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Polltecnico di Milano
Dipartimento di Fisica
Piazza Leonardo da Vinci, 32
20133 Milano

Bruker Italia S.r.l. Unipersonale
Viale V. Lancetti 43
20158 Milano
Tel. 02 70 63 63 70
Fax 02 23 61 294
bruker.italy@bruker.com
www.bruker.com

Oggetto: Procedura negoziata ex art. 36 c.2.b, D. Lgs. 50/2016 per la fornitura di un sistema comprendente uno spettrometro infrarosso a trasformata di Fourier e un modulo esterno per dicroismo circolare vibrazionale. CIG 74967333C7 – CPV 38433000-9.

Vostra Richiesta ID 106169355 del 08.01.2019: procedimento di verifica della congruità dell'offerta.

Bruker Italia S.r.l. Unipersonale riscontra la richiesta in oggetto, confermandola soluzione tecnica offerta con riferimento ai criteri da 4.2.1 a 4.2.12 della Lettera di Invito., e allegando a supporto delle caratteristiche dichiarate per i predetti criteri i seguenti documenti:

1. INVENIO-R FTIR Spectrometer Specifications
2. INVENIO-R Optical Diagram
3. PMA50 External Polarization Modulation Accessory Specifications.

In ordine ai singoli criteri in esame, si osserva quanto segue.

4.2.1. Disponibilità, in opzione, di un secondo ingresso nel sistema FTIR (vincolato a scelta singola)

Come si evince chiaramente e senza ambiguità dall'**Allegato 2**, gli ingressi ausiliari E₁ e E₂ hanno un cammino ottico identico (in termine di numero di specchi) ed entrambi, in virtù del disegno ottico peculiare della serie INVENIO di Bruker, vengono focalizzati sulla ruota dei diaframmi (la stessa usata per le sorgenti interne MIR e NIR), comandabile via software (nel disegno indicata con l'acronimo "APT").

4.2.2. Disponibilità, in opzione, di un upgrade che permetta di utilizzare il sistema VCD per misure PM-IRRAS (vincolato a scelta singola)

Come si evince chiaramente e senza ambiguità dall'**Allegato 3**, il modulo PMA50 è progettato e realizzato per permettere analisi sia VCD che PM-IRRAS.

Estratto dall'**Allegato 3**:

The PMA50 module for polarization modulation is designed for a variety of different techniques such as PM-IRRAS, VLD (Vibrational Linear Dichroism) and VCD (Vibrational Circular Dichroism). The standard PMA50 module allows for PM-IRRAS experiments with angles of incidence between 70 and 89°. Optionally a large module PMA50XL is available with corresponding angles between 32.5° and 89°.

4.2.3. Presenza di filtri ottici (vincolato risposta singola)

Come si evince chiaramente e senza ambiguità dall'**Allegato 2**, il disegno ottico peculiare della serie INVENIO di Bruker permette l'utilizzo di una ruota dei filtri comandabile via software (nel disegno indicata con l'acronimo "OF"), dove vengono inseriti entrambi i filtri richiesti (a 1.800 cm⁻¹ e 3.800 cm⁻¹).

Direzione e coordinamento: Bruker Invest AG

Partita IVA e Codice Fiscale
02143930150
C.C.I.A.A. 770236
Trib. di Milano 137397

Deutsche Bank
Filiale 3 di Milano
c/c 000000021175

ISO 9001



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4.2.4. Disponibilità, in opzione, di un secondo comparto campioni nel sistema FTIR (vincolato risposta singola)

Come si evince chiaramente e senza ambiguità dall'**Allegato 2**, il disegno ottico peculiare della serie INVENIO di Bruker permette l'inserimento, in opzione, di un secondo comparto campioni per misure in trasmissione, denominato *Transit™*.

Estratto dall'**Allegato 1**:

Flexibility & automation opt.: Right hand side Transit™ channel for fast and easy mid IR transmittance

4.2.5. Massima frequenza di scansione (vincolato a risposta singola)

L'opzione fast scan/rapid scan S129/IR, inclusa nella configurazione proposta, permette di acquisire più di 70 spettri/sec @ 16 cm⁻¹ di risoluzione spettrale, come si evince chiaramente e senza ambiguità dall'**Allegato 1**.

