

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.

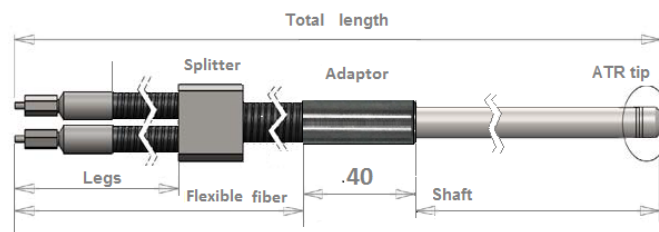
- **Raman Probes** are available in two options – multi-wavelength excitation (630-785 nm) and single-wavelength excitation (532 and 785 nm) - see P.13.

Building blocks for ATR Probe Code

fiber type Polycrystalline or Chalkogenide	Shaft Diameter, mm	Total Length, cm/Length of Legs, cm
ATR tip material	Crown optional	Shaft Length, cm

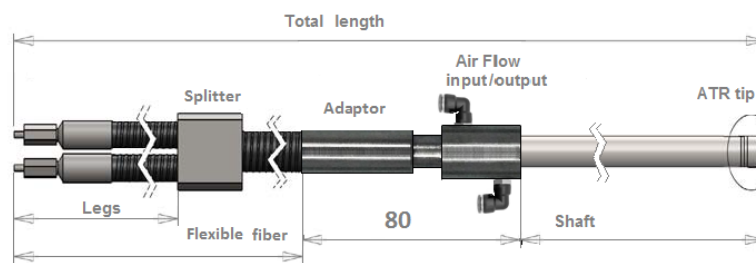
ATR-P-ZnSeC-12-30-150/50

Probe Dimensions Diagrams

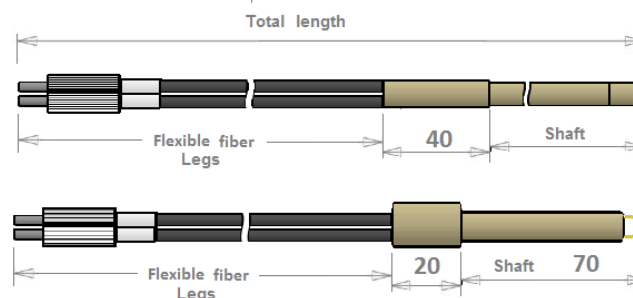


Standard ATR Probe

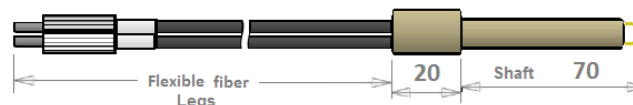
Sterilizable ATR Probe



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	Ø 6,3mm	Ø 12mm	Ø 6,3mm	Ø 12mm	Ø 6,3mm	Ø 12mm
ATR crystal						
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: stable in any liquid; check restriction for use of PEEK (sealing material) prior to operating.

Silizium: pH = -1÷10

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

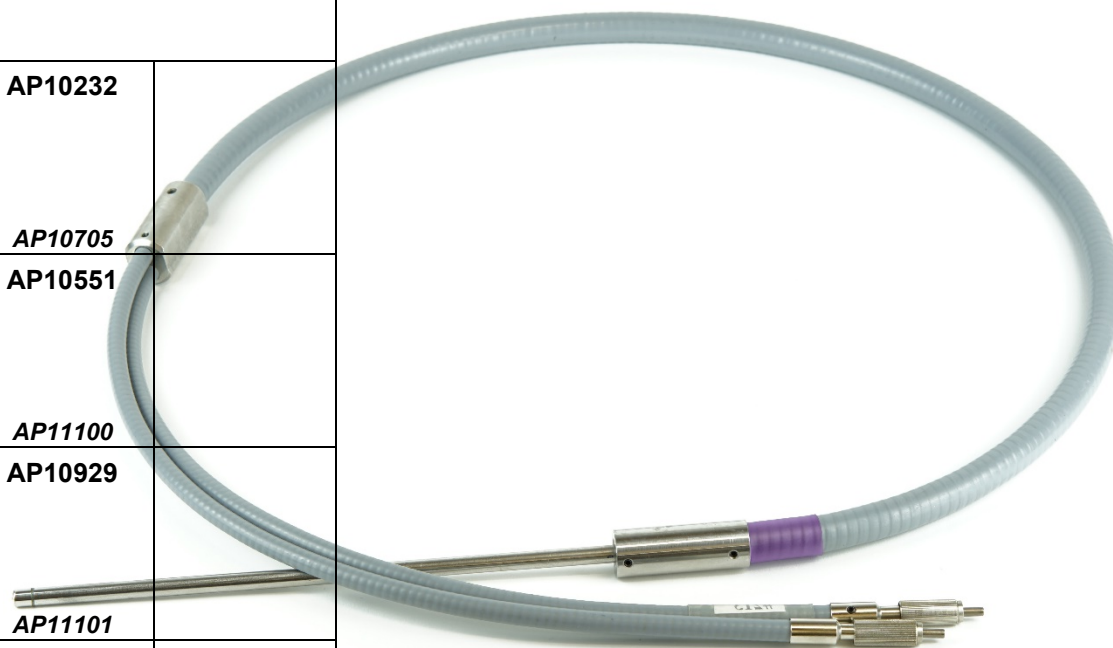
ZnSe: pH = 5÷9; note, that some complexing agents can damage the crystal.

