

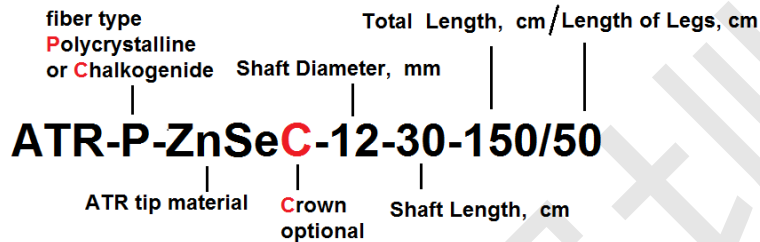
FlexiSpec® product line presents Fiber Optic Probes for the wide spectral range:

- the latest generation of Attenuated Total Reflection **Mid-IR ATR-Probes** work with any type of FT-IR and other IR-spectrometers, photometers and IR-LED or QCL spectral sensors.

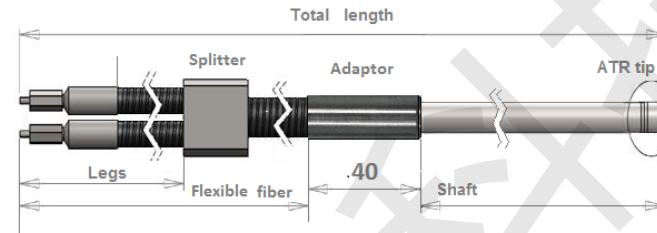
ATR immersion fiber optic probes with patented design are suitable for reaction monitoring in lab, pilot plant and for full automated process control.

- High sensitivity **Transflection Probes** with collimated beam design are used with any fiber optic spectrometer or photometer for UV-Vis or Vis-NIR range - see P.14.
- **Raman Probes** are available in two options – multi-wavelength excitation (630-785 nm) and single-wavelength excitation (532 and 785 nm) - see P.13.

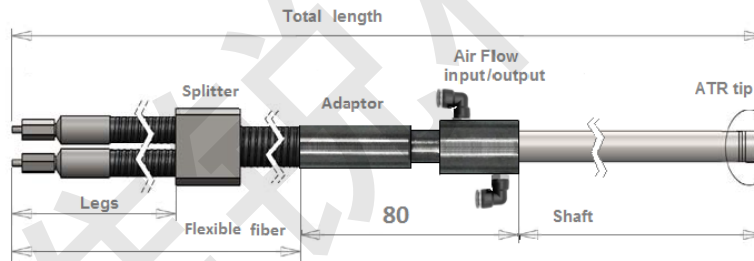
Building blocks for ATR Probe Code



Probe Dimensions Diagrams

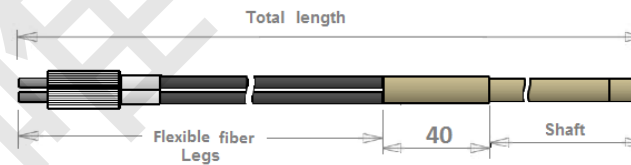


Standard ATR Probe

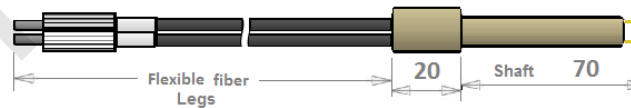


Sterilizable ATR Probe

High Temperature ATR Probe



ATR Probe Lab



Detachable Loop ATR Probe

Mid-IR ATR Probes	PIR fiber 900/1000, 30cm shaft Hastelloy C22, 150cm total, LTP conduit with SMA 905 connectors		PIR fiber 900/1000, 15cm shaft PEEK, 150cm total, PEEK protective tubing with SMA 905 connectors		PIR fiber 900/1000, 30cm shaft Hastelloy C22, 200cm total, LTP conduit with SMA 905 connectors, air flow cooling		PIR fiber 900/1000, 30cm shaft, 150cm total, LTP conduit with SMA 905 connectors, detachable fiber	
Design	Standard		PEEK Lab		High Temperature		Sterilizable	
Shaft Ø	6,3mm dia		12mm dia		6,3mm dia		12mm dia	
ATR crystal	6,3mm dia		12mm dia		6,3mm dia		12mm dia	
Diamond, 600-1900cm ⁻¹	200Bar, -150°C +140°C	200Bar, -150°C +140°C			200Bar, -150°C +250°C		200Bar, -150°C +140°C	200Bar, -150°C +140°C
Si 600-3100cm ⁻¹	100Bar, -150°C +140°C	100Bar, -150°C +140°C	7Bar, -100°C +140°C		100Bar, -150°C +250°C		100Bar, -150°C +140°C	100Bar, -150°C +140°C
Ge, 600-3100cm ⁻¹	10Bar, -150°C +80°C	10Bar, -150°C +80°C	7Bar, -100°C +80°C				10Bar, -150°C +80°C	10Bar, -150°C +80°C
ZnSe, 600-3100cm ⁻¹		10Bar, -150°C +140°C	7Bar, -100°C +140°C		10Bar, -150°C +250°C			
ZrO2 with CIR 500/550 fiber, 1550-9000cm ⁻¹	100Bar, -150°C +90°C	100Bar, -150°C +90°C	7Bar, -100°C +90°C		100Bar, -150°C +200°C		100Bar, -150°C +90°C	100Bar, -150°C +90°C
Detachable Loop	PIR fiber 900/1000, 10cm shaft PEEK, 110cm total, PEEK tubing with SMA 905 connectors, 600-2500cm ⁻¹ , -50°C +90°C Disposable ATR-Loop Tip							
	CIR fiber 500/550, 10cm shaft PEEK, 110cm total, PEEK tubing with SMA 905 connectors, 1550-6500cm ⁻¹ , -50°C +90°C Disposable ATR-Loop Tip							

Chemical resistance of ATR crystals:

Diamond – any medium, limitations could be because of sealing material PEEK only.