Estratto dall'**Allegato 1**:

Rapid-Scan option: > 70 spectra/s @ 16 cm⁻¹ or 50 spectra/s @ 8 cm⁻¹ spectral resolution

4.2.6. Numero massimo di rivelatori installabili (vincolato risposta singola)

Come si evince chiaramente e senza ambiguità dall'**Allegato 1**, il numero massimo dei rivelatori interni installabili simultaneamente è 6 + 1, considerando anche il rivelatore dedicato al comparto campioni *Transit™* di cui al punto 4.2.4:

Estratto dall'**Allegato 1**:

Detectors: Up to 7 internal, 1 external detector position + 2 add. connectors for ext. detectors

Automated 5x MultiTec™ unit for FIR DTGS, MIR DTGS, Bruker FM (FIR-MIR) DTGS, InGaAs (RT & TE cooled), Si- and GaP diodes

1x DigiTec™ for LN2 cooled MCT, InSb, fast or high gain detectors and many more

1x mid IR DTGS for additional Transit™ transmittance channel

4.2.7. Ottica motorizzata pre-allineata per due rivelatori (vincolato a risposta singola)

Come si evince chiaramente e senza ambiguità dall'**Allegato 2**, il banco ottico INVENIO-R viene configurato per avere due differenti posizioni per i detector, con opportuna ottica dedicata motorizzata gestibile via software.

La prima posizione (denominata nel disegno come 5x MultiTec) viene dedicata all'utilizzo del rivelatore MIR a temperatura ambiente (DTGS), la seconda (denominata nel disegno come MCT) viene dedicata ad un qualsiasi altro detector, compreso il rivelatore MCT fornito con il modulo VCD PMA50.

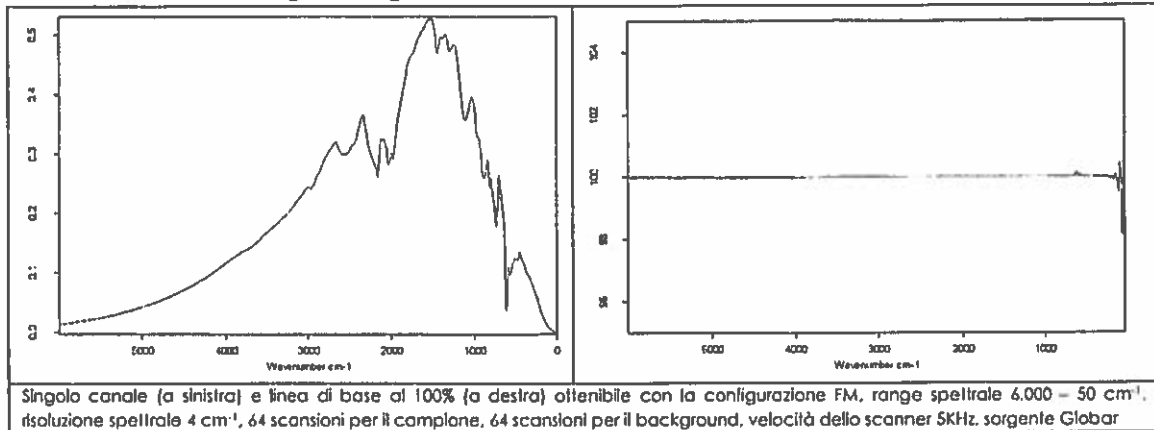
4.2.8. Disponibilità, in opzione, di ottiche broadband per misure su ampio intervallo spettrale (vincolato a risposta singola)

Lo spettrometro INVENIO-R proposto può utilizzare, in opzione, le ottiche broadband proprietarie Bruker (denominata nell'**Allegato 1** configurazione *Bruker FM*), che permettono l'acquisizione di spettri su un range da 6.000 cm⁻¹ a 50 cm⁻¹ senza alcun cambio di componenti ottiche. In condizioni ottimali di misura, qui di seguito vengono riportati i dati tipici ottenibili.

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Oltre allo spettro di singolo canale viene riportata anche la linea 100% che permette di valutare il Rapporto Segnale Rumore di questa configurazione peculiare e quindi di poter valutare il residuo energetico agli estremi di banda.



