



# The Axiot System

Modular Transfer Optics and Sampling Systems for FTIR Spectroscopy

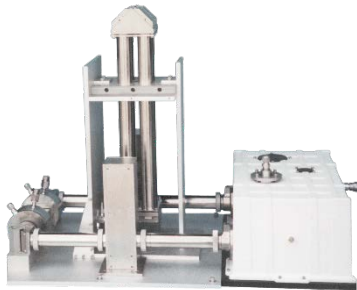


Figure 1: An Axiot System providing switching between two transmission cells.

The Axiot System is a family of optical modules which can greatly expand the sampling flexibility of any FTIR spectrometer. By removing the sampling task from the confines of the conventional sample compartment, the Axiot System eliminates performance compromise while allowing you to carry out your analysis at the most desirable location - even in a fume hood or on a process line. Furthermore, the system's pneumatically actuated switch modules can be used to provide automatic switching between multiple sample cells or reference paths (Figure 1).

## DESIGNING YOUR AXIOT SYSTEM

Key to the Axiot System is a series of hollow metallic light guides (optical conduits) and mirror modules which can be assembled in a variety of ways to meet diverse requirements. An Axiot system can be coupled to an output port of the spectrometer or to the instrument's sample compartment. A number of resources are available to aid in designing an Axiot system to meet your particular needs. Technical Note AN-910 provides examples of several Axiot configurations while AN-917 examines the transmission characteristics of Axiot conduits.

In addition, we can provide outline drawings of all of the standard Axiot modules. For assistance in configuring a system, please don't hesitate to contact us with your requirements.

Including drawings of suggested configurations, free of charge.

## BASIC AXIOT BUILDING BLOCKS

The most basic Axiot components are mirror modules, conduits, and interface flanges. The generic drawings on the next page indicate the dimensions important in configuring a system. Here, "L" represents the length of a conduit and "X" the focal length of a paraboloid mirror. The cross symbol indicates the location of the end of a conduit after assembly. All dimensions are in inches. Note that the interface flanges include window holders and purge orifices.

## MODULES TO MEET DIVERSE REQUIREMENTS

In addition to the basic building blocks, the Axiot System includes various special purpose modules. Dimensional drawings of all of these are available from Hellma. The various module categories are outlined below. Note that many of these - as well as the basic modules - are available in both standard and custom materials and sealing configurations to meet specialized needs.

## ROTATIONAL OPTICAL SWITCHES

ARJ-90 and ARP-L are pneumatically actuated plane mirror and parabolic rotational optical switches respectively.

Each switches an input beam between diametrically opposed outputs, each 90° from the input port.

## TRANSLATIONAL OPTICAL SWITCHES

ASJ-90 and ASP-L are pneumatically actuated plane mirror and parabolic translational optical switches respectively. Each switches between a collimated through path and an output path at 90°. In the case of the ASP-L, the 90° path has a focus at a distance of "L" from the center of the mirror.

## FIBER-OPTIC INTERFACES

Model FAC-100 provides an adjustable interface between an Axiot Conduit and an optical fiber terminated in either an SMA or an FC connector. Its 2" focal length parabolic mirror provides wavelength independent coupling with a numeric aperture of approximately 0.3.

## FEATURES:

- Interfaces FTIR to outboard sampling equipment
- Facilitates sampling on-line or within fume hood
- Provides switching between sampling devices
- Eliminates the risk of instrument damage due to sample spill
- Allows experiments to remain set-up while the FTIR sample compartment is used for other measurements

## REFERENCES

1. U.S. Patent No. 5,054,869



## INSTRUMENT INTERFACES

The Universal Interface Flange (AOI-U) is suitable for coupling to the side port of many FTIR spectrometers. Custom interfaces are available for other spectrometers. These are designated as AOI-1XY, where "X" and "Y" represent the spectrometer make and model. In addition, sample compartment interfaces (AOI-4XY and 5XY) are available for use with instruments lacking side ports. In addition to the above interfaces designed for use with laboratory spectrometers, a number of instrument-specific interfaces are available for use with process spectrometers such as the ABB FTPA2000-300, Bruker MATRIX-M, and AIT PCM Series. For example Figure 2 illustrates an Axiot interface which allows any of our ATR probes to be coupled to a Bruker MATRIX-M spectrometer.