Silizium - pH = -1÷10

Germanium – pH= 1÷14 (without oxidizing agents in alkalies)

ZnSe - pH = 5÷9, cannot withstand some complexing agents

ZrO2 - any medium, limitations could be because of sealing material PEEK only.

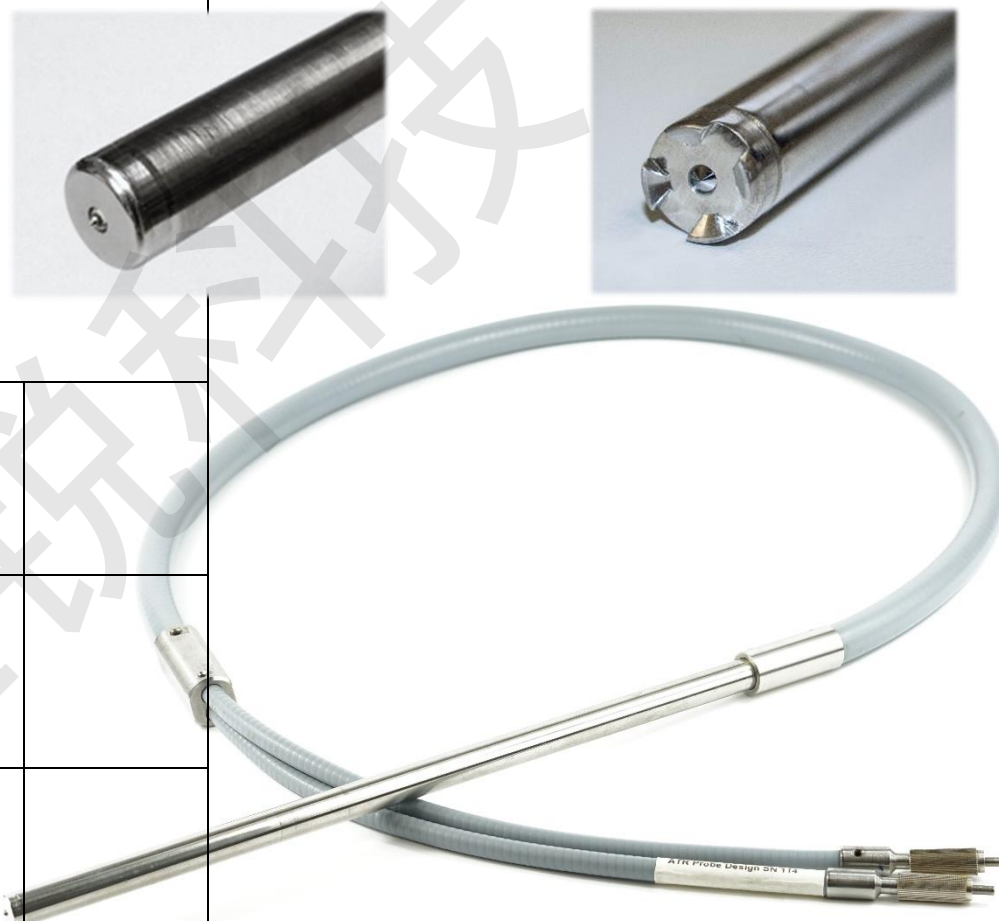
Check the chemical compatibility of ATR crystals with medium if you have some doubts.

Pos.	Description	Article-No.
1.	<p>Standard ATR-Fiber Probes with 6.3mm OD Shaft</p> <p>Probe Type: ATR-probe Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing Material: <i>see separate probe specification</i> Shaft Material: Hastelloy C22 Shaft Size: OD = 6.3mm, length = 300±5mm Flexible Fiber: 0.7m length + 2 legs of 0.5m each Total Length: shaft + fiber = 1.5±0.05m Termination: x 2 Long SMA Protection: Liquid Tight Protection (LTP)</p>	
1.1.	<p>ATR-P-D-6-30-150/50*</p> <p>Spectral Range: 5.2-17µm (600-1900cm⁻¹) Fiber Type: PIR 900/1000 Tip Material: Diamond IIIA, 2.5mm Sealing Material: PEEK <i>Optional: Tip Protection: crown sized – ATR-P-DC-6-30-150/50</i></p>	<p>AP10232</p> <p>AP10705</p>
1.2.	<p>ATR-P-Si-6-30-150/50*</p> <p>Spectral Range: 3.2-17µm (600-3100cm⁻¹) Fiber Type: PIR 900/1000 Tip Material: Silicon Sealing Material: PEEK <i>Optional: Tip Protection: crown sized – ATR-P-SiC-6-30-150/50</i></p>	<p>AP10551</p> <p>AP11100</p>
1.3.	<p>ATR-P-Ge-6-30-150/50*</p> <p>Spectral Range: 3.2-17µm (600-3100cm⁻¹) Fiber Type: PIR 900/1000 Tip Material: Germanium Sealing Material: PTFE <i>Optional: Tip Protection: crown sized – ATR-P-GeC-6-30-150/50</i></p>	<p>AP10929</p> <p>AP11101</p>
1.4.	<p>ATR-C-ZrO2-6-30-150/50*</p> <p>Spectral Range: 1.1-6.5µm (1550-9000cm⁻¹) Fiber Type: CIR 500/550 Tip Material: Cubic Zirconia Sealing Material: PEEK <i>Optional: Tip Protection: crown sized – ATR-C-ZrO2C-6-30-150/50</i></p>	<p>AP10423</p> <p>AP11102</p>



