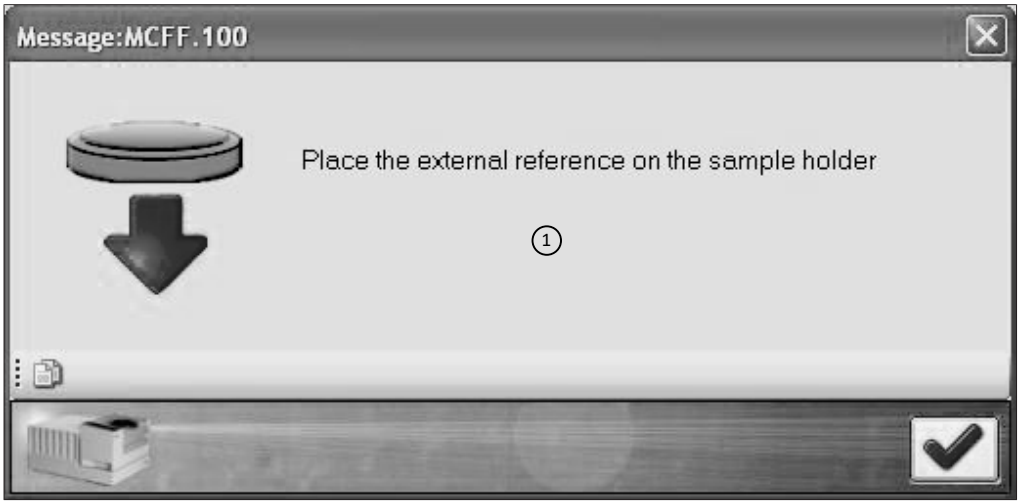
NOTE

For proper device calibration, the external reference or the transflectance adapter must be placed plane on top of the sample window.

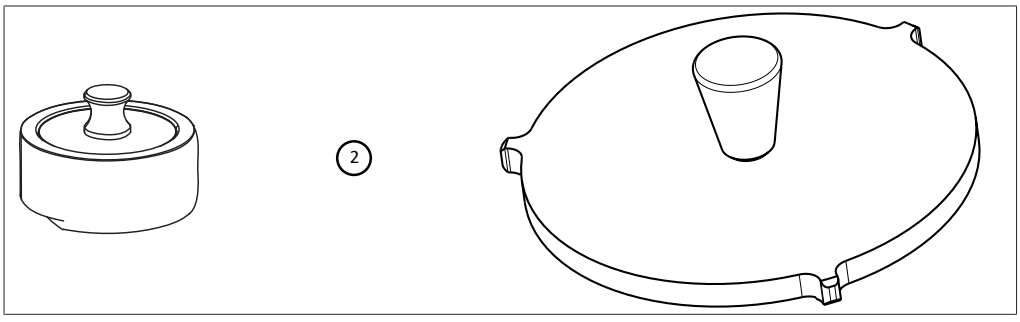
Could otherwise lead to incorrect calibration.

- Do not tilt the external reference / transflectance adapter.
- The external reference must be aligned to match the cut-out of the centering plate on top of the instrument.
- When working with the transflectance adapter, the spinner device is a recommended accessory.
- All items / surfaces must be absolutely clean.
- The external reference and the transflectance adapter must be damage and scratch free.

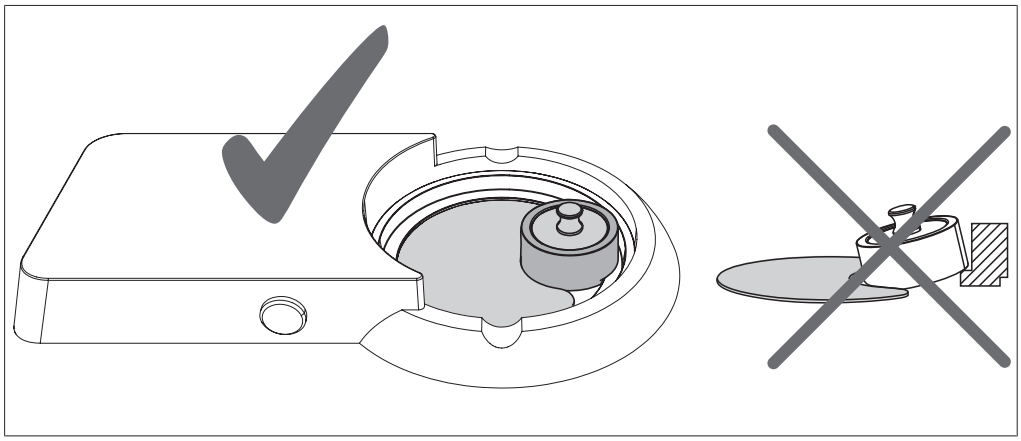
After the expiration of a predefined time interval (60 min. by default), a dialog (1) will remind the operator to perform an external reference measurement. The interval can be set in the Application Designer.
The software guides the user through the process:



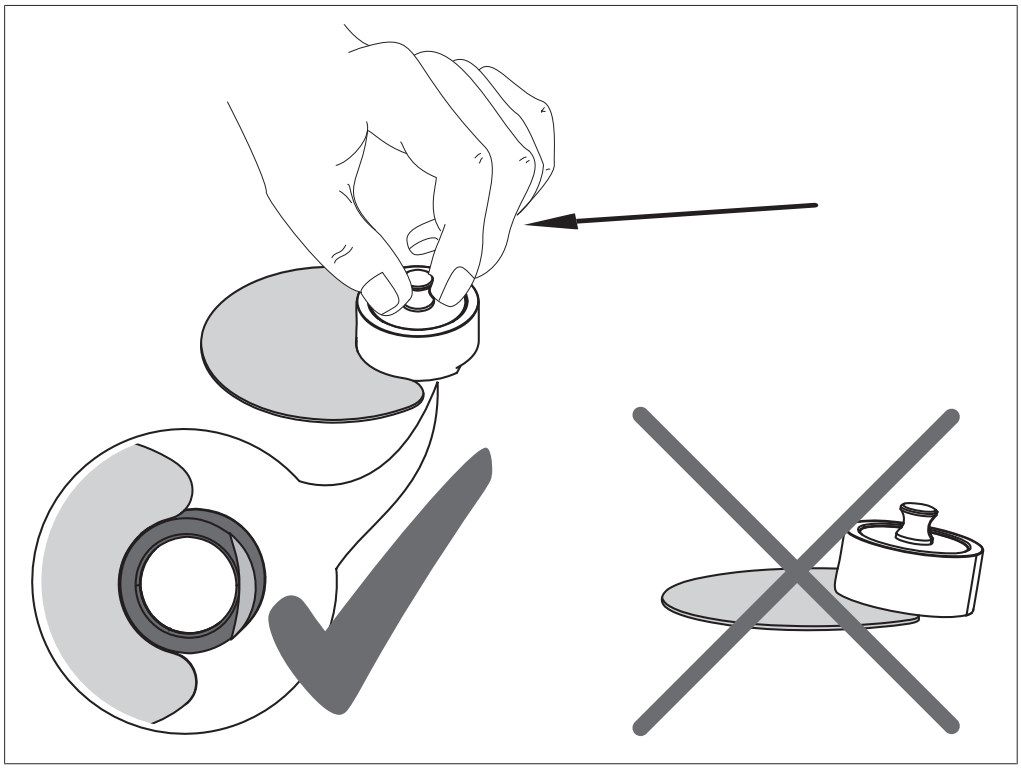
When the external reference (2) has been positioned properly, press the ‘Checkmark’ button. The instrument will automatically measure the reference spectrum.



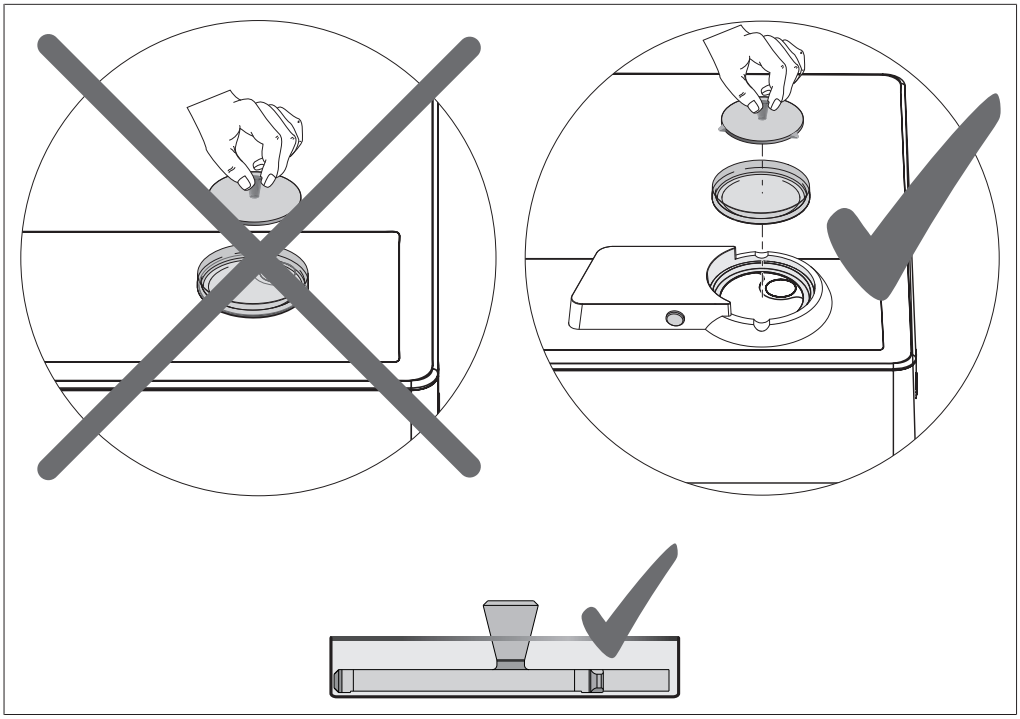
External reference positioning with installed spinner:



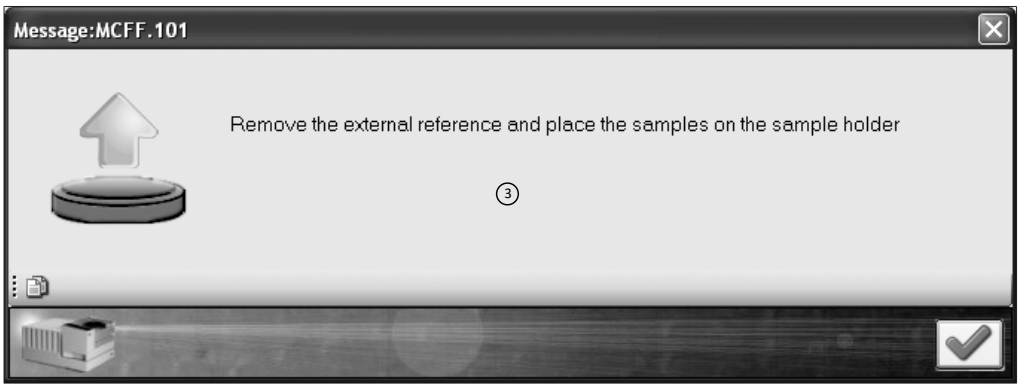
External reference positioning for XL addon (without spinner):



For proper device calibration, the external reference must be placed plane on top of the sample window of the instrument. It is not necessary to remove the spinner. In case the spinner is installed, turn the external reference until it fits perfectly.
Transflectance adapter positioning with / without spinner:



When the measurement is done (3), the user will be requested to remove the external reference.