4.2.9. Risoluzione temporale dell'opzione step-scan 'time resolved spectroscopy' (vincolato a risposta singola)

L'opzione step scan S510/IR, inclusa nella configurazione proposta, permette di acquisire in diverse modalità step scan, con una risoluzione temporale massima di 6µs, così come si evince chiaramente e senza ambiguità dall'Allegato 1.

Estratto dall'Allegato 1:

Step-Scan option: Time resolved step-scan, amplitude & phase modulation spectroscopy. Temporal resolution of 6 µs with internal ADC and down to 2.5/4 ns with dual channel 14 bit transient recorder, fast detector and preamplifier

4.2.10. Condizioni di garanzia per i sistemi FTIR e VCD (vincolato a risposta singola)

Garanzia totale sul sistema INVENIO-R + PMA50: 24 mesi dalla data di collaudo

4.2.11. Condizioni di garanzia per l'interferometro (vincolato a risposta singola)

Garanzia totale sull'interferometro: 10 anni dalla data di collaudo

4.2.12. Condizioni di garanzia per laser e sorgente FTIR (vincolato a risposta singola)

Garanzia totale sul laser dell'interferometro e sulla sorgente ceramica MIR: 5 anni dalla data di collaudo

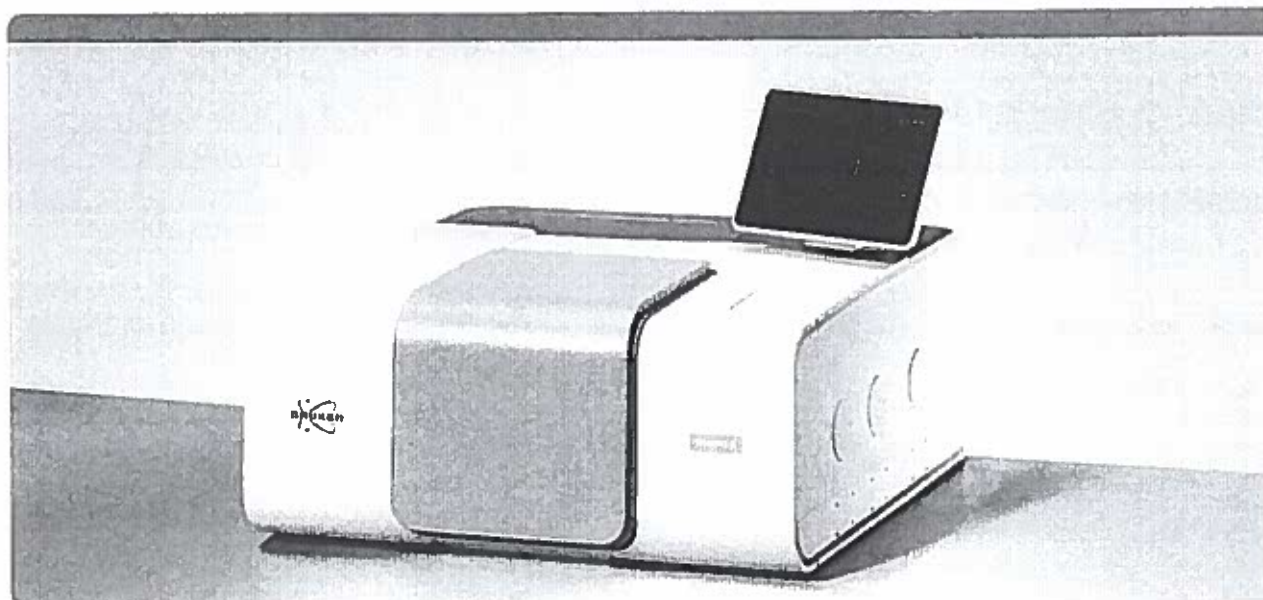
Rimaniamo a disposizione per qualsiasi ulteriore delucidazione in merito, e con l'occasione porgiamo cordiali saluti.

