



i-Raman NxG and i-Raman Duo



2.954.0010 / 2.954.0030 / 2.954.0040 / 2.954.0050 / 2.954.0060

Manual

8.954.8001EN / v1 / 2025-12-17





Metrohm Spectro, Inc.
313 Enterprise Dr
Plainsboro Township, NJ 08536
(732) 230-1601
www.metrohm.com

i-Raman NxG and i-Raman Duo

Manual

8.954.8001EN / v1 / 2025-12-17

Service
Metrohm Spectro, Inc.
Plainsboro Township, NJ 08536

This documentation is an original document.

This documentation has been prepared with great care. However, errors can never be entirely ruled out. Please send comments regarding possible errors to the address above.

Copyright

This documentation is protected by copyright. All rights reserved.

Disclaimer

Deficiencies arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc., are expressly excluded from the warranty. Unauthorized modifications to the product (e.g., conversions or attachments) exclude any liability on the part of the manufacturer for resulting damage and its consequences. Instructions and notes in the Metrohm product documentation must be strictly followed. Otherwise, Metrohm's liability is excluded.

Table of Contents

1. Overview	8
1.1. Product description	8
1.2. Product versions	9
1.3. Further information.....	10
1.4. Displaying the accessories.....	10
2. Safety.....	11
2.1. Intended use.....	11
2.2. Responsibility of the operator	11
2.3. Requirements for operating personnel.....	11
2.4. Laser Safety.....	12
2.4.1. Laser Emission Aperture.....	12
2.4.2. Nominal Ocular Hazard Distance (NOHD)	13
2.4.3. General Laser Safety	15
2.4.4. Laser Safety features.....	15
2.4.5. Remote Interlock and Emission Indicator	16
2.4.6. Risk of injury measuring thermally sensitive materials	17
2.4.7. Laser Warning label.....	17
2.5. General Safety.....	19
2.5.1. Danger from electrical potential.....	19
2.5.2. Danger from highly flammable substances.....	19
2.6. Design of warning messages.....	19
2.7. Meaning of warning signs.....	20
3. Functional description.....	21
3.1. Instrument Overview	21
3.2. Raman Probe	23
3.2.1. Overview.....	23

3.2.2.	Fiber Connection	24
3.2.3.	Working Distance.....	25
3.2.4.	Sample Positioning and Accessories.....	26
3.3.	Function.....	28
3.4.	System light indicators	30
3.5.	Interfaces.....	31
4.	Delivery and transport.....	31
4.1.	Delivery	31
4.2.	Packaging.....	31
5.	Installation.....	32
5.1.	Installation by Metrohm	32
5.2.	Setup location.....	32
5.3.	Connecting a Raman Probe	32
5.4.	Plugging in the power cord	34
5.5.	Setting up the instrument.....	34
5.6.	SpecSuite Setup.....	35
6.	Operation and control.....	35
6.1.	Operation	35
6.2.	Warm up period.....	36
6.3.	Calibration and Validation	36
7.	Maintenance.....	37
7.1.	Good operating practice.....	37
7.2.	Cleaning.....	37
7.2.1.	Instrument.....	37
7.2.2.	Raman Probe	38
7.3.	Maintenance	38
7.3.1.	Test and maintenance intervals.....	38
7.3.2.	Replace the laser.....	40

8. Disposal.....	41
9. Technical specifications.....	41
9.1. Ambient conditions.....	41
Energy supply	41
9.2.....	41
9.2.1. External power supply unit	42
9.2.2. Instrument.....	42
9.3. Measurements and weight.....	42
9.4. Housing.....	43
9.5. Connectors.....	43
9.5.1. Instrument.....	43
9.5.2. External power supply unit	44
9.6. Operation	44
9.7. Spectrometer specifications.....	44
9.8. Laser specifications.....	44



Additional information on the licenses can be obtained from your regional Metrohm representative.

