

NIR Spectroscopy for Routine and Process Analytics

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Company

Polytec is an established manufacturer of optical measurement technology solutions

Founded in 1967, Waldbronn, Germany

Today: more than 450 employees worldwide

Main technological fields:

- Vibrometry
- Velocimetry
- 3D Surface Metrology
- **Process Analytics**
- Image Processing
- other optical systems

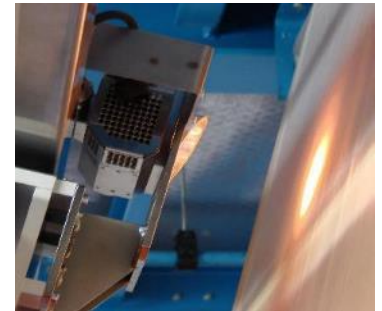


Polytec Process Analytics

NIR-Spectrometer-Systems for Routine-Analytics and Industrial Quality Control

Fast, precise and robust instrumentation for real-time 24/7 chemical analysis of materials

Industry proven technology: successful implementation since 20 years



NIR-Spectroscopy has several advantages compared to conventional lab analytics:

- No sample preparation / no chemicals
- Non destructive, non-invasive
- Real-time / on site measurements
- Representative: all the samples are measured, not just a small fraction
- Better/quicker decisions due to all data immediate availability



Polytec Spectrometer Systems

Configurable fiber-coupled spectrometer systems from standardized equipment and software packages allow optimized solutions for any individual application.

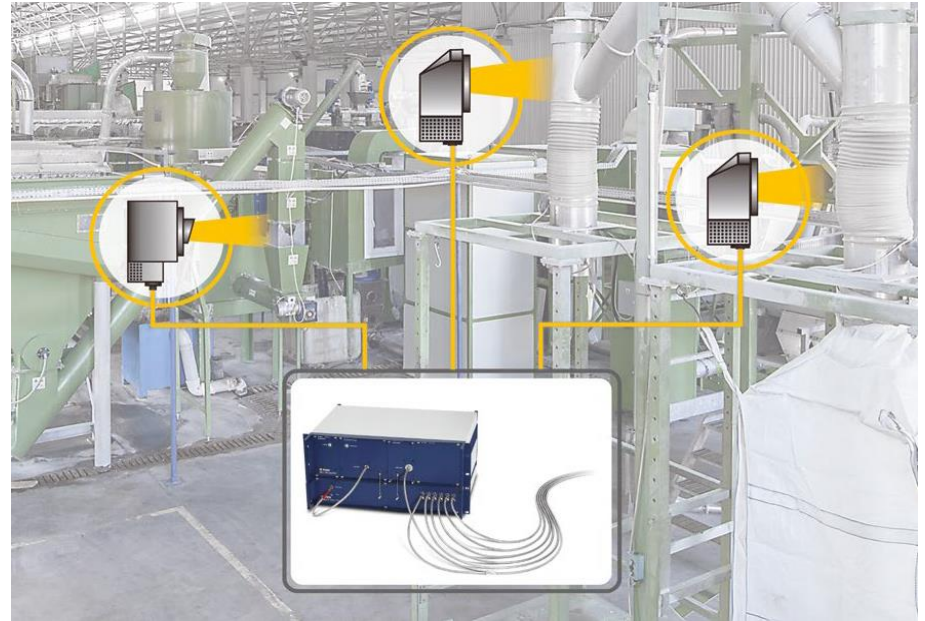


Benefits of the modular system concept

- High flexibility
- Easy integration
- Simplified operation

Further Advantages – Fiber Coupled Sensors

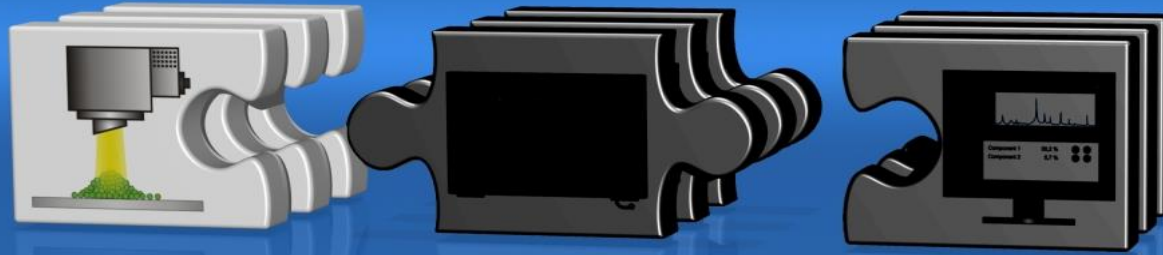
- Compact sensor size (ATEX also) 
- Robust design
- Easy and economical integration of multiple measurement points (up to 6) with one spectrometer
- Installation at remote locations
- Optimal sample presentation





Adequate sample presentation is the key to successful system operation.

