

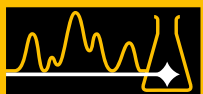
## Process NIR Spectrometers



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Fast, precise, reliable

Product brochure



# Process analytics: universal and efficient



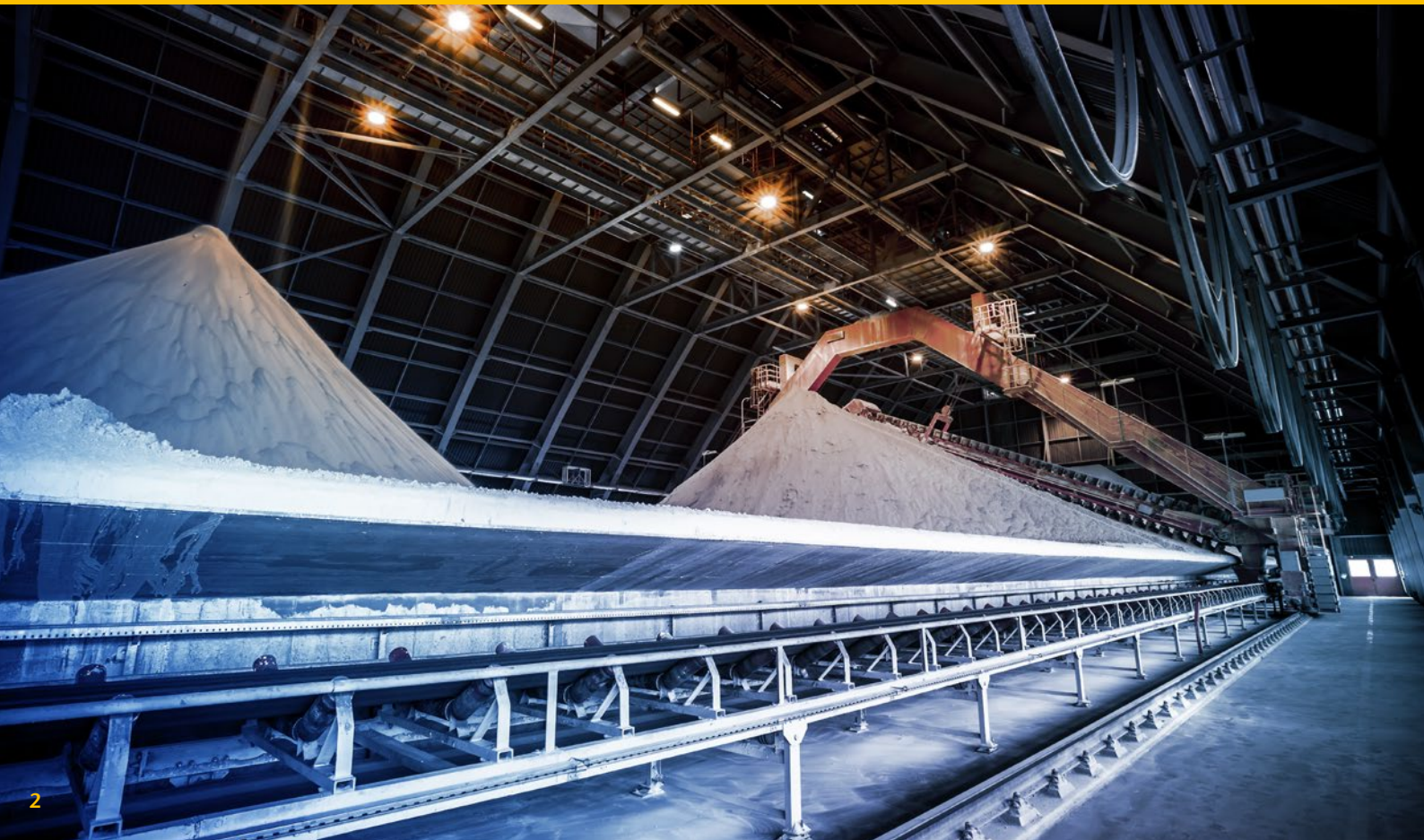
INCOMING GOODS →



PRODUCTION PROCESS →



PRODUCTS





**Polytec Advanced Spektrometer (PAS-System) open up numerous possibilities for economic improvements in production environments: from incoming materials inspection to final product control.**

