



Attenuated Total Reflectance (ATR) Probe Overview

High performance and reliability for the FTIR analysis of liquids, pastes, and Slurries.

Hellma Analytics ATR probes with Axiom Technology are characterized by broad spectral response, photometric accuracy, high transmission, and unmatched long term reliability because of their patented sealing technology, which withstands even the harshest process conditions.

The high performance of these ATR probes is largely due to the use of the Axiot System of hollow metallic lightguides both within the probe and to transmit light between the probe and the associated spectrometer. This eliminates the pitfalls characteristic of mid-infrared optical fibers including low transmission, spectral artifacts, instability, degradation over time, and frequent breakage.

CHOICE OF SMALL DIAMETER AND FLEXIBILITY VERSUS HIGH TRANSMISSION

The offered ATR probes fall into two categories, single lightguide and dual lightguide probes. The single light-guide probe, as the term implies, use the same lightguide to transmit light to and from the ATR element. This allows the probe diameter to be minimized. At the same time, it maximizes coupling flexibility in coupling the probe to the spectrometer. For example, the probe orientation and position can be easily changed without introducing spectral

artifacts. Dual light guide probes are characterized by quite high optical transmission – ranging from 10% to over 25% depending on model and configuration. As a result, these probes provide high sensitivity without required a liquid nitrogen cooled detector.

SELECTION OF DIAMOND OR CONVENTIONAL ATR ELEMENT MATERIALS

DPR Series ATR probes are available with a choice of any of the typically used element materials. The choice of material will generally be determined by the required spectral coverage and the chemical nature of the samples being studied. (Please see the table on page 2.)

DMD Series probes employ flat diamond elements backed by ZnSe coupling elements. This combination provides the extreme chemical resistance of diamond with the optimum spectral coverage consistent with the optical properties of diamond.

SPECTROMETER INTERFACING

In principle, any of the ATR probes can be mounted in the sample compartment of an FTIR spectrometer. The optical designs are optimized for use with an 8 mm diameter focused beam. However, for maximum sampling flexibility, it is often desirable to use an outboard sampling module coupled to the spectrometer by a combination of Axiot lightguides and mirror modules. See the data sheets for the individual product lines for a few possible configurations.

FEATURES:

General

- Easily interfaced to any FTIR spectrometer
- Diamond element for excellent corrosion resistance (DMD-270 and DMD-370)
- Interchangeable ATR elements to meet diverse requirements (DPR-207, 212, and 240)
- Proprietary optical designs for maximum photometric accuracy and precision
- Broad spectral response (650 to > 4,000 cm⁻¹)
- Robust construction for maximum reliability

DPR-207 and DMD-270 Single Lightguide Probes.

- Small diameter
- Highly flexible optical coupling
- Easily articulated without introducing spectral artifacts

DPR-210, 212, 240, DMD-370, and 373 Dual Lightguide Probes.

- High sensitivity without requiring a cooled detector
- Suitable for process applications

APPLICABLE U.S. PATENTS:

- 4,812,041, 4,835,389, 5,051,551, 5,459,316, 5,773,825



DPR AND DMD SERIES PROBES:

	SINGLE LIGHTGUIDE PROBES		DUAL LIGHTGUIDE PROBES				
SPECIFICATIONS	DPR-207	DMD-270	DPR-210	DPR-212	DPR-240	DMD370	DMD373
Diameter	16 mm	16 mm	25 mm	25 mm	28.6 mm	32 mm	23 mm
Maximum Immersion Depth	30 cm	30 cm	16.5 cm	16.5 cm	20 cm	30 cm	30 cm
ATR Material	See Table Below	Diamond	See Table Below	See Table Below	See Table Below	Diamond	Diamond
ATR Reflections	2	3	2	2	2	3	3
Nominal Transmission	2 – 4 %	1 – 2 %	> 10 %	15 %	20 %	18 %	8 %
Operating Temperature	-20 to 275°C	-100 to 200°C	-20 to 250°C	-20 to 250°C	-100 to 200°C	-100 to 200°C	-100 to 200°C
Maximum Pressure	See Table Below	30 bar	5 bar	5 bar	See Table Below	30 bar	30 bar
Wetted Metal	316L Stainless Steel	Hastelloy C-276	316L Stainless Steel	316L Stainless Steel	316L Stainless Steel	Hastelloy C-276	Hastelloy C-276
Seal Type	Kalrez® O-ring	Energized PTFE	Kalrez® O-ring	Kalrez® O-ring	Energized PTFE	Energized PTFE	Energized PTFE

AVAILABLE ATR ELEMENTS:

Material	Spectral Cutoff (cm ⁻¹)	Hardness (Knoop)	Attacked By	Max. Pressure (bar)	
				DPR-207	DPR-240
ZnSe	600	120	Acids, oxidizers	60	30
ZnS	950	250	Strong oxidizers, some acids	60	30
AMTIR-1	850	170	Strong alkalis	20	10
Ge*	700	780	Hot sulphuric acid. Aqua regia	50	25
Silicon	1150	1500	HF, HNO ₃ , NaOH	60	30

* 100°C max.