ZrO2: any medium, prior to operating, check restriction for use of PEEK (sealing material).

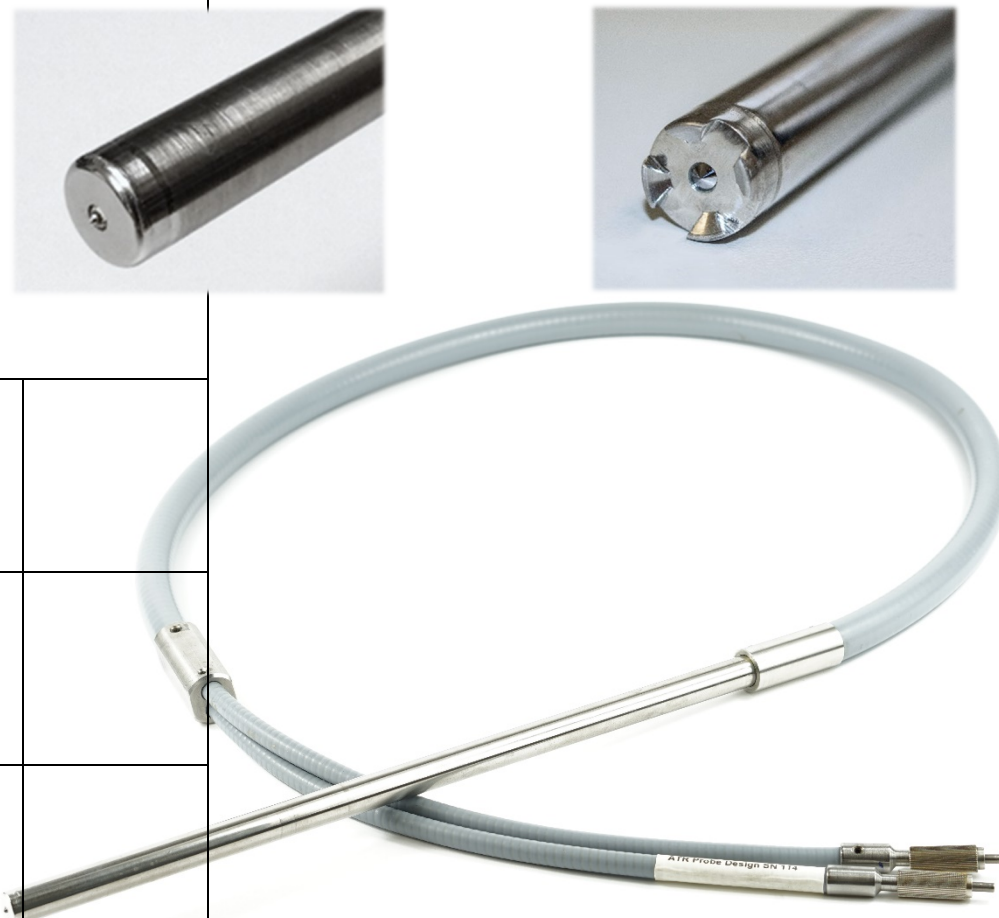
Check the chemical compatibility of ATR crystals with medium if you have any doubts. We are always ready to answer your questions.

