

DXR3 Flex Raman Spectrometer

Site and Safety Guide

Before installation, please read this manual and follow its recommendations for the system.




CONVENTIONS USED









NOTICE

Follow instructions with this label to avoid damaging the system hardware or losing data.

Note Contains helpful supplementary information.

The following table lists some of the safety symbols and their indications that may appear in the user documentation.

Symbol	Description	Symbol	Description
	This is a mandatory action symbol. It is used to indicate that an action shall be taken to avoid a hazard.		
	This is a prohibition symbol. The graphic in this symbol is used to alert the user to actions that shall not be taken or shall be stopped.		
	This is the general warning sign. Failure to heed the safety precautions could result in personal injury.		

Symbol	Description	Symbol	Description
	Alternating current		Earth terminal or ground
	Direct current		Fuse
	Protective conductor terminal		Power on
	Frame or chassis terminal		Power off

Site Preparation

CAUTION



Avoid personal injury. If this equipment is used in a manner not specified in the accompanying documentation, the protection provided by the equipment may be impaired.

Avoid personal injury. Perform only those procedures described in the documentation. If there are other problems, "[Contact Us](#)". Any other service must be performed by trained personnel.

When the instrument arrives, check the exterior of the shipping box for signs of damage. If damage is apparent, "[Contact Us](#)" or your local distributor for instructions.

- Move the shipping box to the installation location at least 24 hours before installation.

NOTICE

- Inside the shipping box, the instrument is sealed in a plastic bag to keep unit dry.
 - Allow 24 hours for the instrument to reach room temperature before opening the bag.
 - If the bag is opened before the instrument reaches room temperature, moisture could condense on the optical components and cause permanent damage.
- While moving the instrument to the installation location, keep upright.

Note It is important to have all system utilities installed before the spectrophotometer arrives. Utility installations must comply with all local building and safety codes.

Lifting or Moving the Instrument

To avoid risk of injury, use proper lifting techniques when lifting or moving the instrument or other system components.

Workspace Considerations

- Spectrometer weight: 24.04 kg
- Laser/Filter/Grating combined weight: 2.72 kg
- Dimensions: 433 mm (L), 288 mm (W), 350 mm (H)
- Clearance needed: 32.5 cm
- Computer:
 - Plan for location of the computer, monitor and keyboard
- Ingress Protection Rating: IPX0

Temperature and Humidity

- Designed for indoor use at altitudes up to 2,000 m (6,500 ft)
- Operates reliably at temperatures between 16 °C and 27 °C
- Maintain humidity at 20% to 80% non-condensing
- Avoid damage to the optical components
 - Do not place system near sources of air conditioning ducts or large windows
 - Do not place system near sources of heat, such as heating ducts, hot plates or heating mantles

Storage

Maximum humidity for storage is 85 %RH, non-condensing, between 20 °C to 60 °C

Vibration

- The instrument will perform better in a mechanically stable environment
- Keep instrument away from machinery that may vibrate the floor
- Minimize or eliminate acoustic noise and vibration wherever possible

Floor vibration or acoustical noise from heavy manufacturing equipment, computer equipment, or other sources will not damage the system, but it can affect performance and spectral quality.

Magnetic and Electric Fields

- Place instrument at least 5.5 m (18 ft) away from magnetic fields
- Minimize or eliminate exposure to magnetic fields wherever possible
- Some wireless devices may also affect instrument performance. If this type of interference is suspected, move all wireless devices at least 2.0 m (6.5 ft) away from the instrument.

Electrical Requirements and Safety

CAUTION

Avoid shock hazard



- Each wall outlet used must be equipped with a ground. The ground must be a non-current-carrying wire connected to earth ground at the main distribution box
 - Only a qualified person using the appropriate measuring device shall check the line voltage, current and frequency
 - Only our trained and certified service representatives shall attempt to service a component that carries this symbol
 - If a protective cover on a system component appears damaged, turn off the system and secure it against any unintended operation. Always examine the protective cover for transport stresses after shipping
 - Do not allow liquid to run over or into any surface where it may gain entry into the instrument
 - All service must be performed by our trained and certified service representatives
- Power supplied to the system must be from dedicated, uninterrupted sources
 - Power must be free of voltage dropouts, transient spikes, frequency shifts, and other line disturbances
 - Use an appropriate grounded power cord for electrical service

