

MiSeq FGx Sequencing System

Site Prep Guide

VEROGEN PROPRIETARY
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Revision History

Document #	Date	Description of Change
VD2018012 Rev. B	February 2021	Added 1000 µl micropipettes and test tube brushes to user-supplied equipment. Updated the following product names: <ul style="list-style-type: none">• MiSeq FGx Control Software• MiSeq FGx Sequencing System• Universal Analysis Software Updated the MiSeq FGx trademark to a registered trademark (®). Updated the format of the guide, including splitting up long sections. Updated the guide name to <i>MiSeq FGx Sequencing System Site Prep Guide</i> . Corrected the link to additional resources.
VD2018012 Rev. A	June 2018	Initial release

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Introduction

The Verogen MiSeq FGx[®] Sequencing System uses sequencing-by-synthesis (SBS) to sequence libraries and perform base calling. The system integrates cluster generation, sequencing, and data analysis into one desktop instrument.

This guide provides specifications and guidelines to prepare your site for system installation and operation:

- Laboratory space requirements
- Electrical requirements
- Environmental constraints
- Computing requirements
- Consumables and equipment

Additional Resources

The [Documentation page](#) on the Verogen website provides the following additional system documentation. Always check the website for the most recent versions.

Resource	Description
<i>MiSeq FGx Sequencing System Safety and Compliance Guide (document # VD2018011)</i>	Provides labeling, compliance certifications, and important safety considerations.
<i>MiSeq FGx Sequencing System Reference Guide (document # VD2018006)</i>	Provides an overview of system components and software, sequencing instructions, and system maintenance and troubleshooting.

Delivery and Installation

A Verogen service provider delivers and uncrates the MiSeq FGx System and positions it on a laboratory bench. Prepare the space and bench before delivery. Proper system function requires connection to a data storage location. See [Network Considerations on page 10](#) for steps you must complete before installation.

A Verogen representative installs and aligns the instrument. If you must relocate the system after installation and alignment, contact your Verogen representative. **Do not** relocate the instrument yourself.

The system is heavy. Improper uncrating, installation, or moving can cause serious injury or damage system components. Mishandling can also affect optical alignment and compromise data integrity.

Crate Contents

The shipping crate contains the instrument and the following components:

- Drip tray
- Labels (two) for shipping restraint locations
- MiSeq FGx Accessories Kit, which includes the following components:
 - Network cable, shielded CAT6
 - T-handle hex-drive tool, 5/64 in.
 - T-handle hex-drive tool, 6 mm

- Wash bottle, 500 ml
- Waste bottle stopper (red)
- Wash tray
- Power cord
- Waste bottle

Crate Dimensions

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

Measurement	Crated Dimensions (Metric)	Crated Dimensions (US)
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 lb.

Laboratory Requirements

This section details the requirements to set up your laboratory to accommodate the MiSeq FGx System.

Instrument Dimensions

The following figure and table provide the dimensions of an installed MiSeq FGx System.

Figure 1 Instrument measurements

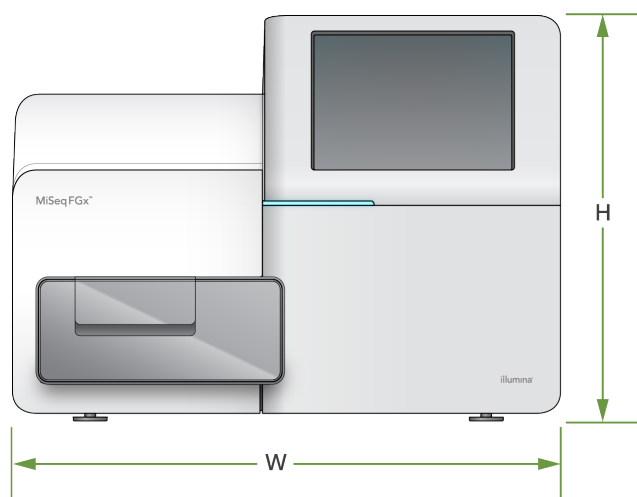


Table 1 Installed instrument dimensions

Measurement	Dimensions (Metric)	Dimensions (US)
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 lb.

Placement Requirements

The position of the MiSeq FGx System must ensure proper ventilation, access to the power switch and power outlet, and access for service. Use the minimum clearance dimensions presented in the following table to ensure that the instrument is accessible from all sides.