1.2. Product versions

The product is available in the following versions:

Article Number	Designation	Version Feature
2.954.0010	i-Raman NxG 532	532 nm laser
2.954.0030	i-Raman NxG 785H	785 nm laser, high throughput
2.954.0040	i-Raman NxG 785S	785 nm laser, wide spectral range
2.954.0050	i-Raman NxG 1064	1064 nm laser
2.954.0060	i-Raman Duo	Spectral range of 100 – 4600 cm ⁻¹ covered by 2 lasers and 1 spectrometer

The article number and serial number for identifying the product is located on the type label:

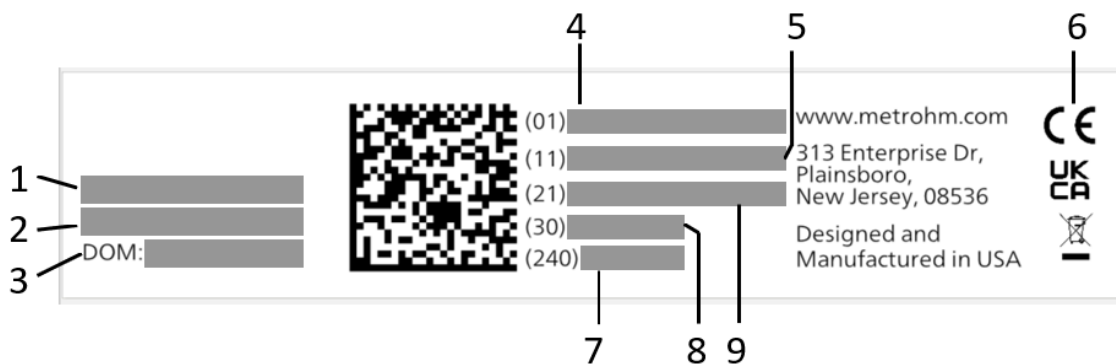


Figure 1: Type Label for i-Raman NxG and i-Raman Duo

- Metrohm recommends keeping the downloaded PDF for reference purposes.

2. Safety

2.1. Intended use

The i-Raman NxG and i-Raman Duo systems are suitable for spectroscopic analysis of a wide range of organic and inorganic samples including common chemicals, active pharmaceutical ingredients (APIs) and excipients, polymers, pigments, petroleum products.

The device is designed for indoor use, including laboratories and manufacturing facilities.

Read the entire manual before operating the system.

2.2. Responsibility of the operator

The operator must ensure that the basic national and international regulations on laser safety, occupational safety and accident prevention in chemical laboratories are observed. The operator has the following responsibilities:

- Instruct personnel in the safe handling of the product.
- Train personnel in the use of the product according to the user documentation (e.g. install, operate, clean, eliminate faults).
- Train staff on basic occupational safety and accident prevention regulations.
- Provide personal protective equipment (e.g. laser safety goggles, gloves).
- Provide suitable tools and equipment to execute the work safely.
- Ensure compliance with applicable laws, regulations and standards.

2.3. Requirements for operating personnel

Only qualified personnel may operate the product. Qualified personnel are persons who meet the following requirements:

- Basic regulations on occupational safety and accident prevention for chemical laboratories are known and complied with.



Figure 2: Raman Probe laser emission aperture

Removing the fiber probe from the instrument will cause the FC coupler port labeled Excitation to be a laser emission aperture. This emission port has a **laser emission aperture** label.



Figure 3: System laser emission aperture with fiber disconnected

2.4.2. Nominal Ocular Hazard Distance (NOHD)

The nominal ocular hazardous distances (NOHD) is the minimum distance from a laser source a person must be to avoid eye damage. **Within this distance, proper laser safety eyewear is required.**

The NOHD is different based on the laser in the instrument and the laser's emission location. The following table shows the NOHD of each product version at each exit aperture:



NOHD based on laser wavelength and exit aperture

Exit Aperture	532 nm Laser NOHD (cm)	785 nm Laser NOHD (cm)	860 nm Laser NOHD (cm)	1064 nm Laser NOHD (cm)
FC coupler at laser port	38	94	79	51
BAC10x w/ standard shaft RSS100	17	41	35	23
BAC10x w/ RIS100-FS shaft	27	69	58	38
BAC10x w/ RIS100-SA shaft	28	71	60	39
BAC101-SS	9	23	19	12
BAC101-HS	7	17	14	9
5X Objective of Microscope	75	187	157	102
10X Objective of Microscope	38	93	79	51
20X Objective of Microscope	19	47	39	25
50X Objective of Microscope	8	19	16	10
100X Objective of Microscope	9	11	9	6
BAC10x without shaft	837	2075	1746	1128

The NOHD values were calculated based on a maximum laser power exiting these apertures of 55 mW for 532 nm instruments and 500 mW for 785 nm, 1064 nm, and 860nm/1064nm instruments.

