

Technical Information

Raman flow assembly

KRFB, KRFC

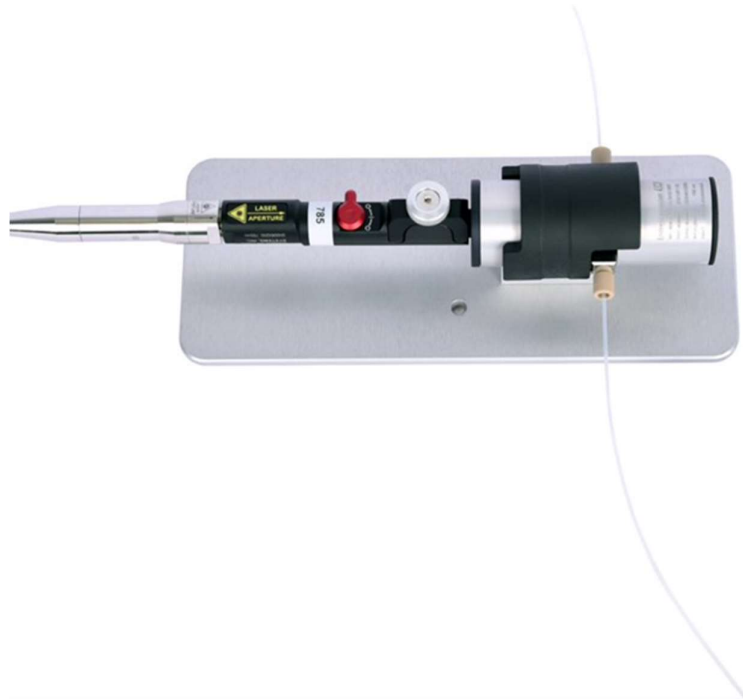


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Function and system design

Micro flow bench and micro flow cell

The Raman micro flow cell and associated micro flow bench, powered by Kaiser Raman technology, enable enhanced signal generation while monitoring material in a flow path. The system is an optimized non-contact apparatus which leverages the internal design characteristics and geometries of the flow cell to enhance the total signal to noise allowing for faster sampling times or lower limits of detection. Refer to the sections below for descriptions of the parts and their operational functions.

The configured system is comprised of the following parts:

- A reusable optic (micro flow bench), that does not contact the sample, and which is tuned for the specific micro flow cell and sample conditions.
- A micro flow cell that interfaces with the micro flow bench and through which the sample to be analyzed flows. The micro flow cell can be sterilized by the approved methods and may be either re-used or discarded after use.

The modular design of this sample system allows for calibration of the micro flow bench directly without affecting sterilization of the sample-contacting surfaces. Another benefit realized from the modular design is reduced service and maintenance because of the simplification of the wetted/sterilized portion. The fixed focus design provides long-term measurement stability and superior signal performance, essential for transferable, high performance Raman-based bioprocess analysis.

Designated use

The Raman micro flow cell and flow bench are designed for flow rates which are most applicable to product and process development and are optimized for biological samples. The micro flow cell is designed to connect to a flow path creating an enclosed, wetted interface which is separate from the flow bench. The flow bench, which is compatible with the Raman Rxn-10 probe from Endress+Hauser, allows for the secure laser-sample interface as well as calibration and verification of the apparatus. The flow bench is required for use of the micro flow cell.

Recommended applications for the optics include:

| Apparatus | Fields of application |
|-----------|---|
| Flow cell | <ul style="list-style-type: none"> ▪ Perfusion stream ▪ Material recirculation loop ▪ Tangential flow filtration ▪ Eluate monitoring ▪ Monomer-aggregate differentiation |

Table 1. Fields of application

The above table lists common applications for the flow cell apparatus. There are other possible fields of application, however, use of the device for any purpose outside of the fields of application described here poses a threat to the safety of people and of the entire measuring system, and invalidates any warranty.

Micro flow bench: options

The micro flow bench provides application flexibility, and can be configured to the unique and demanding needs of a variety of flowed-sample conditions. The micro flow bench is currently available in an Rxn-10 compatible configuration which is factory tuned for the specific application needs. In most cases aqueous environments are an acceptable approximation; however, extension beyond these spaces is available.

If a unique mounting solution is required, the micro flow bench can be configured with OEM-specific hardware to directly integrate into the unique environment.

NOTICE

The focus is set at the factory and cannot be adjusted by the user.

Micro flow cell: options

The micro flow bench and micro flow cell system has been designed to ensure maximum transferability between cells and benches, allowing micro flow cells to be replaced on the flow bench with minimal impact to the resulting spectrum.

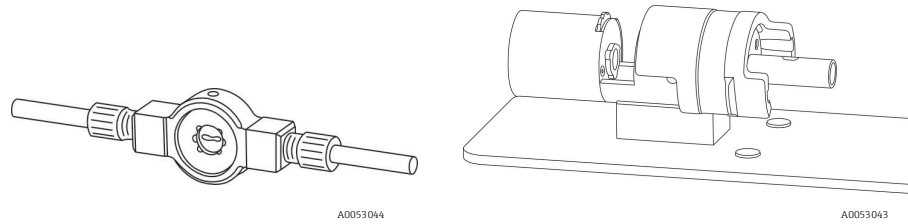


Figure 1. Raman micro flow cell (left) and micro flow bench (right)

Micro flow bench and micro flow cell data collection zone

The micro flow bench and flow cell are configured together to maximize the performance of the system. The amplifier enhances the signal by collecting both forward and backward propagating scatter. The data collection zone has been designed for optimal use in clear samples. If collection in opaque samples is required, contact Endress+Hauser.

Specifications

Micro flow bench

Below are listed the specifications for the micro flow bench and the micro flow cell across configurations.

| Item | Descript | |
|-------------------------------------|--|--|
| Laser wavelength | 785 nm | |
| Spectral coverage | Limited by the coverage of the analyzer being used | |
| Maximum laser power into probe head | < 499 mW | |
| Shipping and storage | Temperature | -10 °C to 50 °C (-22 °F to 302 °F) per IEC 60068-2-14 |
| | Shock and vibration | Vibration: 5-500 Hz @ 2 g 1 octave/min ± 3 axes Shock: 50 g, 10 ms ± 3 axes |
| Performance | Amplification factor | > 3.0 (typ), > 2.5 (min) |
| | Temperature range | 0 °C to 40 °C |
| Integration | Raman Rxn-10 probe | |
| Calibration method | 785 nm | Calibration cell with calibration reference standard* * See Raman flow assembly calibration and verification kit manual for details |
| Verification method | 785 nm | Verification cell with 70% IPA |

Table 2. Micro flow bench specifications

Micro flow cell

Below are listed the specifications for the micro flow cell across configurations.

| Item | Description |
|--------------------------------------|---|
| Laser wavelength | 785 nm |
| Wetted materials | Housing: 316 stainless steel Surface finish: Ra 0.38 µm (Ra 15 µin) with electropolish, ASME BPE SF4 Adhesive: USP Class VI and ISO 10993 compliant Window: proprietary material optimized for bioprocesses Connection: 1/16 through 3/16 in (OD tubing compatible) |
| Sample interface and flow conditions | 0 °C to 40 °C ≤ 70 psig 15 mL/min* maximum volumetric flow rate * Maximum volumetric flow rate to ensure laminar flow specified for micro flow cell with water. |
| Storage | -20 °C to 60 °C ≤ 90 % RH non-condensing |
| Sterilization | SIP, CIP |

Table 3. Micro flow cell specifications

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