Milano, 15.01.2019

Dr. Paolo Mapelli
 Consigliere Delegato
 Bruker Italia S.r.l. Unipersonale

Il presente documento è sottoscritto digitalmente

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• INVENIO® R FTIR Spectrometer

Specifications

Spectral range:	8,000 to 350 cm^{-1} standard, with KBr beamsplitter, DTGS detector and MIR source
Spectral resolution:	Better than 0.16 cm^{-1}
Spectral range options:	Extensions for far IR, near IR and VIS/UV; maximum spectral range 15 to 28,000 cm^{-1}
Detectors:	Up to 7 internal, 1 external detector position + 2 add. connectors for ext. detectors Automated 5x MultiTect™ unit for FIR DTGS, MIR DTGS, Bruker FM (FIR-MIR) DTGS, InGaAs (RT & TE cooled), Si- and GaP diodes 1x DigiTect™ for LN_2 cooled MCT, InSb, fast or high gain detectors and many more 1x mid IR DTGS for additional Transit™ transmittance channel External far IR/THz liquid He cooled bolometer adaption
Beamsplitter options:	KBr (broadband): 10,000 to 380 cm^{-1} CaF_2 -NIR: 15,500 to 1,200 cm^{-1} , Quartz-UV/VIS/NIR: 28,000 to 3,500 cm^{-1} Bruker FM (FIR-MIR): 6,000 to 15 cm^{-1} (achievable resolution 0.4/0.9 cm^{-1}) Multilayer far IR: 680 to 30 cm^{-1} , Mylar® 23 μm : 120 to 30 cm^{-1} Mylar® 50 μm : 60 to 15 cm^{-1} , Silicon solid state: 600 to 15 cm^{-1} Beamsplitters are easy to exchange and stored inside the optics bench
Source:	Globar, electronically stabilized for highest precision and long life time, air cooled
Source options:	Internal tungsten source for near IR/VIS, air cooled External water cooled sources: far IR, high power globar and tungsten
Wavenumber accuracy:	Better than 0.005 cm^{-1} @ 1,554 cm^{-1}
Photometric accuracy:	Better than 0.1% T

FTIR

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Signal-to-Noise:	5 s sample, 5 s reference: >10,000:1 ($< 4.34 \times 10^{-5}$ AU noise) peak-to-peak @ 2,000 cm^{-1} , 4 cm^{-1} spectral resolution and standard optical components
Signal-to-Noise, typical:	5 s sample: 13,000:1 (3.34×10^{-5} AU noise) peak-to-peak 1 min sample: 50,000:1 (8.6×10^{-6} AU noise) peak-to-peak Note: signal-to-noise values are statistical numbers which depend on applied measurement parameters and laboratory working conditions.
Interferometer:	RockSolid™, permanently aligned and wear-free high stability interferometer
Interferometer scan speed:	8 velocities standard 1.6 - 80 kHz (1.0 - 50 mm/s opd). Optional 12 velocities 1.6 - 160 kHz (1.0 - 100 mm/s opd)
Rapid-Scan:	20 spectra/s @ 8 cm^{-1} spectral resolution
Rapid-Scan option:	> 70 spectra/s @ 16 cm^{-1} or 50 spectra/s @ 8 cm^{-1} spectral resolution
Step-Scan option:	Time resolved step-scan, amplitude & phase modulation spectroscopy Temporal resolution of 6 μs with internal ADC and down to 2.5/4 ns with dual channel 14 bit transient recorder, fast detector and preamplifier
Slow-Scan option:	Continuously variable scanner velocity down to 100 Hz (0.0063 cm/s opd)
A/D converter:	True 24-bit dynamic range for all scan velocities, dual channel data acquisition
Validation:	Internal validation unit, 8 positions, certified standards optional
Aperture wheel:	12 positions, fixed diameters from 250 μm to 8 mm; customized positions optional
Optics bench:	Sealed & desiccated, or purgeable. Electronically coded windows w. magnetic mount.
Flexibility & automation opt.:	Right hand side Transit™ channel for fast and easy mid IR transmittance Up to 7 internal software selectable detectors (5x MultiTect™, 1x DigiTect™, 1x Transit™), external bolometer adaption, 2 add. connectors for external detectors, sample compartment detector for dedicated accessories (e.g. integration sphere) 2 internal source positions, software selectable 2 software selectable input ports, through internal aperture wheel & validation unit 3 software selectable output ports, fourth port available on request Automated 5 position attenuator wheel for high sensitivity detectors Automatic sample compartment shutters
Sample compartment:	25.5 cm (W) x 27 cm (D) x 22.5 cm (H)
Spectrometer size:	68 cm (W) x 76 cm (D) x 32 cm (H)
Weight:	approx. 65 kg (basic configuration)
Spectrometer power:	100 - 240 VAC, 50 - 60Hz, typical approx. 100 W (without data system)
Computer interface:	Industry standard ethernet connection, TCP/IP protocol
Spectroscopy software:	OPUS easy to use, fully GLP and 21 CFR part 11 compliant software with various available dedicated software packages
Touch panel option:	Integrated adjustable touch panel with intuitive OPUS-TOUCH software