The i-Raman Duo contains both an 860nm laser and 1064nm laser. Only one laser can be enabled at a time. For safety purposes, reference the 860nm laser NOHD for i-Raman Duo.

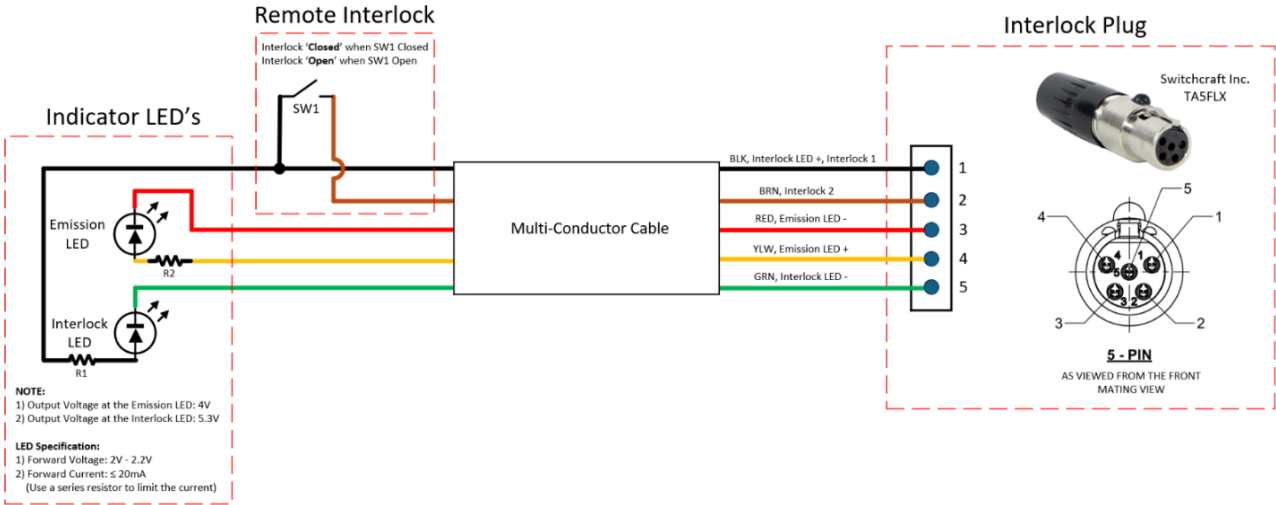


Figure 5: Remote interlock schematic

To install an interlock switch, the user must cut open the interlock loop and connect the 2 wires to the switch terminals.

2.4.6. Risk of injury measuring thermally sensitive materials

Measuring a thermally sensitive sample that is in a tightly sealed vessel can lead to a pressure increase and subsequent explosion of the vessel.

2.4.7. Laser Warning label

The laser warning label is located on the rear panel of the system. The laser warning label displays:

- laser safety class
- laser wavelength
- maximum power of the laser

Lasers that are >700 nm wavelength have an "Invisible Laser Radiation" note next to their wavelength. The i-Raman Duo has a laser warning label with information about both lasers in the system.

