

High Transmission ATR Immersion Probes

Diamond-tipped and conventional probes for industrial at-line and on-line process applications



DMD-370 Mounted to a Bruker Alpha FTIR spectrometer

Models DMD-370, DMD-373, and DPR-240 are ATR immersion probes providing the high optical transmission and robust reliability required for industrial monitoring applications. The key to the performance of these probes is the use of separate metallic light-guides to direct mid-infrared radiation to and from the ATR sensing element. This dual-light-guide design provides high optical transmission, eliminating the need for a liquid nitrogen cooled IR detector an important consideration for industrial monitoring applications. Additional considerations contributing to high accuracy and repeatability are the use of a fixed number of ATR reflections and of a precisely controlled range of incidence angles for each probe.

DMD-370 & 373 DIAMOND-TIPPED PROBE FOR AGGRESSIVE CHEMISTRIES

The DMD-370 & 373 provide excellent transmission throughout the mid-IR fingerprint region combined with the ability to stand up to strong acids and bases and many other aggressive chemistries.

SAMPLE INTERFACING

DMD-370, 373, and DPR-240 probes

In addition, a high degree of photometric accuracy and repeatability are provided by the proprietary optical design which restricts the angular range of the optical rays striking the sample interface and insures that each ray experiences exactly three reflections. The DMD-370 is optimized for the highest possible transmission. The DMD-373 is substantially smaller in diameter but still has adequate transmission for most applications.

DPR-240 VERSATILE PROBE FOR DIVERSE APPLICATIONS

The DPR-240 is a robust ATR probe employing a two reflection conical ATR element in conjunction with nearly collimated IR radiation coupled to and from the element by means of a pair of gold coated light-guides. This combination assures that all optical rays strike the sample interfacing surface at 45 deg. ($\pm 1^\circ$), providing a very high degree of response linearity (photometric accuracy) and repeatability. The ATR element can be easily interchanged in the field. The selection of standard element materials includes ZnSe, ZnS, AMTIR-1, germanium and silicon allowing the probe characteristics to be altered as application requirements change.

SPECTROMETER INTERFACING

Three different standard interfaces are available for coupling the probes to most FTIR spectrometers. Outboard sample module.

HELLMA ANALYTIC'S COMPREHENSIVE IMMERSION PROBE

Model DSR-370XY enables the probe to be coupled directly to the sample compartment of a conventional FTIR spectrometer. The suffixes X and Y are used to specify the spectrometer make and model. Model DSX-370 interfaces to our AXM-601. This provides a high degree of flexibility in placement of the probe by allowing various combinations of Axiot mirror and conduit modules to be used between the sample module and the spectrometer. Finally, model DSD-370XY couples the probe to a dedicated process FTIR spectrometer employing dual input and output beam ports. In addition to the above, a dedicated sampling module is available for coupling the probes to a Bruker Alpha FTIR spectrometer. See data sheet PS-AX-Alpha for further information.

FEATURES:

- High sensitivity without requiring a cooled detector
- Diamond element for excellent corrosion resistance (DMD-370 & 373)
- Interchangeable ATR elements to meet diverse needs (DPR-240)
- Proprietary optical design for maximum photometric accuracy
- Robust construction

APPLICABLE U.S. PATENTS:

- 4,812,041
 - 4,835,389
 - 5,051,551
 - 5,773,825
- reflectance probes tailored to all spectral regions (UV through mid-



can be interfaced to either a batch reaction vessel or a process pipe by means of a variety of optional pipe flanges and fittings. In addition, Hellma offers flow fixtures (models DPF-240, DMF-370, and DMF-373) for use in extractive sampling.

PRODUCT LINE WITH AXIOM TECHNOLOGY

Hellma Analytics products with Axiom Technology pioneered the field of in-situ IR reaction monitoring with the introduction of the first ATR immersion probes in 1989. Since then, the company's immersion probe product lines have continued to expand to include ATR, transmission, and diffuse-

IR) as well as Raman probes. The DPR-240, DMD-370, and DMD-373 continue this tradition, providing unmatched performance along with the robust construction and chemical resistance needed to stand up to the harshest process conditions.

DPR-240/DMD-370/DMD-373

SPECIFICATIONS:

	DPR-240	DMD-370	DMD-373
Probe Diameter:	28.6 mm	32 mm	23 mm
Immersion Depth:	20 cm	15 or 30 cm	15 or 25 cm
ATR Reflections	2	3	3
Angle of Incidence:	45°	45°	45°
Nominal Transmission:	15 %	10 %	8 % (15 cm)
Maximum Temperature:	200°C	170°C	170°C
Max. Pressure:	See table below.	30 bar	30 bar
Wetted Metal:	316 Stainless Steel	Hastelloy C-276	316 Stainless Steel *
Seal Type:	Energized, filled PTFE	Energized, filled PTFE	Energized, filled PTFE

* Hastelloy C-276 optional

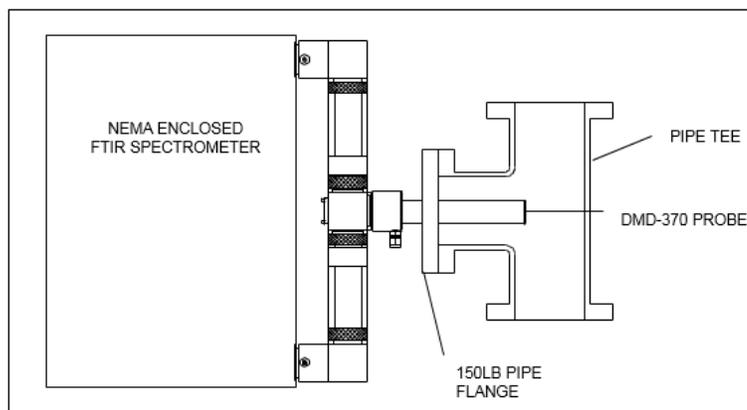


Figure 1: Two port NEMA enclosed FTIR spectrometer with a DMD-370 probe flange mounted to a process pipe tree

DPR-240 ATR ELEMENT MATERIALS:

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

* 100C max.