

SPECTROSCOPY CONFIGURATIONS

FOR LIFE SCIENCES



SOLUTIONS FOR LIFE SCIENCES

Avantes instruments and accessories have been used successfully in a multitude of life science applications. Spectrometers and photonics sensors have been used for years in applications such as blood gas analysis and oximetry but they are now being deployed into a variety of new applications thanks to the developments in the fields of biophotonics and proteomics. Fiber based spectrometers offer a variety of advantages over traditional instruments including:

- Size/portability – enabling integration into handheld devices
- Value – these instrument often have a superior price/performance ratio
- Micro-sampling – by using fiber optics
- Speed – Micro spectrometers can support sampling at KHz rates and higher
- Non-invasive/non-contact sampling

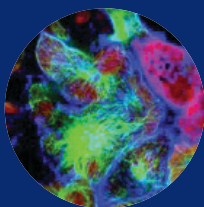
This brochure provides information on common configurations used in life science applications. Avantes offers many possible configurations for life sciences, this brochure only lists a few common configurations so we advise you to speak with one of our knowledgeable sales team members to learn more about the right configuration for your application. Avantes is not a manufacturer of integrated turnkey solutions, rather a component supplier for life science.



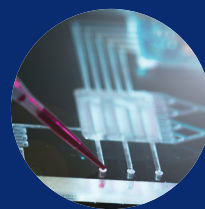
SOME EXAMPLES OF AVANTES LIFE SCIENCES IMPLEMENTATIONS



Diffuse Reflectance



Fluorescence



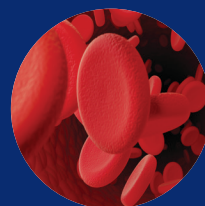
Microfluidics



Blood Gas Analysis



Endoscopy



Blood Perfusion

MICROFLUIDICS CONFIGURATION FOR FLUORESCENCE/ABSORBANCE

For protein and similar biological medium measurements sample volumes are often constrained requiring the use of microfluidics for measurements. Avantes offers a variety of micro-fluidic and probe options to facilitate such measurements. Figures 1 & 2 below show a typical set up for microfluidics measurements.