Laser Safety warning for product version with a visible laser

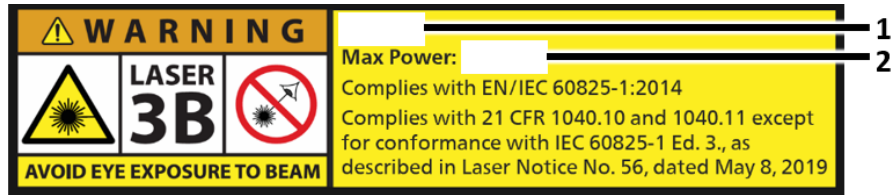


Figure 6: Laser warning for 532nm and 785nm systems

1 Laser wavelength	Instrument	Laser wavelength
2.954.0010	i-Raman NxG 532	532 nm

2 Max laser power	Instrument	Max laser power
2.954.0010	i-Raman NxG 532	55 mW

Laser Safety warning for product versions with Invisible lasers

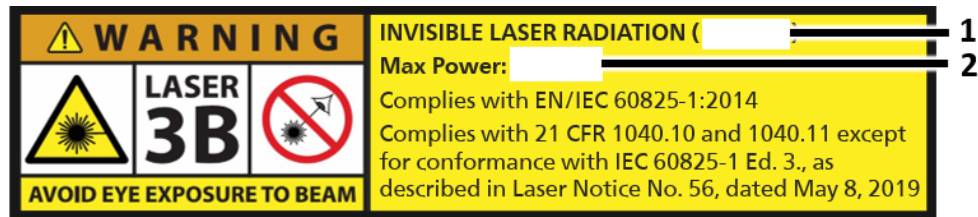


Figure 7: Laser warning for 1064nm and Duo (860nm & 1064nm) systems

1 Laser wavelength	Instrument	Laser wavelength
2.954.0030	i-Raman NxG 785H	785 nm
2.954.0040	i-Raman NxG 785S	785 nm
2.954.0050	i-Raman NxG 1064	1064 nm
2.954.0060	i-Raman Duo	860 nm/1064 nm

2 Max laser power	Instrument	Max laser power
2.954.0030	i-Raman NxG 785H	495 mW
2.954.0040	i-Raman NxG 785S	495 mW
2.954.0050	i-Raman NxG 1064	495 mW
2.954.0060	i-Raman Duo	495 mW

3. Functional description

3.1. Instrument Overview



Figure 8: i-Raman NxG and i-Raman Duo Front

1	Trigger port	2	Wavelength label 532, 785, 1064, or 860/1064
3	Excitation fiber port	4	Laser emission LED
5	Power button	6	Collection fiber port
7	Interlock LED	8	Model name NxG or Duo



Figure 9: i-Raman NxG and i-Raman Duo Rear

1	Venting fan port	2	Laser safety label
3	USB-C port	4	Laser key switch
5	Power port	6	Product label
7	AUX port	8	Interlock
9	Fuse		

Different product versions are available ([see “Product versions”, chapter 1.2](#)).

.....

3.2. Raman Probe

3.2.1. Overview



Figure 10: BAC102 probe with distance regulator

1	Distance regulator	2	Shaft
3	Trigger button	4	Aperture label
5	Shutter	6	Collection fiber cable
7	Excitation fiber cable	8	Trigger cable

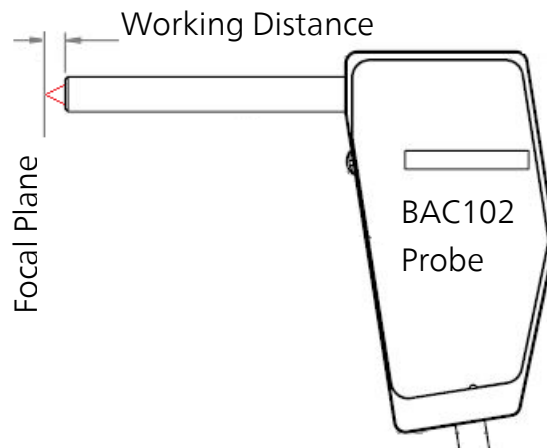


Figure 12: Raman Probe working distance

The Standard i-Raman NxG Raman probes have the following working distance:

Instrument	Standard Raman Probe		Working Distance
2.954.0010	i-Raman NxG 532	607510080 BAC102-532-HT	5.4 mm
2.954.0030	i-Raman NxG 785H	607510140 BAC102-785-HT	5.5 mm
2.954.0040	i-Raman NxG 785S		
2.954.0050	i-Raman NxG 1064	607510260 BAC102-1064-HT	5.9 mm
2.954.0060	i-Raman Duo	607510360 BAC102-DUO1-HT	5.9 mm

3.2.4. Sample Positioning and Accessories

The Raman probe comes with a **distance regulator**. The included **distance regulator** cap is attached to the probe shaft and placed in contact with the sample.