The decisive advantage of process analytics is the automated real-time control of production processes. In addition to ensuring a consistent product quality, the production process itself can be monitored and optimized. Process analytics enables high-quality, cost-effective, and convenient solutions that provide a fast ROI. The method can be applied at several levels of the production chain: incoming goods inspection, process control and 100% end product classification. Many relevant parameters can be derived from a single measurement. For example, qualitative and quantitative chemical analysis or layer thickness measurements are typical applications.



**Diode array spectroscopy**

Optical spectroscopy is one of the most important and widely used methods in process analytics. Especially when based on diode array technology, it provides reliable results even at high measurement rates.

**Advantages of optical process spectroscopy:**

- Real-time process monitoring and control
- Non-destructive measurement, without sample preparation and waste disposal
- Increased efficiency and cost reduction e.g. through reduction of rejects, down-times, optimized cleaning cycles, lower laboratory costs, automated documentation
- Statistical evaluation of the measurement series and trend chart analysis
- Proven technology in agriculture, food, chemistry and pharmaceutical environment



The system concept:  
modular for any demand

As a manufacturer of high-quality optical measurement equipment, Polytec offers configurable spectrometer systems allowing optimized solutions for any individual application.



**Modular spectrometer systems:  
designed for flexibility and precision**

PAS-Systems are designed to be flexibly configured to achieve the most advantageous solution for a wide variety of applications. Individual combinations of the most suitable probe, spectrometer and software fulfill the needs of different applications. Each component is standardized in order to ensure high precision and ease of use during process integration. The PAS systems are based on well-proven technology and offer application-specific solutions that are nevertheless safe and easy to integrate.



**Benefits of the modular  
system concept:**

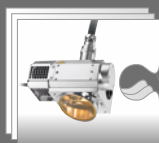
Standardized equipment and software providing

- High flexibility
- Easy integration
- Simplified operation

# The basis: high-quality components

PAS-Systems are manufactured using optical and electronic components specifically developed and manufactured in-house. We know our products down to the smallest screw. Everything is precisely coordinated to achieve high reliability with prompt and highly competent customer support.

## Probes



## Spectrometers



### Sensitive detection: the probes

Appropriate sample presentation is the key to successful system operation. A variety of specialized probes are available to address different sample properties and installation situations.



### Fast, sensitive and precise measurements: the spectrometers

Diode array technology combined with a superior transmission grating design enables the PAS spectrometers to be used for fast and reliable data acquisition. Two optimized spectral ranges and different power supply options are available.





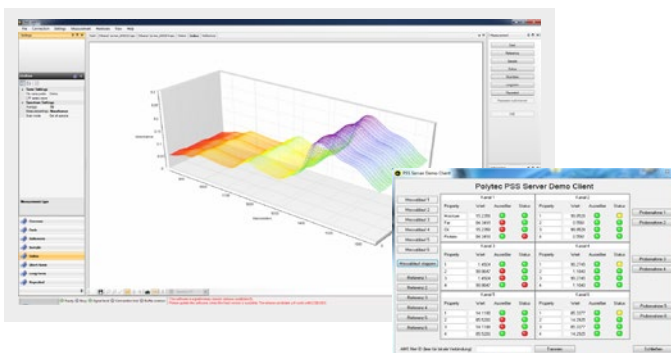
## Software



### Direct, relevant results: the software

Depending on the application, special software solutions are available for data acquisition:

- software platform for laboratory analysis
- multivariate data analysis for method development
- software for proc





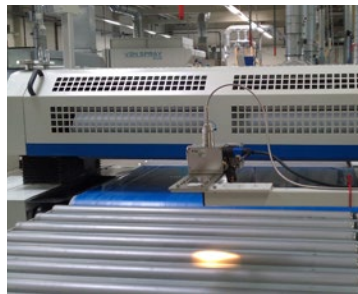
## Probes



Adequate sample presentation is the key to successful system operation. To accommodate different sample properties and installation situations a variety of specialized probes are available.