*Optional modifications and dimensions – see Page 10

Pos.	Description	Article-No.
2.	Standard ATR-Fiber Probes with 12mm OD Shaft Probe Type: ATR-probe Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing Material: <i>see separate probe specification</i> Shaft Material: Hastelloy C22 Shaft Size: OD = 12mm, length = 300±5mm Flexible Fiber: 0.7m length + 2 legs of 0.5m each Total Length: shaft + fiber = 1.5±0.05m Termination: x 2 Long SMA Protection: Liquid Tight Protection (LTP)	
2.1.	ATR-P-D-12-30-150/50* Spectral Range: 5.2-17μm (600-1900cm ⁻¹) Fiber Type: PIR 900/1000 Tip Material: Diamond IIIA, 2.5mm Sealing Material: PEEK <i>Optional: Tip Protection: crown sized – ATR-P-DC-12-30-150/50</i>	AP10241 AP10323
2.2.	ATR-P-Si-12-30-150/50* Spectral Range: 3.2-17μm (600-3100cm ⁻¹) Fiber Type: PIR 900/1000 Tip Material: Silicon Sealing Material: PEEK <i>Optional: Tip Protection: crown sized – ATR-P-SiC-12-30-150/50</i>	AP10920 AP10916
2.3.	ATR-P-Ge-12-30-150/50* Spectral Range: 3.2-17μm (600-3100cm ⁻¹) Fiber Type: PIR 900/1000 Tip Material: Germanium Sealing Material: PTFE <i>Optional: Tip Protection: crown sized – ATR-P-GeC-12-30-150/50</i>	AP10930 AP10931
2.4.	Alternative: ATR-P-ZnSe-12-30-150/50* Tip Material: Zinc Selenide <i>Optional: Tip Protection: crown sized – ATR-P-ZnSeC-12-30-150/50</i>	AP10399 AP10425
2.5.	ATR-C-ZrO2-12-30-150/50* Spectral Range: 1.1-6.5μm (1550-9000cm ⁻¹) Fiber Type: CIR 500/550 Tip Material: Cubic Zirconia Sealing Material: PEEK <i>Optional: Tip Protection: crown sized – ATR-C-ZrO2C-12-30-150/50</i>	AP10400 AP10424



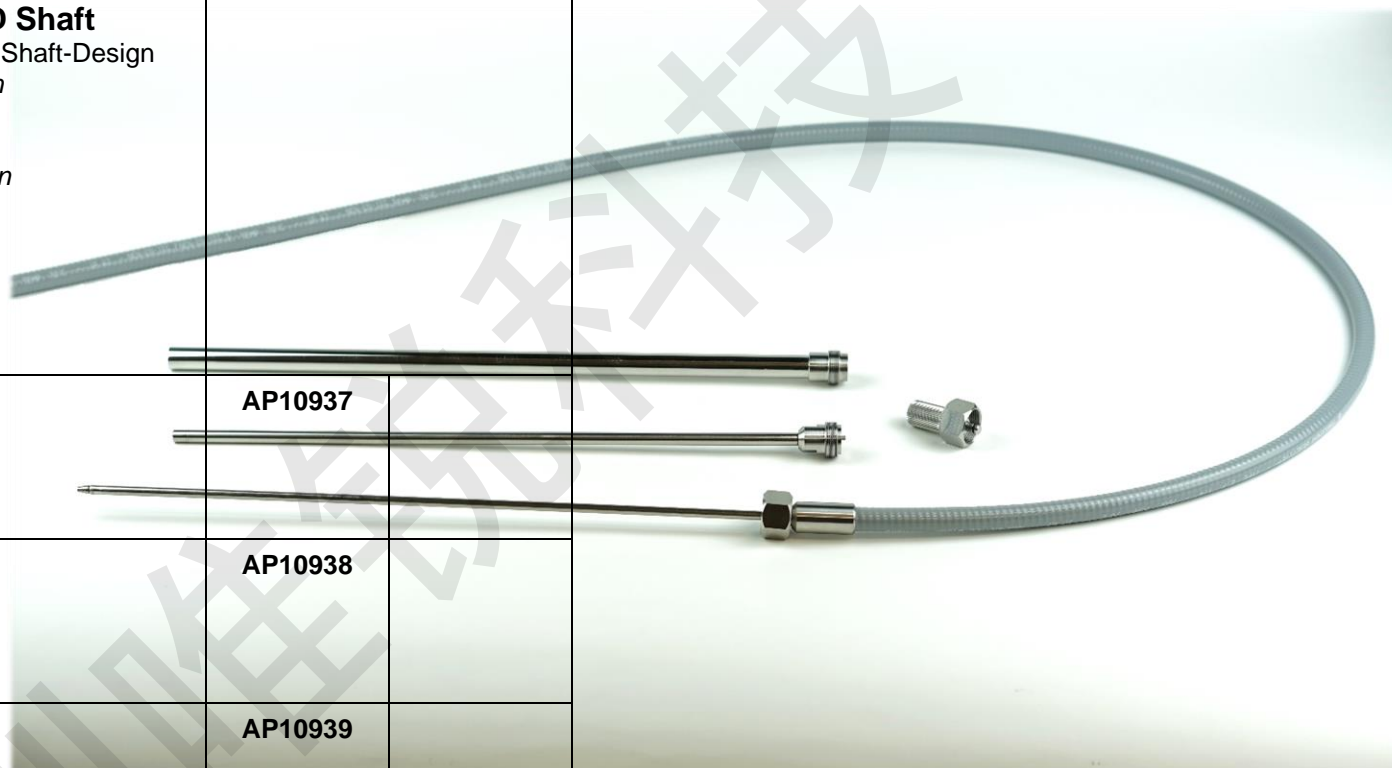
*Optional modifications and dimensions – see Page 10