The regulator will space the probe such that the focal point is roughly at the sample surface. The distance regulator will block ambient light when scanning.



Samples should be placed in a thin plastic container or use a thin plastic barrier to avoid contamination of the probe.

The **distance regulator** allows for quick and easy measurements of bulk material.



Figure 13: Scanning with the distance regulator

For more control of the sampling positioning, Raman probes can be attached to the optional **Probe holder accessory**. The **Probe holder** allows fine tune adjustments to be made.



Figure 14: Fine adjusting the sampling position with Raman probe holder

Raman probes can use an optional **Vial Holder** accessory to sample liquids in a 15mm diameter vial. The optional **Vial Holder** accessory is recommended for sampling liquids because the focal point is inside the vial where the sample is, past the wall of the vial. Additionally, the **Vial Holder** accessory's top cap blocks stray light.

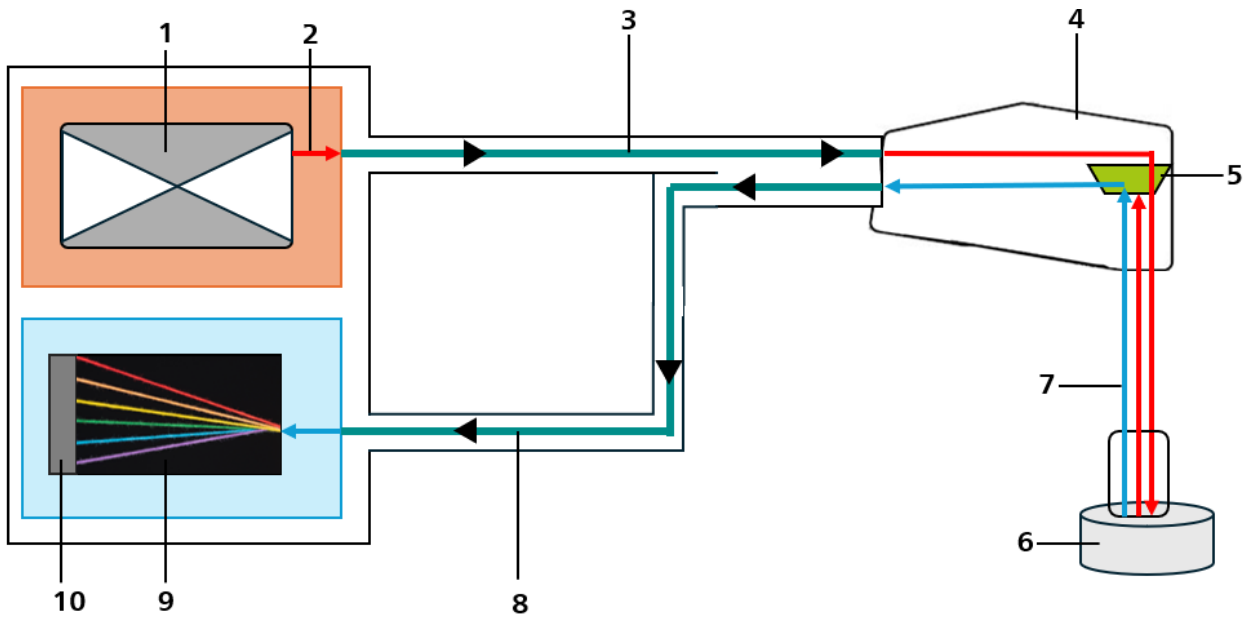


Figure 16: Raman overview

Overview

During operation, The laser source (1) sends laser light (2) through the fiber (3) to the probe body (4). In the probe body, the laser light passes a band-pass filter and interacts with the sample (5).

The backscattered Raman signal (7) is collected with the probe (4). The Raman signal passes through a long-pass filter (5) and enters the collection fiber (8) that leads to the spectrometer (9) and detector (10) inside.

Laser source

A stabilized laser module emits monochromatic light at one of the configured wavelengths (532, 785, or 1064nm) for the i-Raman NxG. The i-Raman Duo system emits both 860nm and a 1064nm laser light.