FIGURE 1: MICROFLUIDIC FLUORESCENCE SET UP WITH AVASPEC ULS2048CL-EVO

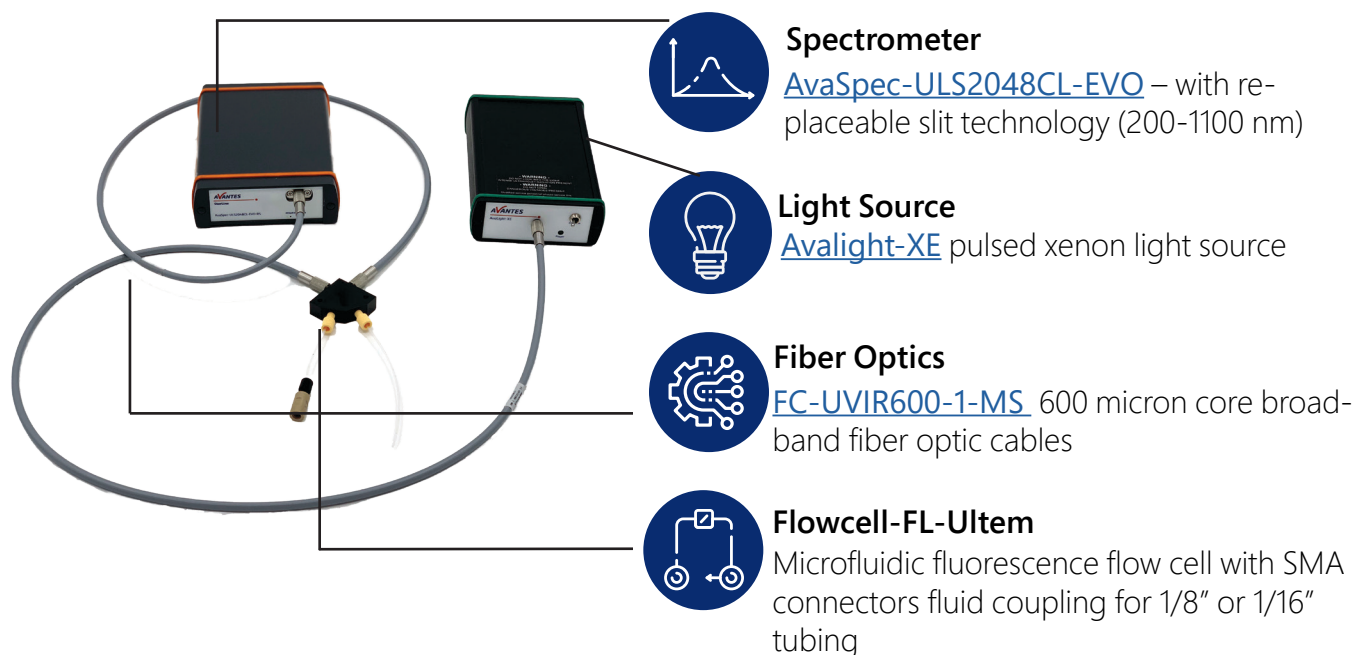
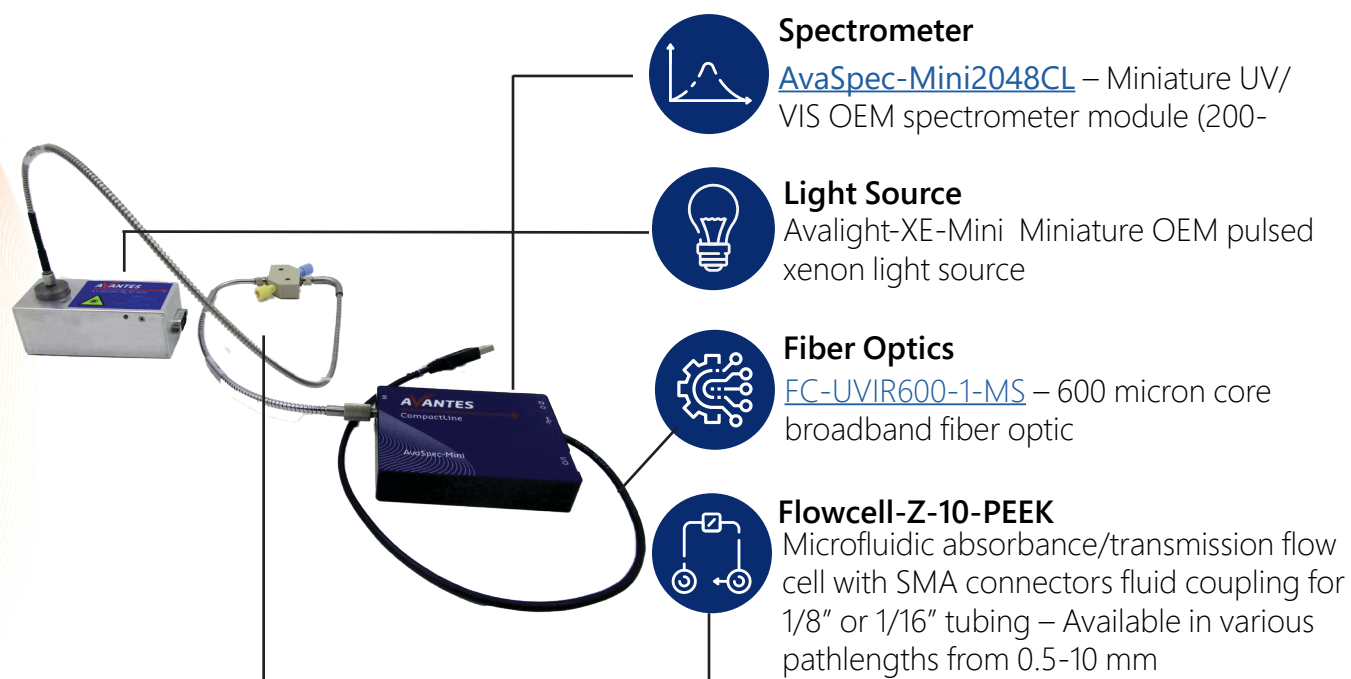


FIGURE 2: MICROFLUIDIC ABSORBANCE SETUP WITH AVASPEC MINI





ADDITIONAL CUSTOMIZATION OPTIONS

Beyond the configurations shown in figures 1 and 2, Avantes AvaSpec instrument lines includes higher performance spectrometers for measurements of lower limits of detection with higher signal to noise performance. The [AvaSpec-ULS2048X64-EVO](#) and [AvaSpec-1024X58-HSC-EVO](#) from our SensLine product family provide for superior performance for more demanding applications. As an alternative to the flow cell configurations, Avantes offers microfluidic dip probes for similar applications. (Figure 3).