Sample Compartment Accessories

- Comprehensive selection of ATR accessories: Micro ATR with Ge, ZnSe and diamond crystals; Horizontal multiple reflection ATR; Wafer ATR
- Specular reflectance with variable or fixed angle of incidence
- Diffuse reflectance (e.g. integrating spheres)
- Various transmittance accessories: Focused or parallel beam; Beam condensers; Horizontal transmittance
- Liquid cells, demountable and fixed
- Gas cells: variable and fixed path length
- Automated sample changer wheel
- Electrochemistry cell adaption
- Cryostats: LN₂, LHe or closed cycle cooling
- Photoacoustic cell
- And many more: Virtually all commercially available sampling accessories are adaptable to the sample compartment.

External Accessories & Modules

- HYPERION series FTIR microscope
- Micro and macro FPA imaging technology
- RAM II FT-Raman and PL II photoluminescence module
- TGA-FTIR coupling
- PMA 50, Polarization Modulation Accessory for VCD and PM-IRRAS
- External sample compartment (left or right)
- Fiber optic coupling unit with fiber probe for solids and liquids
- External integrating spheres
- Liquid auto sampler
- HTS-XT, High Throughput Screening eXTension
- Variable external sample chamber for customized experiments
- Air water reflection unit
- And many more

Technologies used are protected by one or more of the following patents:
US 7034944

Bruker Optics is ISO 9001
and ISO 13485 certified.
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● Bruker Optics Inc.

Bruker Optik GmbH

Bruker Shanghai Ltd.

Billerica, MA · USA
Phone +1 (978) 439-9899
Fax +1 (978) 663-9177
info.bopt.us@bruker.com

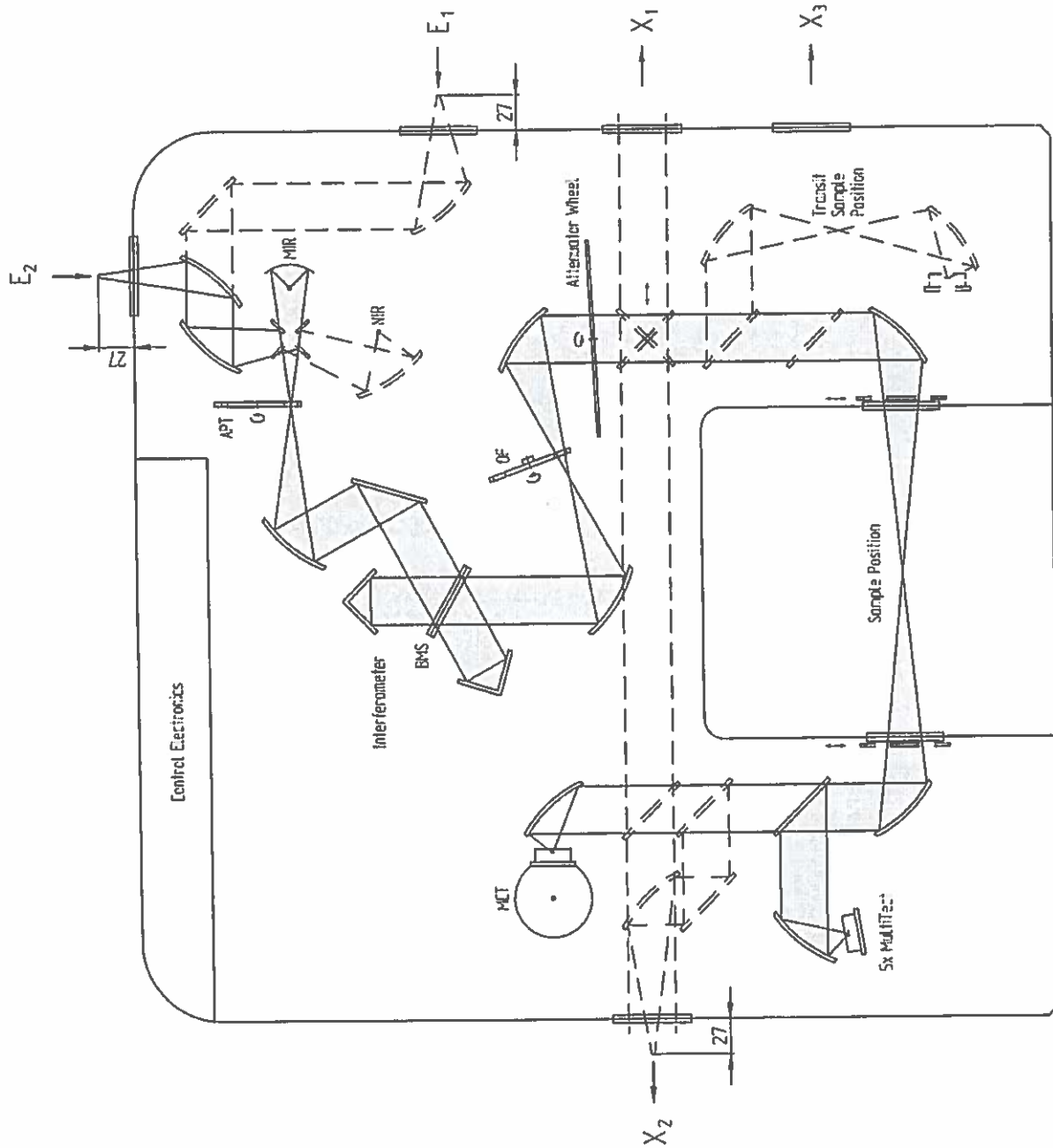
Ettlingen · Germany
Phone +49 (7243) 504-2000
Fax +49 (7243) 504-2050
info.bopt.de@bruker.com