Press the ‘Checkmark’ button to finish the procedure.

Frequency of reference measurement

An additional external reference measurement is mandatory:

- after an application change
- after a lamp exchange and lamp failure
- after a service (when the top cover has been reinstalled and locked)
- when changing the add-on or measurement setup
- at every system start / restart

6.4 How to perform a measurement

Detailed instructions how to perform a measurement can be found in chapter 5 "Creating a qualitative and a quantitative application" of the NIRWare Quick Guide.

6.5 Shutting down the instrument

- Close the NIRWare program on the separate PC.
- Press the ON / OFF button on the left side of the instrument for 1 – 3 seconds to switch it off.

7 Cleaning and servicing

NOTE

Users may only carry out the servicing and cleaning operations described in this section.

Any servicing and repair work which involves opening up the casing may only be carried out by BUCHI service technicians.

7.1 Regular maintenance work

Action		Daily	Weekly	Yearly	Additional information
7.2	Cleaning the housing	1			Clean the surfaces in direct contact with the sample after each measurement in order to avoid contamination.
7.8	Cleaning the add-ons and the custom sample vessels	1			After each measurement
7.6	Cleaning the external reference		1		
7.7	Cleaning the spinner		1		
7.4	Exchanging the outer filters			1	Check if the filter is clogged and replace latest every 6'000 h
7.5	Exchanging the inner filters			1	Check if the filter is clogged and replace latest every 6'000 h
7.10	Exchanging the lamp			1	When defective, latest every 6'000 h
7.12	Exchanging the laser unit			2	When defective, latest every 20'000 hours
7.13	Extended system service and testing			2	

1 - User; 2 - BUCHI service technicians

7.2 Cleaning the housing

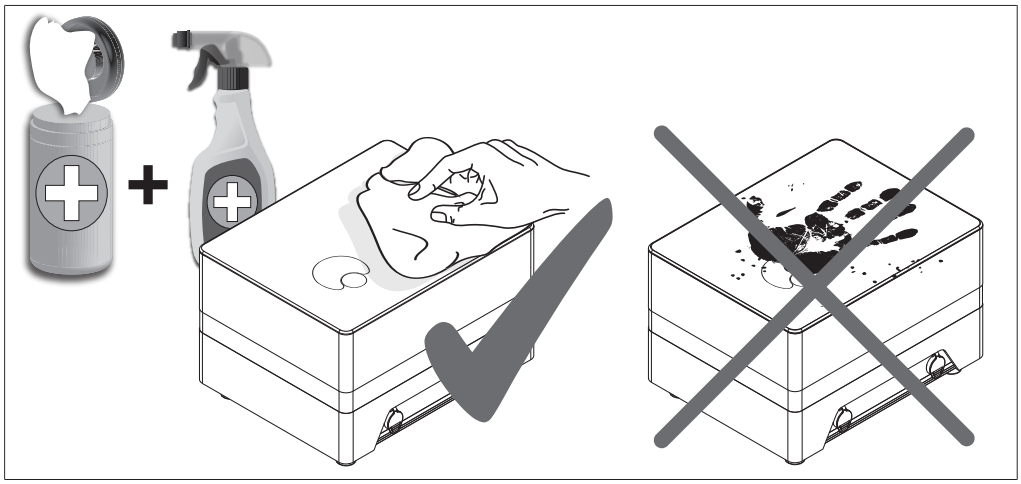
NOTE

Avoid scratches on optical surfaces due to cleaning.

Scratches can influence the measurement precision.

- ▶ Never use any objects for cleaning which might scratch the optical surfaces.
- ▶ Switch off the instrument and all directly connected electronic devices.
- ▶ Clean the housing with a soft, lint free damp cloth with mild soapy water.

- In addition, use surface disinfectant wipes in combination with similar disinfectant spray on alcohol basis.
- Clean the sample window on top of the instrument.
- Use an antimicrobial wipe.
- Avoid fingerprints on any optical surface.
- For coated optical surfaces, use abrasion-resistant precision cloths.