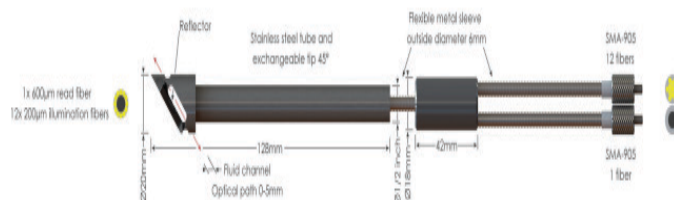
Fluorescence measurements may also be performed with probe configurations such as the [FCR-UVIR200/600-2-IND](#) probe (see figure 4). Each probe-based fluorescence may require the use of band pass and long pass filters which allow for the separation of excitation from emission wavelengths. Avantes direct attached (FH-DA) and inline filter holders (FH-Inline), or an LED excitation source.

PROBE TIP OPTIONS

Figure 3: Microfluidic dip probe with 1.5 mm OD tip (various pathlength options)

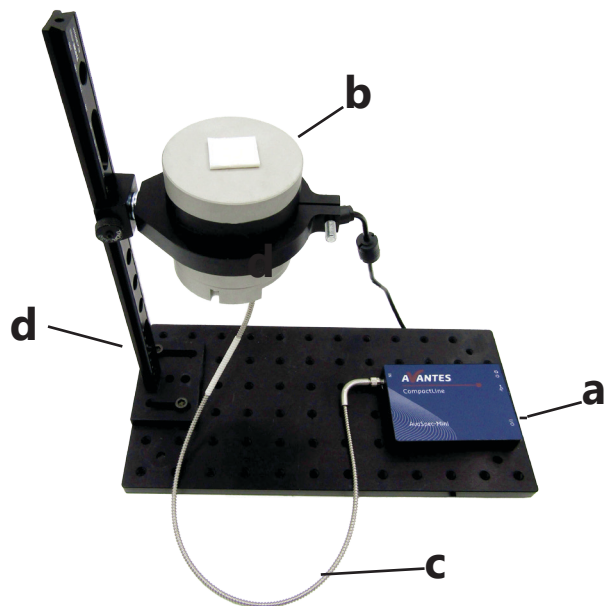


Figure 4: [FCR-UVIR200/600-2-IND](#) Industrial Fluorescence probe



DIFFUSE REFLECTANCE

For surface and sub-surface dermal measurements, diffuse reflection is the technique of choice. This technique allows for measurement of reflection and absorption in the visible and near infrared for characterization of color and identification of abnormalities such as lesions or masses. Diffuse reflection can be performed ex-vivo on skins lesions or in-vivo during a biopsy or endoscopy and yields rich information about the tissues being analyzed. When used in combination with a near infrared detector, the technique can provide deeper penetration down to a 1 cm below the surface. Avantes solutions for diffuse reflection typically consist of a spectrometer and either a reflection probe or integrating sphere and an appropriate light source.



INSTRUMENT DETAILS

Diffuse reflectance configuration with AvaSpec-Mini and Avasphere-50-LS-HAL, shown with tissue phantom sample over integrating sphere port



a) Spectrometer

[AvaSpec-Mini2048CL](#) – Miniature UV/VIS OEM spectrometer module (200-1100 nm) – Also available in NIR configuration (900-1700 nm)



