

Brief Operating Instructions

Accessory optics for the Rxn-10 probe

KIO1, KNC01, KL BIO1, KRSU1, KRBMO, KRBSL



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1 About this document

1.1 Disclaimer

These instructions are Brief Operating Instructions; they do not replace the Operating Instructions included in the scope of supply.

1.2 Warnings

Structure of Information	Meaning
⚠ WARNING Causes (/consequences) Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.
⚠ CAUTION Causes (/consequences) Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE Cause/situation Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

Table 1. Warnings

1.3 U.S. export compliance

The policy of Endress+Hauser is in strict compliance with U.S. export control laws as detailed in the website of the [Bureau of Industry and Security](#) at the U.S. Department of Commerce.

2 Basic safety instructions

The safety information in this section is specific to the optics that are compatible with the Rxn-10 probe. Refer to the *Rxn-10 Raman spectroscopic probe Operating Instructions* for additional information related to probe and laser safety.

2.1 Requirements for personnel

- Only specially trained technical personnel may install, commission, operate, or maintain the probe/optics.
- Technical personnel must be authorized by the plant operator to carry out the specified activities.
- Technical personnel must read, understand, and follow the steps outlined in these Operating Instructions.
- The facility must designate a laser safety officer who ensures staff are trained on all Class 3B laser operating and safety procedures.
- Faults at the measuring point may only be rectified by authorized trained personnel. Repairs not described in this document may only be carried out at the manufacturer's site or by the service organization.

2.2 Designated use

The Rxn-10 probe is designed for product and process development as well as manufacturing (when used with the Raman optic system for single use). The probe is compatible with a range of interchangeable optics (immersion and non-contact) to meet the requirements of different applications.

Recommended applications for the optics include:

Optic	Fields of application
Immersion optic (IO)	▪ Development laboratory ▪ Pharmaceutical: drug substance unit operations, reaction analysis, crystallization, end-point detection, solvent swaps ▪ Chemical: material identification, reaction analysis, polymerization, cross-linking, blending ▪ Food and beverage: blending, purification, natural and synthetic components
Non-contact optic (NCO)	▪ Polymer solids (pellets, films, or powders) ▪ Pharmaceutical drug product manufacturing ▪ Raw material identification ▪ Meat or fish quality ▪ Formulation optimization

Optic	Fields of application
bIO-Optic	▪ Benchtop bioreactors to measure glucose, lactate, amino acids, cell density, titer, and more ▪ Benchtop fermenters to measure glycerol, methanol, ethanol, sorbitol, biomass, and more ▪ Use with Flow assembly CYA680 for select downstream bioprocessing applications
Bio multi optic and bio sleeve	▪ Benchtop bioreactors to measure glucose, lactate, amino acids, cell density, titer, and more ▪ Benchtop fermenters to measure glycerol, methanol, ethanol, sorbitol, biomass, and more ▪ Use with Flow assembly CYA680 for select downstream bioprocessing applications
Raman optic system for single use	▪ Single-use bioreactors to measure glucose, lactate, amino acids, cell density, titer, and more ▪ Single-use fermenters to measure glycerol, methanol, ethanol, sorbitol, biomass, and more

Table 2. Fields of application

The above table lists common applications for the Rxn-10 probe and optics. Different applications are possible; however, use of the device outside of the specified fields of application may compromise the safety of personnel and the measuring system and invalidates any warranty.

Workplace safety

As the user, you are responsible for complying with the following safety conditions:

- Installation guidelines
- Local standards and regulations for electromagnetic compatibility

2.3 Operational safety

Before commissioning the entire measuring point:

- Verify that all connections are correct.
- Ensure that electro-optical cables are undamaged.
- Ensure the fluid level is sufficient for immersing the probe/optics (if applicable).
- Do not operate damaged products. Protect them from unintentional operation.
- Label damaged products as defective.

During operation:

- If faults cannot be rectified, products must be taken out of service and steps taken to prevent unintentional operation.
- When working with laser devices, always follow all local laser safety protocols, which may include using personal protective equipment and limiting device access to authorized users.

Service ratings may include limitations for fittings, flanges, or seals. The installer must understand these limitations and use appropriate hardware and assembly procedures for a pressure-tight, safe joint.

2.4 Service safety

Follow your company's safety instructions when removing a process probe/optic from the process interface for service. Always wear proper protective equipment when servicing the equipment.

2.5 Important safeguards

- Do not use the optics for anything other than their intended use.
- Do not look directly into the laser beam.
- Do not point the laser at a mirrored/shiny surface or a surface that may cause diffuse reflections. The reflected beam is as harmful as the direct beam.
- When not in use, close the shutter on the Rxn-10 probe. If an optic cap is available, place it on the unused optic.
- Always use a laser beam block to avoid scattering laser radiation inadvertently.

2.6 Product safety

This product is designed to meet all current safety requirements for the intended application and has been tested accordingly, leaving the factory in safe operating condition. All applicable regulations and international standards have been observed. Devices connected to an analyzer must comply with the applicable analyzer safety standards.

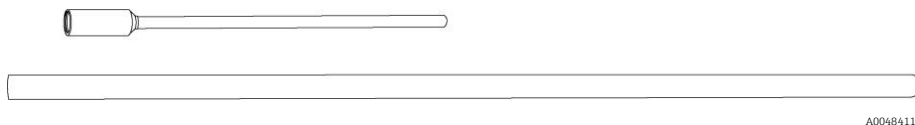
3 Product description

The variety of optics available for the Rxn-10 probe, powered by Kaiser Raman technology, enables flexible sampling options in the laboratory, process development, or a single-use manufacturing environment. Endress+Hauser offers immersion, bioprocess, and non-contact optics for the analysis of liquids, slurries, and solids. Optics are available in multiple lengths and sizes to meet the requirements of different applications. Refer to the sections below for descriptions of the optic types and their uses.