- Make sure that you can reach around the right side of the instrument to turn the power switch on or off. The power switch is on the back panel adjacent to the power cord.
- Position the instrument so that personnel can quickly disconnect the power cord from the outlet.

Table 2 Minimum clearance requirements

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.

Server Dimensions

The following tables list the installed dimensions of the Universal Anaysis Software (UAS) server, router, and monitor.

Table 3 Server

Measurement	Dimension (Metric)	Dimension (US)
Width	17.78 cm	7 in.
Height	45.72 cm	18 in.
Depth	63.5 cm	25 in.

Table 4 Router

Measurement	Dimension (Metric)	Dimension (US)
Width	25.4 cm	10 in.
Height	4.1 cm	1.6 in.
Depth	17.78 cm	7 in.
Weight	590 kg	1.3 lb.

Table 5 Monitor with the monitor stand

Measurement	Dimension (Metric)	Dimension (US)
Width	51 cm	20.11 in.
Height	36 cm	14.37 in.
Depth	24 cm	9.45 in.
Weight	6.45 kg	14.22 lb.

Lab Bench Guidelines

Place the instrument on a lab bench **without casters**. The bench must be able to support the instrument weight of 57.2 kg (126 lb.).

Table 6 Lab bench dimensions

Measurement	Dimension (Metric)	Dimension (US)
Width	122 cm	48 in.
Height	91.4 cm	36 in.
Depth	76.2 cm	30 in.

For North American laboratories, Verogen recommends the Lab Equipment Workbench with Outlet Inlay from Bench-Tek Solutions (part # BT40CR-3048BS-PS).

Vibration Guidelines

The MiSeq FGx System is sensitive to vibrations. Use the following guidelines to minimize vibrations during runs and ensure optimal performance:

- Place the instrument on a sturdy, immobilized lab bench.
- Do not place any equipment on the lab 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 lab bench.

- Do not touch the instrument, open the reagent door, or place anything on top of the instrument during a run.

Setup for PCR Procedures

Preparing libraries for sequencing requires the polymerase chain reaction (PCR) process. Before you start working in the laboratory, establish dedicated areas and procedures to prevent PCR product contamination.

Without sufficient caution, PCR products can contaminate reagents, instruments, and samples, causing inaccurate and unreliable results. PCR product contamination can adversely affect laboratory processes and delay normal operations.

Dedicate Physically Separate Areas

Make sure that your laboratory is set up to reduce the risk of PCR product contamination:

- Dedicate physically separate pre-PCR laboratory space where pre-PCR processes are performed.
- Dedicate physically separate post-PCR laboratory space where PCR products are made and processed.
- Wash pre-PCR and post-PCR materials in different sinks.
- Dedicate separate water purification systems for pre- and post-PCR processes.
- Store all supplies used for pre-PCR processes in the pre-PCR area. Transfer these supplies to the post-PCR area as needed.
- Locate the MiSeq FGx System in the post-PCR laboratory.

Dedicate Equipment and Supplies

- Dedicate separate full sets of equipment and supplies to pre- and post-PCR lab processes, and never share between processes. Pipettes, incubators, heat blocks, vortexers, and centrifuges are examples of dedicated equipment.
- Dedicate separate storage areas (freezers and refrigerators) for pre- and post-PCR consumables.

Electrical Requirements

The following sections list power specifications and electrical requirements.

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, a receptacle: NEMA5-15.
- 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 System 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 System comes with an international standard IEC 60320 C13 connection and a region-specific power cord. Never use an extension cord to connect the instrument to a power supply.

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

Fuses

The MiSeq FGx System does not contain any user-replaceable fuses.

Uninterruptible Power Supply

Using 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 connected to a UPS. Standard generator-backed power is typically not uninterruptible and a brief power outage occurs before power resumes, which interrupts a run.

Environmental Constraints

Element	Specification
Temperature	-10°C to 40°C (14°F to 104°F) for transportation and storage 19°C to 25°C (66°F to 77°F) for operating conditions
Humidity	Non-condensing humidity for transportation and storage 30-75% relative humidity (non-condensing) for operating conditions
Elevation	Below 2000 m (6500 ft)
Air Quality	Pollution Degree II environment or better*
Ventilation	Consult your facilities department for ventilation requirements suiting the expected level of heat output.

* A Pollution Degree II environment normally includes only non-conductive pollutants.