-
- ["Contact Us"](#) if the power cord received is not appropriate for the electrical system in your location, or if the power cord becomes damaged

Power Line Conditioning Accessories

- A UPS reduces the probability of a system shutdown if power is lost in the building
- Power line conditioners (which ensure your service is free from sags, surges or other line disturbances) for 120 volt and 220 volt operation can be purchased locally
- ["Contact Us"](#) for information about power conditioners and UPS

Electrical Service Specifications

- Input current: 1.6A RMS (max.)
- Input voltage: 100-240 VAC
- Line frequency: 50-60 Hz
- Line disturbances: Sags, surges or other line disturbances must not exceed 10% of input voltage (even for a half cycle)
- Noise: < 2 V common mode; < 20 V normal mode
- Power consumption: 80 W
Generally, 50% more power should be available than the entire system (including accessories) typically uses

Safety Information

DANGER



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Fire Safety and Burn Hazards

To avoid a burn injury and the risk of fire or explosion:

- Do not test flammable or explosive samples (see ["Hazardous Materials Including Corrosives and Flammables"](#))
- Do not block any of the vents on the instrument or its power supply
- Use ONLY exact replacement power supplies from us
Correct wattage, voltage and current levels are essential to the safe operation of your instrument.

Laser and Optical Safety

WARNING

Avoid eye injury. The system is a Class 3B laser product emitting visible or invisible laser radiation. Exposure to laser radiation could cause permanent eye damage.



- All persons using or in the vicinity of a Class 3B system must wear safety eyewear that exceeds the specifications for the laser in use.
- Do not look directly into a laser, even when wearing laser safety eyewear.
- Set up a laser safety area in the location where a Class 3B system is being used.
- Do not attempt to defeat the interlocks on the instrument.

Defeating the safety interlocks on the instrument can expose you to dangerous visible/or invisible Class 3B laser radiation at levels up to 500 mW.

- Making adjustments, using controls, or performing procedures that are not specified in the documentation could result in exposure to hazardous visible or invisible laser radiation.

Setting up a Laser Safety Area

If you are going to use a Class 3B laser product the instrument must be connected to an external remote interlock system that blocks the laser beam whenever a safety perimeter around the instrument is breached (when an unauthorized person opens the door, for example).

CAUTION

Avoid personal injury.



- The connectors and the laser safety circuit must be designed and built by someone who is properly trained.
 - One of our representatives will help you install and test your connector.
 - Please have the connector ready before the system arrives.
- All persons using or in the vicinity of a Class 3B instrument must wear appropriate laser safety glasses and must be aware of the safety precautions.
- The remote interlock system protects all people in the vicinity of the Class 3B laser system.

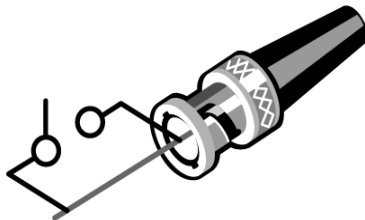
Do not attempt to defeat the interlocks on the system.