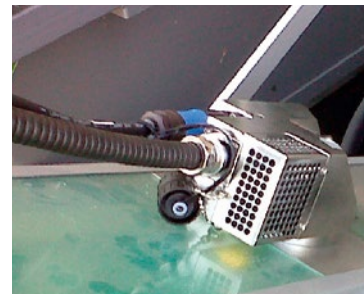


PAS systems for inline quality control can be used for numerous applications in the fields of food production, agriculture, chemical and plastics industries.



### Typical applications:

- Solids (e.g. bulk goods, powders, endless lanes)
- Fluids (e.g. liquids, suspensions, dispersions or paste-like media)



Our probes are designed specifically for industrial applications and meet demanding requirements. They are resistant to dust, humidity, pressure and temperature.

Compliance with common production and safety regulations, e.g., for use in food industry or in explosion protection zones is another important feature.





### Non-contact probe PAS-H-A03

Reflection probe for measurements over large distances (conveyor belts, endless webs, etc.)

Combined illumination and sensor unit for distances varying from 100 to 500 mm.

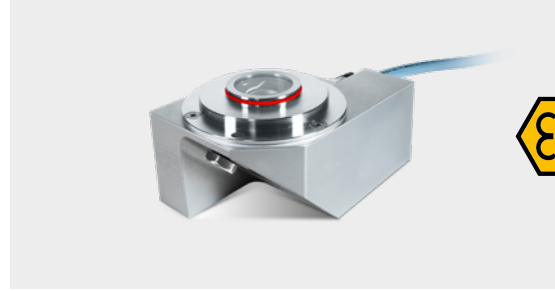
- Fully automated system calibration
- 20 mm measurement spot size
- Integrated 20 W tungsten-halogen light source for sample illumination
- SMA 905 optical fiber connection
- Industrial protection class IP64
- Housing made of stainless steel or anodized aluminum



### Immersible probes

For measurements in liquids and other fluid samples, Polytec's reflection immersible probe is the right choice.


- Robust stainless steel design with sapphire window
- Special „9 around 1“ fiber configuration for superior S/N
- Variable flanges for convenient installation



### Contact probe PAS-H-B04

Reflection probe for measurements over short distances or in direct contact with the sample (tubes, chutes, funnels, etc.)

Combined illumination and sensor unit for distances varying from 0 to 50 mm.

- Fully automated system calibration
- Integrated 10 W tungsten-halogen light source for sample illumination
- Compliant with food laws, ATEX and IECEx 
- SMA 905 optical fiber connection
- Industrial protection class IP66 / IP68
- Housing made of stainless steel or anodized aluminum with sapphire window
- Different flanges and adaptation interfaces



### Adjustable probes

Probes for measurements in transmission (e.g. liquids) and reflection (e.g. solids) with housings made of steel or aluminum.

- Adjustable spot diameter and distance
- Achromatic optics with AR coating
- Suited for high environmental temperatures (<280 °C)
- SMA 905 optical fiber connection
- Integrated light source in spectrometer, optionally with external light source configurable.



# Spectrometers



**Precision spectrometers designed to cover your required spectral ranges: reliable in-process and laboratory measurements**



PAS spectrometers offer an optimal solution for NIR process analytics. Based on diode array technology combined with superior transmission grating design, PAS spectrometers are used for fast and reliable data acquisition. The use of fiber coupled probes enables flexible integration in various measurement scenarios.