Fiber Delivery

Laser light is transmitted via a fiber cable to the probe. Backscattered light is returned through the same probe, is filtered into a separate collection fiber cable that travels to the spectrometer.



- Step 2. Unscrew cap from the *probe's* excitation fiber.
 - i. Identify the correct fiber to connect by reading the label "EXCITATION" near the fiber end cap.
- Step 3. Locate the key on the probe fiber. Align this key with the keyway on the EXCITATION port on the instrument. Do not touch the fiber tip on anything.
- Step 4. Push the fiber straight into the EXCITATION port then screw the fiber into the port.
- Step 5. Unscrew covers from the instrument's COLLECTION port located on the front panel.
- Step 6. Unscrew cap from the probe's collection fiber.
 - i. The fiber can be identified by the label near the cap reading "COLLECTION".
- Step 7. Locate the key on the probe fiber. Align this key with the keyway on the COLLECTION port on the instrument. Make sure not to touch the fiber tip on anything.
- Step 8. Push the fiber straight into the COLLECTION port then screw the fiber into the port.



Step 10. Check the bottom left corner of SpecSuite for the USB icon, instrument model number, and spectrometer c-code to verify connection.



Figure 17: i-Raman NxG 532H connected

5.6. SpecSuite Setup

Before operating the device with SpecSuite, the following steps must be completed:

SpecSuite Tutorial

- First-time Login
- Software Setup
 - Import Licenses for SpecSuite and Metrohm Libraries
 - Configure Probe (Ratio3 correction)
 - Import Performance Validation Reference file
 - Import Metrohm Libraries

Calibration Certificate

- Verify the Instrument is correctly identified

Create a probe setting under the Hardware Setup module of SpecSuite (Ratio3)

- Run Performance Validation Test

Additional information on the SpecSuite setup process can be found in **Tutorial SpecSuite**, section 2.5 software Setup.

6. Operation and control

6.1. Operation

The i-Raman NxG and i-Raman Duo are operated using the SpecSuite software. Additional information can be found in the **Tutorial SpecSuite**.

6.2. Warm up period



NOTICE

Warm up device

The i-Raman NxG and i-Raman Duo requires a 5-minute warm up period. Data collected before the 5-minute warm up period is potentially inaccurate and should not be used.

- The instrument should be connected to SpecSuite for 5 minutes before collecting data.

6.3. Calibration and Validation

The i-Raman NxG and i-Raman Duo can be calibrated and validated using the SpecSuite software.

Standard calibration and validations

- Raman Shift Calibration
- Performance Validation Test

Raman Shift Calibration and the Performance Validation test use the Polystyrene Validation Cap. This accessory is shipped with the unit and has a 4-year expiration date.



Figure 18: Performance Validation Cap for Raman probes with a shaft diameter of 9.5 mm



For a replacement or spare Polystyrene Validation Cap, contact your regional Metrohm service representative.

Information on intervals to run calibration and validation can be found in [Chapter 7.2.1, "Test and maintenance intervals"](#).



Additional information on the calibration and validation process can be found in **Tutorial SpecSuite, section 5.4 Performance and section 5.5 Calibration.**



Additional calibrations and validations are available from your local regional Metrohm service representative.

7. Maintenance

7.1. Good operating practice

To prolong the instrument's lifetime and maintain good operating practice:

- Keep the Raman probe connected to the instrument.
- When the Raman probe is not connected, cover the ends of the fiber with the protective caps.
- When the Raman probe is not connected, cover the FC/PC fiber connectors with protective caps.
- Make sure the fiber tips of the probe do not touch anything.
- Do not bend the fiber cables more than a 10 cm radius.
- Do not clean the instrument by immersion in bleach solutions or similar agents.
- Do not use acetone or other aggressive organic solvents.
- In rare cases where special decontamination protocols are necessary, allow the instrument to fully dry before turning it on.

7.2. Cleaning

7.2.1. Instrument

To clean the i-Raman NxG or i-Raman Duo, wipe it with a soft cloth dampened with ethanol or isopropanol.