Pos.	Description	Article-No.
3.	<p>HighTemperature ATR-Probe Probe Type: ATR-probe with gas cooling design for HighTemperature applications < 250°C Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing Material: PEEK Shaft Material: Hastelloy C22 Shaft Size: OD = 12mm, length = 300±5mm Flexible Fiber: 1.2m length + 2 legs of 0.5m each Total Length: shaft + fiber = 2±0.05m Termination: x 2 Long SMA Protection: Liquid Tight Protection (LTP) with thermo-couple fixed at distal end inside shaft for fiber temperature control and with in-/out gas/air flow Digital Voltmeter included</p>	
3.1.	<p>ATR-P-D-12-30-200/50-HT* Spectral Range: 5.2-17µm (600-1900cm-1) Fiber Type: PIR 900/1000 Tip Material: Diamond 200Bar; -150°C/+250°C Optional: Tip Protection: crown sized – ATR-P-DC-12-30-200/50-HT</p>	<p>AP10344 AP10928</p>
3.2.	<p>ATR-P-Si-12-30-200/50-HT* Spectral Range: 3.2-17µm (600-3100cm-1) Fiber Type: PIR 900/1000 Tip Material: Silicon 100Bar; -150°C/+250°C Optional: Tip Protection: crown sized – ATR-P-SiC-12-30-200/50-HT</p>	<p>AP10932 AP10512</p>
3.3.	<p>ATR-C-ZrO2-12-30-200/50-HT* Spectral Range: 1.1-6.5µm (1550-9000cm-1) Fiber Type: CIR 500/550 Tip Material: Cubic Zirconia 100Bar; -150°C/+200°C Optional: Tip Protection: crown sized – ATR-C-ZrO2C-12-30-200/50-HT</p>	<p>AP10935 AP10936</p>

* Optional modifications and dimensions – see Page 10

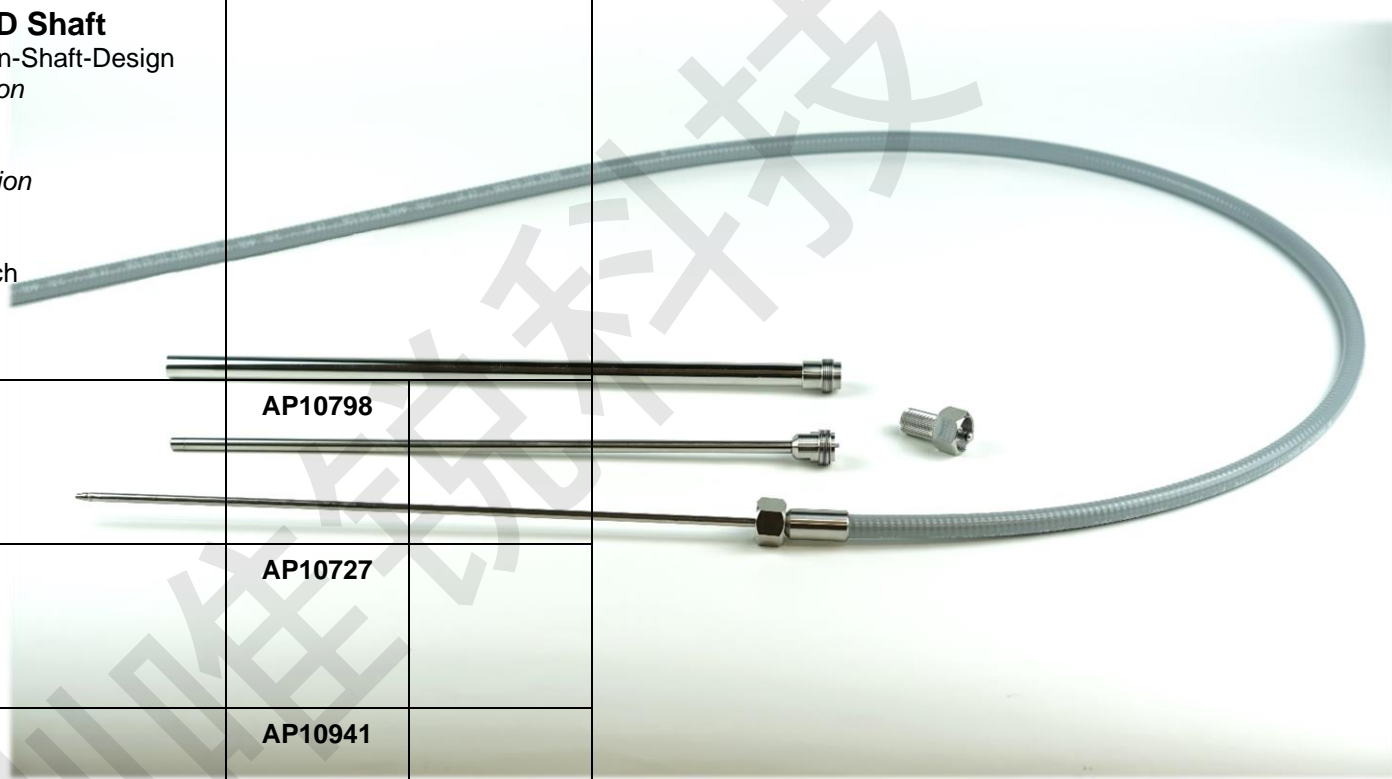


Pos.	Description	Article-No.
4.	<p>Sterilizable ATR-Probe with 6.3mm OD Shaft Probe Type: sterilizable ATR-probe with Shaft-in-Shaft-Design Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing Material: <i>see separate probe specification</i> Shaft Material: Hastelloy C22 Shaft Size: OD = 6.3mm, length = 300±5mm Flexible Fiber: 0.7m length + 2 legs of 0.5m each Total Length: shaft + fiber = 1.5±0.05m Termination: x 2 Long SMA Protection: Liquid Tight Protection (LTP)</p>	
4.1.	<p>ATR-P-D-6-30-150/50-SiS* Spectral Range: 5.2-17µm (600-1900cm-1) Fiber Type: PIR 900/1000 Tip Material: Diamond Sealing Material: PEEK</p>	AP10937
4.2.	<p>ATR-P-Si-6-30-150/50-SiS* Spectral Range: 3.2-17µm (600-3100cm-1) Fiber Type: PIR 900/1000 Tip Material: Silicon Sealing Material: PEEK</p>	AP10938
4.3.	<p>ATR-P-Ge-6-30-150/50-SiS* Spectral Range: 3.2-17µm (600-3100cm-1) Fiber Type: PIR 900/1000 Tip Material: Germanium Sealing Material: PTFE</p>	AP10939
4.4.	<p>ATR-C-ZrO2-6-30-150/50-SiS* Spectral Range: 1.1-6.5µm (1550-9000cm-1) Fiber Type: CIR 500/550 Tip Material: Cubic Zirconia Sealing Material: PEEK</p>	AP10940