7.3 How to lift off the top cover

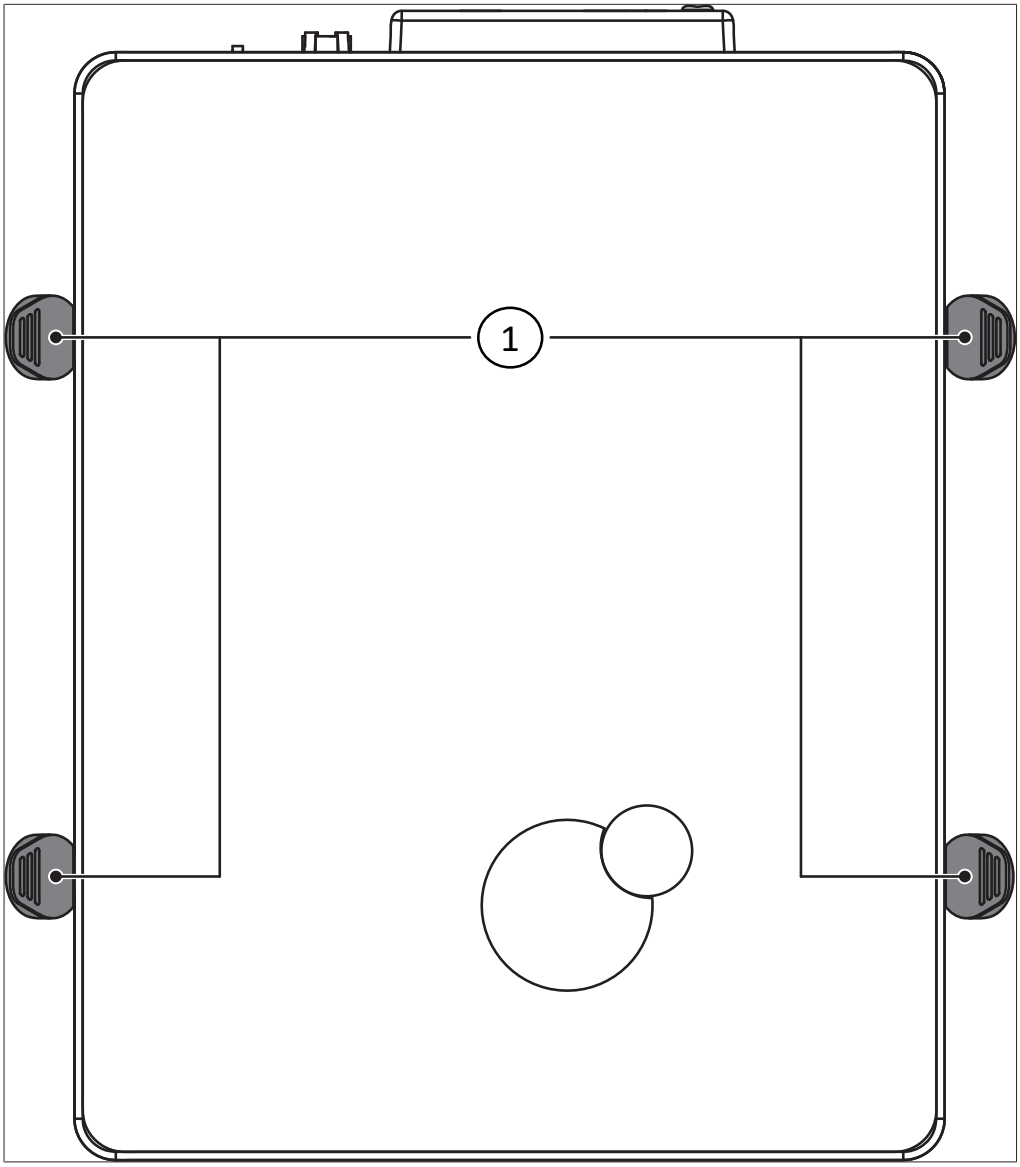
NOTICE

Ingress of particles.

Risk of instrument damage.

- Check proper seating and reliable locking before use.
- Do not operate instrument when housing is open or unlocked.

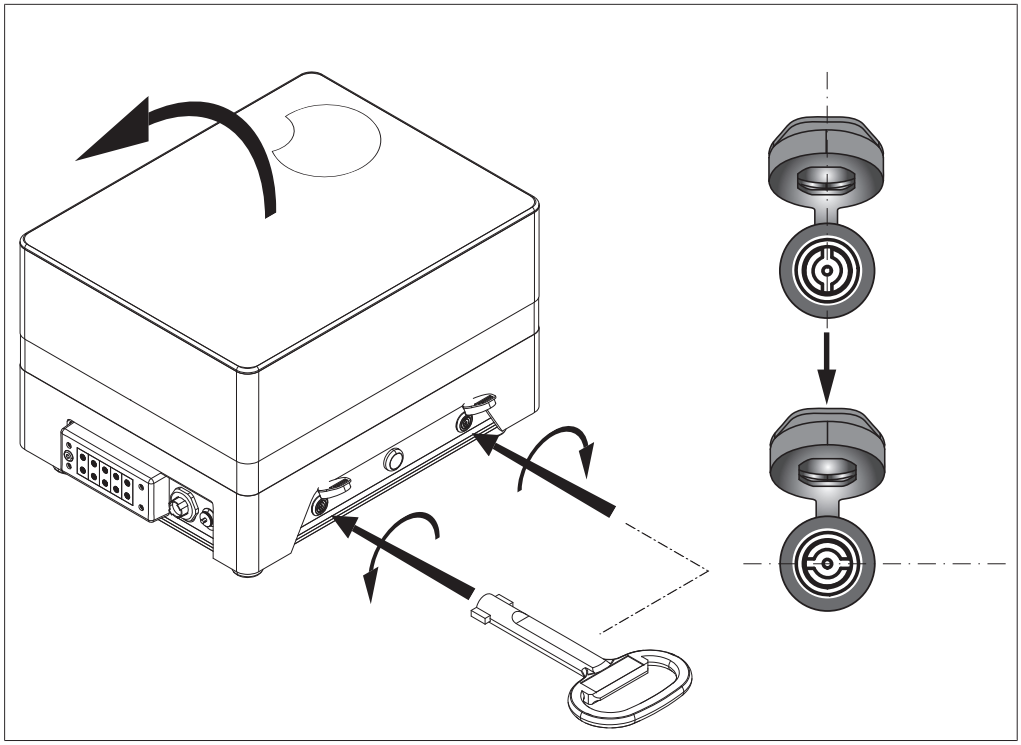
To get access to the light source and the interferometer it is necessary to remove the top cover of the instrument.



