EMax® Plus

Microplate Reader

User Guide

MOLECULAR DEVICES

5032018 C
October 2018

Product manufactured by Molecular Devices, LLC.
3860 N. First Street, San Jose, California, 95134, United States of America.
Molecular Devices, LLC is ISO 9001 registered.

Contents

Safety Information

Information about the safe use of the instrument from Molecular Devices® includes an understanding of the user-attention statements in this guide, the safety labels on the instrument, precautions to follow before you operate the instrument, and precautions to follow while you operate the instrument.

Make sure that everyone involved with the operation of the instrument has:

- Received instruction in general safety practices for laboratories.
- Received instruction in specific safety practices for the instrument.
- Read and understood all Safety Data Sheets (SDS) for all materials being used.

Read and observe all warnings, cautions, and instructions. The most important key to safety is to operate the instrument with care.

WARNING! If the instrument is used in a manner not specified by Molecular Devices, the protection provided by the equipment might be impaired.

Warnings, Cautions, Notes, and Tips

All warning symbols are framed within a yellow triangle. An exclamation mark is used for most warnings. Other symbols can warn of other types of hazards such as biohazard, electrical, or laser safety warnings as are described in the text of the warning. Follow the related safety information.

The following user attention statements might be displayed in the text of Molecular Devices user documentation. Each statement implies the amount of observation or recommended procedure.

WARNING! A warning indicates a situation or operation that could cause personal injury if precautions are not followed.

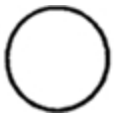
CAUTION! A caution indicates a situation or operation that could cause damage to the instrument or loss of data if correct procedures are not followed.

Note: A note calls attention to significant information.

Tip: A tip provides useful information or a shortcut, but is not essential to the completion of a procedure.

Symbols on the Instrument

Each safety label found on the instrument contains an alert symbol that indicates the type of potential safety hazard.

Symbol	Indication
	Consult the product documentation.
	Potential biohazard.
	Power switch indicates power on.
	Power switch indicates power off.
	Required in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union. It indicates that you must not discard this electrical or electronic product or its components in domestic household waste or in the municipal waste collection system. For products under the requirement of the WEEE directive, contact your dealer or local Molecular Devices office for the procedures to facilitate the proper collection, treatment, recovery, recycling, and safe disposal of the device.

- - California proposition 65 requires businesses to provide warnings to Californians about significant exposures to chemicals that cause cancer, birth defects, or other reproductive harm.

Electrical Safety

To prevent electrical injuries and property damage, inspect all electrical equipment before use and report all electrical deficiencies. Contact Molecular Devices technical support for equipment service that requires the removal of covers or panels.

To prevent electrical shock, use the supplied power cord and connect to a properly grounded wall outlet.

To ensure sufficient ventilation and provide access to disconnect power from the instrument, maintain a 20 cm to 30 cm (7.9 in. to 11.8 in.) gap between the rear of the instrument and the wall.

Power off the instrument when not in use.

Chemical and Biological Safety

Normal operation of the instrument can involve the use of materials that are toxic, flammable, or otherwise biologically harmful. When you use such materials, observe the following precautions:

- Handle infectious samples based on good laboratory procedures and methods to prevent the spread of disease.
- Observe all cautionary information printed on the original containers of solutions before their use.
- Dispose of all waste solutions based on the waste disposal procedures of your facility.
- Operate the instrument in accordance with the instructions outlined in this guide, and take all the required precautions when using pathological, toxic, or radioactive materials.
- Splashing of liquids can occur. Take applicable safety precautions, such as using safety glasses and wearing protective clothing, when working with potentially hazardous liquids.
- Observe the applicable cautionary procedures as defined by your safety officer when using hazardous materials, flammable solvents, toxic, pathological, or radioactive materials in or near a powered-up instrument.

WARNING! Never use the instrument in an environment where potentially damaging liquids or gases are present.

Moving Parts Safety

The plate carrier on the EMax Plus moves in and out of the read chamber during the read, and then returns to the home position after the read ends. If the plate carrier does not return to the home position, select the Operations tab and click **Initialize**.

The instrument contains moving parts that can cause injury. Under normal conditions, the instrument is designed to protect you from these moving parts.