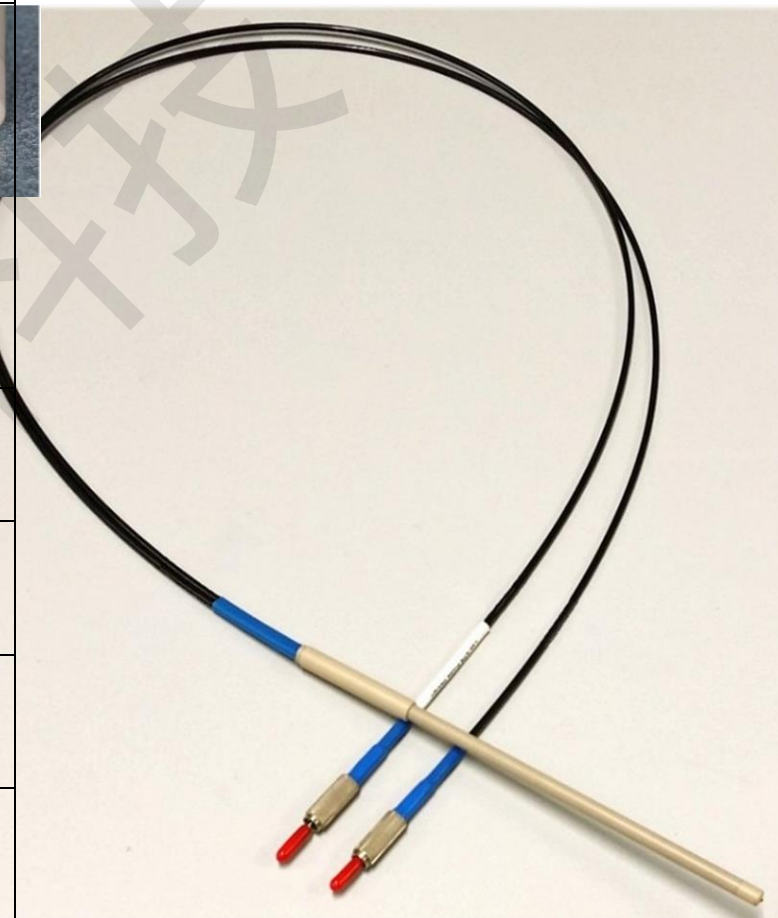
* Optional modifications and dimensions – see Page 10

Pos.	Description	Article-No.
5.	<p>Sterilizable ATR-Probe with 12mm OD Shaft Probe Type: sterilizable ATR-probe with Shaft-in-Shaft-Design Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing Material: <i>see separate probe specification</i> Shaft Material: Hastelloy C22 Shaft Size: OD = 12mm, length = 300±5mm Flexible Fiber: 0.7m length + 2 legs of 0.5m each Total Length: shaft + fiber = 1.5±0.05m Termination: x 2 Long SMA Protection: Liquid Tight Protection (LTP)</p>	
5.1.	<p>ATR-P-D-12-30-150/50-SiS* Spectral Range: 5.2-17µm (600-1900cm-1) Fiber Type: PIR 900/1000 Tip Material: Diamond Sealing Material: PEEK</p>	AP10798
5.2.	<p>ATR-P-Si-12-30-150/50-SiS* Spectral Range: 3.2-17µm (600-3100cm-1) Fiber Type: PIR 900/1000 Tip Material: Silicon Sealing Material: PEEK</p>	AP10727
5.3.	<p>ATR-P-Ge-12-30-150/50-SiS* Spectral Range: 3.2-17µm (600-3100cm-1) Fiber Type: PIR 900/1000 Tip Material: Germanium Sealing Material: PTFE</p>	AP10941
5.4.	<p>ATR-C-ZrO2-12-30-150/50-SiS* Spectral Range: 1.1-6.5µm (1550-9000cm-1) Fiber Type: CIR 500/550 Tip Material: Cubic Zirconia Sealing Material: PEEK</p>	AP10942



* Optional modifications and dimensions – see Page 10

Pos.	Description	Article-No.	
6.	Standard Lab ATR-Probe Probe Type: ATR-probe for Laboratory Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing Material: FKM o-ring Shaft Material: PEEK Shaft Size: OD = 6.3mm, length = 150±5mm Flexible Fiber: 2 legs of 1.35m length each Total Length: shaft + fiber =1.50±0.05m Termination: x 2 Long SMA Protection: PEEK tubing		
6.1.	ATR-P-Si-6-15-150-Lab* Spectral Range: 3.2-16µm (600-3000cm ⁻¹) Fiber Type: PIR 900/1000 Tip Material: Silicon	AP10906	
6.2.	ATR-P-Ge-6-15-150-Lab* Spectral Range: 3.2-17µm (600-3100cm ⁻¹) Fiber Type: PIR 900/1000 Tip Material: Germanium	AP10917	
6.3.	ATR-P-ZnSe-6-15-150-Lab* Spectral Range: 3.2-17µm (600-3100cm ⁻¹) Fiber Type: PIR 900/1000 Tip Material: Zinc Selenide	AP10812	
6.4.	ATR-C-ZrO2-6-15-150-Lab* Spectral Range: 1.1-6.5µm (1550-9000cm ⁻¹) Fiber Type: CIR 500/550 Tip Material: Cubic Zirconia	AP10799	