To accommodate different sample properties and installation situations a variety of specialized fiber coupled sensor heads and immersible probes is available.



Sensor Heads

Measuring Heads and Probes

- Contact Sensor Heads
- Distance Sensor Head
- Flow Cell

Contact Sensor Heads



Reflection sensor head 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. Various mounting flanges available.

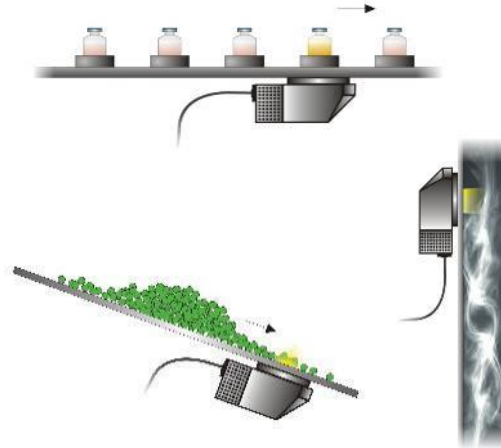


- Fully automated system calibration
- Adjustable measurement spot size (1 mm – 20 mm)
- Integrated 20 W (10 W) tungsten-halogen light source
- SMA 905 optical fiber connection
- Industrial protection class IP64/IP68
- Stainless steel housing with sapphire window

Contact Sensor Heads



Contact sensor heads are dedicated for both laboratory and process applications.

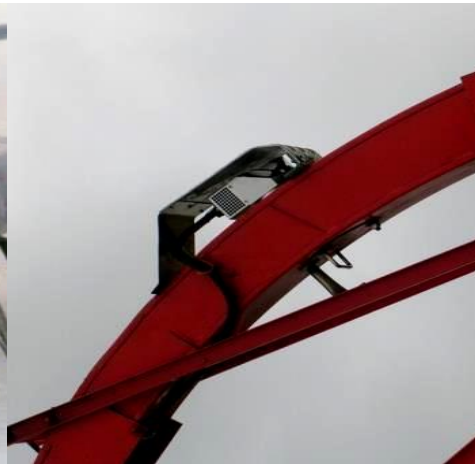


Measurements on

- Tubes
- Chutes
- Funnels
- etc.

Contact Sensor Heads

By using various adapters and flanges easy installation in various process applications is realized.



Distance Sensor Head

Reflection sensor head for measurements over large distances (conveyor belts, web applications, etc.)

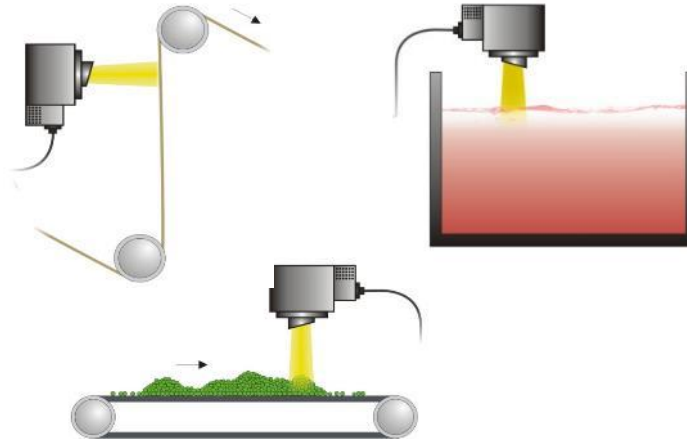
Combined illumination and sensor unit for non-contact measurements at standoff distances varying from 100 to 500 mm.



- Fully automated system calibration
- Adjustable measurement spot size (1 mm – 20 mm)
- Integrated 20 W tungsten-halogen light source
- SMA 905 optical fiber connection
- Industrial protection class IP64
- Stainless steel (opt. Al) housing

Distance Sensor Head

Distance sensor heads are dedicated for both laboratory and process applications.