Shanghai · China
Phone +86 21 51720-800
Fax +86 21 51720-899
info.bopt.cn@bruker.com

ALLEGATO 2 - INVENIO-R OPTICAL DIAGRAM

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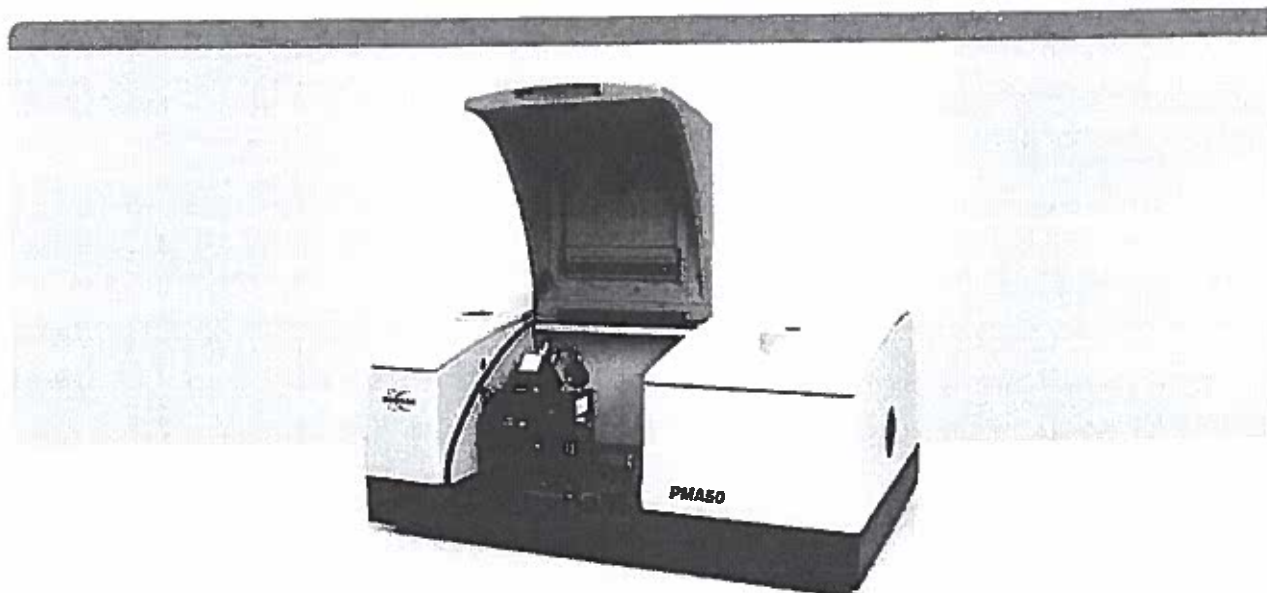
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 Optical Diagram