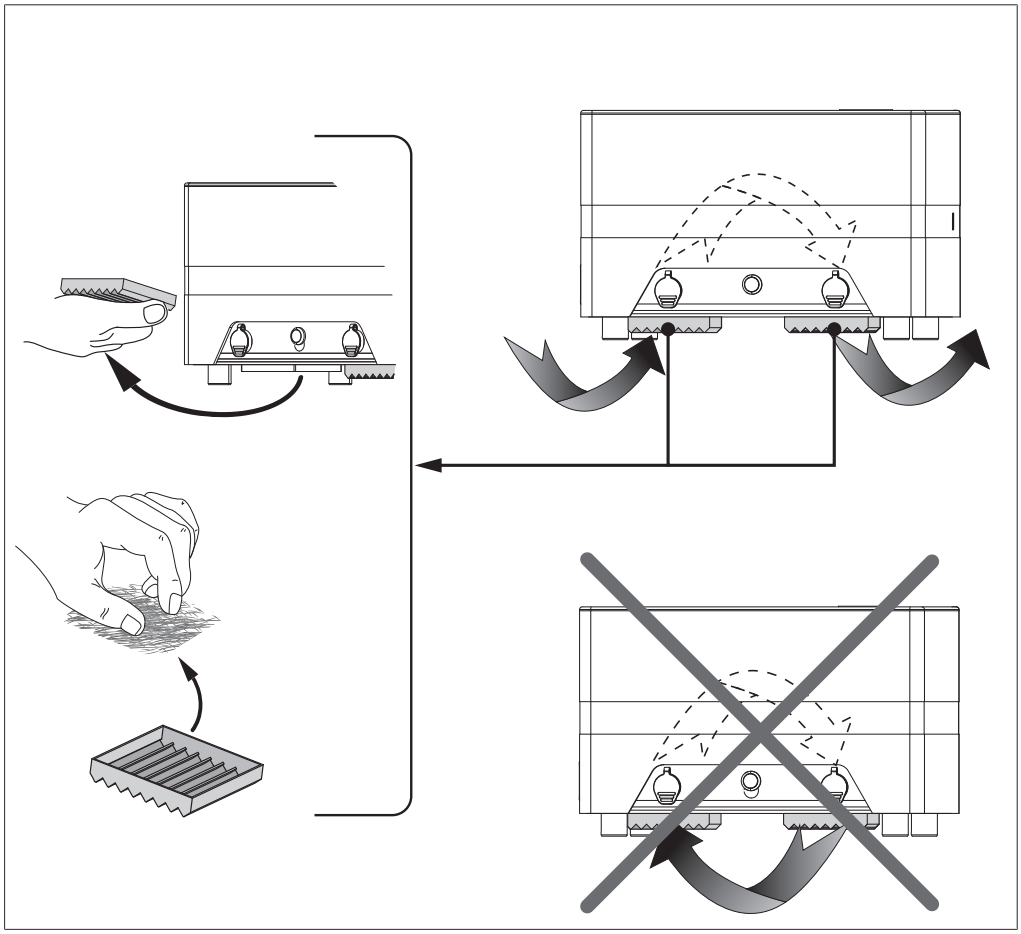
- ▶ Switch off the instrument.
- ▶ Disconnect the external power supply.
- ▶ Clean the housing i.e. remove any dust between the upper and lower cover.
- ▶ Lift the four black dust flaps (1) two at each side of the instrument.

⇨ The latches are accessible.

- ▶ Turn the housing-key and bring the latches into horizontal position to unlock the housing.
- ▶ Carefully lift off the top cover.
- ▶ Unplug the internal power cable.
- ▶ To reinstall the cover, re-plug the internal power cable.
- ▶ Carefully place the top cover onto the instrument.
- ▶ Turn the housing-key and bring the latches into vertical position to lock the housing.
- ▶ Put the four black dust flaps (1) back on.
- ▶ Connect the external power supply to the instrument.
- ▶ Switch on the instrument.