* Optional modifications and dimensions – see Page 10

Pos.	Description	Article-No.
7.	Standard ATR-Detachable Loop Probe	
7.1.	ATR-DLP-P-10-7-110 (4-17μm)* Probe Type: ATR for Detachable-PIR-Loops Fiber Type: PIR 900/1000 Tip Material: Detachable PIR-fiber loop Shaft Material: PEEK Shaft Size: OD = 10mm, length = 70mm -0/+5mm (incl. Loop) Flexible Fiber: 2 legs of 1.0m length each Total Length: shaft + fiber = 1.1 \pm 0.05m Termination: x 2 Long Ti-SMA Protection: PEEK tubing Marking: Blue	AP10100
7.2.	ATR-DLP-C-10-7-110 (1.5-6.0μm)* Probe Type: ATR for Detachable-PIR-Loops Fiber Type: CIR 500/550 Tip Material: Detachable PIR-fiber loop Shaft Material: PEEK Shaft Size: OD = 10mm, length = 70mm -0/+5mm (incl. Loop) Flexible Fiber: 2 legs of 1.0m length each Total Length: shaft + fiber = 1.1 \pm 0.05m Termination: x 2 Long SMA Protection: PEEK tubing Marking: Red	AP10106
7.3.	Detachable Single PIR-Loops for DL-Probe sealed in PEEK-flange; Loop length: 5 \pm 0,5mm Package of 5 pcs. Package of 10 pcs.	AP10109 AP10031
7.4.	Detachable Dual PIR-Loops for DL-Probe sealed in PEEK-flange; Loop length: 7 \pm 0,5mm Package of 5 pcs. Package of 10 pcs.	AP10110 AP10111
7.5.	Detachable Triple PIR-Loops for DL-Probe sealed in PEEK-flange; Loop length: 7 \pm 0,5mm Package of 5 pcs. Package of 10 pcs.	AP10191 AP10238



* Optional modifications and dimensions – see Page 10

Optional Modifications for ATR Probes*:

Dimension limits*:

Hastelloy Shaft: 50mm – 500mm*

Legs: 200mm – 500mm*

Total: 1m – 5m* (DLP and Lab-ATR 1m – 3m)

Customizing*:

Connector: e.g. BQC*

Tubing: e.g. Kopex*

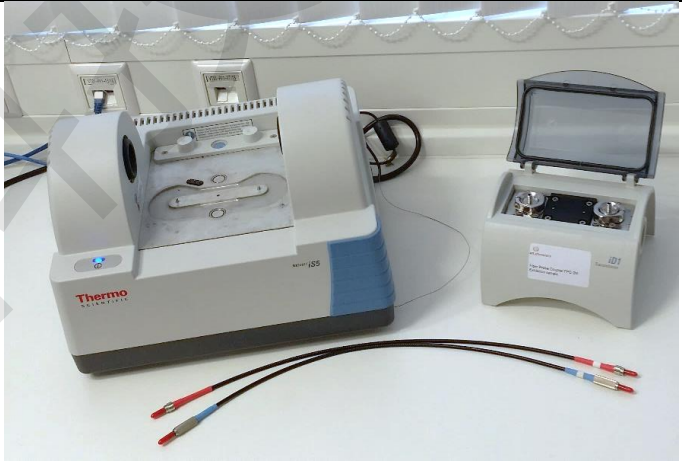

Compatibility to Fiber Optic System: e.g. flange; Ceramat*

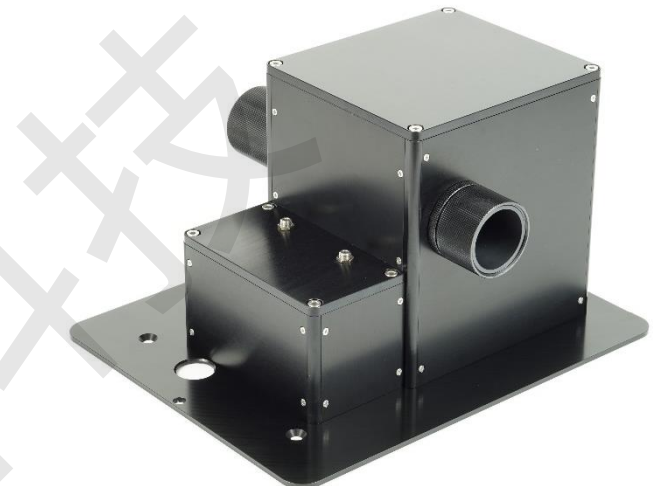
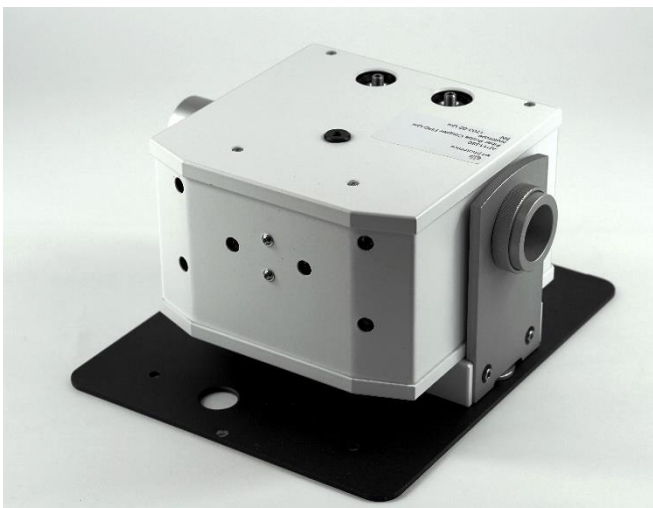
Others: ATEX conform design including certification