b) Light Source

[Avasphere-50-LS-HAL](#) Integrated light source and 50 mm integrating sphere



c) Fiber Optic

[FC-UVIR600-1-MS](#) – 600 micron core broadband fiber optic cables

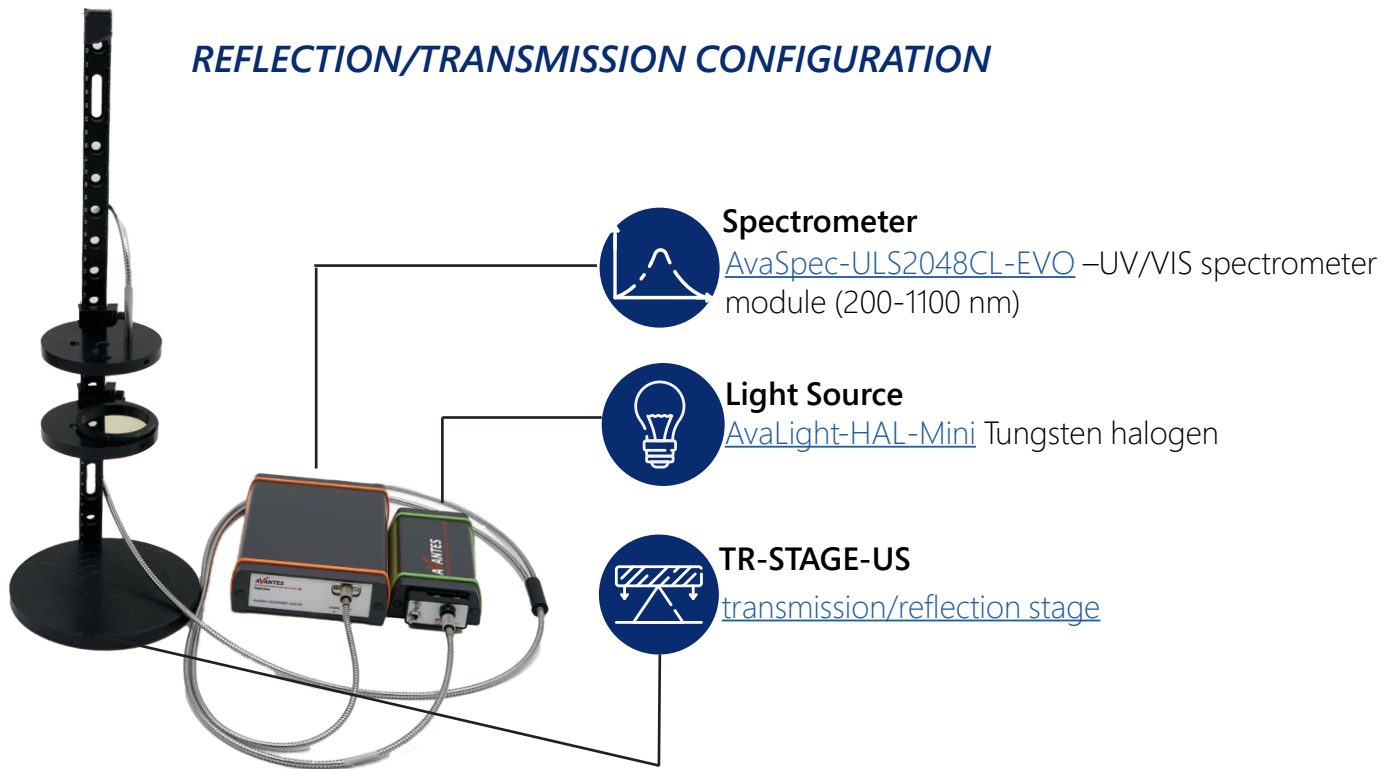


d) TR-STAGE-US

transmission stage with optional integrating sphere holder

DIFFUSE REFLECTANCE PROBE BASED INSTRUMENT CONFIGURATION

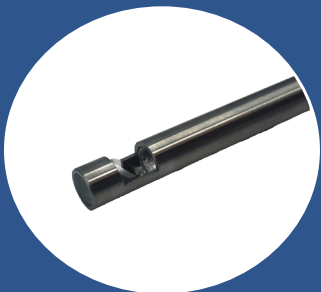
Probe configurations for diffuse reflection are available with a variety of options including small tip diameters, side firing configurations, right angle tips or 45 degree angle tips with integrated windows such as our FCR-7UVIR200-2-45-ME. All probe configurations obviate the need for external light sources and Avantes AvaLight line of sources can cover your needs. Avantes also offers a variety of custom fiber optic probes with configurations to meet whatever application requirements you should have. Systems for in situ fluorescence measurement can also be configured with similar probe configurations and the additional band pass filters to control excitation/emission



PROBE OPTIONS



FCR-7UVIR400-2-ME: 0.7 mm outside diameter reflection fiber optic standard probe.