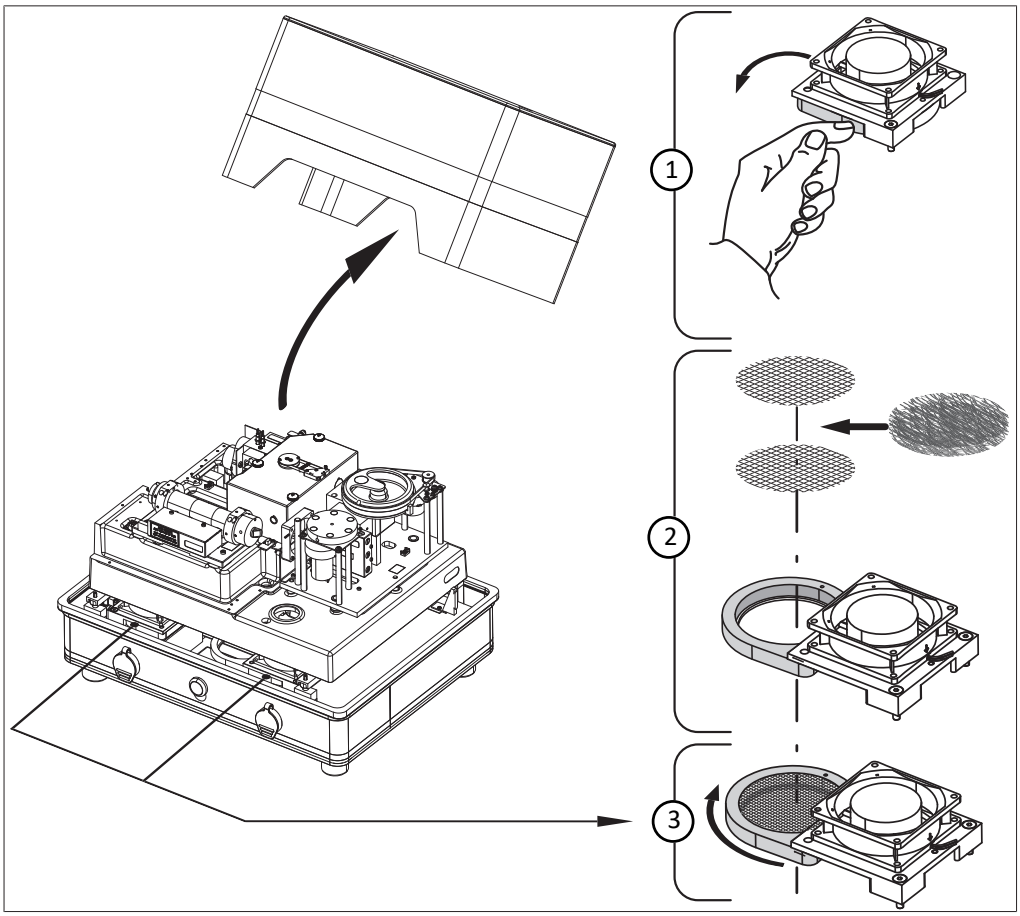
7.4 Exchanging the outer filters



- Pull off the filter frames located at the bottom. **NOTICE! Do not tilt the instrument. The access is possible from the side.**

- ▶ Take out each filter pad.
- ▶ Insert new filter pads.
- ▶ Reassemble the filter frames.
- ▶ Make sure the ventilation slots of the filter frames show into opposite direction to avoid a shortcut of the cooling airflow.

7.5 Exchanging the inner filters



- ▶ Lift off the top cover.

⇨ The filter drawers are accessible below the fans.

- ▶ Push the drawer (1).

⇨ The filter holder moves out of its position.

- ▶ Pop out the sandwich filter.
- ▶ For each filter, place a new filter pad between the metal grids (2).
- ▶ Put the filters back in its holders.
- ▶ Push the drawers back into position (3).
- ▶ Close the housing.

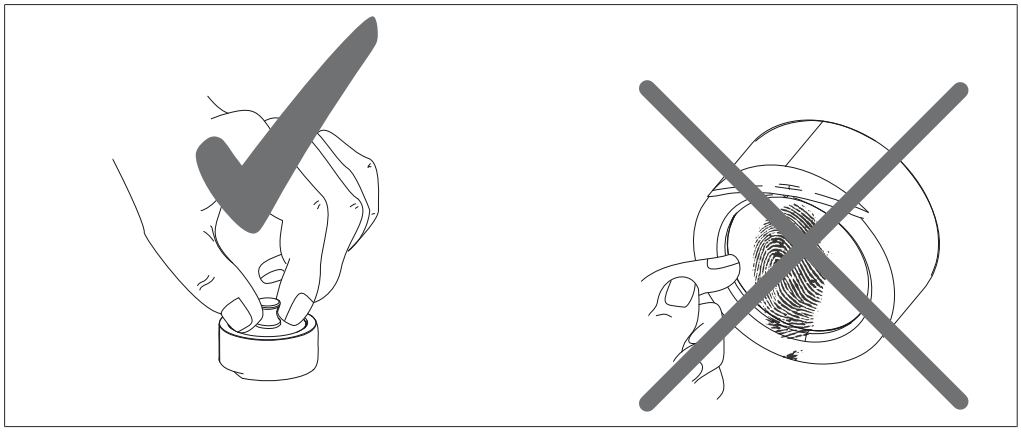
7.6 Cleaning the external reference

NOTE

Do not use any cleaning media with abrasive character which might scratch the surface.

- ▶ For cleaning use abrasion-resistant precision cloths.

- If substances still adhere, clean the surfaces with alcohol.
- Avoid contact with hard objects.
- Do not drop the external reference.
- Keep it in a dry and clean place.



7.7 Cleaning the spinner

- The spinner can be cleaned in a dishwasher. **NOTICE! Not cleaning the spinner on a regular basis can lead to a reduced force transmission of the inner wheel and inlay. As a result the sample cup will not rotate.**
- The O-ring of the inner wheel needs replacement in case its mechanical treated.
- Replacement is recommended by a service person.

7.8 Cleaning the add-ons and the custom sample vessels

- All BUCHI add-ons can be rinsed and cleaned with disinfectants on alcohol basis. **NOTICE! Spray-disinfection should be used in addition to surface disinfection with wipes only.**
- The following sample vessels can be cleaned in a dishwasher with standard detergents:

- Petri dishes
- Unbreakable cup
- Spinner cpl.
- XL add-on
- High performance cup

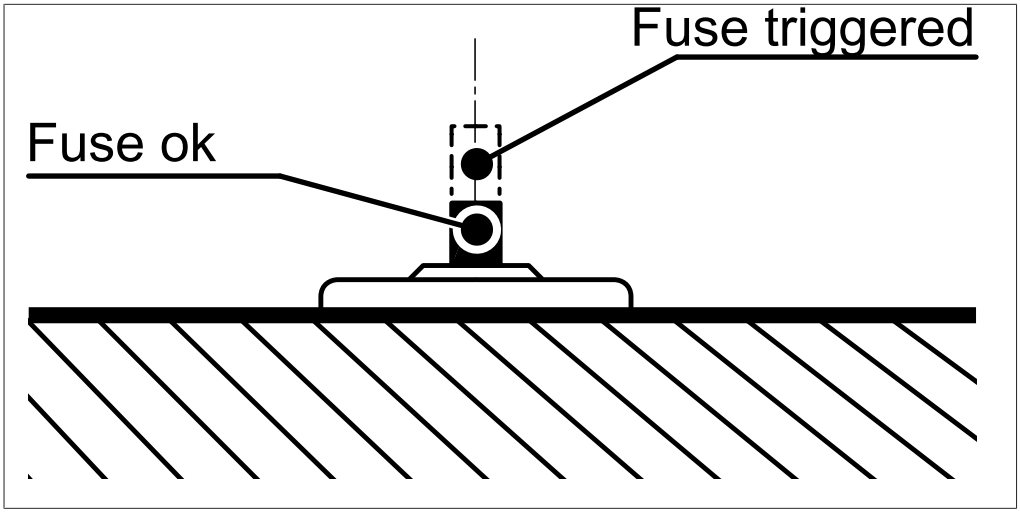
7.9 How to reset the system fuses

NOTICE

Device fuses may be triggered occasionally (e.g. due to voltage peaks).