The plastic surfaces of the instrument can be wiped down with a soft, damp cloth that has been moistened with water and soap. Do not allow water to enter the instrument through the vents on the sides of the device.



Task	Execution interval	Result
Performance Validation Test	<u>Unregulated industry:</u> Every 1 to 2 weeks <u>Regulated industry:</u> Daily	Raman shift accuracy and photometric precision are within the stipulated tolerance.
Create a new Performance Validation Reference file	Performance Validation Cap has been replaced After replacement of probe or spectrometer.	<ul style="list-style-type: none"> • New Performance Validation Reference file is created • Reference file has been tested to work as intended

7.3.1.2. Raman Shift calibration

Task	Execution interval	Result
Raman Shift Calibration	Known peak locations have shifted $\leq 6 \text{ cm}^{-1}$. Instrument is failing Performance Test wavelength accuracy. After transport of the instrument. After replacement of laser, probe or spectrometer.	<ul style="list-style-type: none"> • Raman shift accuracy of all peaks calibrated, or confirmation that no Raman shift calibration is needed.



8. Disposal



Properly dispose of chemicals and of the product to reduce negative effects on the environment and public health. Local authorities, waste disposal companies or dealers provide more detailed information on disposal. Observe the WEEE EU directive (WEEE = Waste Electrical and Electronic Equipment) for the proper disposal of waste electronic equipment within the European Union.

9. Technical specifications

9.1. Ambient conditions

Nominal function range	+0 to +35°C +18 to +30°C preferred
Relative Humidity	10 to 80%, non-condensing <70% preferred
Altitude / Pressure range	Max. 3,000 m. above sea level

9.2. Energy supply

Power supply requirements:

- 12 V DC
- 6.6 A
- 80 W MAX



9.2.1. External power supply unit

Inlet

<i>Nominal voltage range</i>	100 V AC to 240 V AC
<i>Frequency range</i>	50 to 60 Hz
<i>Typical Current</i>	1.3 A

Outlet

<i>Nominal voltage range</i>	12 V DC
<i>Nominal current</i>	7.0 A

9.2.2. Instrument

Power In

<i>Barrel port</i>	5.5 mm O.D. / 2.5 mm I.D.
<i>Nominal voltage</i>	12 V DC
<i>Nominal current</i>	6.67 A
<i>Max Power</i>	80 W

Power Out

AUX port	5 V DC	SMA
	400 mA	

9.3. Measurements and weight

Measurements

<i>Width</i>	25.4 cm
<i>Depth</i>	38 cm
<i>Height</i>	23.5 cm

Weight

29540010	11.8 kg
29540030	11.8 kg



29540040	11.8 kg
29540050	9.5 kg
29540060	9.5 kg

9.4. Housing

Material

<i>Front panel</i>	ABS	Acrylonitrile butadiene styrene
<i>Rear panel</i>	Anodized aluminum	
<i>Side panels</i>	ABS	Acrylonitrile butadiene styrene
<i>Base plate</i>	Anodized aluminum	
<i>Top panel</i>	ABS	Acrylonitrile butadiene styrene
<i>Feet</i>	Rubber	

9.5. Connectors

9.5.1. Instrument

Power In	Barrel port	5.5 mm O.D. / 2.5 mm I.D.
Communication	USB-C port	
AUX Port	SMA connector	Used to control LED illuminator of the optional video microscope accessory.

Laser Safety Connectors

<i>Interlock port</i>	5 pin	
<i>Laser key switch</i>	Laser key switch	The key can only be removed when it is in the OFF position.



Laser wavelength

<i>29540010</i>	532 nm
<i>29540030</i>	785 nm
<i>29540040</i>	785 nm
<i>29540050</i>	1064 nm
<i>29540060</i>	860 nm & 1064 nm

**Max laser power
(at port)**

<i>29540010</i>	55 mW
<i>29540030</i>	495 mW
<i>29540040</i>	495 mW
<i>29540050</i>	495 mW
<i>29540060</i>	495 mW

**Typical laser power
(at probe)**

<i>29540010</i>	35 mW
<i>29540030</i>	400 mW
<i>29540040</i>	400 mW
<i>29540050</i>	400 mW
<i>29540060</i>	400 mW