WARNING! If the instrument is used in a manner not specified by Molecular Devices, the protection provided by the equipment might be impaired.

To prevent injury:

- Never try to exchange labware, reagents, or tools while the instrument is operating.

  The instrument calibrates the lamp before moving the microplate carrier into the chamber for each read. Between multiple-wavelength or kinetic reads, the carrier waits in the home position before the read continues. Do not try to remove the plate until the software indicates that the entire read is complete.
- Never try to physically restrict the moving components of the instrument.
- Keep the instrument work area clear to prevent obstruction of the movement.

CAUTION! To prevent damage to the instrument, the height of the plate must not exceed 15 mm.

Note: Observe all warnings and cautions listed for all external devices attached to or in use during the operation of the instrument. See the applicable user guide for the operating and safety procedures of that device.

CAUTION! Never touch the optic mirrors, lenses, filters, or cables. The optics are extremely delicate, and critical to the function of the instrument.

Chapter 1: Introduction

The EMax® Plus Microplate Reader is a filter-based absorbance microplate reader with eight standard filters for a wide range of applications.

The instrument can read 96-well plates to run protocols with the visible Absorbance (ABS) read mode with the Endpoint and Kinetic read types.

The high sensitivity and flexibility of the EMax Plus Microplate Reader make it useful for applications in the fields of biochemistry, cell biology, immunology, molecular biology, and microbiology.

Typical applications include ELISA, total protein, and cell proliferation.

Application notes with specific application protocol suggestions are in the Information Center and Knowledge Base on the Molecular Devices web site at www.moleculardevices.com.

Computer Integration

Each Molecular Devices microplate reader is shipped with a license key for the SoftMax® Pro Data Acquisition and Analysis Software that you install on the computer that you use to operate the instrument. The SoftMax Pro Software provides integrated instrument control, data display, and statistical data analysis.

You should install the SoftMax Pro Software on the computer before you set up the instrument. Please be aware that some updates to the SoftMax Pro Software require a purchase. Contact Molecular Devices before you update the software. To download the latest version of the software, visit: https://www.moleculardevices.com/products/microplate-readers/acquisition-and-analysis-software/softmax-pro-software#Order.

Note: For information about the computer specifications that are required to run the software, the software installation and licensing instructions, and the directions to create the software connection between the computer and the instrument, see the *SoftMax Pro Data Acquisition and Analysis Software Installation Guide*.

To prevent data loss, turn off all sleep and hibernation settings for the hard disk, the CPU, and the USB ports. Disable automatic Windows updates. Update Windows manually when you do not use the computer to control an instrument. You can set these options in Windows Control Panel.

You can connect the instrument to a printer and operate the instrument in stand alone mode to run basic Absorbance read mode Endpoint read type protocols. In stand alone mode, the instrument control panel enables you to adjust the temperature and the wavelength to do fixed point plate reads. For the SpectraMax Plus 384 you can do fixed point cuvette reads. Stand alone mode is not available for the VersaMax.

To run protocols that require advanced acquisition settings or to run Absorbance read mode Kinetic read type and Spectrum read type protocols, you must connect the instrument to a computer and use the SoftMax Pro Software to operate the instrument.

Absorbance Read Mode

The instrument uses the Absorbance (ABS) read mode to measure the Optical Density (OD) of the sample solutions.

Absorbance is the quantity of light absorbed by a solution. To measure absorbance accurately, it is necessary to eliminate light scatter. If there is no turbidity, then absorbance = optical density.

$$A = \log_{10}(I_0 / I) = -\log_{10}(I/I_0)$$

where I_0 is intensity of the incident light before it enters the sample divided by the light after it passes through the sample, and *A* is the measured absorbance.

When you measure absorbance, the pathlength is defined by the volume of sample in the well. To make sure that all the wells in the plate contain the same volume, use an accurate liquid handler to dispense the sample into the plate.

The temperature-independent PathCheck® Pathlength Measurement Technology normalizes your absorbance values to a 1 cm path length based on the near-infrared absorbance of water.

The instrument enables you to choose whether to display absorbance data as Optical Density (OD) or %Transmittance (%T) in the Reduction dialog.