Heat Output

Measured Power	Thermal Output
400 Watts	1364 BTU/h

Noise Output

The MiSeq FGx System is an air-cooled instrument. Noise from the fan is clearly audible when the instrument is running. A measurement of < 62 dB is the level of a normal conversation at a distance of approximately 1 m (3.3 ft.).

Noise Output	Distance from Instrument
< 62 dB	1 m (3.3 ft.)

Network Considerations

The amount of data the MiSeq FGx System generates requires a network connection. The network connection can be a customer local area network (LAN) or the router supplied by Verogen. The instrument includes a shielded CAT6 network cable 3 m (9.8 ft.) long.

Customers access a web interface on the server to communicate with the system. If the Domain Name System (DNS) does not list the server, have one of the following addresses ready by installation:

- Static server IP address
- Static lease on a Dynamic Host Configuration Protocol (DHCP) address

Network Connections

The following functions require network connections:

- Access manifest files, sample sheets, and references located on a network server from the MiSeq FGx Control Software (MFCS) interface.
- Easily move data from previous runs and analyses to a server location for storage and manage disk space on the instrument computer.
- Monitor and manage data analysis with UAS.

The following recommendations support installing and configuring 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.
- When connecting to a network, configure Windows Update so that automatic updates are turned off. Wait one month after a Windows release before allowing an update.

If automatic updates are left on, the system might restart mid-run and the run must be restarted.

Network Support

Verogen does not provide installation or technical support for networking the MiSeq FGx System. Review network maintenance activities for potential compatibility risks, including the following risks:

- **Removal of 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 are tested and verified to operate correctly. After connecting to domain GPOs, some settings might affect the system software.
- If the system 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. Install anti-virus software to protect the instrument computer against viruses. See [Anti-Virus Software on page 11](#).
- **Changes to the privileges of preconfigured users**—Maintain existing privileges for preconfigured users. However, the preconfigured users can be made unavailable.

Anti-Virus Software

Purchase and install anti-virus software of your choice to protect the instrument computer against viruses. Verogen has tested Symantec on Windows 7 with the following settings. To avoid data loss or interference with instrument operation, apply the same settings.

- 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, drive D, and drive E.

User-Supplied Consumables and Equipment

Performing a sequencing run or wash on the MiSeq FGx System requires purchasing the consumables and equipment listed in this section. Make sure that all items are available before starting a run or wash. For run and wash instructions, see the *MiSeq FGx Sequencing System Reference Guide (document # VD2018006)*.

Consumables

Consumable	Supplier	Purpose
Alcohol prep pads	VWR, catalog # 95041-714 ¹	Cleaning the flow cell holder
Gloves, disposable, powder-free	General lab supplier	General use
Lab tissue, low-lint	VWR, catalog # 21905-026 ²	Cleaning the flow cell stage and sample seal
Lens paper, 4 x 6 in	VWR, catalog # 52846-001 ²	Cleaning the flow cell
MiSeq Disposable Wash Tubes	Verogen, part # MS-102-9999	Washing the instrument
One of the following kits: <ul style="list-style-type: none"> • MiSeq FGx Reagent Kit • MiSeq FGx Reagent Micro Kit 	The equivalent supplier: <ul style="list-style-type: none"> • Verogen, part # 15066817 • Verogen, part # 20021681 	Provides the reagents and flow cell for a run
Sodium hypochlorite	General lab supplier	Post-run washes

Consumable	Supplier	Purpose
Tween 20	Sigma-Aldrich, catalog # P7949	Washing the instrument
Water, deionized	General lab supplier	Thawing reagents
Water, nuclease-free	General lab supplier	Washing the instrument
[Optional] Tweezers, plastic square tip	McMaster-Carr, catalog # 7003A22 ²	Handling the flow cell

¹ Or equivalent pads (70% isopropyl or 70% ethanol)

² Or equivalent

Guidelines for Nuclease-Free Water

Always use nuclease-free water to perform instrument procedures. Do not use tap water or deionized water.

The following reagents are considered nuclease-free water:

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

Equipment

- 1000 µl micropipettes
- Freezer, -25°C to -15°C, frost-free
- Ice bucket
- Refrigerator, 2°C to 8°C
- Test tube brushes

Technical Support

For technical assistance, contact Verogen Technical Support.

Contact Information

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Safety data sheets (SDS)—Available for download from verogen.com/documentation.

Product documentation—Available for download from verogen.com/documentation.

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