

# Raman spectroscopic probes

## Robust optical measurement of chemical composition

### For lab-to-process safety, quality, and optimization

- Robust and reliable in-line, on-line, or at-line measurement data
- Increased process understanding, control, and monitoring of key quality parameters
- *In situ*, real-time measurement of multiple components with a single probe
- Simplified process equipment and seamless model transferability
- Faster processing time, less waste, and enhanced yields
- Easier compliance with strict industry regulatory requirements
- Flexibility for use with any phase of matter in any installation environment



# Our Raman spectroscopic probes

## Quality matters

Endress+Hauser Raman spectroscopic probes are the “eyes” that see into your process to help you understand, monitor, and control your chemistries. Just as healthy eyes and clear vision are essential to help the human brain process information, the quality and accuracy of your sampling probes are crucial to gaining a clear picture of your processes. This transparency is an important component to operational excellence.

Our Raman sampling probes, powered by Kaiser Raman technology, are rugged, robust, and high-performing. They are constructed with the highest quality contact materials and offer the most flexible sampling capabilities available on the market. Whether you want to measure solids, liquids, gases, or slurries, our Raman probes deliver continuous, real-time, in-line measurement data with exact precision.

You can rely on each of these Raman probes to help you meet rigorous industry standards, while boosting plant safety, ensuring product quality, and increasing operational efficiency across your enterprise.

**Safety data you can count on** Boost plant safety and performance through automation and transparency into your process. Our Raman *in situ* probes maximize personnel safety by avoiding extractive sampling and enable monitoring of critical safety parameters to better predict and mitigate risk.

**Product quality and compliance at your fingertips** Improve quality and compliance by gaining process control and identifying quality markers for real-time release. As a result, you can consistently produce higher, better quality yields and more easily comply with industry regulations.

**Lab-to-process optimization and scalability** Our Raman probes are uniquely designed to work with our award-winning analyzers, providing a system that scales from the laboratory to the process environment without missing a beat. This transferability results in seamless model transfer, faster time to market, and a quicker return on investment.



### Top quality material & design

- Corrosion resistant materials
- High purity, low background windows
- Bubble shedding characteristics
- Fixed-focus design



### Lab-to-process scalability

- Simplified equipment
- Easy method transferability
- Self-alignment and calibration innovation



### Sampling versatility

- Non-invasive, non-destructive sampling
- No-touch and remote measurements
- Representative measurements
- Direct insertion, side insertion, or sample loop
- Through site glass, in a sleeve-type port, or in slipstream



### Industry standards/regulation compliance

- ATEX, CSA, and IECEx hazardous area certification
- CIP/SIP, autoclave, and gamma radiation sterilization protocols
- cGMP, ASME BPE
- ISO 9001:2015
- NeSSI compatibility