Pos.	Description	Article-No.	
1.	Standard ATR-Fiber Probes with 6.3mm 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 = 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)		
1.1.	ATR-P-D-6-30-150/50* 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-6-30-150/50</i>	AP10232 AP10705	
1.2.	ATR-P-Si-6-30-150/50* 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-6-30-150/50</i>	AP10551 AP11100	
1.3.	ATR-P-Ge-6-30-150/50* 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-6-30-150/50</i>	AP10929 AP11101	
1.4.	ATR-C-ZrO2-6-30-150/50* 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-6-30-150/50</i>	AP10423 AP11102	

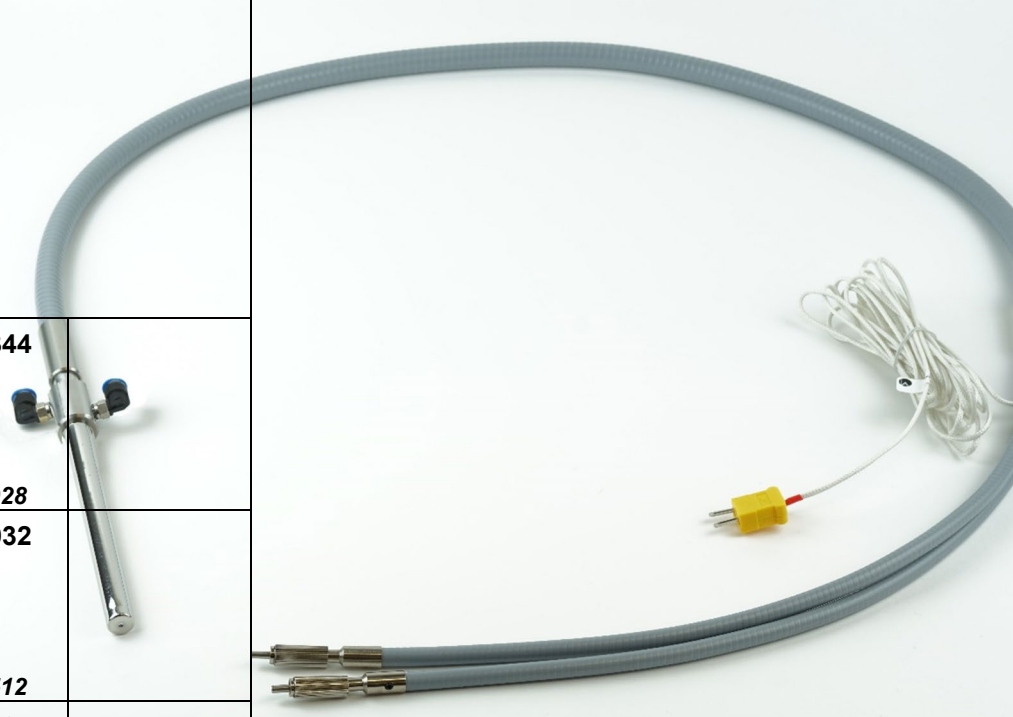
*Optional modifications and dimensions – see Page 10