#### Features:

- Standardized spectral ranges
- Innovative transmission grating design
- High measurement rate
- Superior sensitivity and long term stability
- Uniform optical resolution at the theoretical limit
- Actively cooled diode array for optimum signal-to-noise ratio
- Extremely low scattered light levels
- SMA 905 fiber connectors
- Ethernet interface

Model	Range	Detector	Pixels	Resolution	Housing
PAS-2121 NIR Spektrometer	1100 to 2100 nm	InGaAs	256	< 8.0 nm	1/2 19 Zoll
PAS-2120 NIR Spektrometer	1100 to 2100 nm	InGaAs	256	< 8.0 nm	19 Zoll
PAS-1751 NIR Spektrometer	850 – 1650 nm	InGaAs	512	< 4.0 nm	1/2 19 Zoll
PAS-1721 NIR Spektrometer	850 – 1650 nm	InGaAs	256	< 7.0 nm	1/2 19 Zoll
PAS-1720 NIR Spektrometer	850 – 1650 nm	InGaAs	256	< 7.0 nm	19 Zoll

### Housing and power supply

The PAS systems are available with an internal voltage input (+12 VDC and +24 VDC) for industrial cabinets. An external power supply with an input voltage range between 100 V and 240 V is available and thus offers ideal conditions for mobile applications.

### PSS-M Polychromators

The core component of our NIR spectrometer systems is the PSS-M Polychromator, developed and manufactured in-house. It is a perfect match for many OEM requirements and comes with outstanding engineering support.

#### Features:

- Transmission design setup for maximum sensitivity and extremely low scattered light
- Integrated shutter for dark signal measurement
- Uniform optical resolution at the theoretical limit
- Pre-aligned and supplied with wavelength calibration data ( $\Delta \lambda < 0.5 \text{ nm}$ )
- Prepared for use with various sensor electronics