When fuses trigger frequently action needs to be taken.

- Inform your customer service.
- Do not try to repair or modify the fuses.



Precondition:

☑ The primary fuses are located inside the instrument next to the interferometer power supply socket.

- ▶ Switch off the instrument.
- ▶ To get access to the resettable fuses, lift off the top cover as described in Chapter 7.3 "How to lift off the top cover", page 31.
- ▶ Push in the fuse for reset.
- ▶ Switch on the instrument.

7.10 Exchanging the lamp

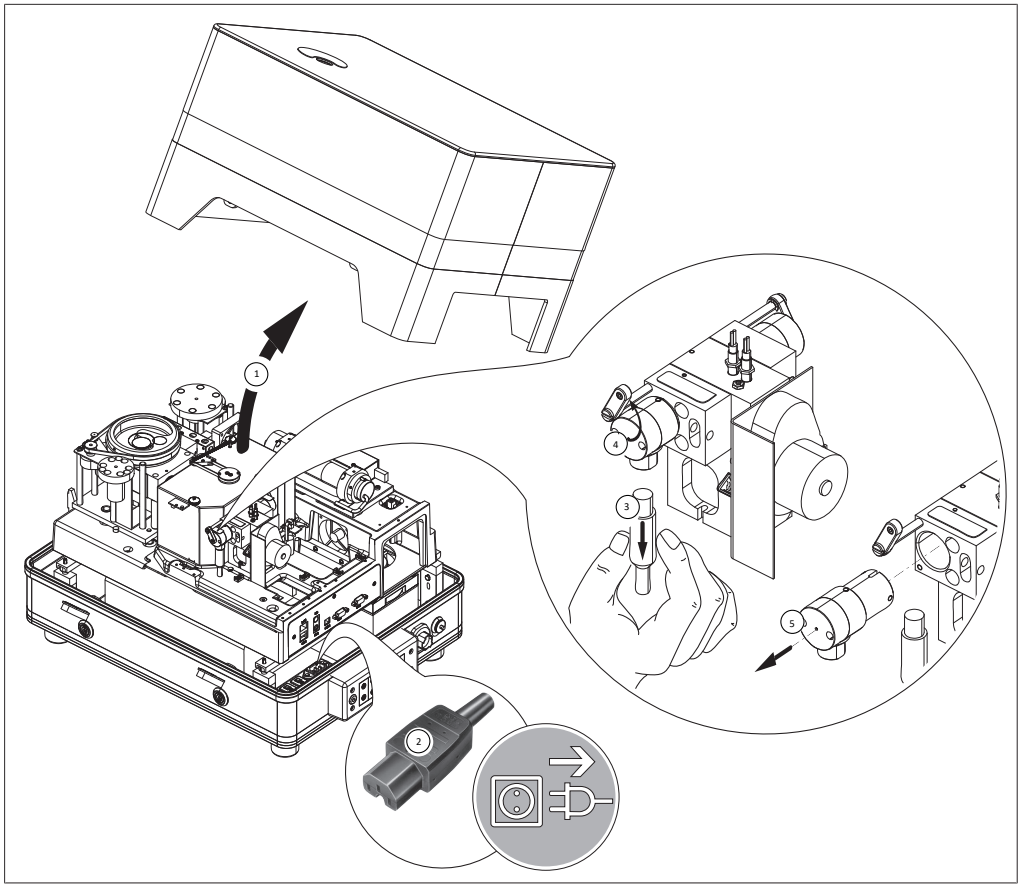
⚠ CAUTION

Risk of minor burns by hot lamp module.

- ▶ Do not touch hot parts or surfaces.
- ▶ Let the lamp module cool down.
- ▶ Do not touch the bulb glass.

NOTE

After lamp-module exchange, a reference spectrum should be generated to match the individual light intensity output of the module. See Chapter 6.3 "Reference measurements", page 25.



- Switch off the instrument.
- Lift off the top cover (1) and put it aside.
- Unplug the mains plug inside the device (2).
- Unplug the power cable (3) of the primary / secondary lamp module.
- Turn the locking lever upwards (4) to unlock the module.
- Carefully pull out the lamp (5).
- Put the new lamp in.
- Turn the locking lever downwards to lock the module.
- Connect the power cable of the primary / secondary lamp module.
- Connect the mains plug inside the device.
- Install the top cover again.
- Switch on the instrument
- Reset the lamp lifetime counter using the separate PC as described in chapter 7.8.4. of the NIRWare Operation Manual.

7.11 Resetting the lamp lifetime counter

To correctly monitor the lamp lifetime the software hour counter has to be reset after each lamp replacement. See chapter 7.8.4. of the NIRWare Operation Manual.

7.12 Exchanging the laser unit

NOTE

A BUCHI service technician is required to replace the LASER unit.

Over its lifetime, the intensity of the laser light will decrease. It is continuously monitored by a sensor to be sure levels are above a certain threshold.

7.13 Extended system service and testing

Contact BUCHI customer service for the annual extended service and testing.