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	



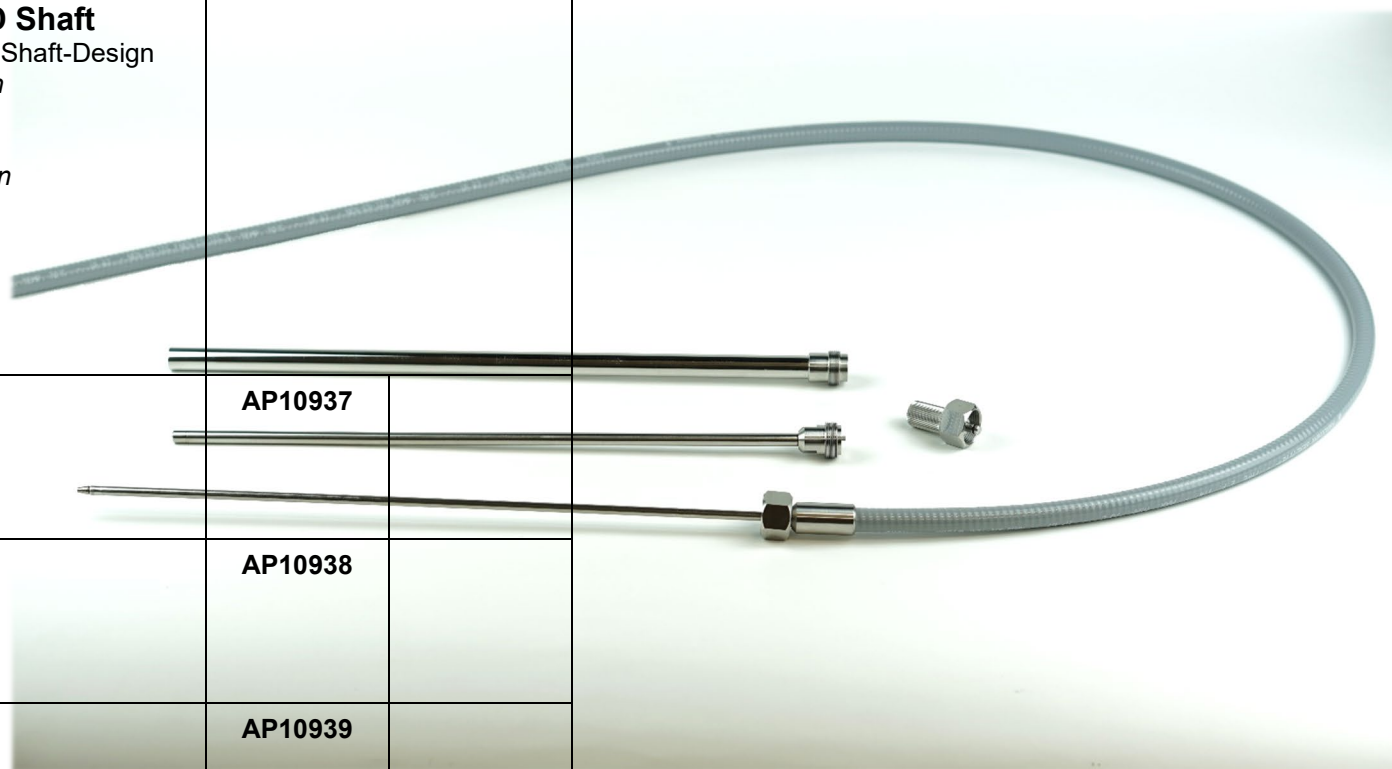
*Optional modifications and dimensions – see Page 10

AP10344	
AP10928	
AP10932	
AP10512	
AP10935	

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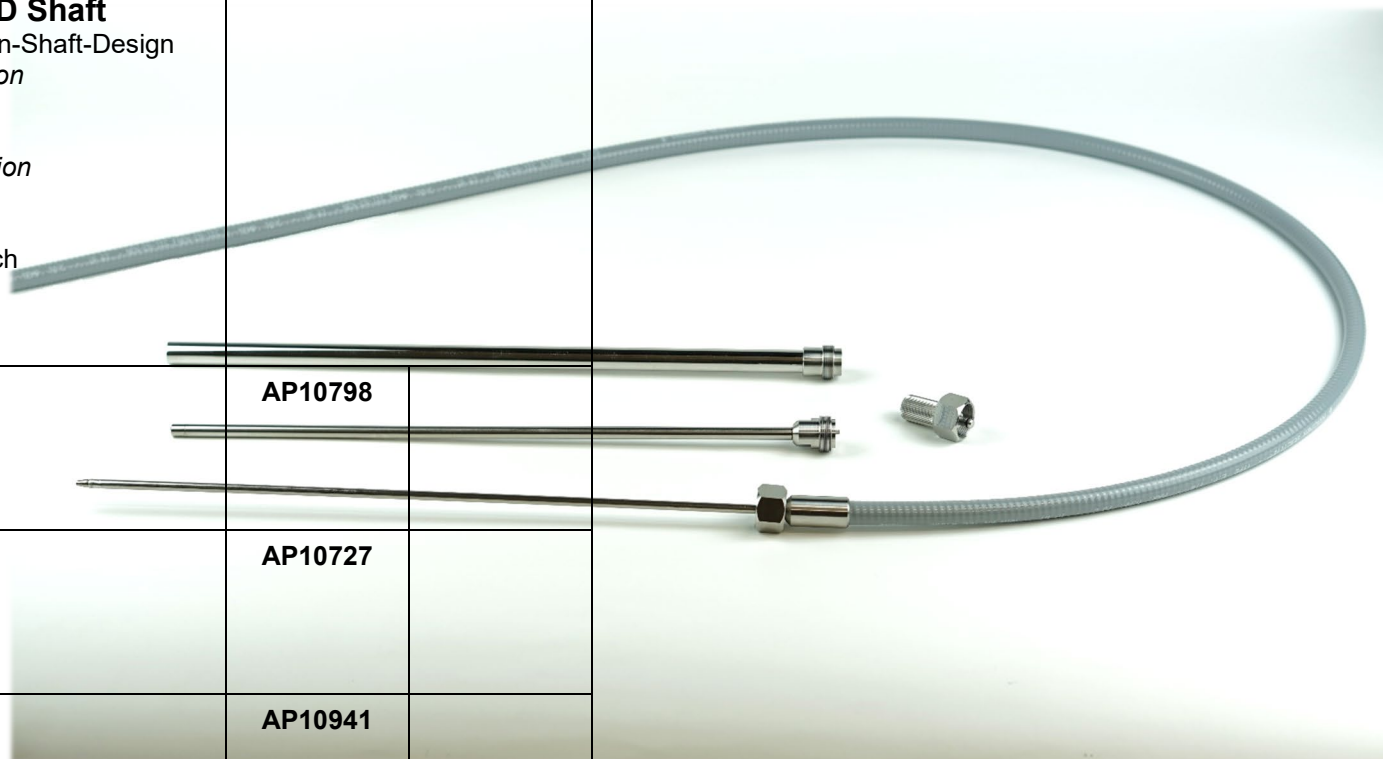
Pos.	Description	Article-No.	
4.	Sterilizable ATR-Probe with 6.3mm OD Shaft Probe Type: sterilizable ATR-probe with Shaft-in-Shaft-Design Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing 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)		
4.1.	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	AP10937	
4.2.	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	AP10938	
4.3.	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	AP10939	
4.4.	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	AP10940	