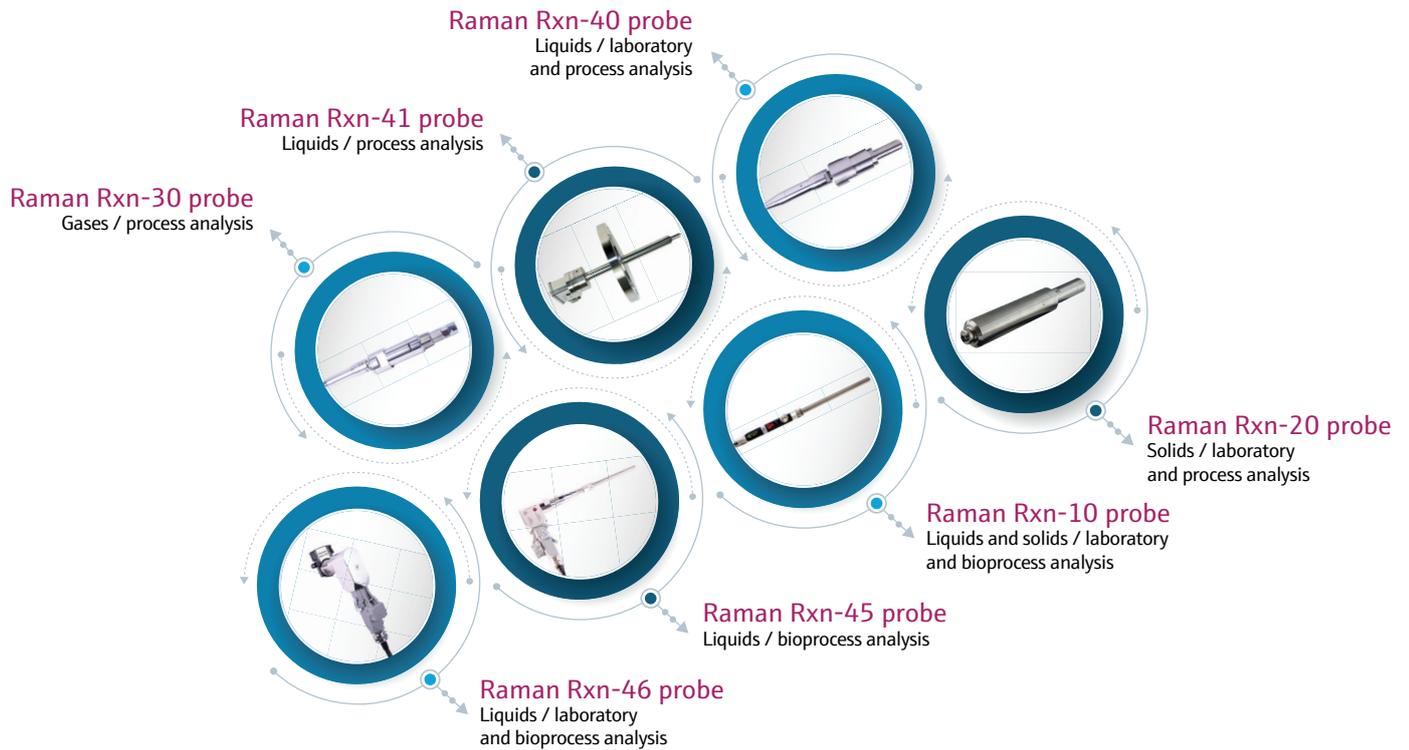
### Environmental flexibility

- All phases of matter
- Any installation environment
- Wide range of application suitability
- Modular designs for site installation or site acceptance



### Reliable data accuracy

- In-line, on-line, at-line
- Real-time
- Continuous 24/7 and 365
- Long-term measurement stability
- Streamlined calibration and verification procedures



## Not all Raman probes are created equal

When only the best will do, trust Endress+Hauser

The Endress+Hauser Raman probe portfolio is backed by over 30 years of process Raman leadership, expertise, reliability, and innovation. All of our probes are uniquely designed to enable non-invasive compositional analysis of a material without needing to extract, prepare, or destroy the native sample or modify existing hardware. Each probe line has been tailored, by design, to its target use by incorporation of specific windows, materials, and sampling features. In addition, our probes include self-alignment and calibration innovation for unparalleled method transfer capabilities.

Our Raman spectroscopic probes are optimized for solids, liquids, gases, and turbid media to ensure high performance in the laboratory or in process environments. They can be configured to the Raman sampling point for your application or plant setting, thereby providing reliable chemical analysis in any installation environment.

### Benefit highlights

- Increased safety through reliable, non-extractive, *in situ* measurement techniques, which minimize human intervention while maximizing risk avoidance capabilities
- Enhanced product quality through increased process visibility and tighter control of critical quality parameters
- Optimized process efficiency through faster delivery of real-time, highly accurate measurement data and streamlined lab-to-process scalability
- Lower costs by reducing maintenance, product waste, and cleaning burdens while increasing yields and plant availability
- Easier compliance with industry and safety regulations through better process control and 24/7/365 monitoring

# Raman Rxn-10 probe

## Liquids & solids / laboratory & bioprocess analysis

Designed for product and bioprocess development, the Rxn-10 probe is the workhorse of the Endress+Hauser Raman probe portfolio. It is trusted to deliver high performance Raman measurements across a wide spectral range.

Compact, lightweight, and flexible, the Rxn-10 probe offers multipurpose convenience for both liquids and solids analysis in the laboratory or single use manufacturing environment.

The Rxn-10 probe accepts a variety of interchangeable accessory optics which make it a highly versatile and easily adaptable instrument in your analysis toolbox.

- **Non-contact optic:** for use with solids or turbid media or when sample contamination is a concern
- **Immersion optic:** for use in reaction vessels, laboratory reactors, or process streams
- **bIO-Optic:** for use with continuous in-line measurement in benchtop bioreactor/fermentor applications requiring headplate entry
- **Raman optic system for single use:** for use with disposable fittings for single-use bioreactors



### Benefits at a glance

- Multipurpose use for both solids and liquids measurement
- Lightweight and compact
- Integrated laser safety interlock, including "laser on" indication and remote shut-off
- Flexible output compatible with a range of sampling options
- Easy switching of non-contact, immersion, and bioprocessing optics to suit a variety of applications
- Wide spectral range, including access to a critical low-wavenumber region



### Field of application

- Chemical: reaction monitoring, blending, catalyst monitoring, hydrocarbon speciation, process unit optimization
- Polymer: polymerization reaction monitoring, extrusion monitoring, polymer blending
- Pharmaceutical: active pharmaceutical ingredient (API) reaction monitoring, crystallization
- Biopharmaceutical: cell culture and fermentation monitoring, optimization, control
- Food & Beverage: zonal heterogeneity mapping of meats and fish

