

MiSeq FGx™ Instrument Site Prep Guide

VEROGEN PROPRIETARY
Document # VD2018012 Rev. A
June 2018



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Introduction

This guide provides the information you need to prepare your site for installation and operation of the MiSeq FGx instrument:

- ▶ Laboratory space requirements
- ▶ Electrical requirements
- ▶ Environmental constraints
- ▶ Computing requirements
- ▶ User-supplied consumables and equipment

Additional Resources

The following documentation is available for download from the Verogen website:

- ▶ *MiSeq FGx Instrument Safety and Compliance Guide (document # VD2018011)*—Provides information about instrument labeling, compliance certifications, and safety considerations.
- ▶ *MiSeq FGx Instrument Reference Guide (document # VD2018006)*—Provides an overview of instrument components and software, instructions for performing sequencing runs, and procedures for proper instrument maintenance and troubleshooting.
- ▶ *ForenSeq Universal Analysis Software Guide (document # VD2018007)*—Provides a comprehensive overview of analysis procedures and computing requirements.

Visit the MiSeq FGx instrument support page on the Verogen website for access to documentation, software downloads, frequently asked questions, and additional resources.

Delivery and Installation

A Verogen authorized service provider delivers, uncrates, and places the MiSeq FGx instrument on the lab bench. The space and bench must be ready in advance of delivery.



CAUTION

Allow only authorized personnel to uncrate, install, or move the MiSeq FGx instrument. Mishandling of the instrument can affect the alignment or damage instrument components.

The instrument is heavy. Improperly uncrating, installing, or moving the MiSeq FGx instrument can:

- ▶ Cause serious injury, if dropped or mishandled.
- ▶ Cause damaged to the instrument.

A Verogen representative installs and aligns the instrument. Connection to a data storage location is required for proper function of the system. See *Network Considerations* on page 12 for steps that you must complete before installation.



CAUTION

After your Verogen representative has installed and aligned the MiSeq FGx, **do not** relocate the instrument. Moving the instrument improperly can impact the optical alignment and compromise data integrity. If you need to relocate the MiSeq FGx instrument, contact your Verogen representative.

Crated Dimensions and Contents

The MiSeq FGx instrument is shipped in one crate. Use the following dimensions to determine the minimum door width required to accommodate the shipping container.

Measurement	Crated Dimensions
Width	72.4 cm (28.5 in.)
Height	76.8 cm (30.25 in.)
Depth	83.8 cm (33 in.)
Weight	90.7 kg (200 lbs.)

The crate contains the MiSeq FGx instrument along with the following components:

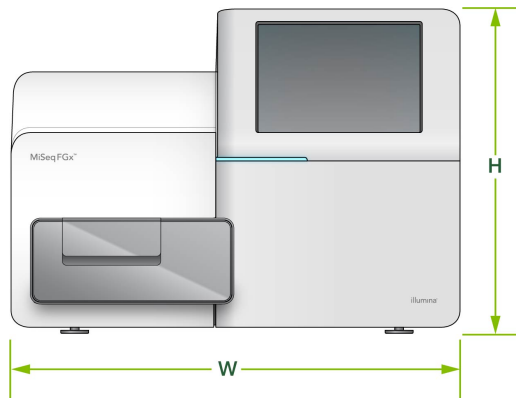
- ▶ Waste bottle, drip tray, and two labels for shipping restraint locations.
- ▶ MiSeq FGx Accessories Kit, which contains the following components:
 - ▶ Wash tray
 - ▶ Wash bottle, 500 ml
 - ▶ Waste bottle stopper (red)
 - ▶ T-handle hex-drive tool, 6 mm
 - ▶ T-handle hex-drive tool, 5/64 in.
 - ▶ Network cable, shielded CAT6
- ▶ Power cord

Laboratory Requirements

This section provides requirements and guidelines to set up your lab space properly for the MiSeq FGx instrument. For more information, see *Environmental Constraints* on page 11.

Instrument Dimensions

Figure 1 MiSeq FGx Instrument



The MiSeq FGx has the following dimensions upon installation:

Measurement	Instrument Dimensions
Width	68.6 cm (27 in.)
Height	52.3 cm (20.6 in.)
Depth	56.5 cm (22.2 in.)
Weight	57.2 kg (126 lbs.)