* Optional modifications and dimensions – see Page 10



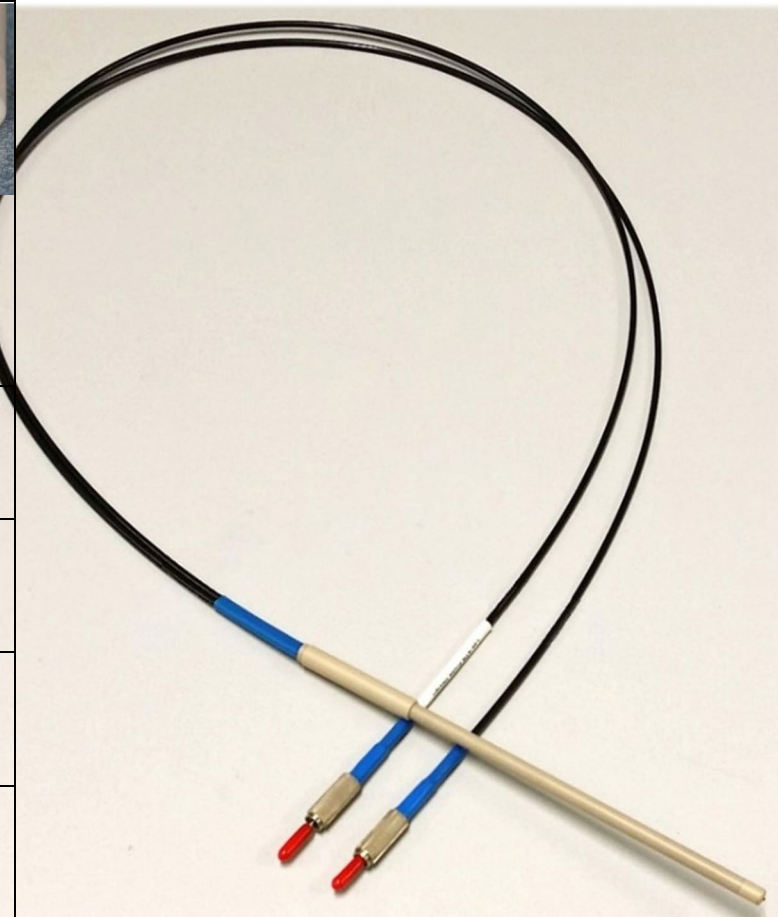
Pos.	Description	Article-No.	
5.	Sterilizable ATR-Probe with 12mm OD Shaft Probe Type: sterilizable ATR-probe with Shaft-in-Shaft-Design Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing 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)		
5.1.	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	AP10798	
5.2.	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	AP10727	
5.3.	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	AP10941	
5.4.	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	AP10942	