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• PMA50 External Polarization Modulation Accessory

Specifications

The PMA50 module for polarization modulation is designed for a variety of different techniques such as PM-IRRAS, VLD (Vibrational Linear Dichroism) and VCD (Vibrational Circular Dichroism). The standard PMA50 module allows for PM-IRRAS experiments with angles of incidence between 70 and 89°. Optionally a large module PMA50XL is available with corresponding angles between 32.5° and 89°.

Design	PMA50 module is coupled to the right hand side of a TENSOR or VERTEX series FT-IR spectrometer, its optics housing is purgeable
Electronics	Specially adapted double modulation electronics integrated into the PMA50 module allows easy operation
Data acquisition	Parallel dual channel data acquisition technique (DigiTect™) with 24 bit dynamic range provides simultaneous acquisition of sum and difference signals
Demodulation Technique	integrated synchronous demodulator in the electronic units of the basic spectrometers provides state of the art demodulation technology
Spectral range	Broad spectral range depending on configuration. The basic configuration covers 8000 - 750 cm ⁻¹ which is limited by PEM and/or polarizer efficiency only

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Spectral resolution	depending on configuration of the basic FT-IR spectrometer, continuously variable		
Photo Elastic Modulator (PEM)	ZnSe, 42 kHz nominal frequency, useful aperture diameter 16.7 mm (is specified to indicate the aperture for which any point in the aperture field will have >90% of the maximum retardation), more details available on request		
Polarizers	KRS-5 rotatable linear polarizer (Tmax 75%, typical Extinction ratio 375 @1000 cm ⁻¹), additional substrate materials available optionally		
Optical filters	user exchangeable filter holder for selecting desired spectral range, several optical filters available		
Focusing optics	ZnSe lens for non-polarizing beam focusing onto detector element		
Data evaluation	specially designed operation and evaluation surface within standard OPUS package		
Module Size and Weight:	PMA50	67 (W) x 46 (D) x 27 (H) cm,	35 kg
	PMA50XL	67 (W) x 74 (D) x 35 (H) cm,	60 kg

Dedicated VCD Specification:

A deviation of the baseline by $\pm 3 \times 10^{-5}$ ΔAU with respect to the zero-line in the range of 1800-900 cm⁻¹ is achievable in combination with liquid cell A145 (adjusted to 50 μm thickness) and BaF₂ windows and CCl₄ only.

A peak-to-peak noise without any accessory at the sample position of better than 2×10^{-5} ΔAU is provided, for 2 x 10 min averaging.

The quality of VCD spectra is checked on Camphor spectra (both enantiomers solvent corrected, cell thickness 50 μm) by comparison of the relative and absolute intensities for the single spectra as well as in comparison of both spectra in the spectral ranges 1480-1445 cm⁻¹, 1260-1230 cm⁻¹, 945-915 cm⁻¹. Acceptable deviations are ca. $\pm 20\%$.

Optional internal accessories:

- VLD/VCD:
- VCD-Kit for calibration: calibration crystal (quarter-wave plate), KRS-5 rotatable linear polarizer (Tmax %75, typical Extinction ratio 375 @1000 cm⁻¹), optical filter with holder (LWP<1828 cm⁻¹)
 - Liquid cell, demountable, windows (Quartz, ZnSe, AgCl, BaF₂, CaF₂, NaCl, KBr), spacers (0.05, 0.1, 0.13, 0.21 and 1 mm)
 - Liquid cell, demountable, vacuum tight, windows (Quartz, ZnSe, AgBr, CaF₂, NaCl, KBr, KRS-5, CsI, PE), spacers (6, 12, 23, 50, 75, 100, 125, and 250 μm)
 - Heatable sample stage for standard sample holder, maximum temperature 180°C, samples 13 mm in diameter (standard pellet size), smaller samples may be mounted on or sandwiched between IR-transparent discs
 - Variable temperature cell, -190°C to 250°C, for liquids and solids, for liquids: windows (NaCl, KBr, CaF₂, BaF₂, ZnSe), pathlength 0.05, 0.1, 0.2, 0.5 or 1 mm, permanently sealed
- PM-IRRAS:
- Sample holder for PM-IRRAS with vertical sample orientation, sample dimensions up to 33 mm x 75 mm, adjustable, rotatable sample mount

Bruker Optics is ISO 9001 and ISO 13485 certified.