- 3.1: Immersion optic
- 3.2: Non-contact optic
- 3.3: bIO-Optic
- 3.4: Bio multi optic and bio sleeve
- 3.5: Raman optic system for single use

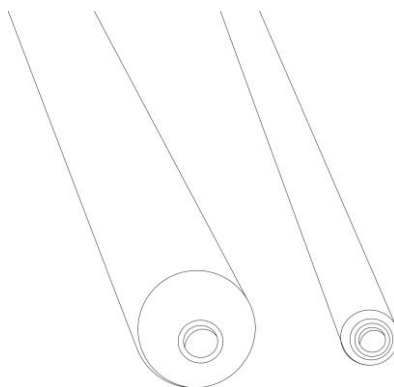
3.1 Immersion optic (KIO1)

The Endress+Hauser immersion optic is suited for use with the Rxn-10 probe in reaction vessels, laboratory reactors, or process streams. It has a fixed focus design and no movable parts, providing long-term measurement stability and superior signal performance. The sealed design is the standard for use with embedded Raman Rxn analyzers.



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Figure 1. Immersion optics with different shaft lengths and diameters



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Figure 2. Tips of immersion optics with different diameters

3.2 Non-contact optic (KNCO1)

Paired with the Rxn-10 probe, the Endress+Hauser non-contact optic enables contactless Raman sample measurements taken directly, through sight glass, or through translucent sample packaging. These optics are ideal for applications involving solids, or turbid media or when avoiding sample contamination or damage to optical components is critical.

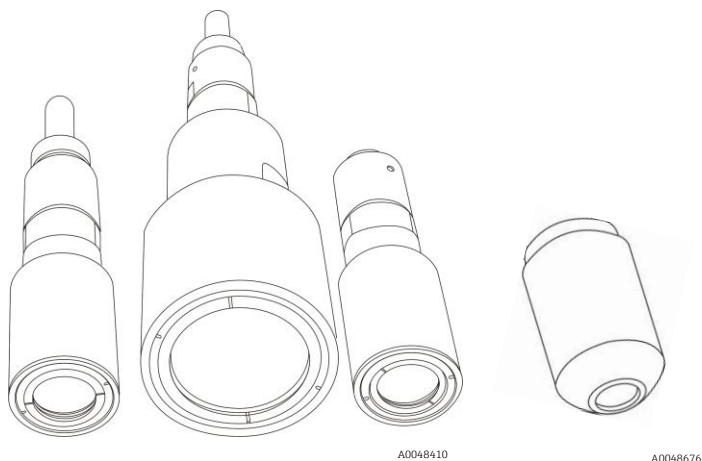


Figure 3. Non-contact optics in varying sizes

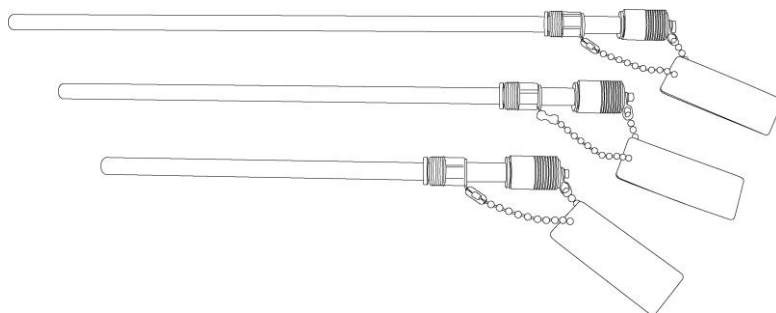
3.3 bIO-Optic (KLBI01)

The Endress+Hauser bIO-Optic is a versatile immersion optic designed for use with the Rxn-10 probe. It enables real-time measurement of key bioprocessing components and is compatible with standard PG13.5 bioreactor ports.

The fixed focus design of the bIO-Optic provides long-term measurement stability and superior signal performance, supporting reliable and transferable Raman-based bioprocess analysis.

Available in a range of industry standard lengths, the bIO-Optic is suitable for benchtop bioreactor or fermenter applications requiring headplate entry.

The 120 mm version is compatible with Endress+Hauser flow assembly [CYA680](#).



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Figure 4. bIO-Optics in varying lengths

NOTICE

Do not use the bIO-Optic with hydrocarbon solvents (including ketones and aromatics).

- ▶ These solvents can degrade probe performance and invalidate the warranty.

3.4 Bio multi optic (KRBMO) and bio sleeve (KRBSL)

The Endress+Hauser bio multi optic and bio sleeve make up a versatile, two-part immersion optic system for use with the Rxn-10 probe. This system enables real-time measurement of multiple key bioprocessing components and is compatible with standard PG13.5 bioreactor ports.

The system consists of the following parts:

- Reusable bioprocessing multi optic with no product contact
- Bioprocessing sleeve with product contact that interfaces with the bio multi optic. The sleeve supports up to 50 autoclave cycles when used with the bio sleeve desiccator.

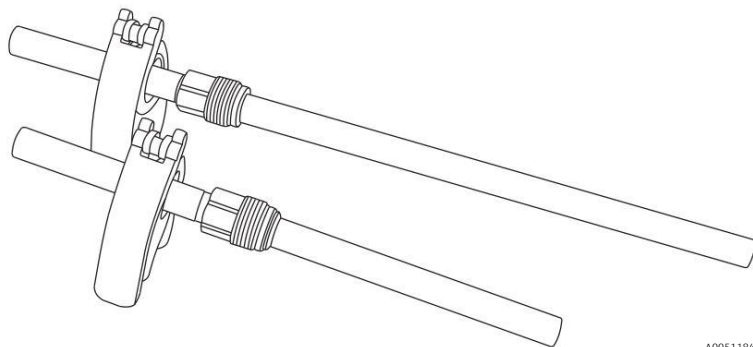
The modular design allows calibration of the optic without removing the bio sleeve from the bioreactor or wetted area. This design simplifies the wetted and sterilized portion, reducing service effort and minimizing process disruption.

