



Robust probes for demanding applications.

The RFP-500 Series has been developed specifically to meet the need for Raman probes capable of performing reliably under the harsh conditions common to most process environments. The probes in this series combine robust optical designs with Hastelloy C-276 external construction and Axiom's proprietary welded metal window sealing technique*.

The extreme robustness of RFP-500 Series probes is accomplished by eliminating all fibers and other sensitive optics from the immersed portion of the probe and by employing a sapphire to Hastelloy window sealing technique that is virtually immune to thermal shock and to attack by most chemical systems. This technique employs a metal C-ring compressed at high pressure and welded in place. Since the required compliance is provided by the properly loaded C-ring, the seal can withstand virtually unlimited thermal cycling with no change in performance. This is in marked contrast to elastomer seals, which tend to flow and set at high temperatures, and to sapphire to metal brazes, which typically experience stress factors.

Probes for Cleared Liquid and Gas Streams: Model RFP-540 has been configured to maximize the illuminated area and depth of field without sacrificing sensitivity. These features provide a number of benefits, including, insensitivity to small scale sample inhomogeneity, reduced sample heating, and enhanced performance stability.

Probes for Highly Scattering Sample Streams: Model RFP-550 employs a unique dual-element objective lens design which provides a very high collection efficiency for highly scattering samples such as powders, slurries, or emulsions. In addition, the position of its optical focus can be set by means of internal spacers at any point from near contact to approximately 1 mm from its window. This allows its performance to be optimized for scattering diffusion depth of a particular sample stream.

Laboratory Raman Probes

In addition to the RFP-500 Series, Axiom Analytical manufactures the RFP-400 Series of laboratory probes (See data sheet PS-RFP40-02). These probes use the same basic optical design as the RFP-500 Series but in a smaller, less expensive package, making them ideal for use in a controlled laboratory environment. In addition, RFP-400 Series probes are provided with interchangeable objective lens assemblies and immersion tips. These features provide the flexibility to meet diverse requirements with a single basic optical head.

Options and Accessories

Interchangeable Filter Modules: RFP-500 probes can be switched to operate with a selection of laser

RFP-500 SERIES PROCESS RAMAN PROBES



Features:

- Withstands most aggressive chemistries
- Compatible with process temperatures to 400°C and pressures to 200 bar
- Withstands repeated thermal shock
- Standard Hastelloy C-276 construction
- Interchangeable filters for application flexibility
- Large depth of field and illumination area (RFP-540)
- Large numeric aperture and adjustable focus (RFP-550)
- Very high collection efficiency

*U.S. Patent Pending

excitation frequencies by interchanging RFF-W Series Filter Modules. Here, "W" specifies the excitation frequency in nanometers.

Process Probe Retraction Mechanism: PRM Series retraction mechanisms provide a reliable means for retracting a probe from a process line or vessel for cleaning or background measurement. Both manual and pneumatic mechanisms are available.

Option RFL, Custom Probe Lengths: RFP Series probes can be provided in a wide range of extended lengths with minimal loss in a signal level. Inquire with Axiom for price and delivery.

Option RFB, Barrier Window: Provides an O-ring sealed transparent barrier between the immersed portion of an RFP-500 probe and the fiber connectors. This option allows the probe to be isolated from the fiber-optic conduit and vented to a vapor detector.

Option RFSC, Secondary Containment: Provides a metal C-ring sealed transparent barrier between the immersible portion of the probe and the main optical housing as well as provision for an isolated flow path for purge or pressurization gas within the probe.

Vessel Attachment: RFP Probes can be provided with a variety of means for attachment to a reaction vessel, including welded-on flanges, pipe fittings, or port connectors. Inquire with Axiom for price and availability.

Fiber-Optic Cables:

RFP-500 Series probes can be connected to a laser source and to a Raman spectrometer by means of a variety of different fiber-optic cables. The optimum cable numeric aperture for both the excitation and collection cables is 0.25. For optimum performance, the core diameter of the collection fiber should be at least three times that of the excitation fiber (e.g. 100 μm collection). When the probes are

RFP-500 Series General Specifications

Spectral Range (Stokes Raman Shift):	200-4000 cm ⁻¹
Standard Excitation Wavelengths:	532, 632, 785 nm (others available)
Immersible Length:	30 cm
Immersion Shaft Diameter:	19 mm
Maximum Sample Temperature:	250°C standard (400°C optional)
Maximum Pressure:	200 bar
Wetted Metal:	Hastelloy C-276
Window Material:	Sapphire
Window Seal:	Permanent welded seal using gold coated Hastelloy C-ring, PTFE coating optional
Fiber Connectors:	SMA-905 standard, FC optional

INDIVIDUAL MODELS	RFP-540	RFP-550
Objective Lens Design:	Conventional F:2	Dual-lens objective using truncated ball lens tip
Optical Focus Offset:	8 mm	0.1 to 1 mm, internally set

used with a dispersive spectrometer, it is often advantageous to use a bundle to make the transition from the circular pattern characteristic of the probe output to a slit pattern at the spectrometer input slit. Two such configurations are listed below.

FRB-007-2N FIBER-OPTIC BUNDLE: Consists of 7, 2 meter long, 100 μm core diameter, low OH fiber arranged in a circular pattern at the probe end and a linear pattern at the spectrometer end. The first end is provided with an SMA connector, the second with a custom ferrule to accommodate the linear pattern. The cable is supplied with a mating female fitting which can be installed on most spectrometers in place of the standard SMA or FC connector.

FRB-019-2N FIBER-OPTIC BUNDLE: Consists of 19, 2 meter long, 100 μm core diameter, low OH fibers arranged in a circular pattern at the probe end and a linear pattern at the spectrometer end. The first end is

provided with an SMA connector, the second with a custom ferrule to accommodate the linear pattern. The cable is supplied with a mating female fitting which can be installed on most spectrometers in place of the standard SMA or FC connector.