Time needed: Approximately 5 minutes

Parts needed: 2 BNC cables

1. Install a switch across the pins of the connectors on each of the BNC cables.

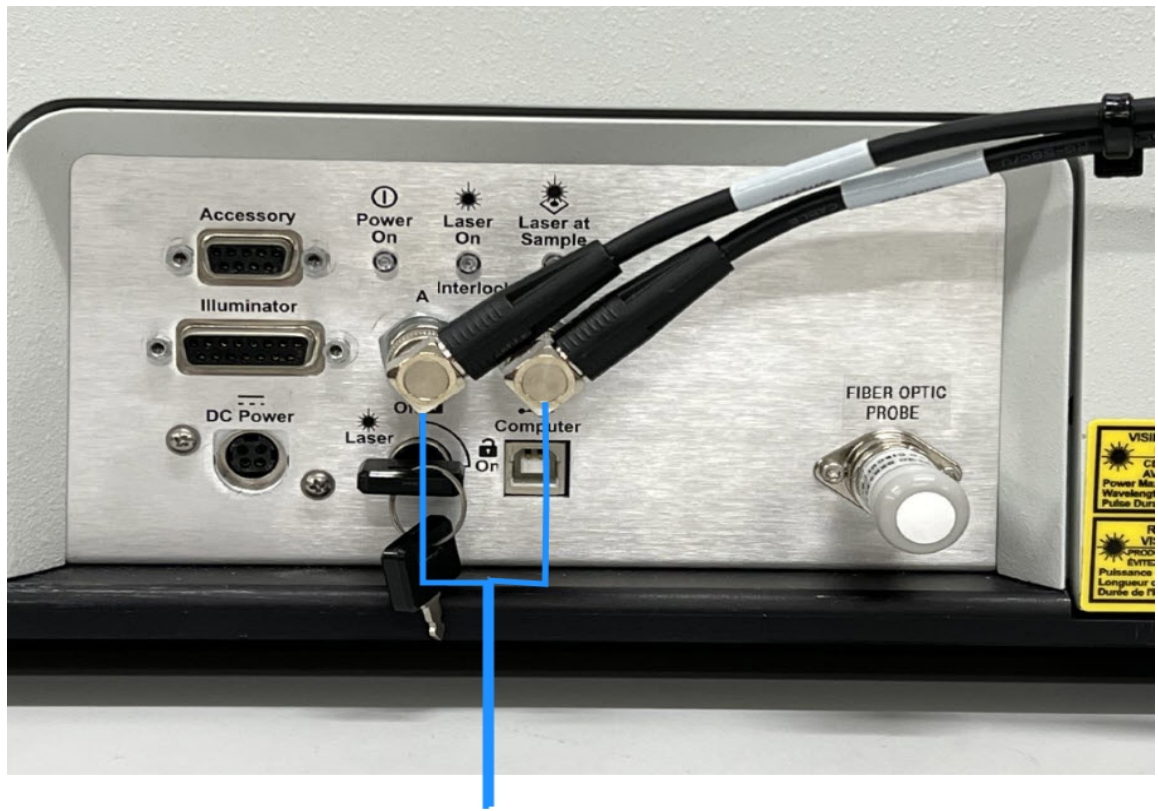
The switch must accommodate +5 VDC at 10 mA while it is closed.



Note Opening the switch blocks the laser beam, and closing the switch unblocks the beam.

2. Connect the BNC cables to the BNC connectors on the instrument power panel.

Connecting BNC cables



BNC Cables

3. Connect the BNC cables to the laser safety circuit you have designed.
4. If you are not using the fiber optic accessory, ensure the Fiber Optic Probe circuit bypass is in place, as shown.

WARNING



Avoid eye injury. Keep magnets away from the instrument because they can defeat the interlocks, which could cause the emission of visible and/or invisible laser radiation when the doors are open.

Protective Housing

WARNING

Avoid personal injury.



- Do not alter or attempt to remove the laser head from its protective housing or attempt to remove the shields that surround the laser head.
- Exposure to laser energy and high voltage may result.
- Do not attempt to service a laser that is not functioning properly.
- If a laser is malfunctioning, contact our sales or service representative in your area. Use only accessories and equipment supplied by us.

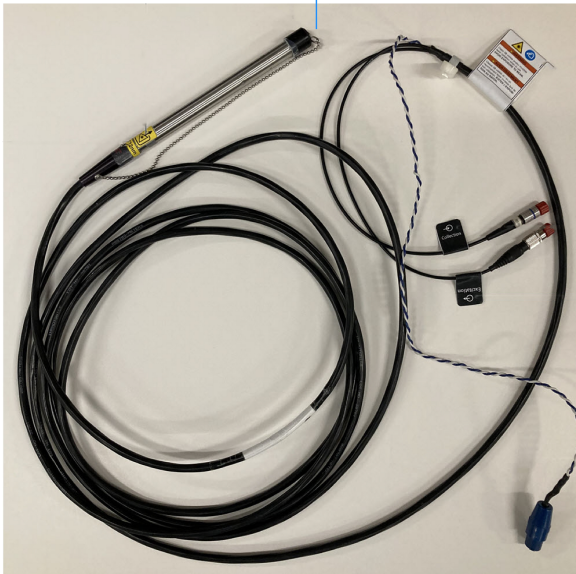
The protective housings on the instrument prevent exposure to laser energy. During normal operation, leave all the covers in place.