* Optional modifications and dimensions – see Page 10



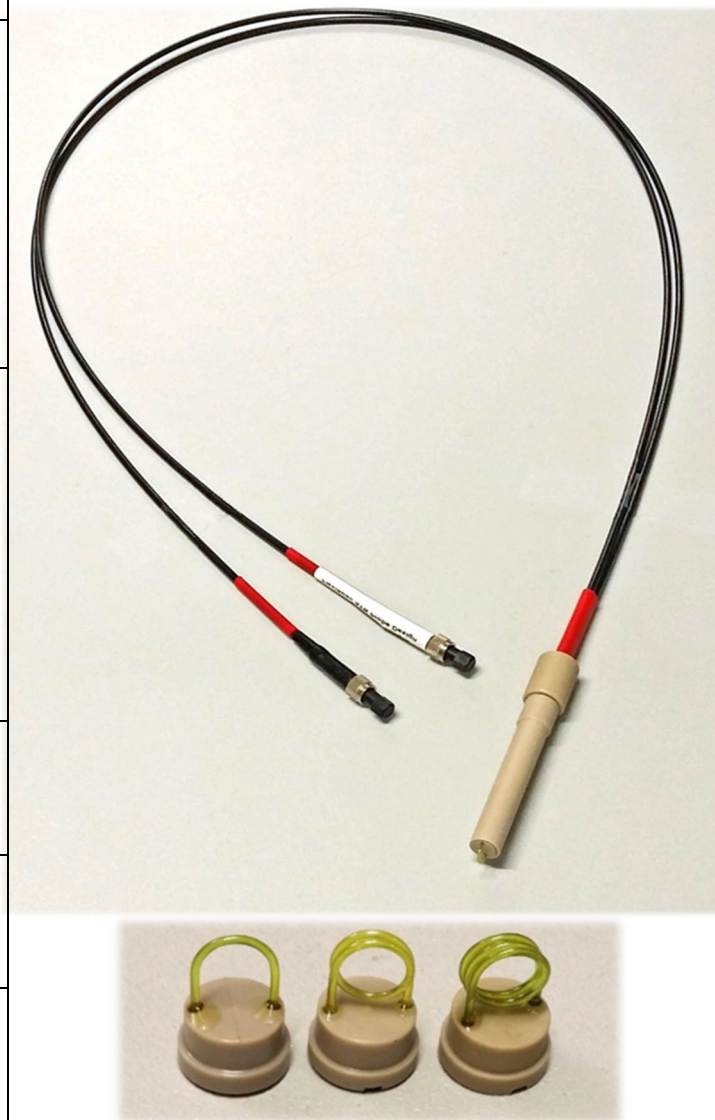
Pos.	Description	Article-No.	
6.	Standard Lab ATR-Probe Probe Type: ATR-probe for Laboratory Spectral Range: <i>see separate probe specification</i> Fiber Type: <i>see separate probe specification</i> Tip Material: <i>see separate probe specification</i> Sealing Material: FKM o-ring Shaft Material: PEEK 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*

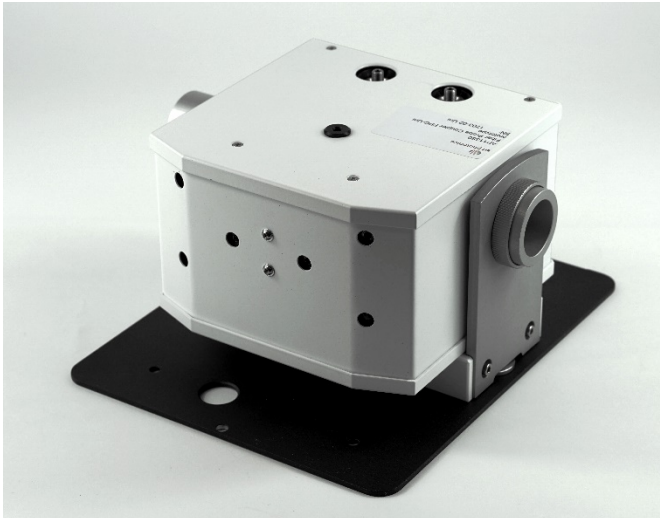
Others: ATEX conform design including certification