#### Benefits:

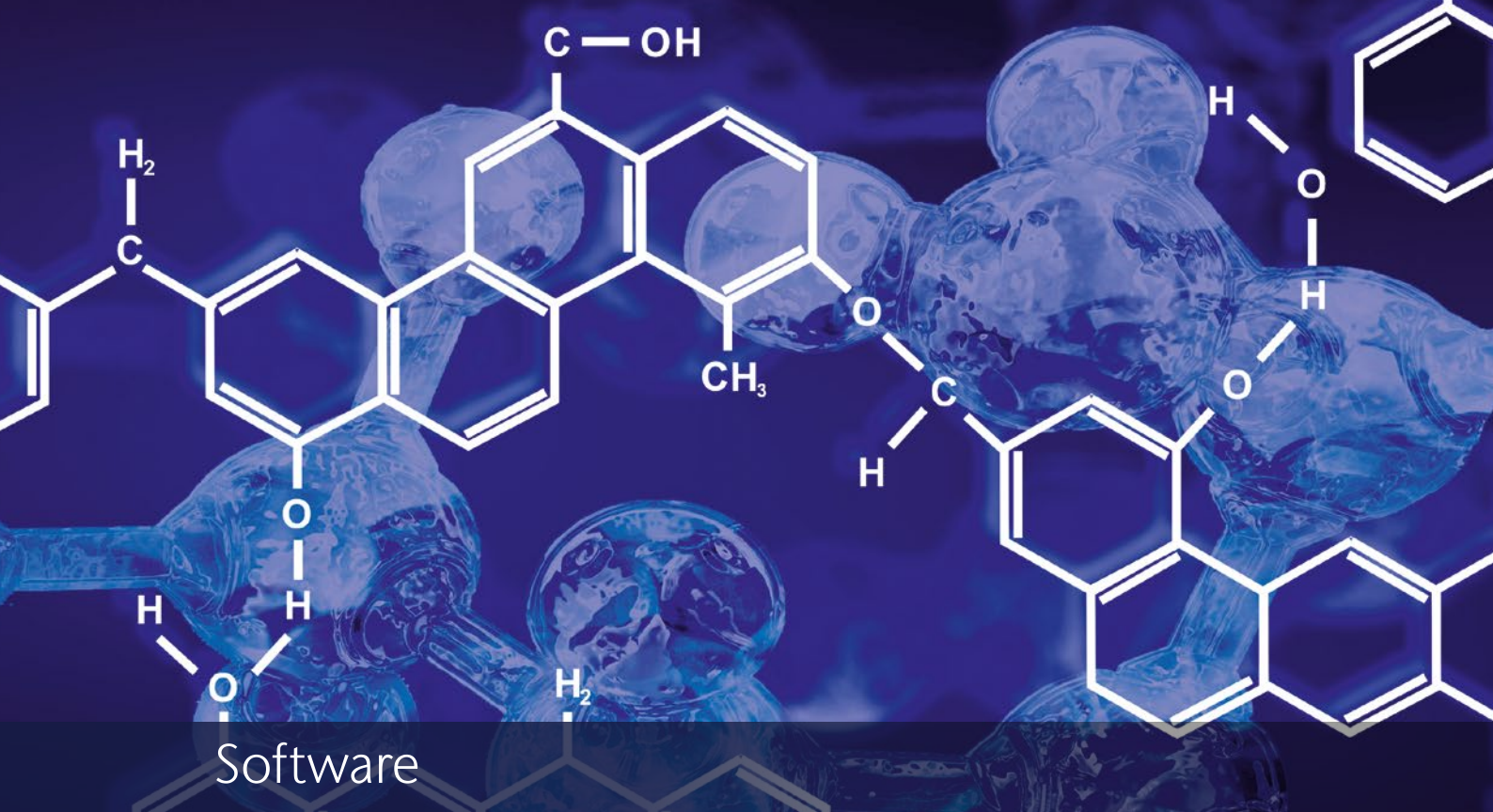
- Superior sensitivity for short integration times and high spectra rates
- Tightly specified wavelength ranges
- Ideal for calibration transfer
- SMA connection for standard fibers
- Convenient electrical and mechanical integration



### Customized solutions

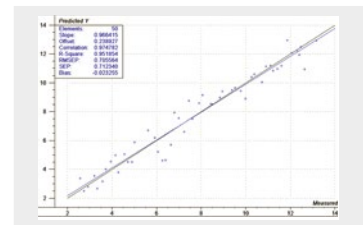
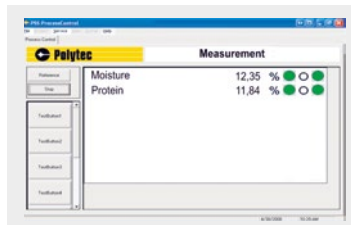
Polytec provides customized OEM solutions for system suppliers with special needs regarding quality or price. These solutions are widely used in process, laboratory, or handheld applications.

- Optical design (spectral range, optical resolution, sensitivity etc.)
- Mechanical and electronic integration development
- Serial production

