



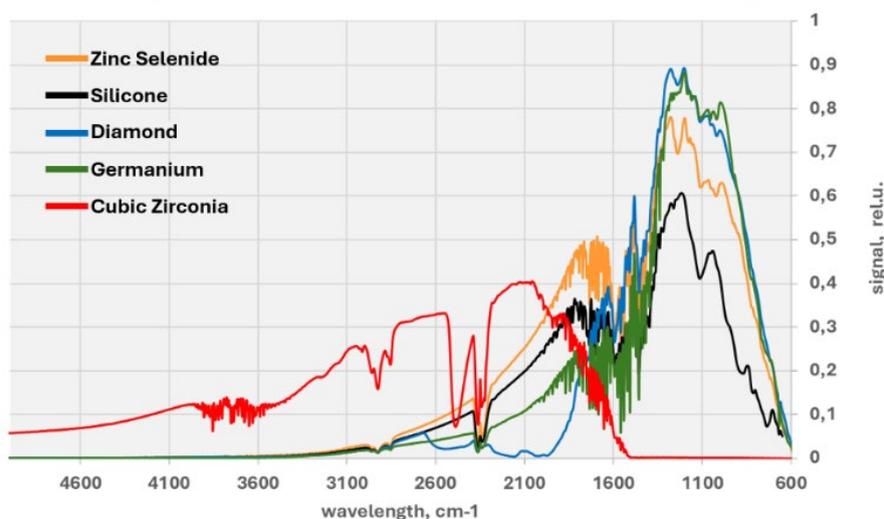
How to choose an ATR fiber probe for your application?

Fiber optic ATR probes are manufactured for various spectral ranges in the UV-Vis-NIR and mid-IR. These probes must withstand demanding process conditions such as elevated temperature and pressure within reactors. The probe shaft, seals, and ATR crystal each have different chemical resistance properties, so their materials must be selected based on the chemical characteristics of the sample.

How to choose a proper ATR probe?

1. Select the working spectral range for the probe based on the chosen ATR crystal. Typical single beam spectra are shown in the figure.
2. Verify chemical compatibility between ATR crystal and your sample. For additional details on crystals types and their properties, refer to the technical note "ATR Crystal Choice for Fiber-based Process Spectroscopy".
3. Consider the probe design - laboratory or industrial. Each design has different limitations regarding operating temperature range and maximum pressure (see Appendix below)

Single beam spectra of standard ATR probes 1.5m long



ATR probes for Industrial applications

Standard ATR fiber probes are suitable for measurements in reactors or pipelines operating under high pressure or vacuum. The probe shaft is made of Hastelloy C22, which provides excellent resistance to aggressive chemicals. Standard sealing materials include PEEK, PTFE or gold. Typical probe-shaft diameters are 6.3 mm and 12 mm.

Diamond ATR Touch Probe is a modification of a standard design and it is suitable for contact measurement of solids, pastes and highly viscous liquids. Its construction allows easy cleaning. The probe-shaft diameter is 6.3 mm and the sealing material is gold.

Sterilizable ATR probes are designed with a detachable structure: the fiber section and the probe shaft can be separated so that the shaft can be placed in a sterilizer or left inside a reactor. Standard probe-shaft diameters are 6.3 mm and 12 mm.

High-temperature ATR probes are equipped with special internal cooling channels for air-cooling and are designed for operation in high-temperature reactors. A thermocouple integrated into the probe tip allows monitoring the temperature of the sensitive optical fibers to prevent overheating. Standard probe-shaft diameters are 6.3 mm and 12 mm.

ATR probes for Lab applications

For laboratory applications without harsh environmental conditions, a cost-effective Loop Probe or Lab ATR probe is the best choice.

Loop probe features a 10.6 mm diameter shaft made of PEEK (polyetheretherketone). It is equipped with a replaceable tip that can be easily changed by the user. Single, double, or triple loop tips are available to achieve the desired sensitivity. The fiber loops are sealed using epoxy while the internal part of the shaft is sealed with PTFE (Polytetrafluoroethylene). Due to its construction, the loop probe is not suitable for high temperatures, high pressures or applications that involve mechanical impact.