## SAMPLING DEVICE INTERFACES

Interfaces are available for all our sampling devices. These include both standard and quick-release interfaces. The latter facilitate rapid interchange of sampling devices.

## DETECTOR MODULES

In most systems, an infrared detector and preamplifier will be mounted within the Axiot system and connected to the spectrometer by an electronic cable. Various Axiot modules are available to accommodate this arrangement. ADO-500XY and ADO-501XY are detector optics modules which include mounting hardware and focusing mirrors with three axes of optical adjustment. They are designed for use with liquid nitrogen cooled detectors in the case of ADO-500 and either room temperature or TE cooled detectors in the case of the ADO-501.

## OUTBOARD SAMPLING MODULES

AXM Series modules include ADO Detector Optics Modules, mounting stands, and various mirror modules and conduits to provide the equivalent of an f: 4.8 focused beam sample region external to the spectrometer.

## MISCELLANEOUS ITEMS

In addition to the above, an assortment of Axiot modules is available to meet specialized needs. Some of these are listed below:

- ABF-50 Bulkhead Feed-through and Window Holder
- ABF-31 Feed-through Boot Assembly
- AVA-30 Variable Attenuator
- AVI-31 Variable Iris Assembly

## SYSTEM INTEGRATION SERVICES

The design services available from Hellma cover a broad range of possibilities. On the one hand, if you prefer to assemble your own Axiot system, Hellma can provide extensive design assistance, often at no charge. At the other extreme, we can provide comprehensive system integration design and assembly services including NEMA qualified packaging, sample conditioning, and environmental control. A typical example is shown in Figure 3.



Figure 2: DMD-270 Diamond ATR Probe coupled to a Bruker IR Cube FTIR spectrometer by means of a custom Axiot interface.

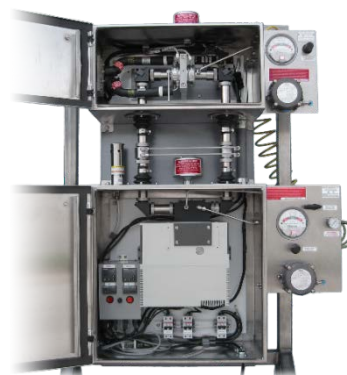
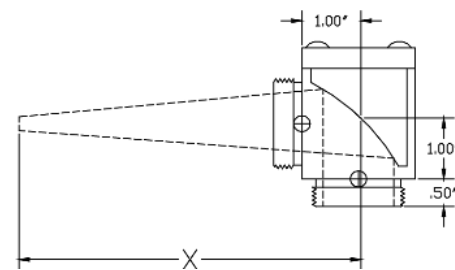
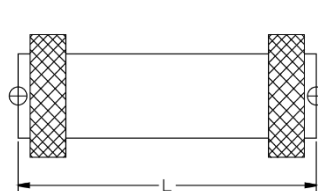


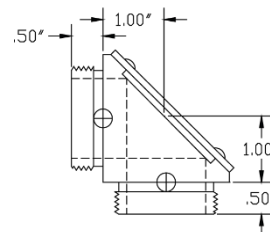
Figure 3: Fully integrated FTIR analysis system incorporating a Bruker IR Cube FTIR, NEMA classified enclosure, purged safety barriers, sample conditioning, and environmental control.



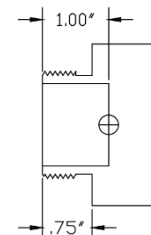
AOP-X Parabolic Mirror Module



AOT-L Optical Conduit



AOJ-90 Plane Mirror Module



AOI-U Universal Interface Flange