*other options upon request

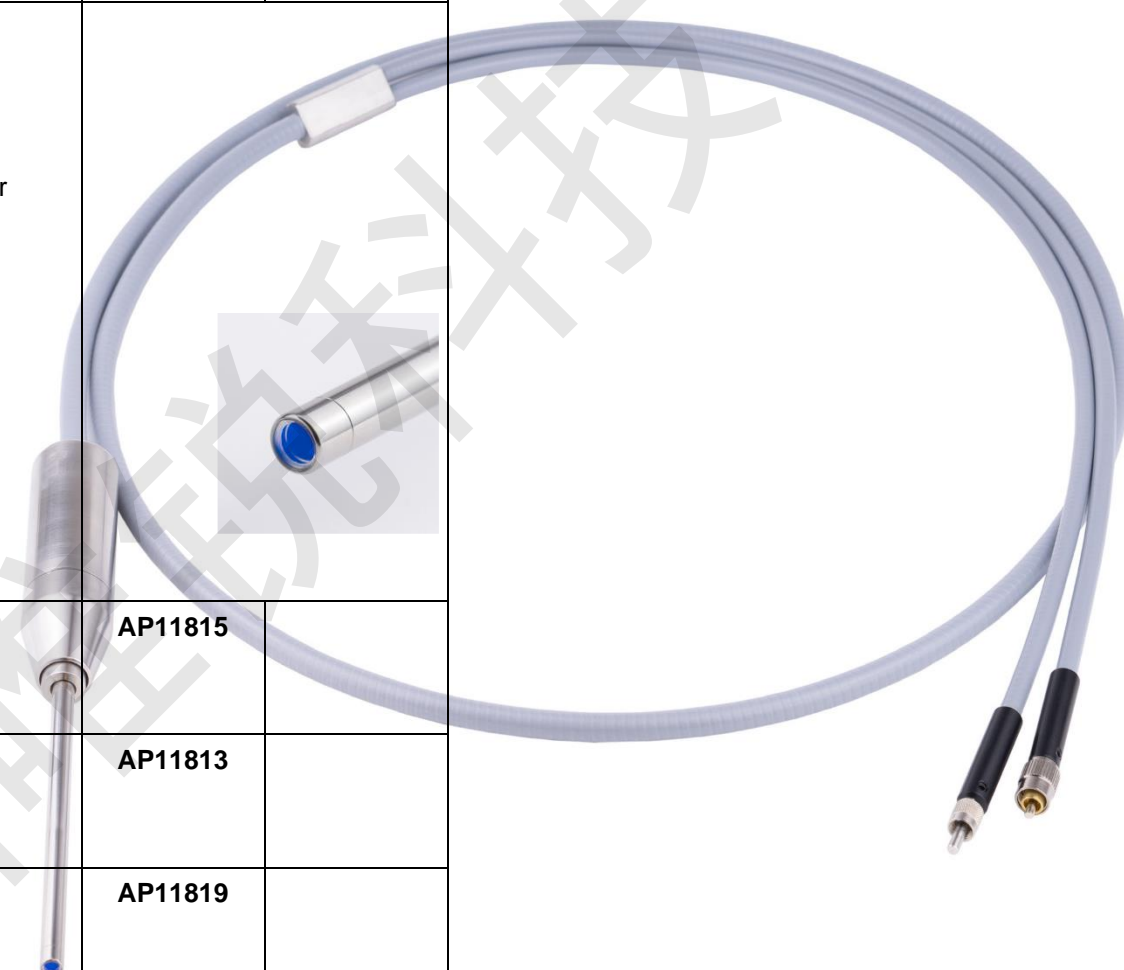
Customized probe example



Pos.	Description	Article-No.	
8.	Fiber Probe Couplers		
8.1.	Fiber Probe Coupler FPC-2M for iS5 Mirror & lens design suitable for iS5 FTIR spectrometer SMA-905 connectors unit can be purged	AP10285	
8.2.	Fiber Probe Coupler FPC-2M for iS5N Mirror design suitable for iS5N FTIR spectrometer SMA-905 connectors unit can be purged	AP11394	

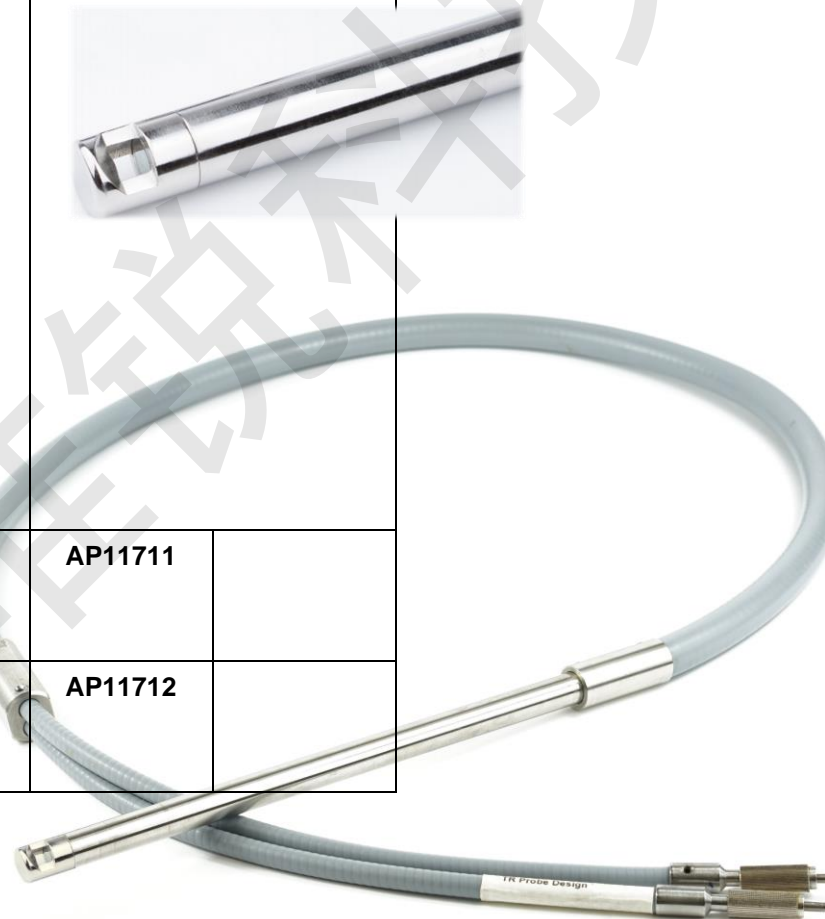
<p>8.3.</p>	<p>Fiber Probe Coupler FPC-6M</p> <p>All mirror design with beam height position 88mm compatible with Nicolet 5700, 6700, iS10, iS50, Avatar 360 SMA-905 connectors The unit can be purged</p>	<p>AP10307</p>	
<p>8.4.</p>	<p>Fiber Probe Universal Coupler</p> <p>All mirror design with flexible beam height position can be adapted into any FTIR spectrometer SMA-905 connectors The unit can be purged</p>	<p>AP11380</p>	

