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NIR-DR + Raman Combi-Probe Rev.1

Multichannel Fiber Optic Probe for simultaneous contact NIR Diffused Reflectance and Raman Spectroscopy



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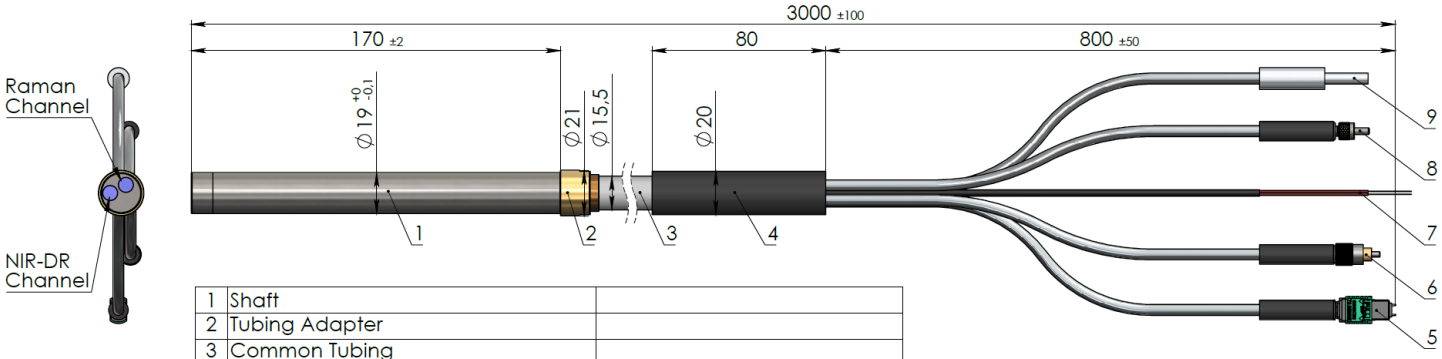
Description

NIR-DR + Raman Combi Probe is a multichannel fiber optic probe designed for in situ NIR diffuse reflectance (NIR-DR) and Raman measurements of powders or liquids. NIR-DR and Raman channels of the probe can work simultaneously – the wavelength ranges of both channels are separated: Raman 785 – 1000nm; NIR-DR 1000-2500nm. The probe shaft is electrical heated to prevent moisture condensation on optical windows.

The probe was designed to be used with Diode Array NIR spectrometer (slit: 90x400µm) and Kaiser RXAndor DVA420A-OE or RXn4 instrument.

Probe Specifications

General View



1	Shaft	
2	Tubing Adapter	
3	Common Tubing	
4	Splitter	
5	Raman Spectrometer Channel	48-Fibers MTP male Connector
6	Raman Laser Channel	FC/PC Connector
7	Electrical Wires for Heating Element	
8	NIR-DR Spectrometer Channel	SMA905 Connector
9	NIR-DR Light Source Channel	Custom ∅5mm Connector

Materials

- Optical windows: Sapphire
- Probe shaft: stainless steel EN1.4435 (AISI 316L)
- Common protective tubing: silicon coated stainless steel tubing with bending protection
- Bundle splitter: PVC
- Fiber Channels: metal protective tubing
- Electrical wires channel: PVC coated metal tubing

Sealing Materials

- Optical windows: EPO-TEK 301
- Probe shaft: O-Rings FPM 75 (Viton)

NIR-DR channel optics

- 32x fibers: low OH Fused Silica 400/440µm, NA=0.22, Polyimide coating
- 3mm OD x 3mm FL double convex lens
- Custom parabolic concentrator Aluminium mirror

Raman channel optics

- 49x fibers: low OH Fused Silica 105/125µm, NA=0.22, Acrylate coating
- 4.7mm OD x NA=0.3 aspherical collimating lens
- 6mm OD x NA=0.2 aspherical focusing lens
- 785nm narrow bandpass filter
- 2x 785nm 45° dichroic beam splitters
- 785nm longpass filter

Temperature range

- -20°C to +100°C



Safety Instructions

This unit is not designed for use in hazardous areas. Find the limitations for its use in the text below.

The units supplied should not be repaired by anyone other than *art photonics* engineers or technicians authorized by *art photonics*.

In case of operation trouble, please address to our service department using the form for *Confirmation on Decontamination*.

Conditions for operation!
To operate the probe with a spectrometry system, all specified conditions have to meet the requirements. Otherwise trouble or defects may occur.

Sensitive optical fibers!
Please note the advice given below concerning the handling of the sensitive optical fibers.

Components designed to fit together!
Always use the spectrometer units which were assembled for you at the original installation. Only use original spare parts. If it is necessary to change parts not listed in the following chapters, please refer to *art photonics* customer service. Do not repair or change parts which are not explicitly mentioned in this manual. Always contact *art photonics* Customer Services if you are considering an exchange.

Record the operating parameters of your spectrometer setup.

The operating parameters of the system should be checked, defined and recorded each time a change is made in the measurement system (e.g. change of optical fibers, measuring head etc.). This can either be done by carrying out the measurements described in the following chapters or individually defined standard measurements.



Laser safety!

This unit is designed to work with lasers emitting radiation in invisible wavelength range (785nm). It is not equipped with any shutter or special indicators showing that the laser radiation is on. ALWAYS use special laser protective glasses to avoid eye injuries. Refer to the manual of the laser manufacturer to see the laser class. Diameter of the collimated laser beam emitting from the probe tip is 3mm.