*other options upon request

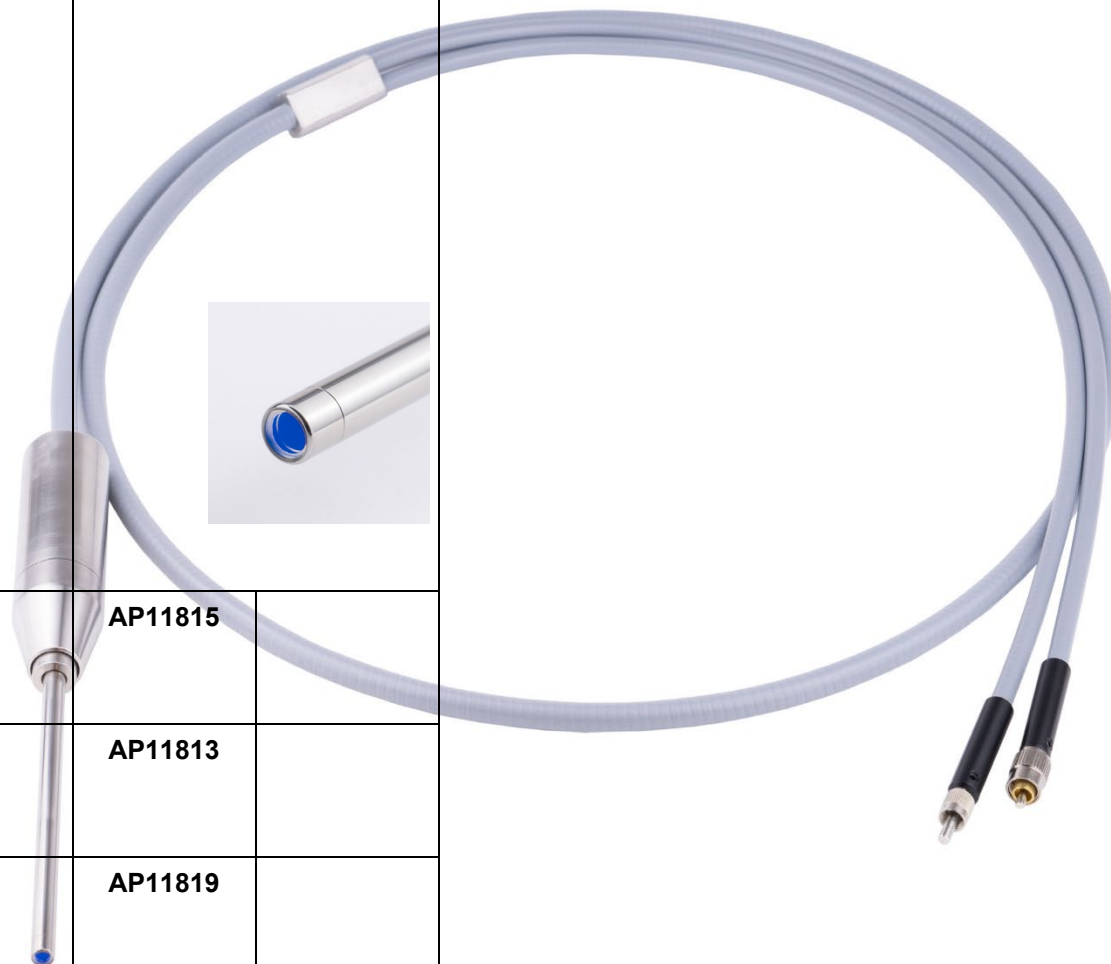
Customized probe example



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	

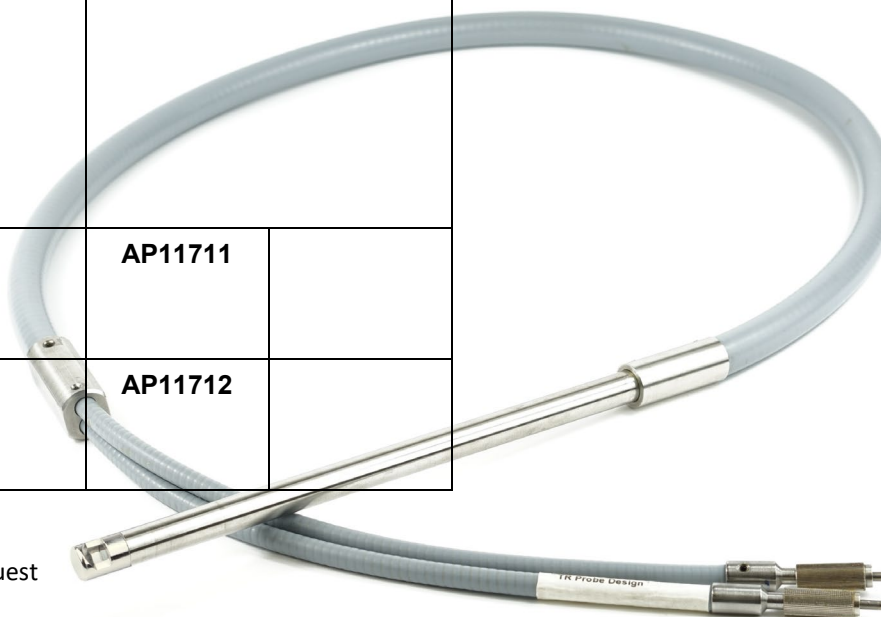
8.3.	Fiber Probe Coupler FPC-6M All mirror design with beam height position 88mm compatible with Nicolet 5700, 6700, iS10, iS50, Avatar 360 SMA-905 connectors The unit can be purged	AP10307		
8.4.	Fiber Probe Universal Coupler All mirror design with flexible beam height position can be adapted into any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

Pos.	Description	Article-No.	
9.	Raman Scattering probe 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)		
9.1.	RSP-DoS-12-20-200/50-FS* Laser Spot: ~0.2mm at 2-3mm from the tip Shaft Size: OD = 12mm, length = 200±5mm	AP11815	
9.2.	RSP-DoS-12-20-200/50-CL* Laser Spot: collimated beam ~3mm OD Shaft Size: OD = 12mm, length = 200±5mm	AP11813	
9.3.	RSP-DoS-6-10-200/50-FS * Laser Spot: ~0.2mm at 2-3mm from the tip Shaft Size: OD = 6mm, length = 100±5mm	AP11819	
9.4.	RSP-DoS-6-10-200/50-CL* Laser Spot: collimated beam ~3mm OD Shaft Size: OD = 6mm, length = 100±5mm	AP11818	



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

Pos.	Description	Article-No.	
10.	Transflection Probe 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)		