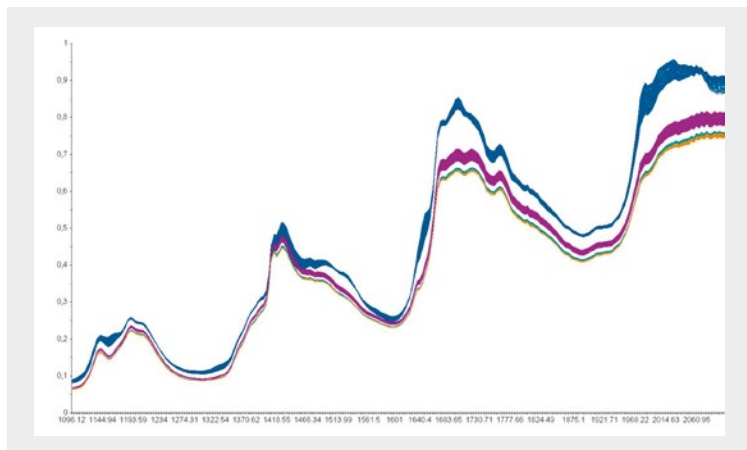


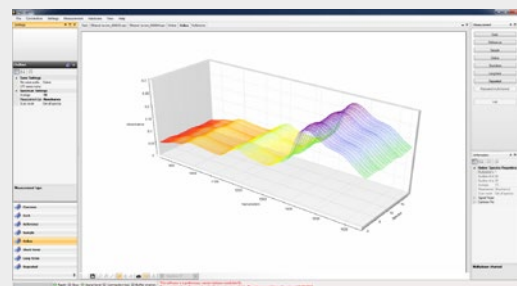
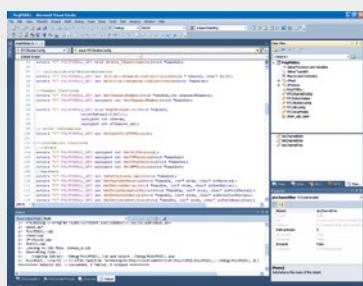
Depending on your needs, we have dedicated software solutions for laboratory data acquisition, multivariate data analysis and process control.

Laboratory and industrial applications differ depending on the typical measurement and output tasks required. For data acquisition in the laboratory, our software packages offer extensive measurement for fast and efficient data acquisition.



For industrial inline applications we offer configurable solutions covering the specific measurement setup all the way up to communication with the process control system. Our software portfolio is completed by a range of compatible packages from well established multivariate data analysis providers.





## PAS-S-DRV

PAS-S-DRV provides several possibilities for hardware driver implementation into your own software.

### Features:

- .NET driver for basic device access
- The driver interface supports: Polytec spectrometer systems and spectrometer simulation as well as Polytec multiplexers and sensor heads with integrated reference

## PAS SERVER

The PAS SERVER software package is used for routine online analysis in process environments.

### Features:

- Fully automated system operation
- Various user interfaces (clients or via PLC)
- Sophisticated data pretreatment
- Online chemometric predictions
- Warning and alarm thresholds
- Supports numerous analog and digital PLC interfaces

## PAS LABS

Laboratory software PAS LABS is suitable for spectroscopic purposes. It offers automated system operations and easy data acquisition.

### Features:

- Enhanced system operation with preconfigured measurement routines
- Easy data storage for subsequent chemometric method development
- Determination of thin film layer thickness

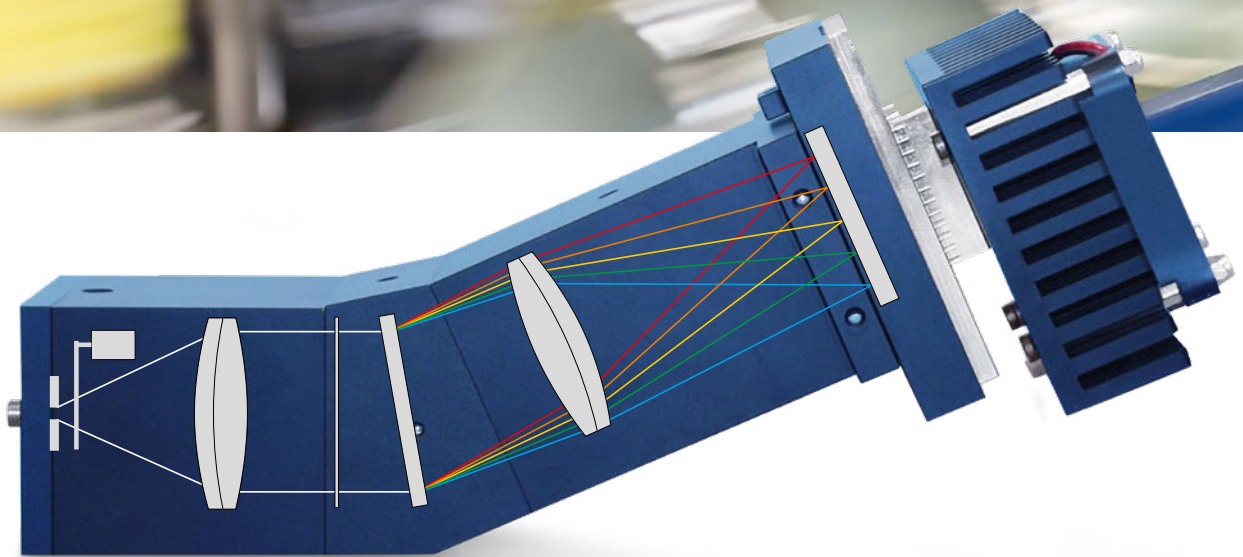
## Multivariate data analysis for laboratory and process spectroscopy