The fixed focus design provides long-term measurement stability and robust signal performance, supporting reliable and transferable Raman-based bioprocess analysis.

The bio multi optic and bio sleeve are available in 120 mm and 220 mm (4.73 in. and 8.67 in.) standard lengths.

The 120 mm version is compatible with Endress+Hauser Flow assembly [CYA680](#).

The sample system is suitable for benchtop bioreactor or fermenter applications requiring headplate entry.



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Figure 5. Bio multi optic and bio sleeve system in varying lengths

NOTICE

Do not use this system with hydrocarbon solvents (including ketones and aromatics).

- These solvents can degrade probe performance and invalidate the warranty.

3.5 Raman optic system for single use (KRSU1)

The Endress+Hauser Raman optic system for single use was developed in accordance with industry standards for single-use sensors and is designed for single-use applications. The system is used in conjunction with the Rxn-10 probe and is comprised of the following parts:

- Reusable optic with no product contact
- Disposable fitting supplied, installed, and tested by the single-use vessel vendor.

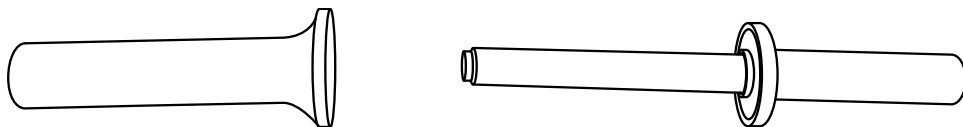


Figure 6. Disposable fitting (right) and reusable optic (left)

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NOTICE

Do not use this system with hydrocarbon solvents (including ketones and aromatics).

- ▶ These solvents can degrade probe performance and invalidate the warranty.

4 Incoming product acceptance and product identification

4.1 Incoming acceptance

- Verify that the packaging is undamaged. Notify the supplier of any damage to the packaging. Keep the damaged packaging until the issue has been resolved.
- Verify that the contents are undamaged. Notify the supplier of any damage to the delivery contents. Keep the damaged goods until the issue has been resolved.
- Check that the delivery is complete and nothing is missing. Compare the shipping documents with your order.
- Pack the product for storage and transportation in such a way that it protects it from impact and moisture. The original packaging offers the best protection. Make sure to comply with the permitted ambient conditions found in the *Accessory optics for the Rxn-10 probe Operating Instructions* manual.

If you have any questions, please contact your supplier or your local sales center.

NOTICE

Incorrect transportation can damage the optics.

4.2 Product identification

4.2.1 Label

The optic labels contain the following minimum information:

- Manufacturer data
- Serial number

Compare the information on the label/tag with the order.

4.2.2 Manufacturer address

Endress+Hauser
371 Parkland Plaza
Ann Arbor, MI 48103 USA

4.3 Scope of delivery

The scope of delivery comprises:

- Selected optic(s)
- *Accessory optics for the Rxn-10 probe Operating Instructions* manual

If you have any questions, please contact your supplier or local sales center.

5 Installation

The installation information in this section is specific to the optics that are compatible with the Rxn-10 probe. Refer to the *Rxn-10 Raman spectroscopic probe Operating Instructions* for additional information related to probe installation.

The Rxn-10 probe is compatible with both immersion optics and non-contact optics. The probe has a torque limiting clamp that secures the immersion optics. The clamp also holds the adapter for non-contact optics.

Before installation, ensure any protective covers are removed from the optics.

When replacing a probe optic, use the multi optic calibration accessory or the Raman Calibration Accessory (HCA) to perform an intensity calibration for that probe with the new optic. Refer to the *Accessory optics for the Rxn-10 probe Operating Instructions* to determine the appropriate calibration method for each optic.

5.1 Installing immersion optics and bIO-Optics

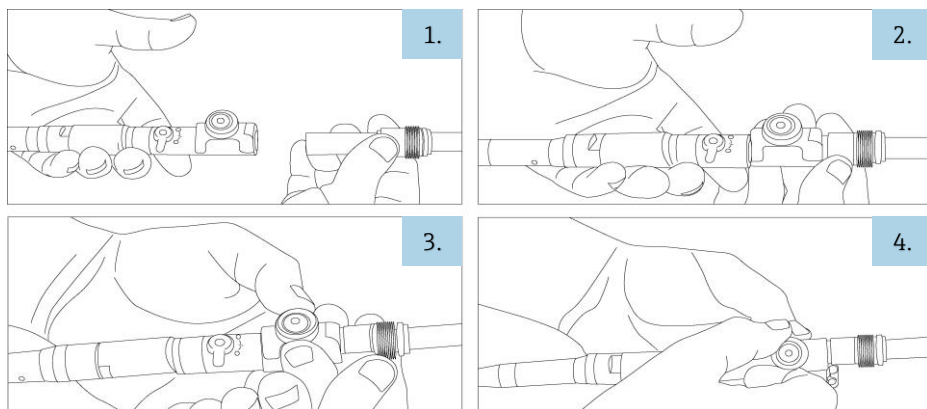
Endress+Hauser immersion optics and bIO-Optics slip into the Rxn-10 probe and are secured by a torque-limiting clamp and thumb screw. The thumb screw on the Rxn-10 probe should never be fully removed.

WARNING

When installing or removing immersion optics, ensure the laser and emission shutter are in the closed position.

To install an immersion optic:

1. If necessary, loosen the metal thumb screw on the Rxn-10 probe by turning the screw counterclockwise approximately one turn (do not remove). Next, find the probe end of the optic, which is the end that includes the product markings.
2. Insert the probe end of the optic through the end optic clamp.
3. Push the optic back until it stops.
4. Tighten the thumb screw by gently turning it clockwise until there is an audible “click” sound. This indicates the thumb screw has reached the desired torque. Failure to tighten the screw will allow the optic to come loose, potentially damaging the optic.
5. After inserting an optic into a probe, use the Raman Calibration Accessory to perform an intensity calibration for the probe with the new optic.