8 Help with faults

8.1 Troubleshooting

Problem	Possible cause	Action
System is over-heated	Filter clogged	▶ Exchange outer / inner filters.
System does not power up	Power outage	▶ Make sure that the instrument has power.
	Built-in resettable fuses or electronic malfunction	▶ Reset internal fuses. ▶ If error persists, call service for repair.
External reference measurement fails	See Chapter 8.3 "Reference measurement fails", page 40	▶ Clean all optical surfaces in the measurement path. ▶ Perform NADIA Chapter 8.2 "Enhanced system diagnose (NADIA)", page 39.
Sample cup does not rotate	Spinner contaminated with oil or fat	▶ Clean spinner in dishwasher.
Incorrect measure-ments results	Not enough sample material available	▶ Use sufficient sample material.
	Sample not homogenious or representative	▶ Take a representative sample. ▶ Mix the sample before measurement.
	Humidity of sample material	▶ Only use dry samples.
	Temperature of sample mate-rial	▶ Wait until the sample reaches ambient temperature.
	Sample cup inadeqate	▶ Only use from BUCHI recommended sample cups. See Chapter 10.1.2 "Accessories", page 43

Malfunctions or errors which are not listed in the table are to be corrected by a BUCHI technical engineer. In this case please refer to your local BUCHI customer service agent.

8.2 Enhanced system diagnose (NADIA)

Additional tests to the SST can be run via the NIRWare Automatic Diagnose (NADIA) tool. It can be used to verify the condition of the instrument e.g. during service for an enhanced performance check.
To run NADIA see chapter 5.9 in the NIRWare Operations Manual.

8.3 Reference measurement fails

When the deviation between the stored reference spectrum is out of limit, the reference measurement will fail. A dialog will show both curves and give details of the measurement result.
Possible reasons for a reference measurement to fail:

- Optical surfaces (e.g. external reference) are dirty or scratched
- Environmental conditions out of operational range (e.g. condensating humidity at optical surfaces)
- Defective instrument (e.g. electronic damage)
- After lamp-module exchange

What to do:

- ▶ Clean the external reference and the instrument output window.
- ▶ Place the external reference onto the output window and press the ‘Rerun’ button to repeat the measurement.
- ▶ If measurement still fails, a new reference spectrum can be stored by pressing the ‘Checkmark’ button. **NOTICE! An administrator login is required to store the new data set. Setting a new reference spectrum should be the last option after consequent trouble shooting (run SST).**

9 Taking out of service and disposal

9.1 Taking out of service

- ▶ Switch off the instrument and disconnect it from the mains power supply.
- ▶ Remove all cables from the device.

9.2 Disposal

The operator is responsible for proper disposal of the instrument.

- ▶ When disposing of equipment observe the local regulations and statutory requirements regarding waste disposal.
- ▶ When disposing, observe the disposal regulations of the materials used. Materials used see Chapter 3.6 "Technical data", page 15.

9.3 Returning the instrument

Before returning the instrument, contact the BÜCHI Labortechnik AG Service Department.
https://www.buchi.com/contact

10 Appendix

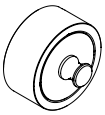
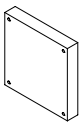
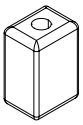
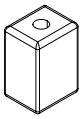
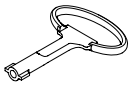
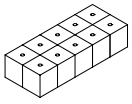
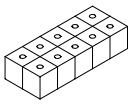
10.1 Spare parts and accessories

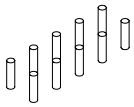
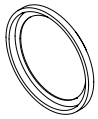
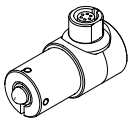
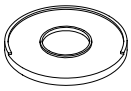
Use only genuine BUCHI consumables and spare parts in order to ensure correct, safe and reliable operation of the system.

NOTE

Any modifications of spare parts or assemblies are only allowed with the prior written permission of BUCHI.

10.1.1 Spare parts

	Order no.	Image
Spinner	11056771	
External reference	11056371	
Outer filter holder with pads, 2 pcs	11056672	
Set spare filter pads 10 pcs	11056773	
Inner filter pads, 10 pcs	11056917	
Ferrit sleeve 5 mm	11056714	
Ferrit sleeve 6 mm	11056715	
Housing-key	11056766	
Plug bushing 3-6mm 10 pcs	11056665	
Plug bushing 6-9mm 10 pcs	11056666	

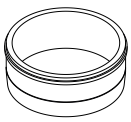
	Order no.	Image
Set round cord 10 pcs	11056667	
Spinner (inlay-) ring	11056772	
Replacement Window HPSC	046246	
Primary lamp module	N560-001	
Adapter plate for gold cell For both High Performance Transflectance Cells 11056994 or 11056995.	11056793	

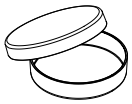
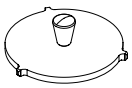
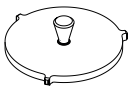
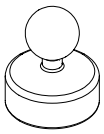
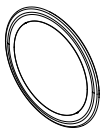
10.1.2 Accessories

Compatibility

Sample holding accessories	Easy-Spin Magnetic spinner*	XL* glass spacer	Adapter plate for gold cell
Petri dishes	•		
High performance cup	•		
Unbreakable cup	•		
Small plastic bags		•	
High performance trans-flectance gold cell			•
Sample dimensions	100 mm	Adaptable	35 mm

*Included in system as described in Chapter 3.4 "Scope of delivery", page 14.
**See Chapter 3.2 "Measurement modes", page 13.

	Order no.	Image
High performance cup	046259	

	Order no.	Image
Robust cup	11055058	
Glass petri dishes 10 pcs. (up view) Not suitable for use with Transflectance Cover	11072073	
Transflectance cover 0.3 mm Not suitable for use with robust cup	041636	
Transflectance cover for robust cup	11055998	
Pressing Stamp To compress and compact samples like ground meat or cheese. Stainless steel, approx. 1.8 kg.	11057584	
XL-Add-On	11056784	

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