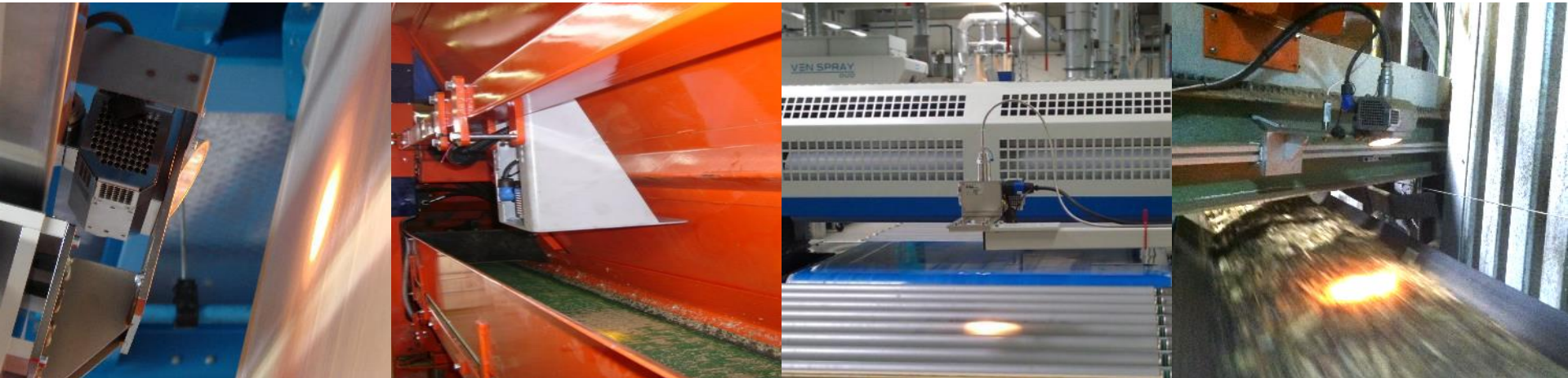


Measurements on

- Conveyor belts
- Reservoirs
- Webs (converting industry)
- etc.

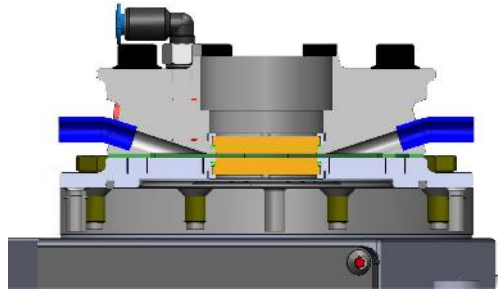
Distance Sensor Head

Easy installation in various non-contact process applications is realized.



Flow Cell

For measurements of liquids and other fluid samples, transfectance flow cell, compatible with contact sensor head, is the right choice.



- Robust stainless steel design with sapphire window
- Customized optical pathlength 1-5mm
- Measurement spot diameter 2cm
- Optional temperature-stabilization-circuit (air, fluid)
- Easy installation and operation

NIR Spectrometers

Fast, precise and robust spectrometers are designed to cover required spectral ranges:
Reliable in-process and laboratory measurements



Spectrometers

Spectrometers

- Innovative 3D transmission grating design
- High measurement rate
- Superior sensitivity and long term stability
- Uniform optical resolution at the theoretical limit
- Extremely low scattered light levels

NIR Spectrometers (PAS-Series)

High measurement rates and short measurement times

NIR spectrometers are available with:

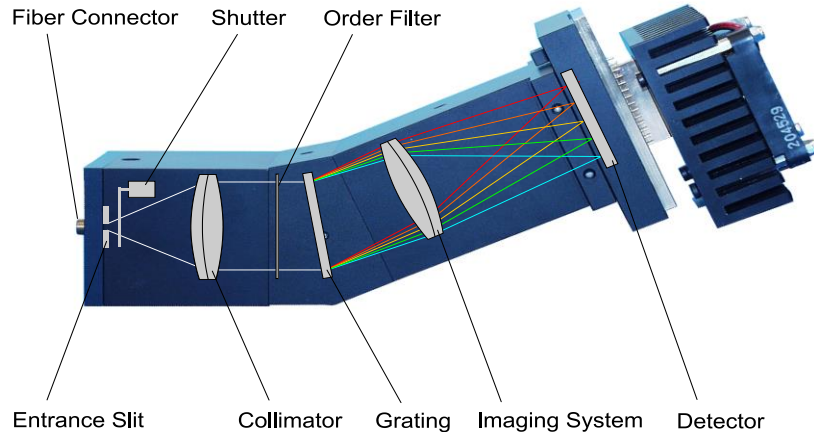
- 19" plug-in industrial rack or table-top housing
- ½ 19" housing