Lab ATR probe is more robust than a loop probe and can be used in a broader range of laboratory applications. It is ideal for measurements in small laboratory reactors and open vessels. The probe has a 6.3 mm diameter PEEK shaft, and the sealing material is PTFE. Optional **crown protection** for the probe tip is available for enhanced durability.



Appendix

Operating temperature ranges and maximum pressure values

Table 1.
Standard and Flat Tip Diamond ATR probes

Shaft's material - Hastelloy C22, sealing -- PEEK (PTFE for Germanium ATR crystal). Gold sealing for Flat Tip Diamond ATR probes and as an option for Standard ATR Probe), shaft's length = 300 mm, total length = 1.5 m

ATR Crystal in a probe Probe's shaft diameter	Diamond	Flat Tip Diamond	Zinc Selenide	Silicon	Germanium	Cubic Zirconia		Sapphire
						for 1550-9000cm ⁻¹ range option	for 400-2200nm range option	
Ø 6.3 mm	200 bar, -150 ÷ +140 °C	100 bar, -150 ÷ +140 °C		100 bar, -150 - +140 °C	10 bar, -150 ÷ +90 °C	100 bar, -150 ÷ +90 °C	100 bar, -150 ÷ +200 °C	100 bar, -150 ÷ +200 °C
Ø 12 mm	200 bar, -150 ÷ +140 °C		10 bar, -150 ÷ +140 °C	100 bar, -150 ÷ +140 °C	10 bar, -150 ÷ +90 °C	100 bar, -150 ÷ +90 °C	100 bar, -150 ÷ +200 °C	100 bar, -150 ÷ +200 °C

Table 2.
High Temperature ATR probes for harsh environment

Shaft's material - Hastelloy C22, sealing – PEEK (Gold sealing as an option), shaft's length = 300 mm, total length = 2 m

ATR Crystal in a probe Probe's shaft diameter	Diamond	Silicon	Cubic Zirconia for 1550-9000cm ⁻¹ range option
Ø 6.3 mm	200 bar, -150 ÷ +230 °C	100 bar, -150 ÷ +230 °C	100 bar, -150 ÷ +180 °C
Ø 12 mm	200 bar, -150 ÷ +250 °C	100 bar, -150 ÷ +250 °C	100 bar, -150 ÷ +200 °C

Table 3.
Sterilizable ATR probes (Shaft -in -Shaft design)

Shaft's material - Hastelloy C22, sealing – PEEK (Gold sealing as an option), shaft's length = 300 mm, total length = 2 m

ATR Crystal in a probe Probe's shaft diameter	Diamond	Silicon	Germanium	Cubic Zirconia for 1550-9000cm ⁻¹ range option
Ø 6.3 mm	200 bar, -150 ÷ +140 °C	100 bar, -150 ÷ +140 °C	10 bar, -150 ÷ +90 °C	100 bar, -150 ÷ +90 °C
Ø 12 mm	200 bar, -150 ÷ +250 °C	100 bar, -150 ÷ +250 °C	10 bar, -150 ÷ +90 °C	100 bar, -150 ÷ +90 °C

Table 4.
Lab ATR and Detachable Loop probes

Shaft's material - PEEK, sealing - PTFE for Lab probe and Epoxy for Loop probe , shaft's length = 150 mm/ 300 mm for Lab probe and 80mm for Loop probe, total length for Lab probes = 1.5 m and 1.1 m for Loop probes

ATR Crystal in a probe Probe's shaft diameter	Diamond	Zinc Selenide	Silicon	Germanium	Cubic Zirconia		Sapphire	Detachable Loops
					for 1550-9000cm ⁻¹ range option	for 400-2200nm range option		
Ø 6.3 mm	10 bar, -100 ÷ +140 °C	10 bar, -100 ÷ +140 °C	10 bar, -100 ÷ +140 °C	10 bar, -100 ÷ +80 °C	10 bar, -100 ÷ +90 °C	100 bar, -150 ÷ +200 °C	100 bar, -150 ÷ +200 °C	
Ø 10,6 mm								3 bar, 0 ÷ +80 °C

