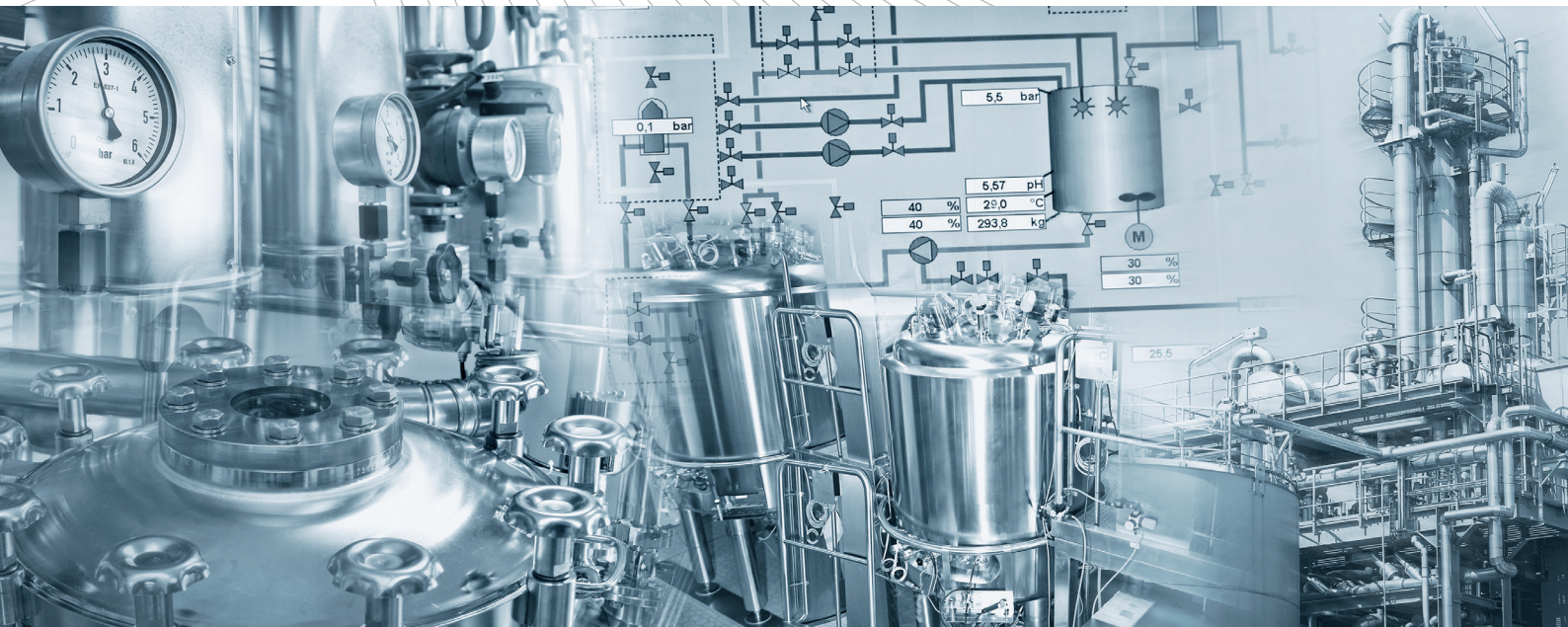


tec5

MEMBER OF THE NYNOMIC GROUP



Process Spectrometers

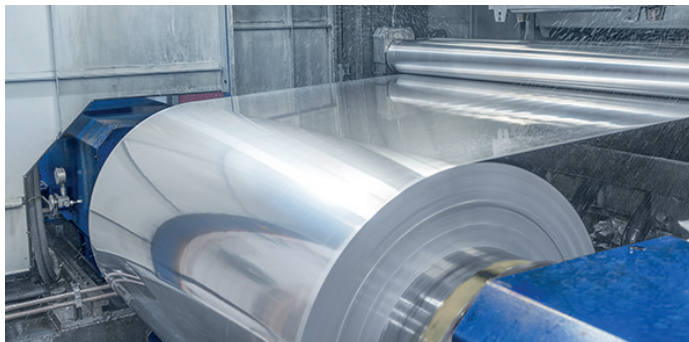


Optimization of Products and Processes



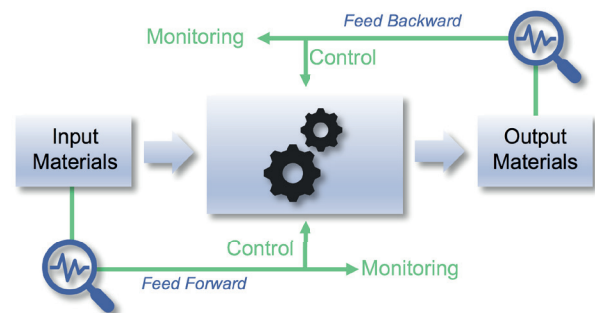
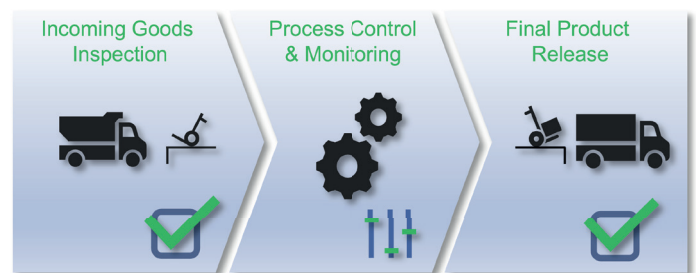
Quality Assurance in Industrial Processes

Process analytical technologies, defined as “a system for designing, analyzing, and controlling manufacturing through timely measurements” are used in manufacturing and processing industries for automated physical-chemical analysis of raw materials, intermediates and final products. The motivation for continuous monitoring of measurement data is to optimize production processes and ensure product quality,



which includes the following main goals:

- Prevent out-of-specification batches
- Reduce production cycling time
- Enable real time release
