



## ● **PMA50** External Polarization Modulation Accessory

Bruker's PMA50 is a fast and powerful external optics module for the INVENIO and VERTEX series FT-IR spectrometers for polarization modulation measurements.

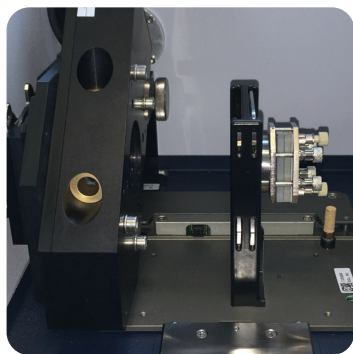
- High sensitivity and dynamics
- Parallel dual channel data acquisition technique (24bit) enables the measurement of the sum and the difference spectrum at the same time
- Photo Elastic Modulator (PEM) ZnSe, 42 kHz nominal frequency, AR coated
- Continuously variable spectral resolution, depending on basic FT-IR spectrometer
- Large sample compartment for a variety of different sampling accessories
- Adjustment of spot size on the sample allows for measurement of smaller samples or liquid cells with smaller windows
- Full-integrated demodulation electronics for compact design and easy operation

Polarization modulation (PM) provides advantages for a variety of different techniques such as PM-IRRAS, VLD (Vibrational Linear Dichroism) and VCD (Vibrational Circular Dichroism). The applied double modulation techniques overcome residual atmospheric absorptions that tend to mask desired spectral information even in purged systems. In combination with Bruker's real dual channel acquisition technique (DigiTect™) external signal disturbances are prevented and highest signal-to-noise ratio is guaranteed.

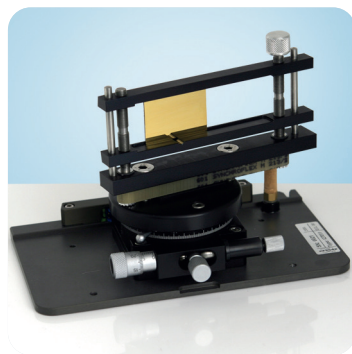
### **High Performance and Stability**

The PMA50 module utilizes the high performance characteristics of Bruker's INVENIO and VERTEX series spectrometers. Data acquisition is based on real dual channel delta-sigma ADCs with 24bit dynamic range, running in parallel and are integrated into the detector preamplifier electronics. This advanced, patented DigiTect™ technology prevents external signal disturbance and guarantees highest signal-to-noise ratio.

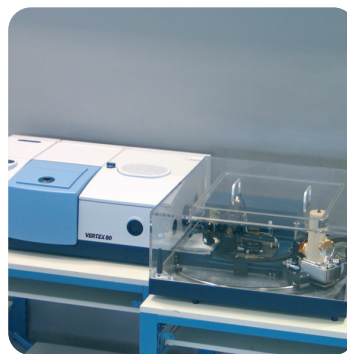
In combination with the optical filter holder for a user selectable exchange of filters and the internal aperture wheel of INVENIO and VERTEX series spectrometers, the signal quality can be optimized with respect to the desired spectral range and sample size.



PMA50 sample compartment with Photoelastic Modulator (PEM) and liquid cell for VCD application.



Dedicated PM-IRRAS sample holder for variable angle of incidence with different sample sizes.



PMA50XL module for measurements with enlarged range for angles of incidence between 32.5° - 89°

Furthermore, the short beam path in the PMA50 module itself allows for optimum performance with respect to S/N and stability. In spite of the short beam path, a large space at the sample position enables the use of a variety of different sampling accessories.

Since mirrors would influence the character of polarized light beyond the PEM, no mirrors are inside the optical path. Therefore, in all techniques the light is focused with a non-polarizing lens onto the detector element and the element itself is protected by a non-dichroic window in front of it. The linear polarizer in front of the PEM is rotatable and enables any desired orientation for states of polarized light to the sample.

All necessary electronics are integrated into the PMA50 module and specially designed software allows for control of parameters and complete data evaluation.

### Demodulation Technology

The innovative designed synchronous demodulator integrated in the electronic units of the Bruker INVENIO and VERTEX series FT-IR spectrometers replaces the traditional external electronic lock-in amplifier. This state of the art demodulation technology is easy to handle and provides at least comparable demodulation efficiency like an external lock-in amplifier for PM-IRRAS and VCD experiments. Together with the Bruker DigiTect™ dual channel ADCs and

the integrated detector preamplifier electronics an optimum data acquisition will be performed.

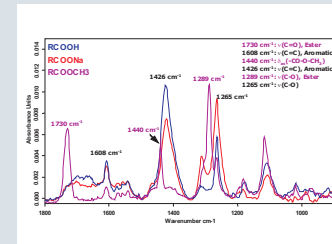
### VCD and VLD

In VCD and VLD experiments, liquid, gas cells and holders for solid samples can be offered. All of these accessories can be used heated and with variable path length. For the acquisition of a VCD spectrum only one calibration has to be performed in advance. This calibration gives information on the phase corrections for the interferogram and the electronic devices. Also the zero path difference of the interferogram and the normalization function for the VCD spectrum are calculated. In order to control long term stability of the system, spectra can be averaged and standard deviations can be derived.

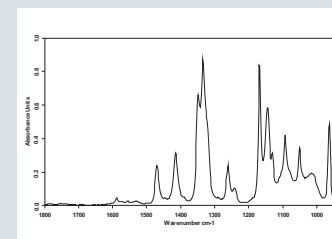
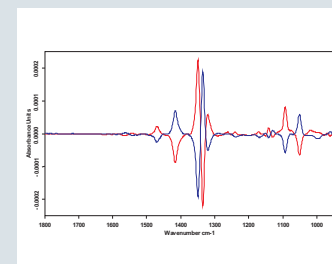
### PM-IRRAS

PM-IRRAS reflection measurements can be performed between angles of 70 and 89°. If larger angles are of interest, Bruker's PMA50XL module will offer access to a range between 32.5° and 89°. For easy sample adjustment, a continuously variable rotation stage and self-masking sample mount with fixed focal point at the sample reflecting surface is available.

### PMA50 Example Spectra



PM-IRRAS spectra of organic compounds with carboxylic acid functionality, as the respective sodium salt and with ester functionality.



VCD (upper) and absorption (lower) spectra of a MeSO<sub>2</sub>-polychlorinated biphenyl (PCB). Spectra were collected as a solution of the PCB in CDCl<sub>3</sub> in a 210µm KBr cell. All spectra are baseline corrected against the pure spectra of CDCl<sub>3</sub>.

Covered by one or more of the following patents: DE102004025448; DE19940981. Additional patents pending.

**Bruker Optics is ISO 9001 and ISO 13485 certified.**

Laser class 1 product.

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