### Technical highlights

- Laser wavelength: 532 nm, 785 nm, or 1000 nm
- Maximum laser power: <499 mW
- Construction: 6061 aluminum, 316L stainless steel, and 303 stainless steel
- Length: 203 mm
- Diameter: 19 mm

# Raman Rxn-10 probe accessory optics

## Liquids & solids / laboratory & bioprocess analysis

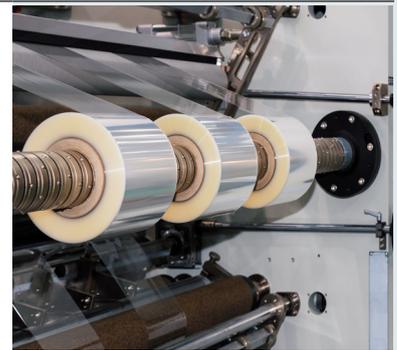
Accessory optics for the Rxn-10 probe broaden sampling flexibility so you can tailor your Raman system to your specific laboratory and single use manufacturing needs.

### Rxn-10 probe accessory optics



#### Non-contact optic

- Range of working distances for remote measurements either directly or through sight glass and translucent packaging
- Highly versatile – measuring films to pellets to powders
- Can measure static or moving samples
- Contact-free analysis of delicate or corrosive samples



#### Immersion optic

- Ideal for quick liquids, slurries and semi-solids measurements in the lab
- Superior signal performance
- Available in 1/4" and 1/2" diameters
- Wettable components that resist corrosion in harsh environments



#### biO-Optic

- Immersion optic for multi-component bioprocess measurement
- Compatible with standard bioreactor ports
- Fixed-focus design
- Available in 12 mm diameter with PG13.5 threaded connector
- 120, 220, 320, or 420 mm lengths
- Autoclavable



#### Raman optic system for single use

- Disposable fitting for single-use bioreactors (SUBs), plus a non-contact reusable optic
- Developed to industry standards for single-use sensors
- Gamma sterilizable
- Tested and supplied by multiple SUB vendors





## Raman Rxn-45 probe

### Liquids / bioprocess analysis

The Rxn-45 probe capitalizes on the power of Raman in bioprocess manufacturing by measuring multiple, specific components in real-time for continuous, around-the-clock process feedback. It also meets the daunting sampling requirements of compliance, sterilization, port compatibility, and convenience. The Rxn-45 probe offers a surface finish suitable for cGMP manufacturing, fits the side ports of large bioreactors, and is compatible with CIP/SIP protocols. With flexibility in mind, the Rxn-45 probe was designed for installation in development and cGMP stainless-steel reactors. The PG13.5 connector allows for installation with multiple port types, utilizing industry standard sensor housings for 25 mm side ports. Welded port connectors and flanges are also available in multiple brands and sizes. The Rxn-45 probe is successfully used to provide an analytical “eye” into large-scale bioprocesses.

#### Benefits at a glance

- Measures multiple components in real-time for automated 24/7 process feedback
- Provides long-term measurement stability
- Offers a suitable surface finish for cGMP manufacturing
- Provides compatibility with industry standard bioreactor side ports and sensor housings
- Offers the flexibility of being installed in development and production reactors
- Compatible with CIP/SIP standards for reduced sterilization and cleaning burdens

#### Field of application

- Cell culture: glucose, lactate, cell density, titer, amino acids, and more
- Fermentation: glucose, glycerol, acetate, methanol, ethanol, biomass, and more

#### Technical highlights

- Laser wavelength: 785 nm, 1000 nm
- Process connection: PG13.5
- Surface finish: Ra 15 with electropolish
- Insertion length: 120 mm
- Diameter: 12 mm
- Body: 316L stainless steel
- Sterilization protocol: CIP/SIP compatibility



## Raman Rxn-46 probe

### Liquids / laboratory & bioprocess analysis

The Rxn-46 probe is the latest innovation in our robust bioprocessing probe series. Optimized to fit the BioPAT® Spectro platform by Sartorius, this collaboration represents the first instance of Raman being brought down to Sartorius' Ambr® scale and Biostat STR® single-use product lines. It offers the market an ideal interface to high throughput development through single-use commercial manufacturing. By providing fast, reliable, and accurate measurement of key process variables from lab-to-process, the Rxn-46 probe empowers bioprocessing companies to more easily scale-up and scale-out from development to cGMP while complying with strict quality standards.