- Increase degree of automatization and control
- Comply with relevant regulatory guidelines



Rapid Analysis in Process

Optical spectroscopy is one of the most versatile tools in modern process analytical technologies. Depending on the application and the detailed requirement specifications, appropriate spectroscopic methods such as UV-VIS, NIR, Raman and LIBS are applied. Samples to be analysed emit material-specific radiation after interaction with light, from

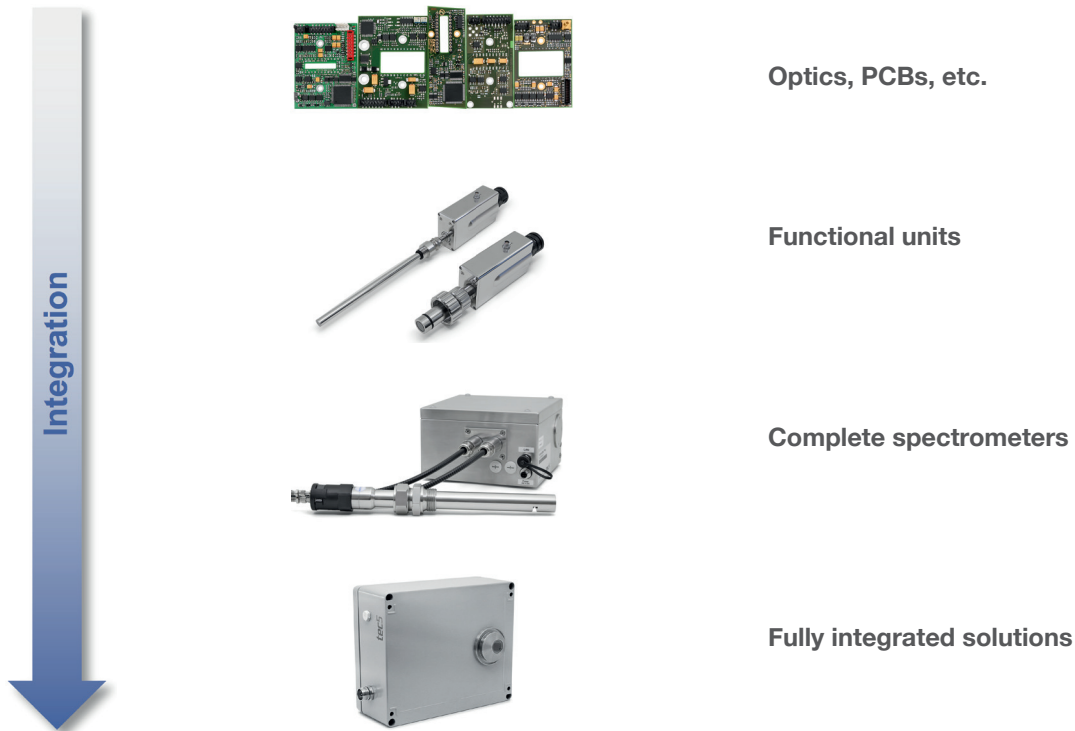
which the chemical composition of the samples is determined. For solid materials, even morphological parameters such as particle size or surface roughness can be quantified as well. Fibre optic technology allows versatile implementation: The measurement point can either be close by or in greater distances from the instrument.