- Standardized spectral ranges 850 - 1650 nm and 1100 - 2100 nm
- Integrated shutter for dark signal measurement
- SMA 905 fiber connectors
- Ethernet interface
- Operating voltage 12-24V DC

Technology: Polychromator

The core component of NIR spectrometers is robust high-end polychromator, developed and manufactured in-house.



- Transmission design setup for maximum sensitivity and extremely low scattered light (contrast ratio > 1 : 50.000)
- VPH grating with diode array
- Diffraction limited optics
- Integrated shutter for dark signal measurement

Depending on individual needs, dedicated software solutions for laboratory data acquisition, multivariate data analysis and real-time process control are available.

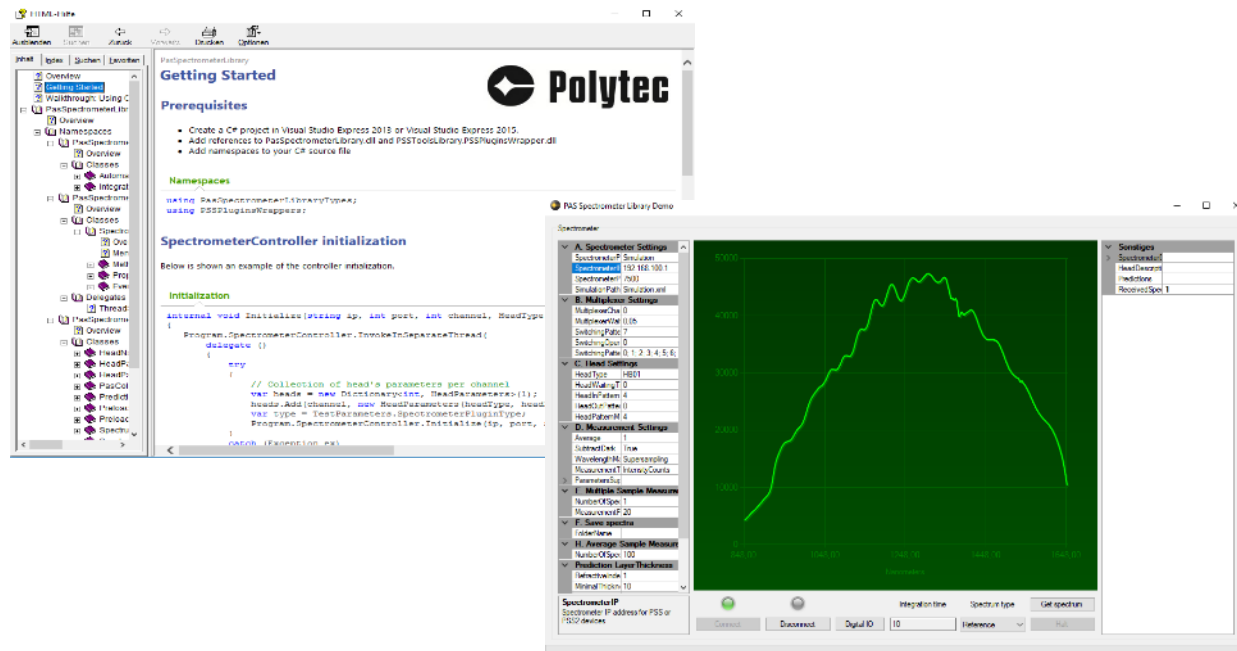


Software

- Hardware drivers
- Laboratory software
- Real-time process control software
- Multivariate data analysis