#### Benefits at a glance

- Enables faster, easier, and more robust model building via integration with Ambr 15 and Ambr 250
- Allows high throughput process development which supports QbD
- Provides a more efficient transfer to Biostat STR for single-use manufacturing
- Offers a scale-independent interface from 15 ml in the laboratory to 2000 L in the production suite
- Requires no probe cleaning, sterilization, or frequent maintenance due to non-contact sampling



#### Field of application

- Cell culture: glucose, lactate, cell density, titer, amino acids, and more

#### Technical highlights

- Laser wavelength: 785 nm
- Process connection: non-contact, only attaches to BioPAT Spectro for Ambr and Biostat STR
- Analyzer compatibility: Ambr 15 and Ambr 250: Raman Rxn2 single channel; Biostat STR: Raman Rxn2/4 up to four channels, or upgraded non-embedded four channel analyzers



## Raman Rxn-40 probe

### Liquids / laboratory & process analysis

Designed to promote versatility and materials compatibility, the Rxn-40 probe is a compact, sealed immersion probe for *in situ* Raman spectroscopy of liquid-phase samples in a laboratory or process plant setting. The Rxn-40 probe provides in-line, real-time chemical measurements without needing to send a technician to the field and collect a sample from the stream. The process connection for the Rxn-40 probe can be swaged, compression-mounted, flange-mounted, installed in a flow cell, and is NeSSI compatible. These options allow for direct insertion in slipstreams, drain valves, reactors, circulation loops, blend headers, and inlet or outlet pipework. The Rxn-40 probe is available in a flanged or unflanged configuration, and in a mini configuration, to aid customization to your process and offer greater sampling flexibility. In addition, the Rxn-40 probe is compatible with installations in hazardous areas/classified environments.



#### Benefits at a glance

- Customizable to your process
- Robust design with a range of process connections
- *In situ* /no transfer lines or fast-loops required
- Faster, simpler installation
- Support for a range of chemical processes and corrosivity requirements
- Ensures safety and meets regulatory requirements
- Suitable for hazardous /classified environments

#### Field of application

- Chemical: reaction monitoring, blending, catalyst monitoring, feed and final product monitoring
- Polymer: polymerization reaction monitoring, extrusion monitoring, polymer blending
- Pharmaceutical: API reaction monitoring, crystallization, polymorph, blending
- Oil & Gas: any hydrocarbon analysis

#### Technical highlights

- Laser wavelength: 532 nm, 785 nm, 1000 nm
- Maximum laser power: <499 mW
- Immersible length: 36 mm (mini configuration); maximum immersible length is dependent on material choice (Rxn-40)
- Immersible diameter: 12.7, 19.05, 25.4 mm options
- Wetted material: C276 alloy, 316L stainless steel, or Grade 2 titanium
- Hazardous area certified: ATEX, CSA, IECEx



# Raman Rxn-41 probe

## Liquids / process analysis

The Rxn-41 probe is a rugged, process insertion probe with no sample handling system. Its single cable design streamlines installation, eliminates risk scenarios, and minimizes installation cost for long fiber runs in the process environment. The Rxn-41 probe utilizes a hybrid electro-optical fiber cable assembly to carry the analytical signal and the safety interlock in a single easy-to-install cable. The Rxn-41 probe is ideally suited for use in chemical plants and refineries to measure batch or continuous flow production. It is also highly effective for use in pharmaceutical manufacturing facilities for glass-lined reactors as part of a Quality-by-Design (QbD) solution using Process Analytical Technology (PAT) analyzers. For direct measurements in cryogenic fluids, an optimized cryogenic version of the Rxn-41 probe is available.

### Field of application

- Chemical: reaction monitoring, blending, feed, and final product monitoring
- Polymer: polymerization reaction monitoring, polymer blending
- Pharmaceutical: API reaction monitoring, crystallization, polymorph, drug substance production unit operation
- Oil & Gas: any hydrocarbon analysis

### Technical highlights

- Laser wavelength: 532 nm, 785 nm, 1000 nm
- Maximum laser power: <499 mW
- Body: C276 alloy, 316L stainless steel, Grade 2 titanium, or a hybrid metal combination (316L stainless steel, C276 alloy)
- Immersible length: Maximum immersible length is dependent upon material choice
- Immersible diameter: 25.4 or 60.325 mm (25.4 only for Grade 2 titanium)
- Hazardous area certifications: ATEX, CSA, IECEx

### Benefits at a glance

- Constructed to individual site requirements
- Sealed probe design
- Integrated "laser on" indicator
- One in/one out fiber optics
- Direct insertion compatibility
- Meets Category 1 pressure equipment safety standards
- Suitable for hazardous /classified environments



# Raman Rxn-20 probe

## Solids / laboratory & process analysis

For solids and semi-solids analysis, the Rxn-20 probe reigns supreme. Its state-of-the-art, stainless-steel probe design produces representative, focus-free, quantitative Raman measurements. The Rxn-20 probe illuminates a large surface area and eliminates the need to align the probe for surface roughness. A large excitation spot (6 mm) and multiple collection fibers in the Rxn-20 probe achieves heterogenous solids sampling in both the axial and lateral dimensions. In doing so, it provides information on deeper layers in addition to the surface, which is highly useful for measuring heterogenous solids such as tablets, capsules, food solids, and polymer beads.