PAS-Systems are fully compatible with standard chemometric software packages for convenient multivariate data analysis of spectroscopic measurements. These packages can be successfully used for chemometric method development as well as for online predictions in process analytics.

The Polytec spectrometer software is compatible with the following chemometric software packages of external partners:

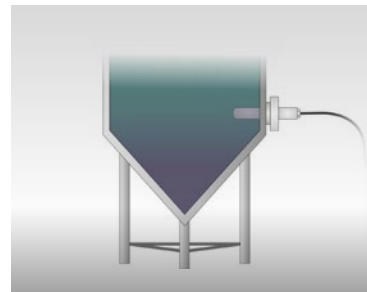
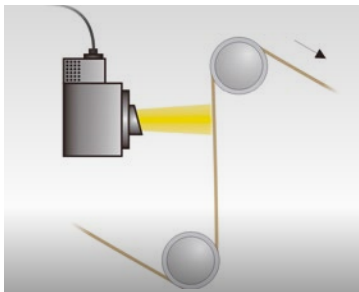
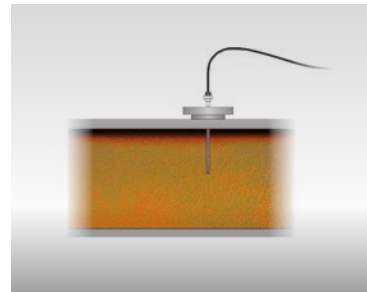
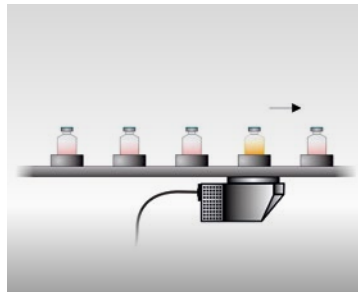
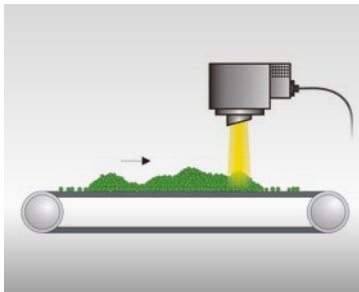
- Camo (Unscrambler® X)
- SensoLogic (Calibration Wizard)
- Umetrics (Simca)
- Matlab
- Python
- CRAN R-Project





## Diode array spectroscopy: versatile and robust


The core component of our NIR spectrometer system is the PSS polychromator. This assembly combines advanced diode array and 3D transmission grating technology. The advantage of this technology is an optimized light throughput resulting from the higher regularity of VPH gratings (Volume Phase Holographic Gratings). The grating structure is additionally provided with an anti-reflective coating which increases the efficiency and thus enables a higher temporal resolution. The PSS polychromator is thus less sensitive to temperature fluctuations and vibrations.