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Figure 7. Installing an immersion optic (IO) on an Rxn-10 probe

To remove an immersion optic:

Loosen the torque limiting thumb screw by turning it counterclockwise approximately one turn to release the immersion optic from its clamp. Do not remove the screw. Slide the immersion optic out.

5.2 Installing the bio multi optic and bio sleeve system

Proceed as follows to insert the bio multi optic and bio sleeve system into a bioreactor for data acquisition:

- Insert the bio multi optic into the Rxn-10 probe
- Slide the bio sleeve into the bioreactor
- Sterilize the bio sleeve/bioreactor combination (typically)
- Insert the Rxn-10 probe with the bio multi optic into the bio sleeve/bioreactor

5.2.1 Inserting the bio multi optic into the Rxn-10 probe

The Endress+Hauser bio multi optic slips into the Rxn-10 probe and is secured by a torque-limiting clamp and thumb screw. The thumb screw on the Rxn-10 probe should never be fully removed.

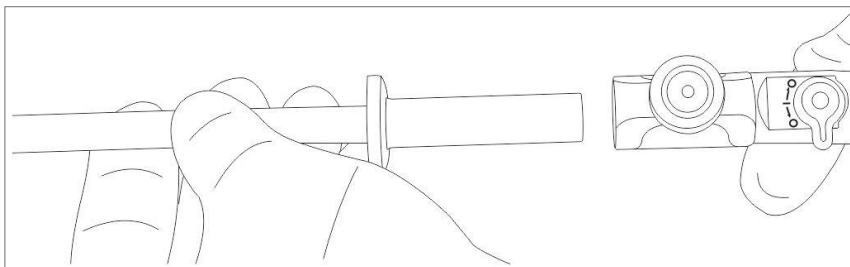
⚠ WARNING

When installing or removing optics, ensure the laser and emission shutter are in the closed position.

To insert the optic into the probe:

1. If necessary, loosen the metal thumb screw on the Rxn-10 probe by turning the screw counterclockwise approximately one turn (do not remove).

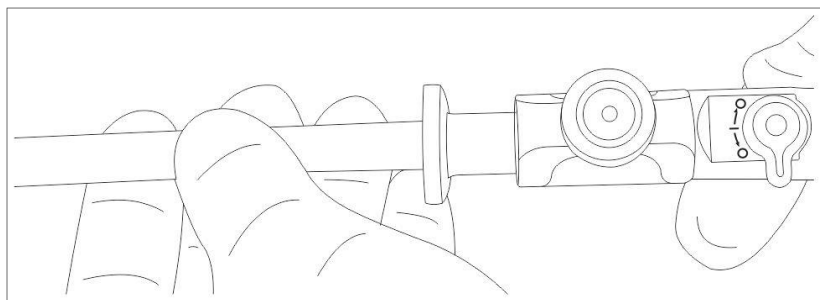
2. Insert the optic through the end optic clamp.



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Figure 8. Inserting the bio multi optic into the Rxn-10 probe

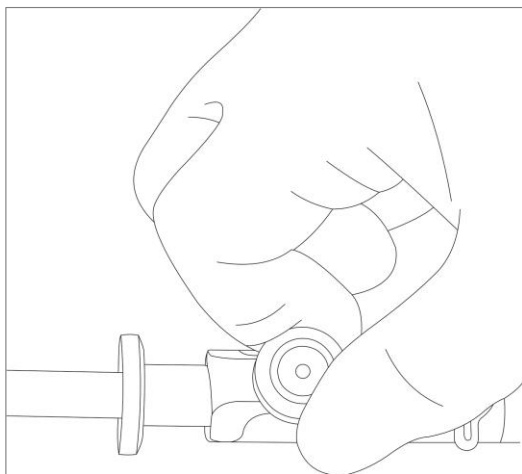
3. Push the optic back until it stops.



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Figure 9. Final position of bio multi optic in the Rxn-10 probe

4. Tighten the thumb screw by gently turning it clockwise until there is an audible “click” sound. This indicates the thumb screw has reached the desired torque. Failure to tighten the screw will allow the optic to come loose, potentially damaging the optic.



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Figure 10. Tightening the thumb screw on the Rxn-10 probe

5. After inserting an optic into a probe, use the multi optic calibration accessory to perform an intensity calibration for the probe with the new optic. Alternately, the Raman Calibration Accessory (HCA) may be used, but a bio sleeve is required.

To remove the bio multi optic from the Rxn-10 probe:

Loosen the torque limiting thumb screw by turning it counterclockwise approximately one turn to release the optic from its clamp. Do not remove the screw. Slide the optic out.

5.2.2 Inserting the bio sleeve into the bioreactor

The bio sleeve is designed to interface with a PG13.5 threaded port on the bioreactor. To insert the bio sleeve into the bioreactor:

1. Align the bio sleeve with the available PG13.5 port.
2. Insert the bio sleeve into the PG13.5 port on the bioreactor.
3. Tighten the PG13.5 nut on the PG13.5 port of the bioreactor according to the bioreactor manufacturer's guidelines.

NOTICE

The bio sleeve must never interfere with the internal stirring device.

- Interference can damage the optic system and may cause cavitation.