To enhance sampling flexibility, both insertion and non-contact sampling optics are available for the Rxn-20 probe.

### Benefits at a glance

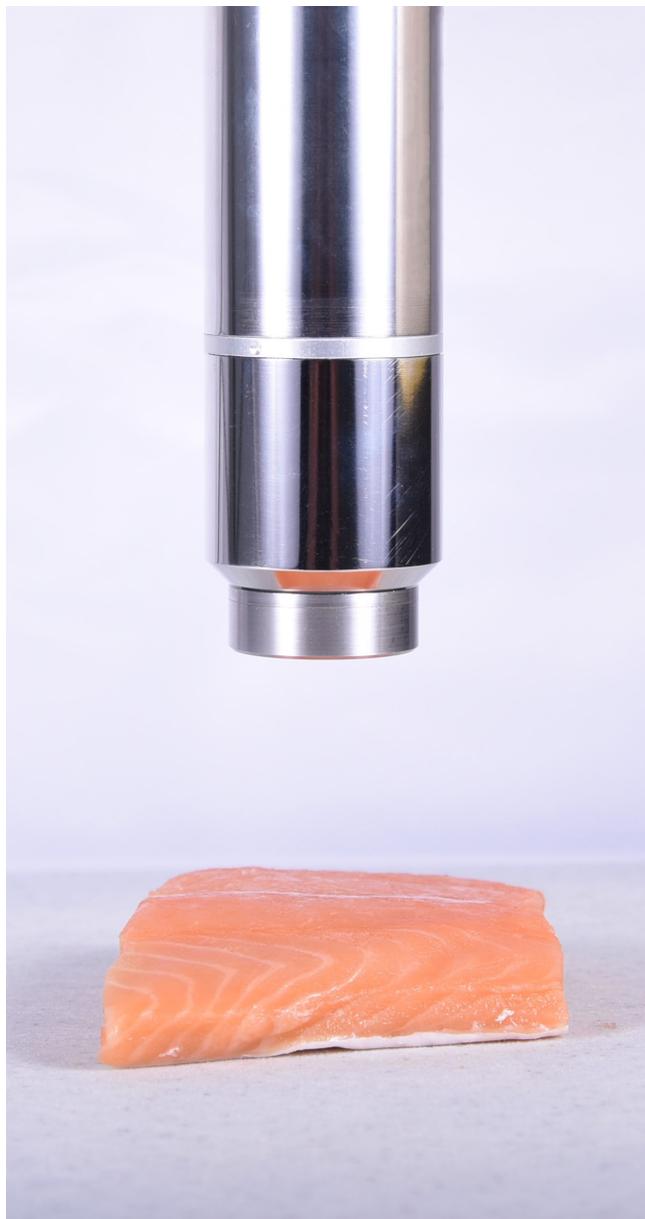
- Non-contact measurement of heterogeneous solids for better representation
- Improved process control and efficiency through faster measurements
- Non-destructive measurements from a distance
- Reproducible sampling
- "Focus free" alignment
- No need to align probe for surface roughness
- Surface and deep layer analysis