Pos.	Description	Article-No.	
9.	<p>Raman Scattering probe</p> <p>Probe Type: Raman probe Laser Wavelengths: 621-787nm Laser Spot: <i>see separate probe specification</i> Spectral Range Cut-Off: 800nm (240cm⁻¹ @ 785nm Laser) Filter Efficiency: OD>6 for Laser rejection; Transmission>95% for Raman shift Laser Transmission: >80% Fiber Type: Laser - NIR105/125 NA=0.22; Detector - NIR200/220 NA=0.22 Window Material: Sapphire AR coated (600-1050nm) Window Sealing Material: Epoxy glue Shaft Material: Stainless Steel 1.4301 Shaft Sealing Material: FPM Shaft Size: <i>see separate probe specification</i> Flexible Fiber: 1.2m length + 2 legs of 0.5m each Total Length: shaft + fiber = 2.00±0.05m Termination: Laser - FC/PC; Detector - SMA905 Protection: Liquid Tight Protection (LTP)</p>		
9.1.	<p>RSP-DoS-12-20-200/50-FS*</p> <p>Laser Spot: ~0.2mm at 2-3mm from the tip Shaft Size: OD = 12mm, length = 200±5mm</p>	AP11815	
9.2.	<p>RSP-DoS-12-20-200/50-CL*</p> <p>Laser Spot: collimated beam ~3mm OD Shaft Size: OD = 12mm, length = 200±5mm</p>	AP11813	
9.3.	<p>RSP-DoS-6-10-200/50-FS *</p> <p>Laser Spot: ~0.2mm at 2-3mm from the tip Shaft Size: OD = 6mm, length = 100±5mm</p>	AP11819	
9.4.	<p>RSP-DoS-6-10-200/50-CL*</p> <p>Laser Spot: collimated beam ~3mm OD Shaft Size: OD = 6mm, length = 100±5mm</p>	AP11818	



* Modifications (laser wavelength) and optional dimensions are available on request

Pos.	Description	Article-No.	
10.	<p>Transflection Probe</p> <p>Probe Type: Transflection Spectral range: 400-2200nm (lens AR coated in 1050-1700nm) Fiber type: 2xNIR600/660PI, NA=0.20±0.02 Optical path: <i>see separate probe specification</i> Probe shaft: stainless steel 1.4301 (AISI304), OD=12mm, L=200±5mm Total length: 2±0.05m; Leg length: 0.5±0.05m Optical materials: Sapphire, Fused Silica Termination: 2xSMA905 Protection: Liquid Tight Protection (LTP)</p>		
10.1.	<p>Transflection Probe 1+1-NIR600/660-200-2xSMA Ver.0.2 *</p> <p>Optical path: 4mm (gap 2mm)</p>	AP11711	
10.2.	<p>Transflection Probe 1+1-NIR600/660-200-2xSMA Ver.0.2 *</p> <p>Optical path: 10mm (gap 5mm)</p>	AP11712	



* Modifications (UV-Vis range) and optional dimensions are available on request

Pos.	Description	Article-No.
11.	Reference Cables	
11.1.	<p>Fiber Cable PIR400/500-50-TI/SMA-TI/SMA-MP37</p> <p>Fiber: Standard PIR AgCl:AgBr polycrystalline fiber, core 410±15µm clad 500+0/-15µm, NA=0.30±0.03 Length: 0,5±0,05m Termination 1: SMA 905 connector, titanium ferrule Termination 2: SMA 905 connector, titanium ferrule Protective Tubing: metal, PVC coated, OD 3.7mm marked with blue</p>	AP10680
11.2.	<p>Fiber Cable CIR250/300-50-SMA-SMA-MP37</p> <p>Fiber: CIR As-S glass fiber, core 250±10µm clad 300+10/-20µm double polymer coating 400±30µm, NA=0.30±0.03 Length: 0,5±0,05m Termination 1: SMA connector Termination 2: SMA connector Protective Tubing: metal, PVC coated, OD 3.7mm marked with red</p>	AP11124
11.3.	<p>Fiber Cable NIR200/220-50-SMA-SMA-MP37</p> <p>Fiber: NIR silica/silica, core 200µm clad 220µm, NA=0,22±0,02 Length: 0.5±0,05m Termination 1: SMA 905 connector Termination 2: SMA 905 connector Protective Tubing: metal, PVC coated, OD 3.7mm marked with yellow</p>	AP11140



* Cables of different fiber diameters and designs are available