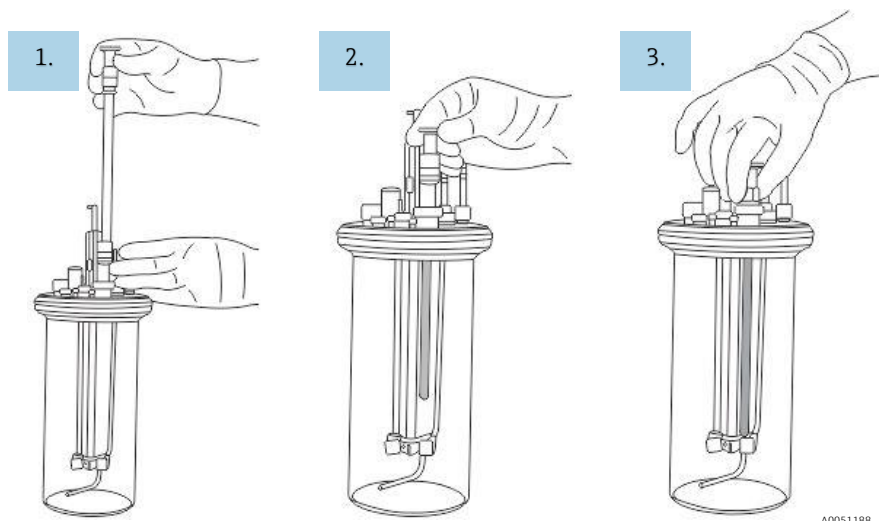


Figure 11. Installing the bio sleeve into the PG13.5 port of the bioreactor

NOTICE

The bioreactor/bio sleeve will typically need to be sterilized prior to use.

► The desiccator must be inserted into the bio sleeve prior to autoclave sterilization. Refer to the *Accessory optics for the Rxn-10 probe Operating Instructions* for autoclaving instructions.

5.2.3 Inserting the Rxn-10 probe with bio multi optic into the bio sleeve

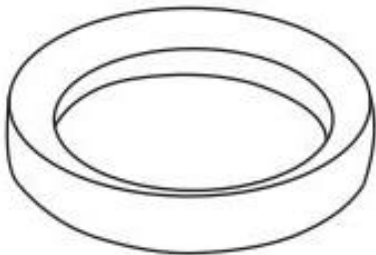
NOTICE

The Rxn-10 probe with the reusable optic should be calibrated and verified prior to insertion into the bio sleeve.

- See Section 6.2 →  for calibration and verification instructions.
- After calibrating the Rxn-10 and bio multi optic and sterilizing the bioreactor (including the installed bio sleeve), join the systems together to begin collecting data. Follow the steps below:

1. Obtain a sanitary flange seal.

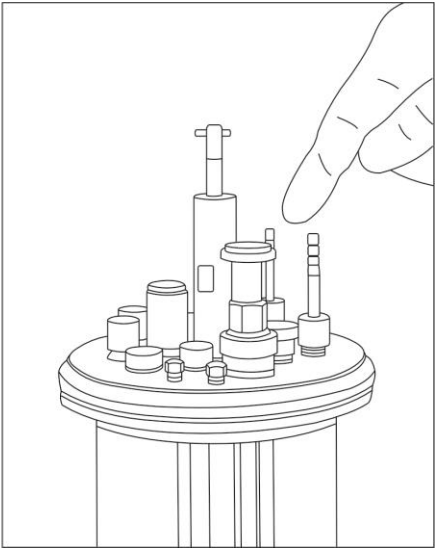
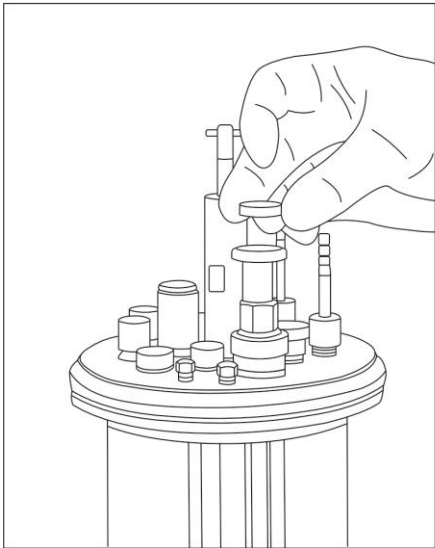
If a sanitary flange seal is already installed on the bio sleeve, go to step 3.



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Figure 12. Sanitary flange seal

2. Place the sanitary flange seal on the seal gland.



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Figure 13. Installing the sanitary flange seal

Confirm that the immersion length is correct for the bio multi optic being used.

3. Insert the bio multi optic into the bio sleeve until the optic rests on the sanitary flange seal.

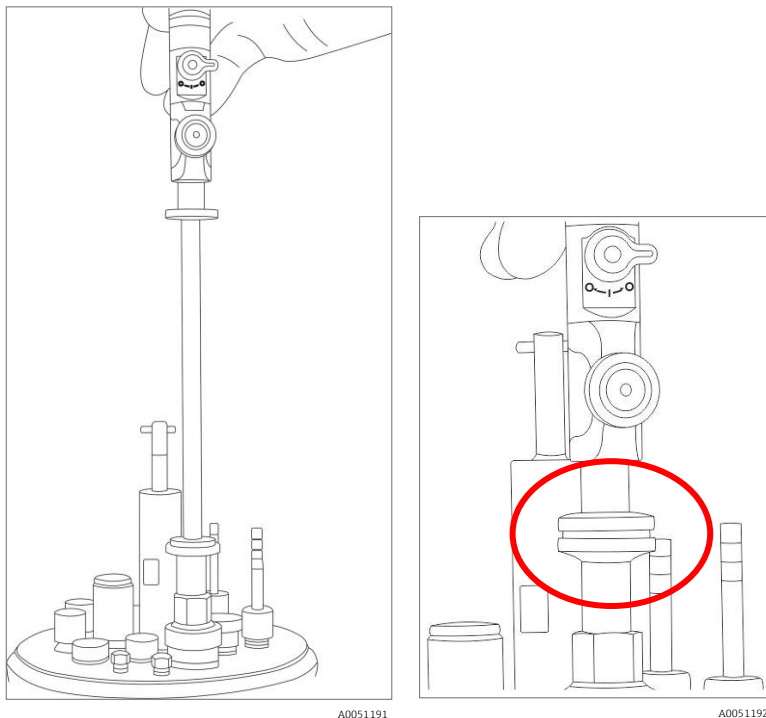
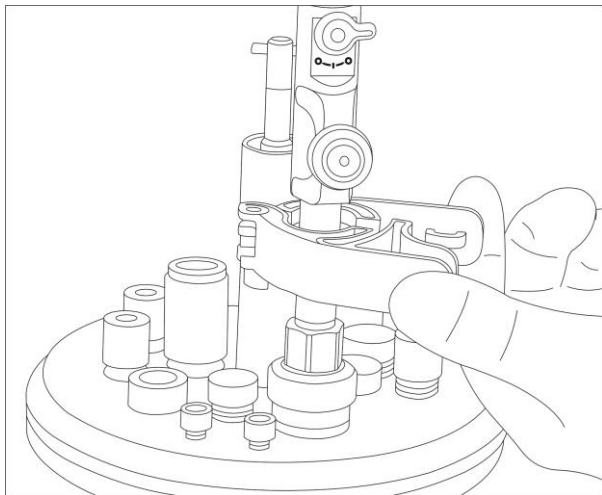