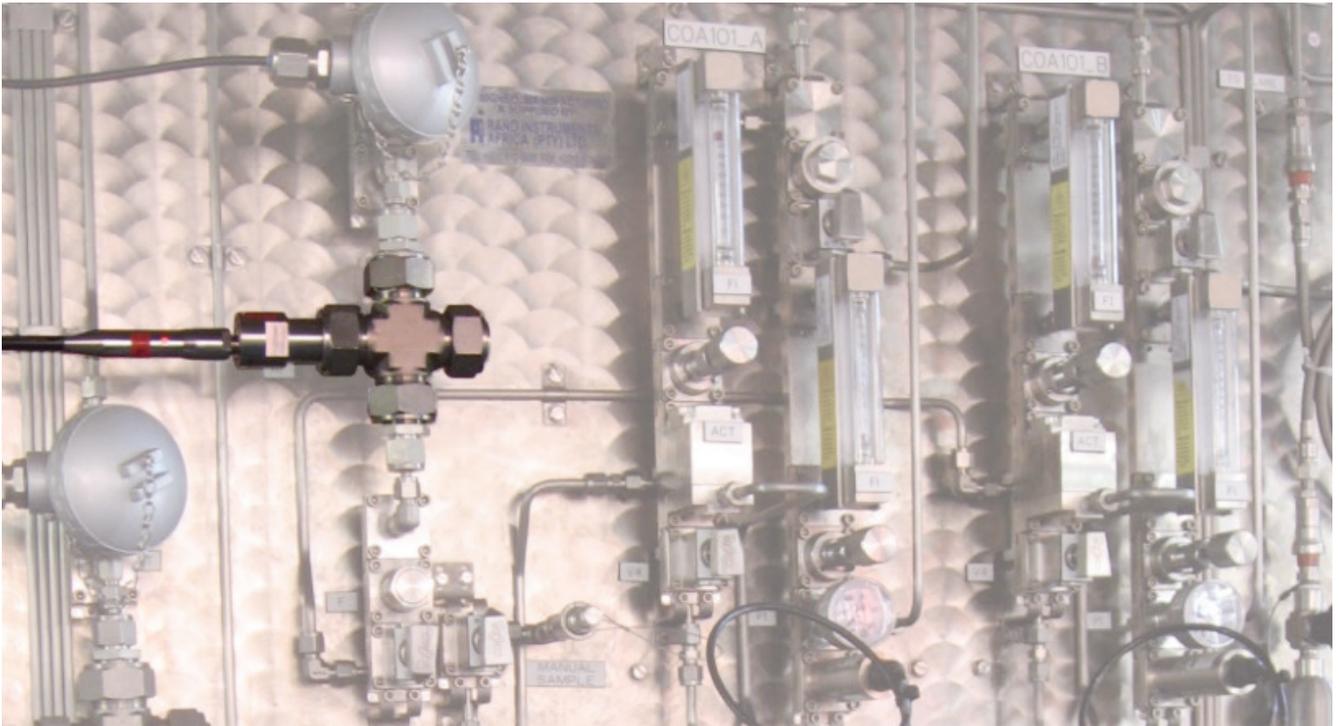
### Field of application

- Polymers: extruded pellet quality, crystallinity, density, raw materials
- Pharmaceutical: crystallinity, polymorphism, granulation, blend uniformity, content uniformity, coating, tableting
- Chemicals: final product quality, blend impurities, crystallinity, raw materials
- Food & Beverage: quality of dairy solids, meat and fish composition

### Technical highlights

- Laser wavelength: 785 nm
- Maximum laser power: <499 mW
- Working distance: based on the sampling optic selected
- Body: 316L stainless steel
- Hazardous area certified: ATEX, CSA, IECEx





## Raman Rxn-30 probe

### Gases / process analysis

The Rxn-30 probe has cross-industry appeal for its robust gas-phase headspace monitoring, *in situ* measurements, and material compatibility. In chemical processes, it successfully addresses common gas/vapor phase process application challenges such as corrosivity, wetness of the sample environment, and low sensitivity of analyzer technology. Certified for use in hazardous area environments, the Rxn-30 probe can be inserted directly into processes with temperatures up to 150 degrees Celsius and pressures up to 68.9 Barg. It is available with a variety of mounting options for maximum installation and sampling flexibility.

#### Benefits at a glance

- Reliable, quantitative gas-phase measurements
- *In situ* measurement / no transfer lines or fast loops required
- Can be directly inserted into processes with temperatures up to 150 °C and pressures up to 68.9 Barg
- Industry standard installation options
- Direct insertion, side insertion, or sample loop
- Suitable for hazardous area/classified environments

#### Field of application

- Chemical: ammonia, methanol, HyCO
- Gas-phase streams in refining: hydrogen production and recycle fuel blending, fuel characterization
- Power & Energy: Integrated Gasification Combined Cycle (IGCC) power plants, gas turbines

#### Technical highlights

- Laser wavelength: 532 nm
- Maximum laser power: <499 mW
- Wetted materials: 316/316L stainless steel, PTFE, sapphire, fused silica glass
- Temperature: -20 °C to 150 °C
- Pressure at probehead: up to 68.9 Barg (at sample)
- Hazardous area certified: ATEX, CSA, IECEx