Laser class I product

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

www.bruker.com/optics

Bruker Optics Inc.

Billerica, MA · USA
Phone +1 (978) 439-9899
Fax +1 (978) 663-9177
info.bopt.us@bruker.com

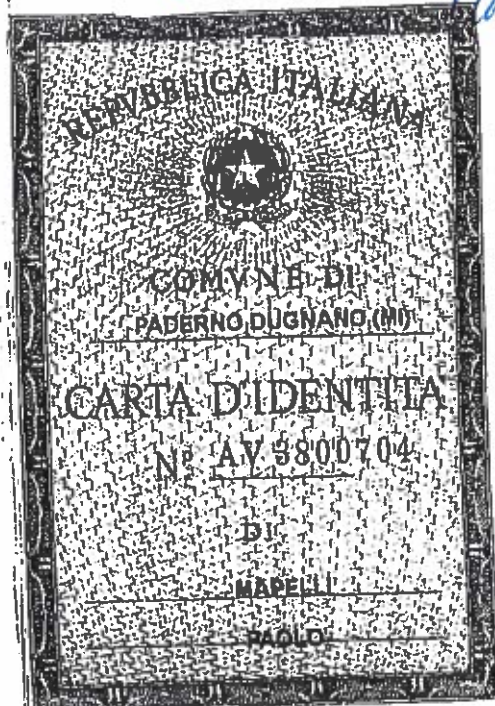
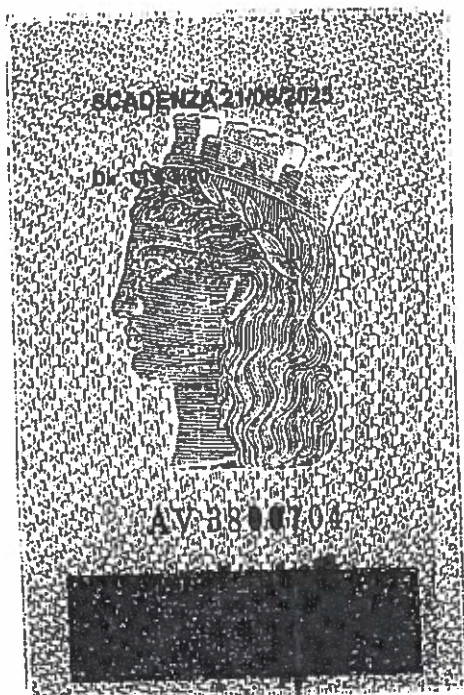
Bruker Optik GmbH

Ettlingen · Germany
Phone +49 (7243) 504-2000
Fax +49 (7243) 504-2050
info.bopt.de@bruker.com

Bruker Shanghai Ltd.

Shanghai · China
Phone +86 21 51720-890
Fax +86 21 51720-899
info.bopt.cn@bruker.com

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Cognome **MAPELLI**
Nome **PAOLO**
nato il **21/08/1963**
(atto n. **2502** **1** **AR5**)
a **MILANO (MI)** (.....)
Cittadinanza **ITALIANA**
Residenza **PADERNO DUGNANO (MI)**
Via **Castelletto n. 49 scala 3 int. 2**
Stato civile
Professione
CONNOTATI E CONTRASSEGNI SALIENTI
Statura **1.85**
Capelli **CASTANI**
Occhi **CASTANI**
Segni particolari



Firma del titolare *Paolo*
PADERNO DUGNANO **19/07/2014**
IL SINDACO
Impronta del dito indice sinistro
D'ORDINE DEL SINDACO
L'UFFICIALE D'ANAGRAFE
DELLA C.A.
(Timbro della C.A. di Paderno Dugnano)