



● **MATRIX-F** FT-NIR Spectrometer

The award winning MATRIX-F is the next generation of FT-NIR spectrometers for process applications.

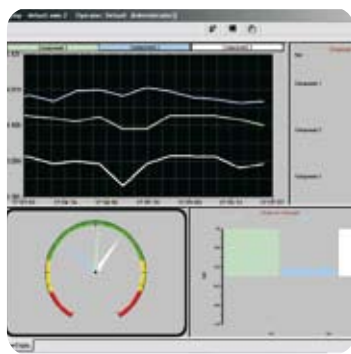
- Accurate in-line results in seconds
- Multiple components per measurement
- Non-destructive analysis
- Built-in 6-port multiplexer
- Direct method transfer
- Rugged design
- Ethernet connectivity and industry standard communication protocols

The award winning MATRIX-F is a dedicated Fourier Transform Near Infrared (FT-NIR) process spectrometer. It is the first industry hardened FT-NIR system that can directly withstand harsh environments. This instrument incorporates state-of-the-art optics for outstanding sensitivity and stability in a compact module. Its innovative design provides consistent high quality results, less downtime, direct methods transfer and the possibility of new applications that less sensitive and precise instruments are incapable of. Full support of industry standard communication protocols makes the integration simple.

The MATRIX-F is an ideal process instrument, yet it can also be used in the laboratory as a stand-alone system for method development and then move directly into your process application. The MATRIX-F is available as a free-standing unit with NEMA 4/IP66 (splashproof) housing. It can also be mounted in a standard 19 inch rack in a temperature controlled cabinet. The MATRIX-F can be equipped with a 6 port fiber optic multiplexer. External multiplexers for additional measurement points are also available. The MATRIX-F is the future of FT-NIR technology for process control.



MATRIX-F FT-NIR spectrometer is ideal for in-line and on-line process monitoring.



OPUS/PROCESS, the dedicated tool for process monitoring.



MATRIX-F duplex with fiber optic probe and measurement head.

Maximum Utility

The MATRIX-F is the only FT-NIR spectrometer which can measure liquids and solids in transmission and reflection with just one instrument using light fiber technology:

- **Fiber Optic Probes:**
Classic diffuse reflectance, transmittance or transmission probes with various path lengths can be adopted as well as process flow cells or pilot plant assemblies. Various probe materials are available, like stainless steel or Hastelloy.
- **Heads for Contactless Measurements:**
The fiber optic NIR illumination and detection heads contains tungsten sources which illuminate the sample. The scattered light is collected and guided via a fiber optic cable to the spectrometer. This way, a contactless measurement can be performed remotely, opening a whole array of new applications. Up to six heads can be connected to one MATRIX-F emission or MATRIX-F duplex spectrometer.

While the MATRIX-F *emission* is a dedicated instrument for the operation of up to six fiber optic NIR illumination and detection heads, the MATRIX-F *duplex* spectrometer can operate both fiber optic heads and the classic fiber optic probes.

Technologies used are protected by one or more of the following patents:
US 5309217; DE 4212143; US 7034944; US 5923422; DE 19704598

Maintenance

The MATRIX-F was designed for reliability and easy maintenance. Consumable components on pre-aligned mounts are user-exchangeable without any realignment of the optics. The instrument can be serviced quickly for minimal disruption of the manufacturing process.

Instrument Performance Validation

The MATRIX-F comes equipped with an automated filter wheel which houses standard materials and filters for testing instrument performance. The OVP (OPUS Validation Program) software executes a series of performance tests, evaluating the instrument performance and ensuring that if the instrument is operating within specifications - the precondition for applications in the pharmaceutical industry.

Connectivity

The OPUS/PROCESS software offers an industry standard interface (OPC) which allows OPUS to be integrated in any process control environment, using a wide range of standard communication interfaces and protocols, including:

- | | | |
|----------|---------------|------------|
| ■ TTL | ■ 4-20mA | ■ Ethernet |
| ■ RS-232 | ■ Modbus | ■ OPC |
| ■ RS-485 | ■ Profibus DP | ■ DDE |

FT-NIR Process Monitoring

Today many manufacturers are striving not only to produce the highest quality final product but also to improve manufacturing efficiency by taking analysis technology from the laboratory and applying it in their plants. By gaining tighter control over the manufacturing process, it is possible to optimize the use of materials and reduce or eliminate the production of off-specification material, thus saving reprocessing or disposal costs. Common process control applications include direct monitoring of chemical reactions and quality of intermediate and final products:

- Direct measurement in process reactors or pipelines, over webs or conveyor belts.
- Remote measurements over long distances.
- Better understanding and control of the process.
- Ideal tool for determination of homogeneity of blending processes, concentrations of constituent chemicals and state of polymerization processes in various industries.

FT-NIR is an ideally suited spectroscopic technique for process measurements because of its ability to rapidly perform remote measurements via high efficiency quartz fiber optics. The attenuation of the signal inside such fibers is very small and NIR fiber optic cables and probes are robust, relatively inexpensive, and widely available. Process probes may be located directly in process streams at a distance of hundreds of meters from the spectrometer, and multiple probes may be attached to a single spectrometer.

Bruker Optics
is ISO 9001 certified.

Laser class 1

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