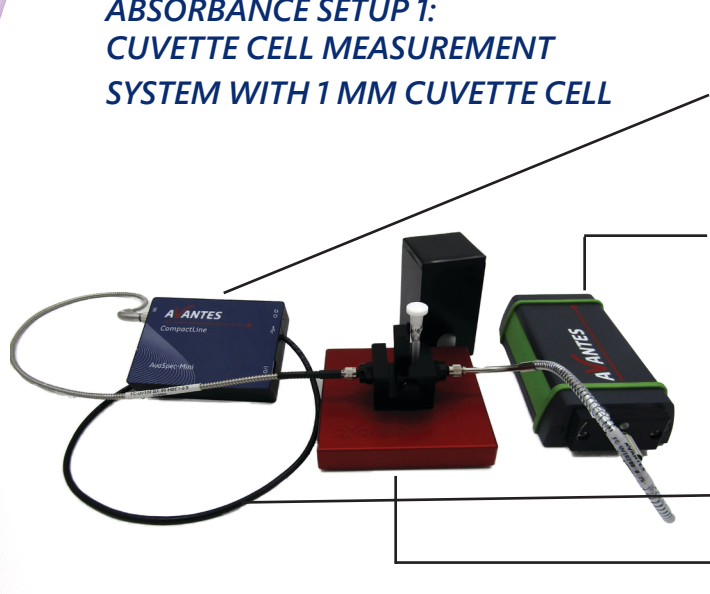


FCR-7UVIR200-2-45-BX: Side firing reflection probe with 45 degree window

ABSORBANCE CONFIGURATIONS

Most life science applications begin at the experimental level in a cuvette cell and with this in mind, Avantes offers a variety of configurations to support researchers performing cuvette measurements of biological samples. Cuvette measurements provide a stable, well controlled means of measuring samples while controlling variable such as pathlength, sample geometry, referencing and temperature. For biological samples temperature control can be of critical importance and for this reason we offer temperature control cuvette cell holder capable of operating over the range from -30° to 105° C. Probe based absorbance measurement featuring so call dip probes are also facilitated within our instrument platform.

ABSORBANCE SETUP 1: CUVETTE CELL MEASUREMENT SYSTEM WITH 1 MM CUVETTE CELL



Spectrometer

[AvaSpec-Mini2048CL](#) – Miniature UV/VIS OEM spectrometer module (200-1100)



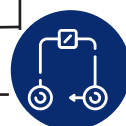
Light Source

[AvaLight-DHc](#) -compact deuterium halogen source



Fiber Optics

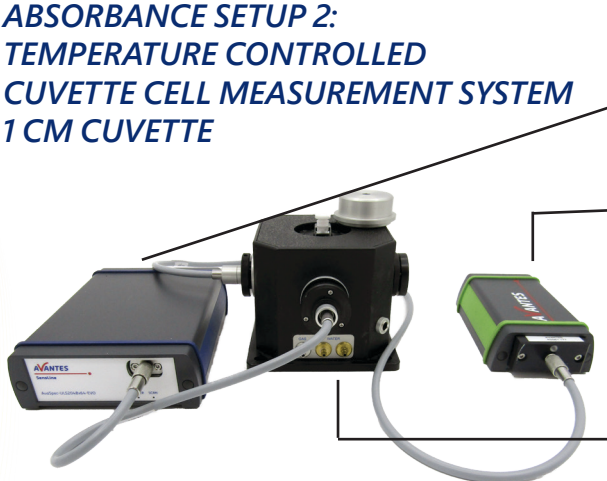
[FC-UVIR600-1-MS](#) 600 micron core broadband fiber optic cables



CUV-UV/VIS

[Cuvette cell holder](#)