Figure 14. Inserting the bio multi optic into the bio sleeve (left) until the optic rests on the seal (right)

4. Confirm that the sanitary seal is properly seated between the optic and the sleeve.

5. Install the sanitary clamp, making sure it is clamped tightly. There should be two distinct clicks indicating it is clamped correctly.



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Figure 15. Installing the sanitary clamp

The Rxn-10 probe and bio multi optic / bio sleeve system are now ready to acquire data within the bioreactor.

5.3 Installing non-contact optics

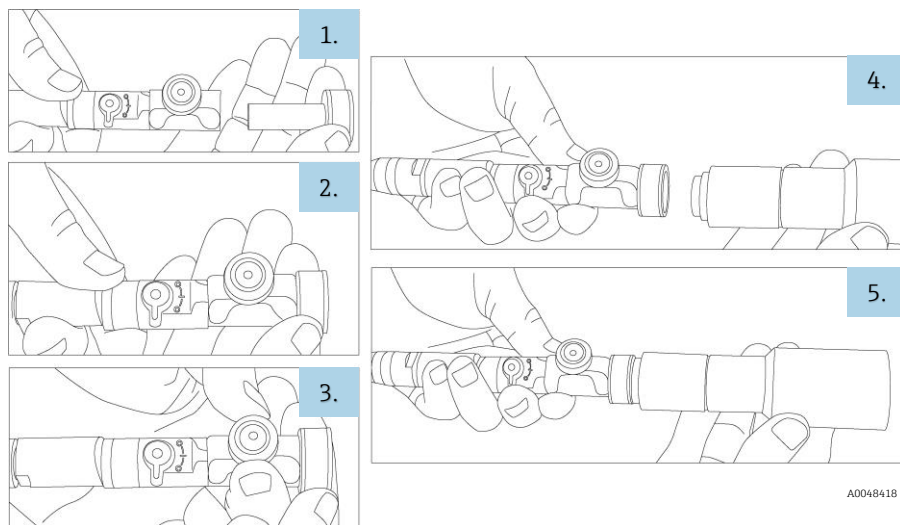
The non-contact optics offered with the Rxn-10 probe are threaded. A threaded adapter is therefore required for attaching the optic to the Rxn-10 probe.

⚠ WARNING

When installing or removing non-contact optics, ensure the laser and emission shutter are in the closed position.

To install a non-contact optic:

1. If necessary, loosen the metal thumb screw on the Rxn-10 probe by turning the screw counterclockwise approximately one turn (do not remove). Next, find the narrow, non-threaded end of the adapter.
2. Insert the narrow end of the adapter through the clamp. Push the adapter back until it stops.
3. Tighten the thumb screw by gently turning it clockwise until there is an audible “click” sound. This indicates the thumb screw has reached the desired torque. Failure to tighten the screw will allow the adapter to come loose.
4. Find the externally threaded end of the non-contact optic.
5. Screw the non-contact optic into the threaded end of the adapter.
6. After inserting an optic into a probe, use the Raman Calibration Accessory to perform an intensity calibration for the probe with the new optic.



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Figure 16. Installing an adapter and non-contact optic into the Rxn-10 probe

To remove a non-contact optic:

Unscrew the non-contact optic from the adapter. If planning to use an immersion optic, remove the adapter by turning the torque-limiting thumb screw counterclockwise approximately one turn to release the adapter from the clamp. Slide the adapter out.

5.4 Installing the Raman optic system for single use

NOTICE

Calibrate and verify the Rxn-10 probe with the reusable optic prior to inserting it into the disposable fitting.

- See Section 6.2 → for calibration and verification instructions.

5.4.1 Preparing the disposable fitting

The port shown below is specific to one type of single-use bioreactor. The port, fitting, and cap/clamp (if present) may vary depending on the type of single-use bioreactor. However, the optic insertion instructions are the same for all types of single-use bioreactors.

To prepare the disposable fitting for optic insertion:

1. Depress the release lever on the sanitary clamp and remove the clamp.
2. Remove the sanitary cap from the fitting.
3. Ensure the sanitary O-ring seal is in place on the fitting.