Hardware Driver PAS-S-DRV

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

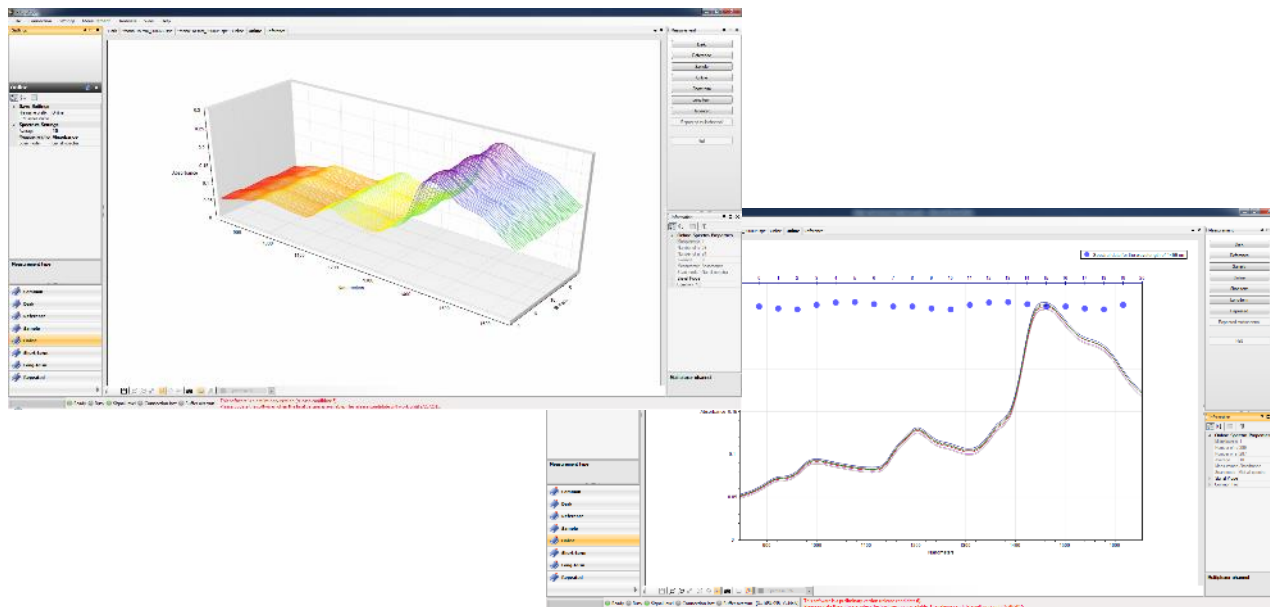


- .NET-Assembly (.NET Framework 4.5)
- Spectra storage in ASCII, SPC und CPF formats
- Documentation of the driver package
- C#-Example Program that covers complete functionality of the driver package

Laboratory Software PAS-S-LABS



Laboratory software PAS-LABS is dedicated for spectroscopic measurements. It offers easy spectrometer control, fast data acquisition and clear measurement results graphical visualization.