ABSORBANCE SETUP 2: TEMPERATURE CONTROLLED CUVETTE CELL MEASUREMENT SYSTEM 1 CM CUVETTE



Spectrometer

[Avaspec-ULS2048x64-EVO](#)-UV/VIS/NIR Spectrometer module (200-1160) nm



Light Source

[AvaLight-DHc](#) -compact deuterium halogen source



CUV-UV/VIS-TC

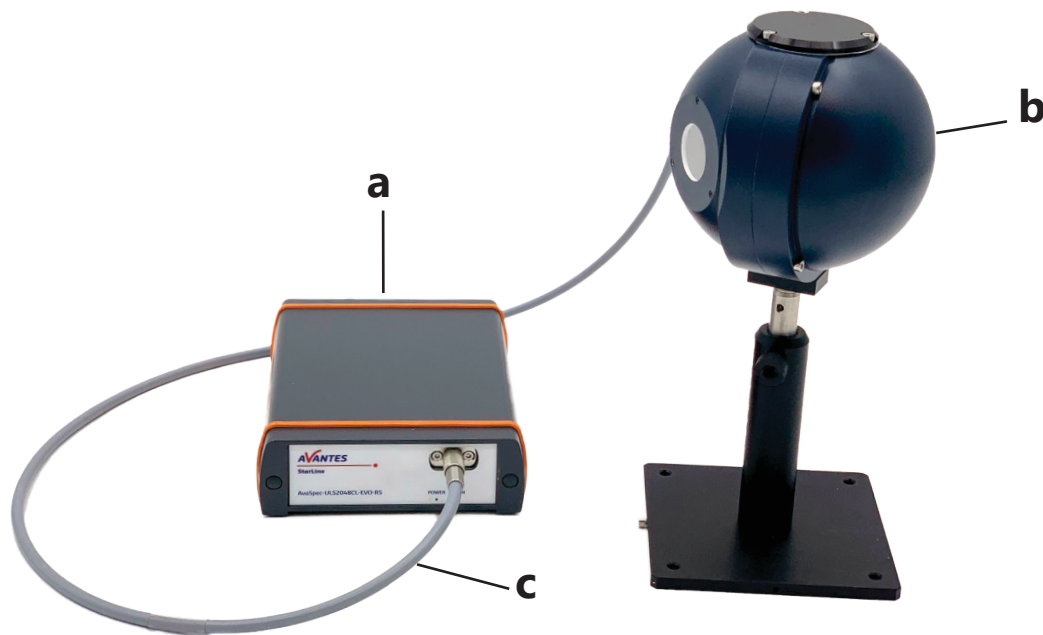
[Temperature controlled cuvette cell holder](#)

Additional Information on Probes

Probe configurations for diffuse reflection are also possible and include a variety of options including micro-tip probes (as low as 0.7 mm OD), 45 degree angle tipped probes, side firing probes and more.

IRRADIANCE CONFIGURATIONS

Many life science applications require radiometric characterization of light sources directly or probes attached to light sources so as to assess the dosing of light which is being emitted with each test. Avantes spectrometer instruments can be configured into spectroradiometer systems which provide for the ability to quantitatively measure light sources such as on chip LEDs, probe tips, etc. The figure below demonstrates such a configuration with an AvaSpec spectrometer and 100 mm integrating sphere.



ABSORBANCE INSTRUMENT CONFIGURATION

Radiometry configuration with spectrometer and integrating sphere.



a) Spectrometer

AvaSpec-ULS2048CL-EVO – UV/VIS spectrometer module (200-1100 nm).



b) Integrating Sphere

Avasphere-IRRAD-100 - 100 mm integrating sphere



c) Fiber Optic

FC-UVIR600-1-MS – 600 micron core broadband fiber optic cables



Calibration

IRRAD-CAL-UV/VIS – NIST traceable irradiance calibration 200-1100 nm

SUPPORT & ADVICE

Providing high-quality equipment is only part of what we do. The other equally important factor is the high level of service we deliver. Our organization includes various specializations to provide you with the best service and advice:

Feasibility studies

Our sales engineers perform feasibility studies to find the right solution.

Support team

Our support team never sleeps and provides you with the best service.

Demo program

Our demo program allows you to try our products for free to ensure you find the perfect solution.

MyAvantes

Personal platform where you'll find AvaSoft Software and other material

Online support

Helpful documents and tutorial videos for extra help with your products.



ABOUT AVANTES

Avantes is the leading innovator in the development of fiber-optic spectroscopy instruments and systems with nearly 30 years of experience developing customer-defined configurations.

With a long history of consulting with clients across diverse industries and applications, Avantes is an experienced partner, equipped to guide customers who want a solution tailored to their application and research needs. By building worldclass spectrometers and providing second-to-none customer service, Avantes offers customers the peace of mind that the Avantes solutions they purchase will meet, and exceed, their expectations.

Through our headquarters in Apeldoorn, the Netherlands and offices in the USA and China, our sales engineers work closely with our customers to recommend the optimal measurement solution. In addition to our direct offices, Avantes has a worldwide network of distributors in over 35 countries who are ready to assist you. Our production team, which is located at our headquarters in the Netherlands, is dedicated to quality workmanship and has a relentless drive to exceed customer expectations.

Curious how spectroscopy can help you reveal answers by measuring all kind of materials in-line at your production facility, in a lab or in the field? Please contact one of our technical experts, we are happy to help!



CONTACT

WE'RE HAPPY TO HELP

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