Product Portfolio for Spectroscopy

tec5 provides systems and components for a broad range of spectroscopic methods. Easily and safely adaptable to the particular application and always consequently engineered for the use in an industrial environment, they are sophis-

ticated tools for process analysis. PC-based systems are available for UV-VIS, NIR and Raman spectroscopy, as well as embedded solutions for smart sensor technology with integrated low-level chemometric evaluation.



Standardized Process Spectrometer Systems

Our wide range of measuring heads, flow cells and immersible probes allows to configure the optimum setup for your process task. Different grades of standard detector types allow to configure high-end performance as well as compact and cost-effective smart sensors, based on for example MEMS technology.

A specialty are our smart sensor solutions, which offer a low-level, real-time implementation of the entire data processing including chemometric evaluation directly in the measuring instrument. Therefore, our smart sensors operate without an additional computer or PC-based software.

Portfolio for Proprietary Developments

Provision of OEM components and systems for spectroscopy or photometry is a major focus of our activities. We thus offer our OEM partners the opportunity to access an established portfolio for their own device development or machine integration.

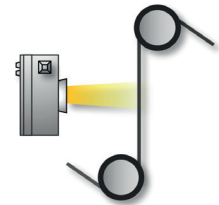
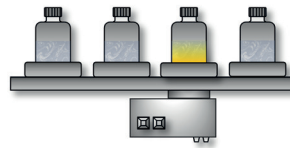
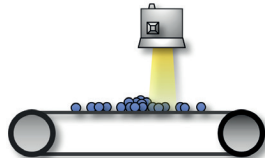
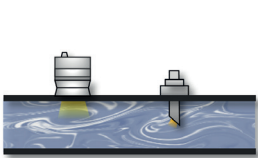
Adaptations to application or industry-specific requirements can be implemented at any integration level. Our partners therefore benefit from individually optimized, competitive solutions with minimal risk and at manageable costs.



Standards for Specific Applications

The configuration of process analytical solutions is always to be considered in the context of the respective final application. Any manufacturing or processing industry has its speci-

fic requirements for hard- and software, for functionality and methodology. In many areas, regulatory frameworks are important as well.



Automated Analysis of Raw Materials, In-Process and Finished Goods

The options for the application specific acquisition of measured parameters on raw materials, intermediate and end products are almost unlimited:

- **Quantitative analyses**
Determination of concentrations of main and secondary ingredients as well as additives
- **Qualitative analyses**
Identification, determination of materials and substances
- **Coating thickness**
Determination of application quantities and thickness of coatings / layers
- **Surface characterizations**
Quantification of grain size and surface roughness
- **Color measurements**
Acquisition of entire color spectra of light sources or surfaces, liquids and solids

Process analytical measuring and control technology does have a significant impact on ensuring efficient and safe production processes and consistent product quality. For a direct integration into the process, the systems are configurable to a high degree, making nearly all media or sample types accessible for measurement tasks:

- Bulk goods on conveyors
- Web goods such as textiles, paper or plastic films
- Liquids and paste-like in pipelines
- Media in reactors and vessels
- And many more

Whether installed stationary, built into a vehicle or used as a handheld device, process and product safety is a matter of reliable technology and trustful partnership.