A: Laser output aperture when not using the fiber optic accessory.

B: Laser output aperture for the fiber optic accessory.

Figure 1-1: When using the fiber optic accessory, light is emitted from the end of the probe.



Protective Eyewear

WARNING



Avoid eye injury. Before using the instrument in a Class 3B configuration:

Always wear laser safety eyewear that exceeds the specifications for the laser



Verify that the wavelength listed on your eyewear corresponds to the wavelength of the laser being used, and exceeds the required optical safety density listed below.

Exposure to radiation from the excitation laser can result in serious injury and/or blindness. To avoid serious injury, wear laser safety eyewear whenever:

- You operate a Class 3B laser product
- You enter a laser control area

- You observe trained personnel servicing the spectrometer
- You are operating a spectrometer that has the interlocks disabled

The laser safety officer or local safety authority must obtain appropriate laser safety eyewear. The following list gives the specifications for protective eyewear for the excitation lasers that are currently available from us:

For this laser...	Wear eyewear rated for these specifications:	
	Laser wavelength	Minimum optical density
455 nm blue	455 nm	3
532 nm green	532 nm	3
633 nm red	633 nm	3
785 nm	785 nm	3

Laser Emissions

In some jurisdictions you may be required to register this instrument; check with your organization's safety officer or your local government offices. The following laser information might be needed for registration.

Laser	Characteristic	Specification
455 nm, excitation (blue)	type of laser	Diode
	wavelength	455 nm
	minimum power	25 mW*
	nominal power	35 mW*

Laser	Characteristic	Specification
	maximum power	50 mW*
	beam diameter	1 mm (1/e ² at 200 to 530 mm)*
	beam divergence	1 mrad
	operating voltage	5 VDC
	CDRH classification	Class 3B
532 nm excitation (green)	type of laser	frequency doubled Nd:YVO ₄ DPSS
	wavelength	532 nm
	minimum power	15 mW*
	nominal power	24 mW*
	maximum power	30 mW*
	beam diameter	1.9 mm (1/e ²)*
	beam divergence	<8 mrad
	operating voltage	5 VDC
	CDRH classification	Class 3B
532 nm excitation (green, high power)	type of laser	diode-pumped, solid state (DPSS)

Lasers	Characteristic	Specification
	wavelength	532 nm
	minimum power	100 mW*
	nominal power	100 mW*
	maximum power	105 mW*
	beam diameter	0.8 mm (1/e ²)*
	beam divergence	0.8 mrad
	operating voltage	5 VDC
	CDRH classification	Class 3B
633 nm excitation (red, high power)	type of laser	stabilized diode laser
	wavelength	632.9 nm
	minimum power	57 mW*
	nominal power	60 mW*
	maximum power	63 mW*
	beam diameter	0.9 mm (1/e ²)*
	beam divergence	1 mrad
	operating voltage	3.3 VDC

Lasers	Characteristic	Specification
	CDRH classification	Class 3B
785 nm excitation (invisible, low power)	type of laser	externally stabilized diode laser
	wavelength	785 nm
	minimum power	90 mW*
	nominal power	100 mW*
	maximum power	150 mW*
	beam diameter	4.0 mm (1/e ²)*
	beam divergence	1.5 mrad
	operating voltage	5 VDC
	CDRH classification	Class 3B
785 nm excitation (invisible, high power)	type of laser	internally stabilized diode laser
	wavelength	785 nm
	minimum power	420 mW*
	nominal power	420 mW*
	maximum power	450 mW*

Laser	Characteristic	Specification
	operating voltage	12 VDC
	CDRH classification	Class 3B
* At output of laser head.		

Maximum Permissible Exposure

The maximum permissible exposure (MPE) is the level of laser radiation that a person may be exposed to, under normal circumstances, without suffering adverse effects. (These levels are based on the assumption that a person is exposed to the laser beam for an infinite length of time.) The nominal ocular hazard distance (NOHD) is the distance from the laser output aperture within which the level of laser radiation exceeds the MPE.