Placement Requirements

The MiSeq FGx must be positioned in such a way to ensure access to the power switch and power outlet, for proper ventilation, and for servicing the instrument.

- ▶ Make sure that you can reach around the right-side of the instrument to turn on or turn off the power switch on the back panel adjacent to the power cord.
- ▶ Position the instrument so that personnel can quickly disconnect the power cord from the outlet.
- ▶ The instrument must be accessible from all sides using the following minimum clearance dimensions:

Access	Minimum Clearance
Sides	Allow at least 61 cm (24 in.) on each side of the instrument.
Rear	Allow at least 10.2 cm (4 in.) behind the instrument.
Top	Allow at least 61 cm (24 in.) above the instrument. If the instrument is positioned under a shelf, make sure that the minimum clearance requirement is met.

**CAUTION**

If you need to relocate the MiSeq FGx, contact your Verogen representative. Moving the instrument improperly can impact the optical alignment and compromise data integrity.

Server, Router, and Monitor Dimensions

The ForenSeq Universal Analysis Software server has the following dimensions upon installation:

Measurement	Instrument Dimensions
Width	17.78 cm (7 in.)
Height	45.72 cm (18 in.)
Depth	63.5 cm (25 in.)

The router has the following dimensions upon installation:

Measurement	Instrument Dimensions
Width	25.4 cm (10 in.)
Height	4.1 cm (1.6 in.)
Depth	17.78 cm (7 in.)
Weight	590 g (1.3 lbs.)

The monitor with the monitor stand has the following dimensions upon installation:

Measurement	Instrument Dimensions
Width	51 cm (20.11 in.)
Height	36 cm (14.37 in.)
Depth	24 cm (9.45 in.)
Weight	6.45 kg (14.22 lbs.)

Lab Bench Guidelines

Verogen recommends placing the instrument on a lab bench without casters. The bench must be capable of supporting the weight of the instrument, which is 57.2 kg (126 lbs.).

Width	Height	Depth	Casters
122 cm (48 in.)	91.4 cm (36 in.)	76.2 cm (30 in.)	No

For North American customers, Verogen recommends the following lab bench: Bench-Tek Solutions (www.bench-tek.com), part # BT40CR-3048BS-PS

Vibration Guidelines



CAUTION
The MiSeq FGx is sensitive to vibrations.

Use the following guidelines to minimize vibrations during sequencing runs and ensure optimal performance:

- ▶ Place the instrument on a sturdy immobilized lab bench.
- ▶ Do not place any other equipment on the bench that might induce vibrations, such as a shaker, vortexer, centrifuge, or instruments with heavy fans.
- ▶ Do not install the instrument near frequently used doors. Opening and closing of the doors might induce vibrations.
- ▶ Do not install a keyboard tray that hangs below the bench.
- ▶ While the instrument is sequencing, do not touch the instrument, open the reagent door, or place anything on top of the instrument.

Lab Setup for PCR Procedures

The polymerase chain reaction (PCR) process is used to prepare libraries for amplicon sequencing. Unless you exercise sufficient caution, PCR products can contaminate reagents, instruments, and samples, causing inaccurate and unreliable results. PCR product contamination can impact lab processes adversely and delay normal operations.



CAUTION
You must establish dedicated areas and lab procedures to prevent PCR product contamination before you begin work in the lab.

Dedicate Physically Separate Areas

Make sure that your lab is set up appropriately to reduce the risk of PCR product contamination.

- ▶ Dedicate physically separate pre-PCR laboratory space where pre-PCR processes are performed (DNA extraction, quantification, and normalization).
- ▶ Dedicate physically separate post-PCR laboratory space where PCR products are made and processed.
- ▶ Never use the same sink to wash pre-PCR and post-PCR materials.
- ▶ Never share the same water purification system for pre-PCR and post-PCR processes.
- ▶ Store all supplies used in pre-PCR protocols in the pre-PCR area, and transfer to the post-PCR area as needed.
- ▶ *The instrument must be located in the post-PCR laboratory.*

Dedicate Equipment and Supplies

- ▶ Dedicate separate full sets of equipment and supplies (pipettes, incubator, heat block, vortexer, centrifuge, etc.) to pre-PCR and post-PCR lab processes, and never share between processes.
- ▶ Dedicate separate storage areas (freezers and refrigerators) for pre-PCR and post-PCR consumables.