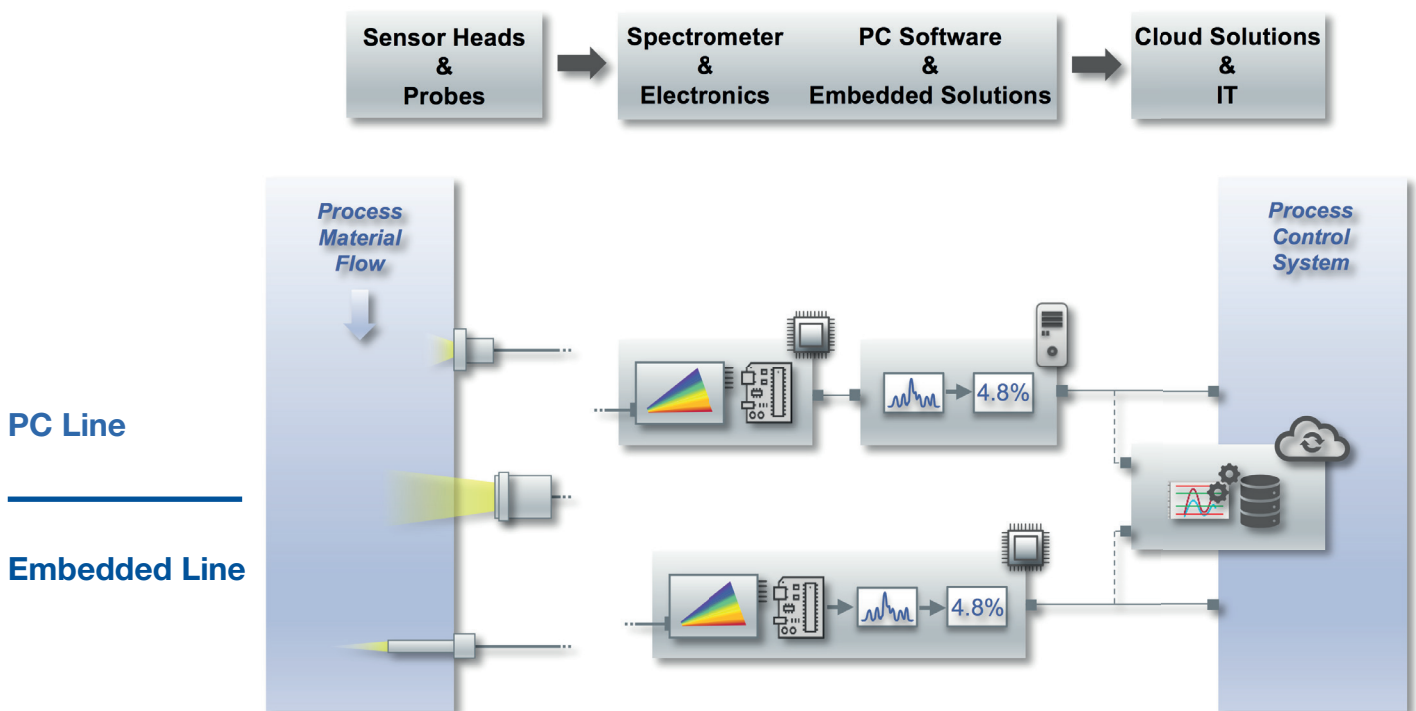
System Concepts for Industrial Use

Our dedicated industrial spectrometers provide high-speed analysis of ingredients and can be used for qualitative analysis such as variety identification as well as for the quantitative determination of intermediate and finished products directly in the process.

Especially for process analytical applications in an industrial environment, the performance of optical spectroscopy is

highly advantageous and typically pays off in short time:

- High measurement rates at short integration times
- Non-invasive and non-destructive
- 100% monitoring of product flows
- Non-contact analysis, directly integrated into the process line
- Fully automated online or inline process control or monitoring



Both embedded and PC-based versions offer two alternative system approaches covering the state of the art in process-enabled industrial spectroscopy in the best possible way:

- The embedded line allows the realization of process sensors offering all advantages of a real-time smart sensor system due to fully low-level system control and data processing

- The PC-based version with its comprehensive process software packages offer a high degree of versatility and flexibility in the implementation of online or at-line routine analyses

Dedicated to industrial applications, all our systems are designed to be low-maintenance and robust against harsh or aggressive environments.



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