MPE and NOHD values for the system

Laser	MPE (W/m ²)	NOHD (m)	
		10x objective	no objective
455 nm	10.0	0.30	55.45
532 nm	10.0	0.25	59.92
532 nm (high power)	10.0	0.46	59.92
633 nm (high power)	10.0	0.36	85.92
785 nm	14.8	0.37	72.91
785 nm (high power)	14.8	0.81	22.46

Disabling the Excitation Laser

Your instrument has a key switch that allows you to disable the laser.

Hazardous Materials Including Corrosives and Flammables

Spectroscopic analysis may involve the use of solvents or samples which are volatile or corrosive.

WARNING



Avoid an explosion or fire hazard. This instrument or accessory is not designed for use in an explosive atmosphere.

CAUTION



Avoid personal injury. Do not leave solvents or flammable samples near the instrument. Be sure that the workspace is properly ventilated.

- Use appropriate personal protective equipment when handling these samples
- Solvents and corrosives may damage the surfaces or structure of the instrument if spilled on it
- When working with volatile materials, ensure proper workspace ventilation to minimize entry of vapors into the interior of the instrument

Biohazard or Radioactive Materials and Infectious Agents

WARNING



Reduce the risk associated with potentially infectious samples:

- Do not spill samples on any of the instrument components
- If spill occurs, disinfect the external surfaces immediately following your laboratory protocols

- Follow your organization’s Biosafety Program protocols for working with and/or handling potentially infectious materials
 - Individuals should be trained according to applicable regulatory and organization requirements before working with potentially infectious materials
- Do Not return to us any instruments, accessories, components or other associated materials that have been contaminated with biohazard or radioactive materials, infectious agents, or any other materials and/or conditions that could constitute a health or injury hazard to employees
 - Biological samples such as tissues, body fluids, infectious agents, and blood of humans and other animals have the potential to transmit infectious diseases
- Contact us if you have questions about decontamination requirements

Safety Labels

Figure 1-2: Your system came with the following safety labels:

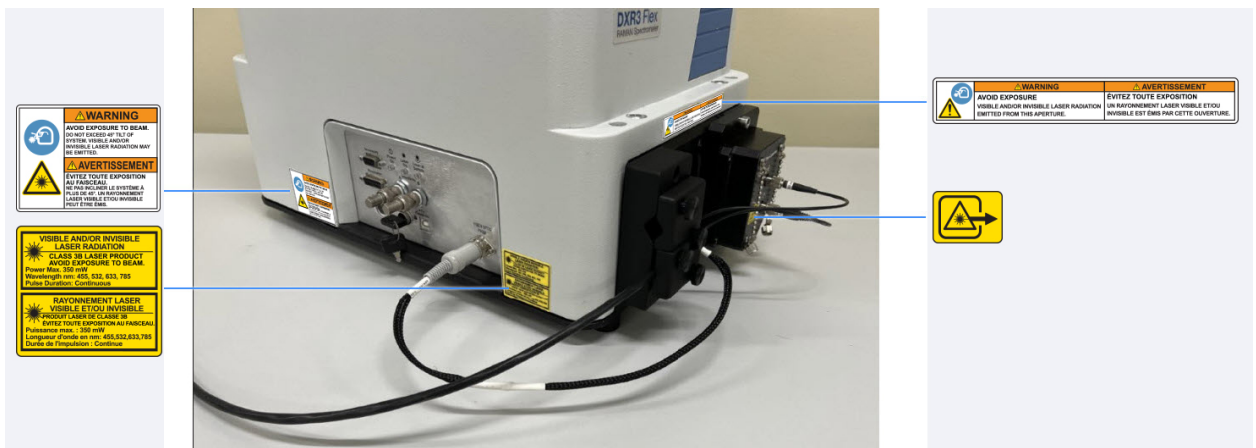
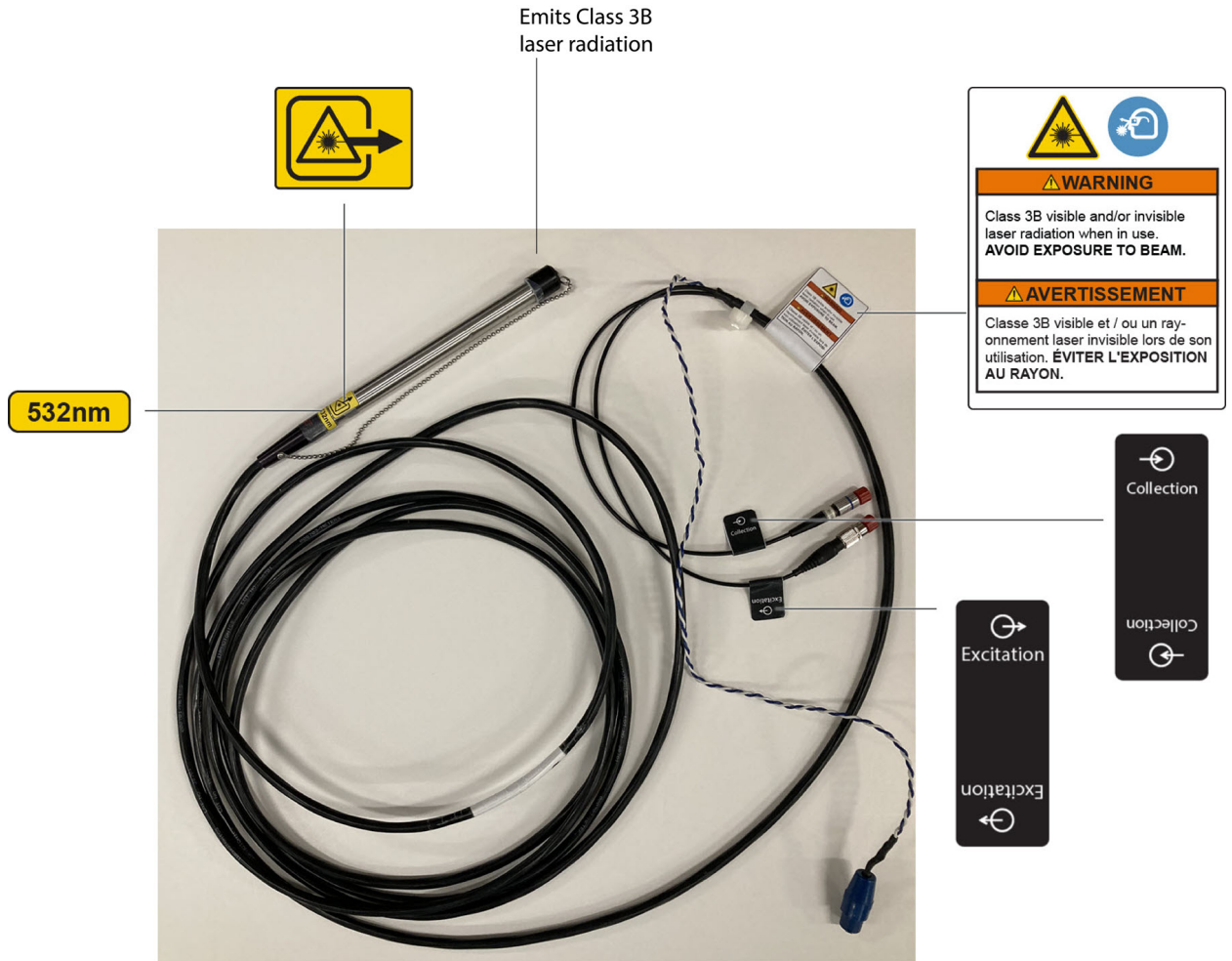


Figure 1-3: The fiber optic accessory includes the following labels:



Cleaning



Avoid shock hazard.

- Turn off power supply before cleaning
- Do not allow liquid to run into a power supply

NOTICE

- Do not use harsh detergents, solvents, chemicals or abrasives
- Do not allow liquid to run onto optical surfaces
- Do not attempt to clean or touch the mirror surfaces

Clean the outside of the spectrometer with a damp (not wet), soft cloth and a mild soap.

Contact Us

For U.S. Technical Support, please contact:

Unity Lab Services
Part of Thermo Fisher Scientific
5225 Verona Road
Madison WI 53711-4495 U.S.A.
Telephone: 1 800 532 4752
E-mail:
us.techsupport.analyze@thermofisher.com

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Thermo Fisher Scientific
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Avoid an explosion or fire hazard. This instrument or accessory is not designed for use in an explosive atmosphere.