# Technical specifications: probes for liquid-phase

## Technical specifications

	Rxn-10 probe with immersion optic	Rxn-40 probe	Rxn-41 probe
Laser wavelength	532 nm, 785 nm, 1000 nm	532 nm, 785 nm, 1000 nm	532 nm, 785 nm, 1000 nm
Laser maximum	Maximum power into probehead: <499 mW		
Sample interface	<p><b>Temperature, immersion optic:</b> -30 °C to 120 °C (316L stainless steel), -30 °C to 280 °C (C276 alloy), -30 °C to 300 °C (Grade 2 titanium)</p> <p><b>Temperature ramp:</b> ≤30 °C/min</p> <p><b>Pressure, immersion optic:</b> full vacuum (0 Bara) but not ultrahigh vacuum (UHV) where outgassing may be a concern</p> <p><b>Minimum pressure (Bara):</b> full vacuum (0 Bara) but not ultrahigh vacuum (UHV) where outgassing may be a concern</p> <p><b>Maximum pressure (Barg):</b> 68.5 (316L stainless steel), 74.0 (C276 alloy), and 29.0 (Grade 2 titanium)</p> <p><b>Temperature, Rxn-10 probe:</b> -10 °C to 70 °C</p> <p><b>Pressure, Rxn-10 probe:</b> ambient</p>	<p><b>Temperature, Rxn-40 mini configuration:</b> -30 °C to 120 °C (316L stainless steel), -30 °C to 150 °C (C276 alloy), -30 °C to 150 °C (Grade 2 titanium)</p> <p><b>Temperature, Rxn-40:</b> -30 °C to 120 °C (316L stainless steel), -30 °C to 280 °C (C276 alloy), -30 °C to 300 °C (Grade 2 titanium)</p> <p><b>Temperature ramp:</b> ≤30 °C/min</p> <p><b>Pressure:</b> dependent on material choice and probe size. Contact Sales for more details</p> <p><b>Flange:</b> ANSI B16.5 and DIN EN1092 Type B flanges available upon request</p>	<p><b>Temperature:</b> -30 °C to 120 °C (316L stainless steel), -30 °C to 150 °C (C276 alloy), -196 °C to 70 °C (C276 alloy, and hybrid construction for cryogenic use), -30 °C to 150 °C (Grade 2 Titanium)</p> <p><b>Temperature ramp:</b> ≤30 °C/min</p> <p><b>Pressure:</b> dependent on material choice and probe size. Contact Sales for more details</p> <p><b>Flange:</b> up to 305 mm diameter, ASME B16.5 or DIN EN1092 Type B flanges available upon request</p>
Wetted materials	<p><b>Immersion optic metal:</b> C276 alloy (316L stainless steel or Grade 2 titanium upon request)</p> <p><b>Immersion optic window:</b> High-purity sapphire, proprietary compression fit non-brazed design</p>	<p><b>Metal:</b> C276 alloy, 316L stainless steel, or Grade 2 titanium</p> <p><b>Window:</b> High-purity sapphire</p>	<p><b>Metal:</b> C276 alloy, 316L stainless steel, Grade 2 titanium, or a hybrid metal combination (316L stainless steel, C276 alloy)</p> <p><b>Window:</b> High-purity sapphire</p>
Fiber optic cable	<p><b>Design:</b> PVC jacketed, proprietary construction</p> <p><b>Connections:</b> proprietary electro-optic</p> <p><b>Temperature:</b> -40 °C to 70 °C</p> <p><b>Minimum bend radius:</b> 152.4 mm</p> <p><b>Length:</b> Contact Sales for available lengths</p>	Cable sold separately	Cable sold separately
Immersible length (mm)	<p><b>Immersion optic:</b> ¼" sealed: 152.4 or 203.2 ½" sealed: 152.4, 304.8, or 457.2</p>	<p><b>Rxn-40 mini configuration:</b> 36 <b>Rxn-40:</b> maximum immersible length is dependent on material choice</p>	Maximum immersible length is dependent on material choice
Immersible diameter (mm)	<p><b>Immersion optic:</b> ¼": 6.35 ½": 12.7</p>	12.7, 19.05, 25.4	25.4 or 60.325 (25.4 only for Grade 2 titanium)
Hazardous area certifications	n/a	ATEX, CSA, and IECEx	ATEX, CSA, and IECEx