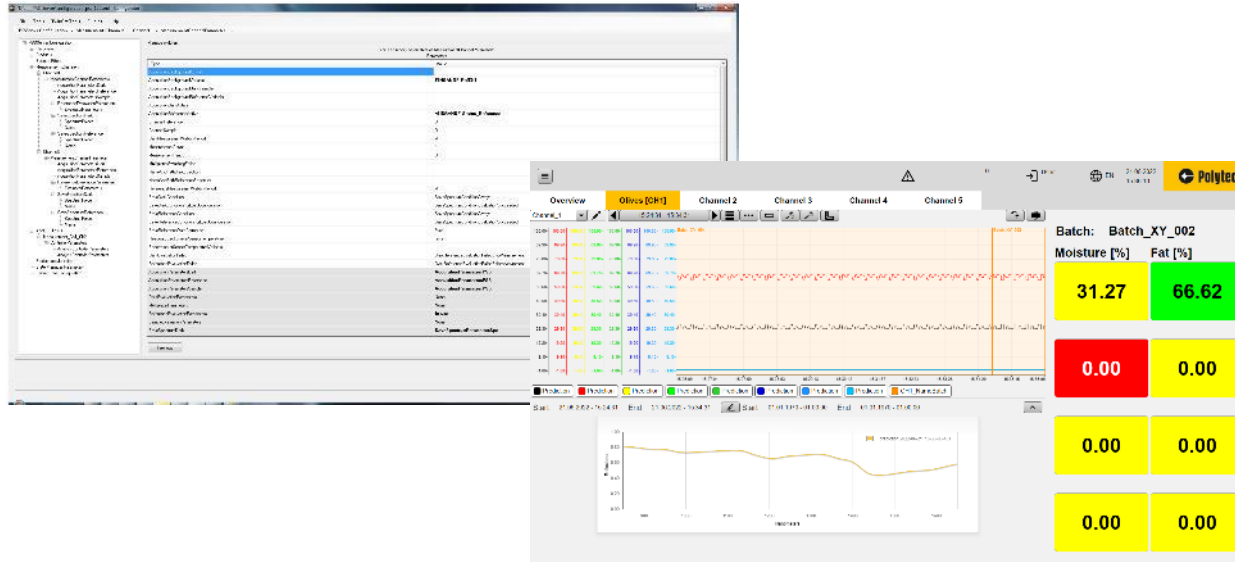
Features

- Manual and automated spectra acquisition
- 2D and 3D graphical spectra visualization
- Control of multichannel systems
- Multiple data saving formats (.spc, .cpf and ASCII)

Process Software: PAS-S-SERV

Real-time process software with a distributed application structure (client-server architecture).

Modern server software for measurement process control.

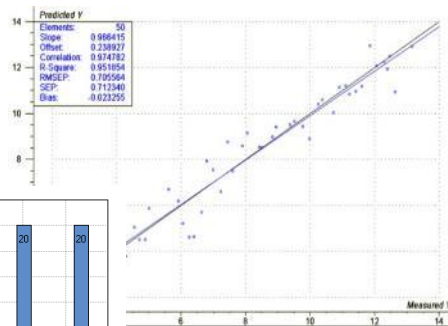
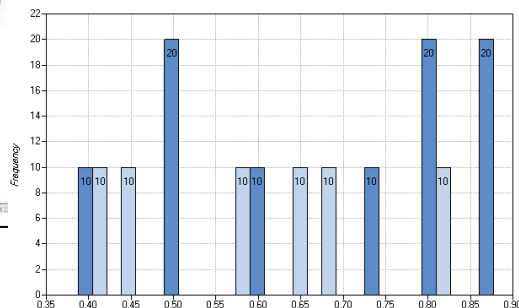
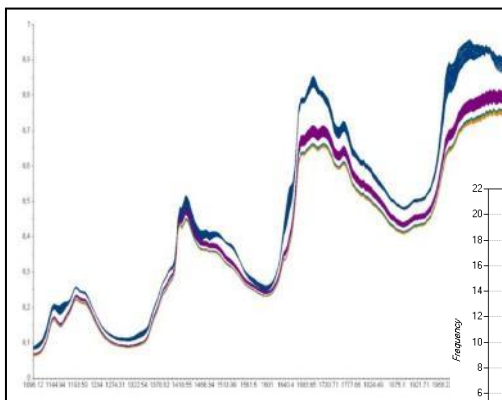


Server Software Features

- Fully automated system operation
- Variety of hardware interfaces to/from the process control system (e.g. fieldbus systems)
- Web browser (Chrome, Firefox, MS Edge) based GUI
- Server- Client (GUI) communication via MODBUS

MVA for Lab and Process Spectroscopy

Polytec spectrometer systems are fully compatible with various 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.



We offer chemometric software packages from our partners

- Calibration Workshop (SensoLogic)
- Simca (Umetrics)
- The Unscrambler (Camo)

Interfaces



Spectrometer systems are compatible with an extensive range of fieldbus components within industrial network systems for real-time distributed control.



Interfaces

- Profibus
- Ethernet
- Modbus (TCP, RTU)
- OPC-DA
- analog: e.g. 0-10V, 4-20mA
- etc.

Polytec offers direct and competent customer service:

- Solution-oriented consulting
- Feasibility studies
- Measurements on site
- Installation & Commissioning
- Support in application and calibration
- Training and seminars
- Tailored support – Regular maintenance
(Maintenance contracts)
- Repairs