Parts Included

- NIR-DR + Raman Combi-Probe Rev.1



Connecting the Probe

Procedure

To connect the probe, follow the steps below:

1. Remove protective cover from the probe shaft;
2. Install the probe shaft in the system / machine at measuring point;
3. Install the probe cable;
4. Remove protective caps from optical connectors;
5. Couple the fiber cable with Ø5mm ferrule to the light source output;
6. Couple the fiber cable with SMA connector to detector / spectrometer input;
7. Couple the fiber cable with FC/PC connector to laser light source;
8. Couple the fiber cable with MTP48 connector to Raman spectrometer;
9. Connect wires to adjustable 12V power supply (at least 1A)

Optical adjustments

There are no adjustments required. The fiber assembly is ready for test/operation.

Operation

- Calibrate the spectroscopy systems by using diffuse reflectance / Raman standards.
- Put the probe shaft into powder / liquid.
- Measure reflection and/or Raman spectrum.



Care of the Probe

Follow these guidelines to ensure that the probe remains functional for as long as possible:

- Handle the probe with care.
- Do not drop the probe. Dropping the probe may cause permanent damage.
- Prevent the drop of the probe when laying on a surface and hold the probe at both ends when transporting as the impact can result in fiber or optical components break.
- Do not bend or twist the probe shaft. This may cause permanent damage of optical components.
- Never bend optical fibers with force! The lowest permitted bending radius is approx. 150 mm (bending diameter 300mm). Bending the probe over this limit may result in fiber break.

- Avoid tension, bending and torsion of the fibers. Do not pull the fiber bundle. Hold the connector when pulling it out of the adaptor.
- The fiber connectors when they are not in use should always be protected with the caps delivered with the fibers.
- Do not disassemble or repair the probe. Only the manufacturer and persons authorized by the manufacturer are permitted to carry out repairs.
- Ask the manufacturer for the advice if fiber ends need the cleaning.
- Despite being hard material, Sapphire windows can be scratched at the touching with hard tools or rough hard surfaces.
- Store optical fiber probes which are not in use in their protective storage cartons.



Cleaning instructions

The probe tip, including the Sapphire windows, can be cleaned using distilled water or light detergents.

- Use a lint-free napkin or dry air to dry the tip. Do not strike Sapphire windows with hard tools.
- Visually inspect the probe shaft and tip – the windows especially- for any residue left. Repeat the cleaning procedure until the probe appears clean.
- To make sure the cleaning is complete determine the optical cleanliness of the windows: Collect a background spectrum. Clean the tip with appropriate solvent(s). Collect a background spectrum one more time and look for bands within the system effective range. Second background spectrum should be the same as first one if the probe tip is clean.
- Ask the manufacturer for the advice if fiber ends need the cleaning.

NEW SAFETY REGULATIONS FOR SERVICING LABORATORY EQUIPMENT

Dear Customer,

For instruments used in analytical laboratories (e.g. bio-, chemical- or pharmaceutical environment) it cannot be ruled out that service personnel could be exposed to health risks by coming into contact with residues of hazardous substances, especially when the instrument or accessories have been used for making measurements using radioactive, infectious or toxic substances.

The current regulations and laws, as well as the extended guidelines and norms, stipulate that we, as a manufacturer of measuring systems, observe more stringent safety regulations in order to ensure the safety of our employees. These regulations and laws include:

- The chemicals ordinance for protection from hazardous substances
- The hazardous substances ordinance, technical rules for hazardous substances
- The radiological protection ordinance
- The accident prevention regulations biotechnology, safety tests concerning biological safety according to UVV, VBG 102
- The guidelines of the professional associations, working in contaminated areas

Moreover, the environmental regulations issued by the environmental protection and industrial inspection board as well as the quality assurance system DIN/ISO 9001, which was awared to AP, also have to be observed.

Therefore, prior to allowing any repair work in your laboratory or before returning the instrument to us we would ask you, either to carefully clean, disinfect or decontaminate the instrument or components to be serviced, or confirm that the instrument or components have not come into contact with any hazardous substances.

The enclosed “Confirmation on Decontamination” should be filled out and attached to the Shipping papers together with your repair order, or handed out directly to our service technicians in your laboratory.

We are unable to commence repair work without a declaration that the instrument has been decontaminated. Should the declaration not be received within three weeks we regret that we must for safety reasons return the instrument unrepaired, at your cost.

For further questions, please do not hesitate to contact us directly.

Confirmation on Decontamination

If you return an instrument or component (e.g. accessory) to AP for sevicing purposes which is not properly decontaminated, there will be a health risk for AP employees.
We therefore need your confirmation that the instrument or component was decontaminated and cleaned properly before shipping. If the form below is not filled in accordingly and completely, we will reject the instrument. This is needed to protect our employees. We kindly ask you for your understanding.

Instrument / component _____	Serial no. _____
Instrument or component has come into contact with:	
[ ] radioactive substances Isotope_____ _____	How decontaminated / cleaned: _____ _____
[ ] chemical reagents R-and S-rules_____ _____	How decontaminated / cleaned: _____ _____
[ ] biological material specifiy_____ _____	How decontaminated / cleaned: _____ _____
[ ] contagious agents specify _____ _____	How decontaminated / cleaned: _____ _____
[ ] I hereby confirm that the instrument or component specified above was not contaminated with any of the above mentioned substances / reagents / agents [ ] I hereby confirm that the instrument or component specified above was decontaminated / cleansed using the appropriate method.	
Date:_____	signature:_____
(please print) name:_____ _____ title:_____	address:_____ _____ _____ phone:_____ fax:_____