Electrical Requirements

The following sections list power specifications and electrical requirements for your facility.

Power Specifications

Type	Specification
Line Voltage	100–240 Volts AC @ 50/60 Hz
Power Consumption	400 Watts

Connections

Your facility must be wired with the following equipment:

- ▶ **For 100–110 Volts AC**—A 10-amp grounded, dedicated line with proper voltage is required.
- ▶ For North America and Japan—Receptacle: NEMA 5-15
- ▶ **For 220–240 Volts AC**—A 6-amp grounded line with proper voltage is required.
- ▶ If the voltage fluctuates more than 10%, a power line regulator is required.

Protective Earth



The MiSeq FGx has a connection to protective earth through the enclosure. The safety ground on the power cord returns protective earth to a safe reference. The protective earth connection on the power cord must be in good working condition when using this device.

Power Cords

The MiSeq FGx comes with an international standard IEC 60320 C13 connection and is shipped with a region-specific power cord.

Hazardous voltages are removed from the instrument only when the power cord is disconnected from the AC power source.



CAUTION
Never use an extension cord to connect the instrument to a power supply.

Fuses

The MiSeq FGx contains no user-replaceable fuses.

Uninterruptible Power Supply

The use of a user-supplied uninterruptible power supply (UPS) is highly recommended. Verogen is not responsible for runs affected by interrupted power regardless of whether the instrument is on a UPS or not. Standard generator-backed power is often not uninterruptible and a brief power outage occurs before power resumes, which interrupts a sequencing run.

Environmental Constraints

Element	Specification
Temperature	Transportation and Storage: -10°C to 40°C (14°F to 104°F) Operating Conditions: 19°C to 25°C (66°F to 77°F)
Humidity	Transportation and Storage: Non-condensing humidity Operating Conditions: 30-75% relative humidity (non-condensing)
Elevation	Below 2,000 meters (6,500 feet)
Air Quality	Pollution Degree II environment or better Note: A Pollution Degree II environment is defined as one that normally includes only non-conductive pollutants.
Ventilation	Consult your facilities department for ventilation requirements for the level of heat output expected from the instrument.

Heat Output

Measured Power	Thermal Output
400 Watts	1,364 BTU/h

Noise Output

The MiSeq FGx is an air-cooled instrument. Noise from the fan is clearly audible when the instrument is running.

Noise Output (dB)	Distance from Instrument
< 62 dB	1 meter (3.3 feet)

A measurement of < 62 dB is the level of a normal conversation at a distance of approximately 1 meter (3.3 feet).

Network Considerations

A network connection is required due to the amount of data generated by the MiSeq FGx. This network connection can be via a customer LAN, or via the router supplied by Verogen.

- ▶ A shielded CAT6 network cable of 3 meters (9.8 feet) in length is provided with the instrument.

Customers access a web interface on the server to communicate with the Verogen Forensic Genomics System. If the server is not listed in the Domain Name System (DNS), make sure to have a static server IP address, or a static lease on a Dynamic Host Configuration Protocol (DHCP) address ready by time of installation.

To use the following features, network connections are required:

- ▶ Access manifest files, sample sheets, and references located on a network server from the MiSeq Forensic Control Software (MFCS) interface.
- ▶ Easily move data from previous runs and analyses to a server location for storage, and to manage disk space on the integrated MiSeq FGx computer.
- ▶ Monitor and manage secondary analysis using the ForenSeq Universal Analysis Software.



NOTE

Upon connection to a network, configure Windows Update so that the MiSeq FGx does not automatically update. If automatic updates are left on, the MiSeq FGx might restart in the middle of a run. If a restart occurs, start the run from the beginning.

Use the following recommendations to install and configure a network connection:

- ▶ Use a 1 gigabit connection between the instrument and your data management system. This connection can be made directly or through a network switch.
- ▶ Upon connection to a network, configure Windows Update so that the MiSeq FGx does not automatically update. Verogen recommends waiting one month after a Windows release before allowing an update.