Applications

Applications



Agriculture



Food & Beverage



Feed



Biotechnology



Chemical industry



Polymers and Plastics



Pharma



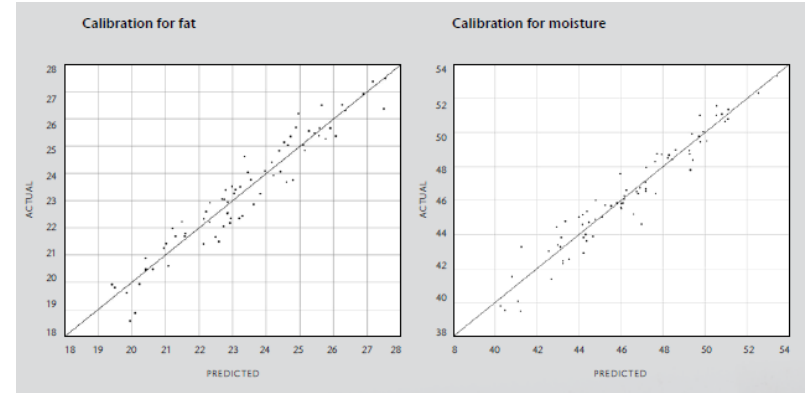
Wood, pulp and paper

Olive Oil Processing: QC of Whole Olives



Olive Oil Processing: Whole Olives

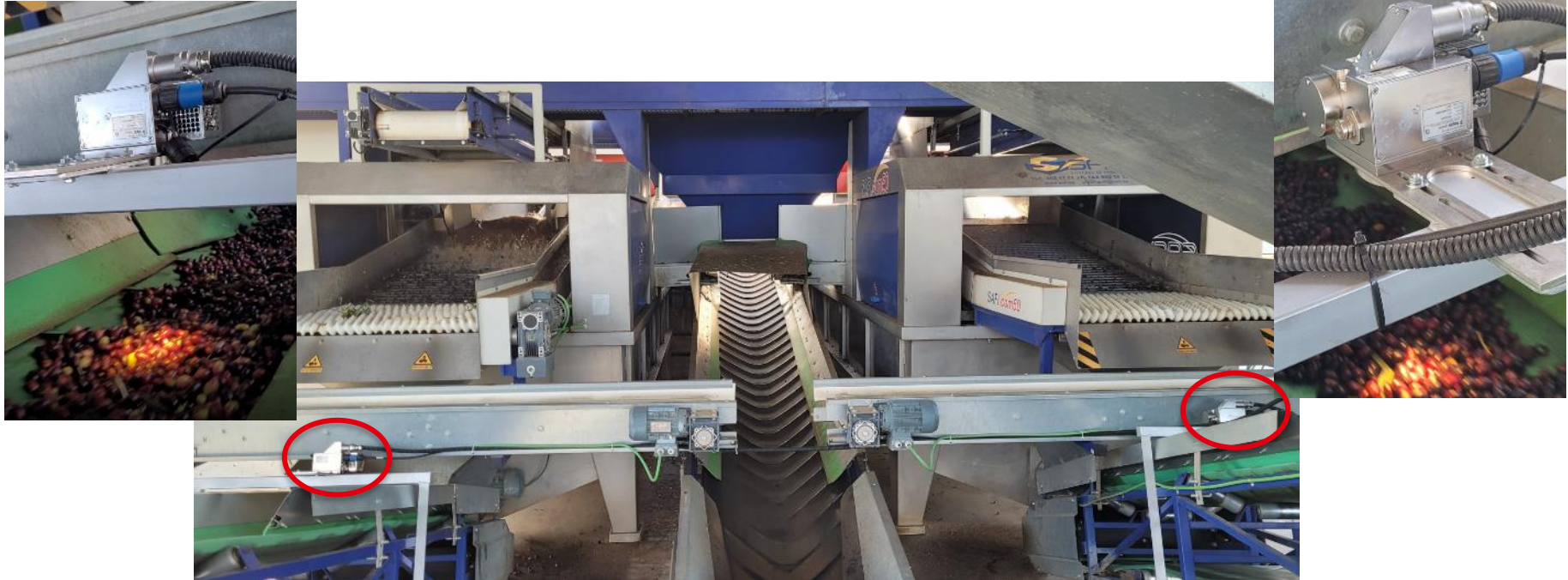
Real time quality control of incoming whole olives. Measurements of moisture and fat.



Parameter	Min (%)	Max (%)	RMSECV
Fat	18.06	28.13	1.39
Moisture	37.91	53.34	1.18

Olive Oil Processing: Whole Olives

Real time quality control of incoming whole olives. Measurements of moisture and fat with two channel NIRS system.



Olive Oil Processing: Press Cake

Real time quality control of the press cake for moisture and fat after the decanter



Olive Oil Processing: Olive Oil

Real time quality control of the olive oil for moisture, fat, acidity, etc. in the bypass before storage



Dairy Industry: Milk, Mayonese, Cheese, etc.

Real time quality control of various products and processes: measurements of fat, protein, lactose, FFDM, etc.