**Non-contact probes**

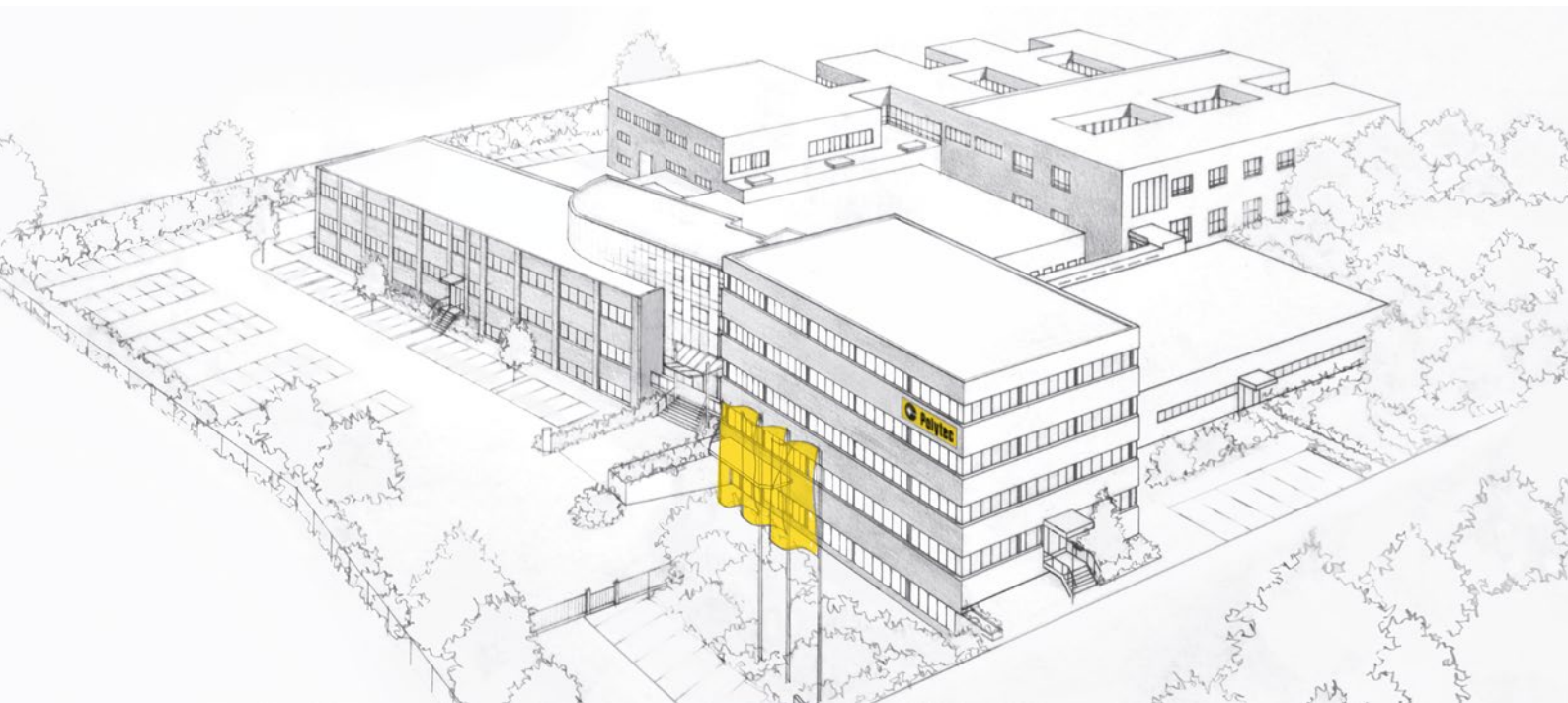
Non-contact inline control of paper and textile webs or solid materials such as bulk goods on conveyor belts or chutes.

**Contact probes**

Contact measurements of powders and solutions such as liquids, dispersions and pasty media. 

**Immersible probes**

Direct inline analytics of liquids in e.g. bio-reactors, pipelines or vessels.



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