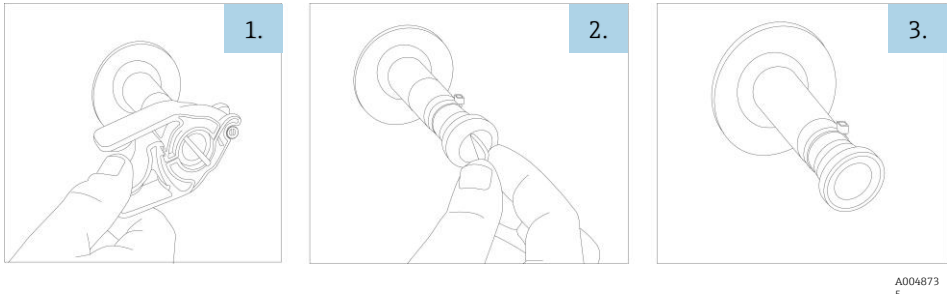
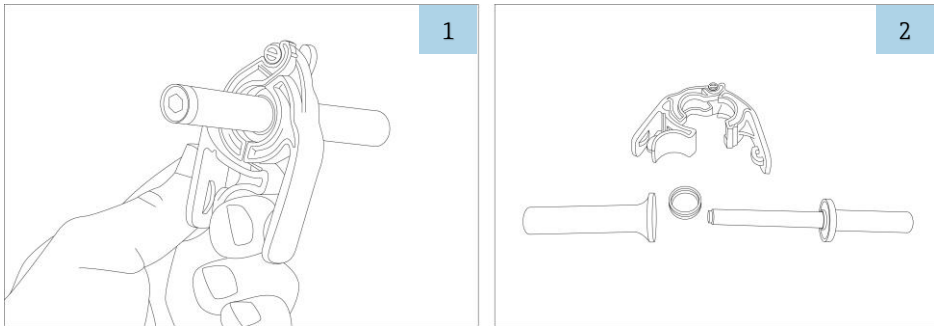
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Figure 17. Preparing the disposable fitting

5.4.2 Preparing the reusable optic for insertion into the fitting

To prepare the optic for insertion into the fitting:

1. Depress the release lever on the sanitary clamp and remove the clamp.
2. Remove the cap and seal. Store these components in a secure location.



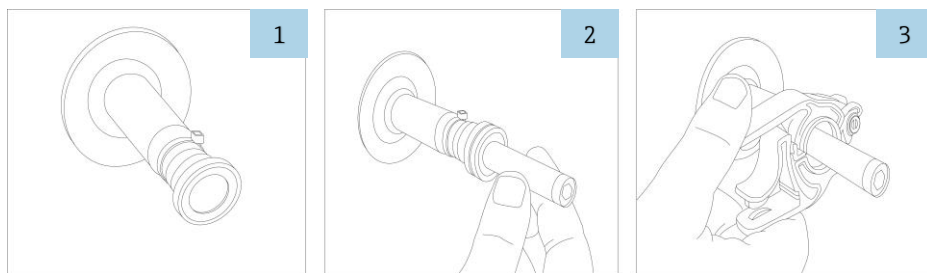
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Figure 18. Preparing the reusable optic

5.4.3 Inserting the optic in the fitting

To insert the optic in the disposable fitting:

1. Verify that the sanitary O-ring seal on the fitting is still in place. If it is not, place a sanitary O-ring seal over the optic, ensuring that it is in the sealing gland area.
2. Insert the optic into the disposable fitting.
3. Install the sanitary clamp, making sure it is clamped tightly. There should be two distinct clicks indicating it is clamped correctly.



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Figure 19. Inserting the optic in the fitting

5.4.4 Inserting the optic into the Rxn-10 probe

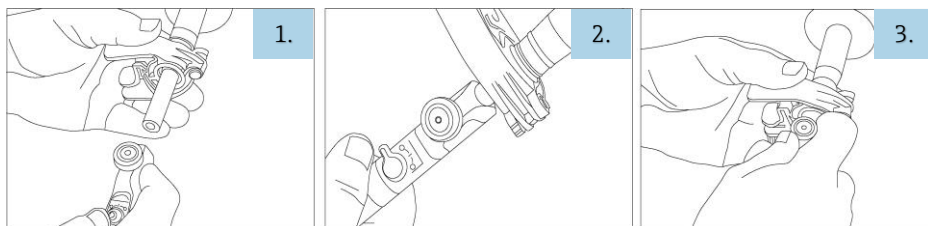
The Endress+Hauser reusable optic slips into the Rxn-10 probe and is secured by a torque-limiting clamp and thumb screw. The thumb screw on the Rxn-10 probe should never be fully removed.

⚠ WARNING

When installing or removing optics, ensure the laser and emission shutter are in the closed position.

To insert the optic into the probe:

1. If necessary, loosen the metal thumb screw on the Rxn-10 probe by turning the screw counterclockwise approximately one turn (do not remove). Next, insert the optic through the end optic clamp.
2. Push the optic back until it stops.
3. Tighten the thumb screw by gently turning it clockwise until there is an audible “click” sound. This indicates the thumb screw has reached the desired torque. Failure to tighten the screw will allow the optic to come loose, potentially damaging the optic.



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Figure 20. Installing the reusable optic into the Rxn-10 probe

After inserting an optic into a probe, and before connecting it to the fitting, use the multi optic calibration accessory to perform an intensity calibration for the probe with the new optic and single-use calibration adapter. Alternately, the Raman Calibration Accessory (HCA) and single-use calibration adapter may be used.

To remove the optic:

Loosen the torque limiting thumb screw by turning it counterclockwise approximately one turn to release the optic from its clamp. Do not remove the screw. Slide the optic out.

6 Commissioning

The optics for the Rxn-10 probe are delivered ready to connect to the probe. No additional alignment or adjustment to the probe head is required. Follow the instructions below to commission the optics for use in conjunction with the probe.

6.1 Receipt of optics

Perform the steps for incoming product acceptance described in Section 4.1 → .

6.2 Calibration and verification

The probe and the analyzer must be calibrated before use.

6.2.1 Multi optic calibration accessory

After inserting the bio multi optic or the Raman optic system for single use into the Rxn-10 probe, use the multi optic calibration accessory to perform an intensity calibration for the probe head with the new optic.

Refer to the *Multi optic calibration kit Operating Instructions* for additional information about the multi optic calibration accessory.

If the multi optic calibration accessory is not available, a Raman Calibration Accessory (HCA) may be used for calibration as follows:

- Bio multi optic: with the bio sleeve and 12 mm HCA adapter
- Raman optic system for single use: with the single-use calibration adapter and 12 mm HCA adapter

6.2.2 Raman Calibration Accessory

After inserting the immersion optic, non-contact optic, or bIO-Optic into the probe head, use the Raman Calibration Accessory (HCA) to perform an intensity calibration for the probe head with the new optic.