NIRS in minced meat production

Quality control of minced meat for moisture, protein, ash, fat after the mixer



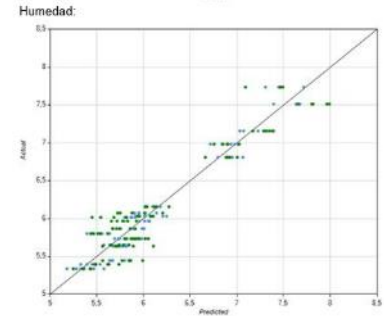
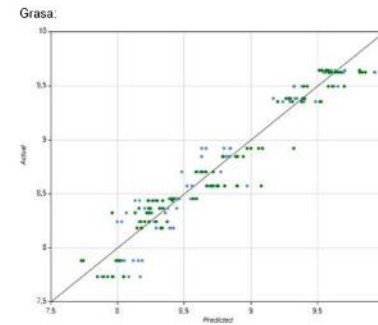
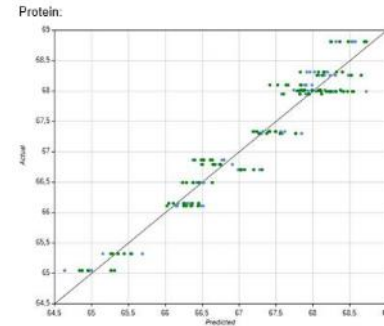
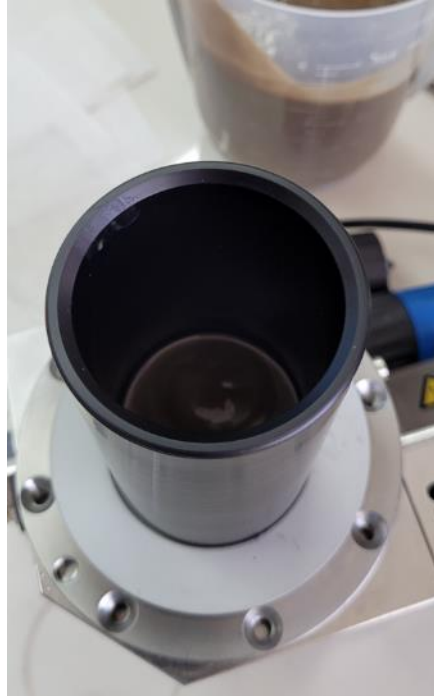
NIRS in brewery applications

Quality control of raw materials (barley, hops, yeast), production processes (malting, mashing, fermentation) and final product.



NIRS in Fish byproduct processing

Quality control measurements on Fishmeal samples

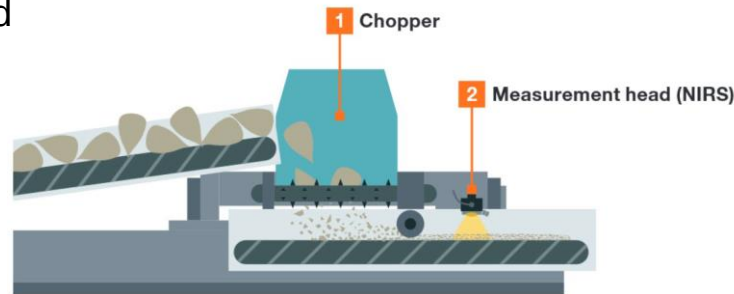


Innovative Beet Quality Analysis System

EXCLUSIVE

Fully-automated analyzer for sugar, dry matter, mark content, etc.

- Sugar Factories
- Beet Pilers
- Mobile Application in Field



Flour (e.g. Wheat) Processing

EXCLUSIVE



Real-time analysis of raw materials and end products

- Moisture 8.0% - 17%
- Protein 11% - 16%
- Ash 0.4% - 0.9%
- Starch damage 8 - 30 UCD
- Wet gluten 20% - 32%
- Water absorption 50% - 70%



NIRS in Agriculture (Seed Breeding)

What can be Measured?

CROP:

Wheat, Barley, Rye, Rapeseed, Corn, Sugar Beets, Beans, Sojabeans, Millet, Rice, Forage, etc.

INGREDIENTS:

Dry Matter, Moisture, Protein, Oil, Ash, Starch, Sugar, Polarization, Amino Acids, Glucosinulates, etc.



NIRS in Agriculture (Seed Breeding)

On-harvester installation



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