Network Support

Verogen does not provide installation or technical support for networking the instrument.

Review network maintenance activities for potential compatibility risks with the Verogen system, including the following risks:

- ▶ **Removal of the Group Policy Objects (GPOs)**—GPOs can affect the operating system (OS) of connected Verogen resources. OS changes can disrupt the proprietary software in Verogen systems.
Verogen instruments have been tested and verified to operate correctly. After connecting to domain GPOs, some settings might affect the instrument software. If the instrument software operates incorrectly, consult your facility IT administrator about possible GPO interference.
- ▶ **Activation of Windows Firewall and Windows Defender**—These Windows products can affect the OS resources that Verogen software accesses. Verogen recommends installing anti-virus software to protect the instrument control computer against viruses. For more information, see *Anti-Virus Software* on page 13.
- ▶ **Changes to the privileges of preconfigured users**—Verogen recommends maintaining existing privileges for preconfigured users. However, the preconfigured users can be made unavailable.

Anti-Virus Software

Verogen recommends that you purchase and install an anti-virus software of your choice to protect the instrument control computer against viruses. Verogen has tested Symantec on Windows 7 with the following settings.

To avoid data loss or interfering with instrument operations, configure the anti-virus software as follows:

- ▶ Set for manual scans. Do not enable automatic scans.
- ▶ Perform manual scans only when the instrument is not in use.
- ▶ Set updates to download without user authorization, but not install.
- ▶ Do not reboot the computer automatically upon update.
- ▶ Exclude the application directory and data drives from any real-time file system protection, specifically C:\Illumina, and the D:\ and E:\ drives.

User-Supplied Consumables and Equipment

The following consumables and equipment are required for performing sequencing runs on the MiSeq FGx. For more information, see the *MiSeq FGx Instrument Reference Guide* (document # VD2018006).

User-Supplied Consumables

Make sure that the following consumables are available before beginning a run.

Consumable	Supplier	Purpose
Alcohol wipes, 70% Isopropyl or Ethanol, 70%	VWR, catalog # 95041-714*	Cleaning the flow cell holder
Disposable gloves, powder-free	General lab supplier	General use
Lab tissue, low-lint	VWR, catalog # 21905-026*	Cleaning the flow cell stage and the foil seal covering the load samples reservoir
Lens paper, 4 x 6 in.	VWR, catalog # 52846-001*	Cleaning the flow cell
Microcentrifuge tubes	General lab supplier	Denaturing and diluting sample libraries and control DNA
MiSeq wash tube	Verogen, part # MS-102-9999	Washing the instrument
Sodium hypochlorite	General lab supplier	Washing the instrument
Tween 20	Sigma-Aldrich, catalog # P7949	Washing the instrument
Tweezers, square-tip plastic (optional)	McMaster-Carr, catalog # 7003A22*	Removing flow cell from flow cell shipping container
Water, nuclease-free	General lab supplier	Washing the instrument

* or equivalent

Guidelines for Nuclease-free Water

Always use nuclease-free water to perform instrument procedures. Never use tap water or deionized water. Any of the following are acceptable examples:

- ▶ Illumina PW1
- ▶ 18 Megaohm (MΩ) water
- ▶ Milli-Q water
- ▶ Super-Q water
- ▶ Molecular biology-grade water

User-Supplied Equipment

- ▶ Freezer, -25°C to -15°C, frost-free
- ▶ Ice bucket
- ▶ Refrigerator, 2°C to 8°C

Technical Assistance

For technical assistance, contact Verogen Technical Support.

Table 1 General Contact Information

Address	11111 Flintkote Avenue San Diego CA 92121 USA
Website	www.verogen.com
Email	techsupport@verogen.com
Phone	+1.833.837.6436 toll-free (North America) +1.858.285.4101 (outside North America)

Safety data sheets (SDSs)

- ▶ For MiSeq FGx sequencing kit safety data sheets, visit www.verogen.com/sds.
- ▶ For Research Use Only (RUO) sequencing reagent and Illumina library preparation kit safety data sheets, visit support.illumina.com/sds.

Product documentation—Available for download in PDF from the Verogen website. Go to www.verogen.com/support select the appropriate document.

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