If using the HCA with the Raman optic system for single use, install an additional single-use calibration adapter onto the optic following the process outlined in Section 5.3 →  for connecting the optic to the fitting. Next, insert the optic/calibration adapter combination into the HCA adapter attached to the HCA head.

Refer to the *Raman Calibration Accessory Operating Instructions* for additional information about the HCA and adapters.

6.2.3 Performing calibration and verification

Refer to the applicable Raman Rxn analyzer operating instructions for the following:

- Calibrating the internal analyzer. This may include alignment calibration, full wavelength calibration, and/or full laser wavelength calibration depending on the analyzer status.
- Calibrating the probe. This requires the multi optic calibration accessory or HCA with an appropriate optic adapter.
- Verifying the probe. This involves verifying the calibration results using a standard reference sample. A bIO-Sample Chamber or multi optic verification accessory may be used instead.
- Viewing calibration and verification reports

NOTICE

The multi optic verification accessory should be used for verifying the bio multi optic or Raman optic system for single use. Do NOT immerse the bio multi optic or optic system for single use directly in a sample.

- If the multi optic verification accessory is not available, the bio multi optic or Raman optic system for single use may be verified using a bIO-Sample Chamber and an additional bio sleeve (for bio multi optic) or a single-use calibration adapter (for single-use optic).

The Raman RunTime software will not allow spectra to be collected without passing internal and probe calibrations. Passing the probe verification step is not required but highly recommended.

Raman Rxn analyzer operating instructions are available by searching the Downloads area of the Endress+Hauser web site: <https://endress.com/downloads>

7 Operation

This manual provides information about the optics used with the Endress+Hauser Raman Rxn-10 probe. The Rxn-10 probe is a versatile probe designed for product and process development and is compatible with Endress+Hauser Raman Rxn analyzers operating at 532 nm, 785 nm, or 993 nm. The Rxn-10 probe is compatible with a variety of interchangeable optics, including the following:

- Immersion optic
- Non-contact optic
- bIO-Optic
- Bio multi optic and bio sleeve
- Raman optic system for single use

Follow the instructions in Section 5 →  when inserting the optics into the probe.

Refer to the *Rxn-10 Raman spectroscopic probe Operating Instructions* for operating the probe with the optics. Standard precautions for laser products should be observed.

Additional use and storage instructions for some optics are provided below.

7.1 bIO-Optic, bio multi optic and bio sleeve system, and Raman optic system for single use

Do not use the bIO-Optic, the bio multi optic and bio sleeve system, or the Raman optic system for single use with hydrocarbon solvents (including ketones and aromatics). Doing so can degrade probe performance and invalidate the warranty.

The Raman optic system for single use is NOT intended to be submerged into any liquid without being attached to the disposable fitting. The bio multi optic is NOT intended to be submerged into any liquid without being attached to a bio sleeve.

7.2 Storing the bio multi optic and the reusable portion of the Raman optic system for single use

When storing the bio multi optic or the reusable portion of the Raman optic system for single use, it is important to always protect the optic using the cover provided during shipping. Verify that the O-ring seal is installed to ensure a clean and dry environment.

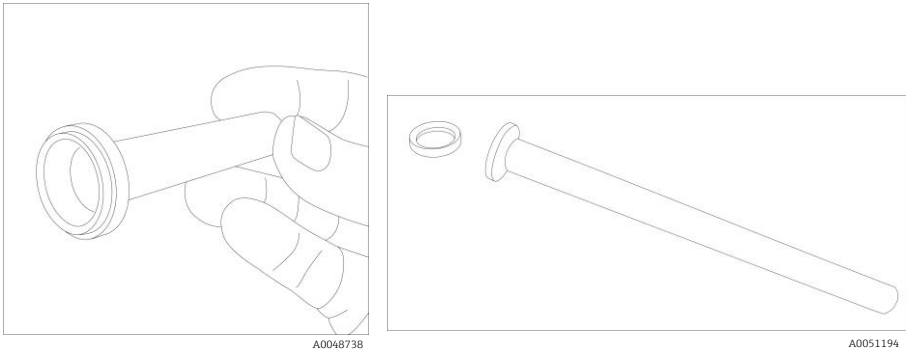


Figure 21. The cover for the reusable optic with O-ring (left) and O-ring and cover for the bio multi optic (right)

⚠ WARNING

When installing or removing optics, ensure the laser and emission shutter are in the closed position.

To remove the optic and install the optic cover for storage:

1. Loosen the metal thumb screw on the Rxn-10 probe by turning the screw counterclockwise approximately one turn (do not remove).
2. Slide the Rxn-10 probe head off the bio multi optic or reusable optic.
3. Locate the quick release clamp, the optic cover, and the sanitary seal (O-ring).
4. Slide the optic into the cover, with the O-ring creating a seal between the two pieces.
5. Install the quick release clamp over the optic/cover flange and squeeze the clamp until you hear two distinct clicks indicating that it is secure.

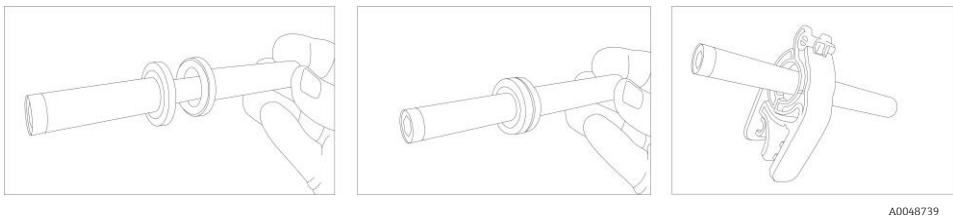


Figure 22. Installing an optic cover (left and center) and clamp (right)

8 **Diagnostics and troubleshooting**

Refer to the *Rxn-10 Raman spectroscopic probe Operating Instructions* to troubleshoot issues with the Rxn-10 probe and accessory optics.

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