# Technical specifications: probes for liquid-phase bioprocessing

## Technical specifications

	Rxn-10 probe with bIO-Optic	Rxn-10 probe with Raman optic system for single use	Rxn-45 probe	Rxn-46 probe
Laser wavelength	785 nm, 1000 nm	785 nm, 1000 nm	785 nm, 1000 nm	785 nm
Max laser power into probehead	<499 mW	<499 mW	<499 mW	<499 mW
Sample interface	<b>Temperature, bIO-Optic:</b> -30 °C to 150 °C <b>Temperature ramp:</b> ≤30 °C/min <b>Pressure, bIO-Optic:</b> ≤200 psig <b>Temperature, Rxn-10 probe:</b> -10 °C to 70 °C <b>Pressure, Rxn-10 probe:</b> ambient	<b>Temperature, single-use optic:</b> 0 °C to 100 °C <b>Temperature ramp:</b> ≤30 °C/min <b>Pressure, single-use optic:</b> n/a <b>Temperature, Rxn-10 probe:</b> -10 °C to 70 °C <b>Pressure, Rxn-10 probe:</b> ambient	<b>Temperature:</b> -30 °C to 150 °C <b>Temperature ramp:</b> ≤30 °C/min <b>Pressure:</b> ≤200 psig	<b>Temperature:</b> probe is non-contact; operating temp: 10 °C to 50 °C <b>Pressure:</b> n/a (probe is non-contact)
Wetted materials	<b>bIO-Optic body:</b> 316L stainless steel <b>Window:</b> Proprietary material, optimized for bioprocesses <b>Process connection:</b> PG13.5 <b>Surface finish:</b> Ra 15 with electropolish <b>Adhesive:</b> USP Class VI and ISO 10993 compatible	Not applicable to this optic	<b>Body:</b> 316L stainless steel <b>Window:</b> Proprietary material, optimized for bioprocesses <b>Process connection:</b> PG13.5 for industry standard sensor housings, welded port connectors available <b>Surface finish:</b> Ra 15 with electropolish <b>Adhesive:</b> USP Class VI and ISO 10993 compatible	<b>Body:</b> n/a <b>Window:</b> n/a <b>Process connection:</b> Sartorius BioPAT Spectro <b>Surface finish:</b> n/a <b>Adhesive:</b> n/a
Fiber optic cable	<b>Design:</b> PVC jacketed, proprietary construction <b>Connections:</b> proprietary electro-optic (EO), or FC to EO fiber converter(s) for non-embedded systems <b>Temperature:</b> -40 °C to 70 °C <b>Minimum bend radius:</b> 152.4 mm <b>Length:</b> Contact Sales for available lengths		Cable sold separately	Cable sold separately
Immersible length (mm)	<b>bIO-Optic:</b> 120, 220, 320, 420	Dimensions vary according to single use bioreactor vendor port and fitting type	120	n/a
Immersible diameter (mm)	<b>bIO-Optic:</b> 12	Dimensions vary according to single use bioreactor vendor port and fitting type	12	n/a
Sterilization method	Autoclave	n/a	SIP/CIP	n/a

# Technical specifications: probes for solid-phase

Technical specifications		
	Rxn-10 probe with non-contact optic	Rxn-20 probe
Laser wavelength	532 nm, 785 nm, 1000 nm	785 nm
Spectral coverage	Probe spectral coverage is limited by the coverage of the analyzer being used	175-1890 cm <sup>-1</sup> (785 nm)
Maximum laser power into probehead	<499 mW	<499 mW
Sample interface	<b>Temperature, non-contact optic:</b> ambient <b>Pressure, non-contact optic:</b> ambient <b>Temperature, Rxn-10 probe:</b> -10 °C to 70 °C <b>Pressure, Rxn-10 probe:</b> ambient	<b>Temperature:</b> 10 °C to 40 °C <b>Pressure:</b> ambient
Body and window materials	<b>Non-contact optic body:</b> optic dependent <b>Rxn-10 probe body:</b> 6061 aluminum, 316L stainless steel, and 303 stainless steel <b>Window:</b> optical-grade materials	<b>Body:</b> 316L stainless steel <b>Window:</b> optical-grade materials
Fiber optic cable	<b>Design:</b> PVC jacketed, proprietary construction <b>Connections:</b> proprietary electro-optic (EO), or FC to EO fiber converter(s) for non-embedded systems <b>Temperature:</b> -40 °C to 70 °C <b>Length:</b> Contact Sales for available lengths <b>Minimum bend radius:</b> 152.4 mm	<b>Design:</b> PVC jacketed, proprietary construction <b>Connections:</b> proprietary electro-optic <b>Temperature:</b> -40 °C to 70 °C <b>Length:</b> 3, 10, and 15 m available <b>Minimum bend radius:</b> 75 mm
Length (mm)	<b>Non-contact optic:</b> varies based on model <b>Rxn-10 probe (including fiber cable bend radius):</b> 356	<b>Rxn-20 probe (including fiber cable bend radius):</b> 312
Diameter (mm)	<b>Non-contact optic:</b> varies based on model <b>Rxn-10 probe:</b> 19	48
Working distance	10 to 140 mm, depending on optic	Based on the sampling optic selected
Hazardous area certifications	n/a	ATEX, CSA, and IECEx

# Technical specifications: probes for gas phase

## Technical specifications

	Rxn-30 probe
Laser wavelength	532nm
Maximum laser power into probe head	<499 mW
Sample interface	<b>Operating temperature, probehead:</b> -20 °C to 150 °C <b>Temperature ramp:</b> <6 °C/min <b>Max pressure:</b> 68.9 Barg (at sample)
Wetted materials	316/316L stainless steel, PTFE, sapphire, fused silica glass
Fiber optic cable	Cable sold separately
Gas stream filtration	20 µm or better Integrated 20 µm particulate filter standard
Hazardous area certifications	ATEX, CSA, and IECEx

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