10.1.	Transflection Probe 1+1-NIR600/660-200-2xSMA Ver.0.2 * Optical path: 4mm (gap 2mm)	AP11711	
10.2.	Transflection Probe 1+1-NIR600/660-200-2xSMA Ver.0.2 * Optical path: 10mm (gap 5mm)	AP11712	



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

Pos.	Description	Article-No.	
11.	Reference Cables		
11.1.	Fiber Cable PIR400/500-50-TI/SMA-TI/SMA-MP37 Fiber: Standard PIR AgCl:AgBr polycrystalline fiber, core $410 \pm 15 \mu\text{m}$ clad $500 + 0/-15 \mu\text{m}$, $\text{NA} = 0.30 \pm 0.03$ Length: $0.5 \pm 0.05 \text{m}$ 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	AP10680	
11.2.	Fiber Cable CIR250/300-50-SMA-SMA-MP37 Fiber: CIR As-S glass fiber, core $250 \pm 10 \mu\text{m}$ clad $300 + 10/-20 \mu\text{m}$ double polymer coating $400 \pm 30 \mu\text{m}$, $\text{NA} = 0.30 \pm 0.03$ Length: $0.5 \pm 0.05 \text{m}$ Termination 1: SMA connector Termination 2: SMA connector Protective Tubing: metal, PVC coated, OD 3.7mm marked with red	AP11124	
11.3.	Fiber Cable NIR200/220-50-SMA-SMA-MP37 Fiber: NIR silica/silica, core $200 \mu\text{m}$ clad $220 \mu\text{m}$, $\text{NA} = 0.22 \pm 0.02$ Length: $0.5 \pm 0.05 \text{m}$ Termination 1: SMA 905 connector Termination 2: SMA 905 connector Protective Tubing: metal, PVC coated, OD 3.7mm marked with yellow	AP11140	



* Cables of different fiber diameters and designs are available