Optical Density

Optical density (OD) is the quantity of light passing through a sample to a detector relative to the total quantity of light available. Optical Density includes absorbance of the sample plus light scatter from turbidity and background. You can compensate for background using blanks.

A blank well contains everything used with the sample wells except the chromophore and sample-specific compounds. Do not use an empty well for a blank.

Some applications are designed for turbid samples, such as algae or other micro-organisms in suspension. The reported OD values for turbid samples are likely to be different when read by different instruments.

For optimal results, you should run replicates for all blanks, controls, and samples. In this case, the blank value that will be subtracted is the average value of all blanks.

% Transmittance

%Transmittance is the ratio of transmitted light to the incident light for absorbance reads.

$$T = I/I_0$$

$$\%T = 100T$$

where *I* is the intensity of light after it passes through the sample and I_0 is incident light before it enters the sample.

Optical Density and %Transmittance are related by the following formulas:

$$\%T = 10^{2-OD}$$

$$OD = 2 - \log_{10}(\%T)$$

The factor of two comes from the fact that %T is expressed as a percent of the transmitted light and $\log_{10}(100) = 2$.

When in %Transmittance analysis mode, the instrument converts the raw OD values reported by the instrument to %Transmittance using the above formula. All subsequent calculations are done on the converted numbers.

Applications of Absorbance

Absorbance-based detection is commonly used to evaluate changes in color or turbidity, permitting widespread use including ELISAs, protein quantitation, endotoxin assays, and cytotoxicity assays.

Endpoint Read Type

For the Endpoint read type, a read of each plate well is taken in the center of each well, at a single wavelength or at multiple wavelengths.

Kinetic Read Type

For the Kinetic read type, the instrument collects data over time with reads taken in the center of each well at regular intervals.

The values calculated based on raw kinetic data include VMax, VMax per Sec, Time to VMax, Onset Time, and more. Kinetic reads can be single-wavelength or multiple-wavelength reads.

Kinetic analysis can collect data points in time intervals of seconds, minutes, hours, or days.

Kinetic analysis has many advantages when determining the relative activity of an enzyme in different types of plate assays, including ELISAs and the purification and characterization of enzymes and enzyme conjugates. Kinetic analysis can provide improved dynamic range, precision, and sensitivity relative to endpoint analysis.

Chapter 2: Setting Up the Instrument

2

Before you unpack and set up the instrument, prepare a dry, flat work area that has sufficient space for the instrument, host computer, and required cables. To provide access for disconnecting power from the instrument, maintain a 20 cm to 30 cm (7.9 in. to 11.8 in.) gap between the rear of the instrument and the wall. To ensure sufficient ventilation, do not block the ventilation grid on the right side of the instrument.

The package contains the instrument and accessories to set up the instrument:

- SoftMax Pro Software, product key, and installation guide
- EMax Plus Microplate Reader Installation Guide
- USB computer connection cable
- AC power adapter

For a complete list of the package contents, see the enclosed packing list.

Install the SoftMax Pro Software on the computer that operates the microplate reader. See the *SoftMax Pro Data Acquisition and Analysis Software Installation Guide*.

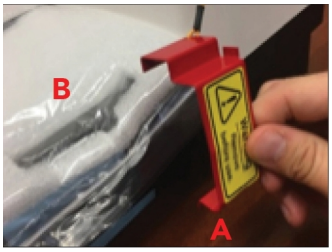
The packaging is designed to protect the instrument during shipment. You must remove the transport locks before you power on the instrument.

Note: Retain the shipping box and all packing materials for future transport needs.

CAUTION! When transporting the instrument, warranty claims are void if damage during transport is caused by improper packaging.

To unpack the instrument:

1. Check the box for damage that occurred during transportation. Inform the supplier immediately and keep the damaged packaging.
2. Open the top of the box.
3. Lift the accessories tool box and the instrument from the package and place the instrument on a level surface.
4. To remove the red transport lock (A), place one hand on top of the lock, and then use your other hand to carefully pull the bottom of the lock until it comes free of the instrument.



5. Remove the padded plastic bag that covers the instrument (B).

6. Follow the orange string attached to the red transport lock to a screw located underneath the instrument. Carefully move or tilt the instrument away from the table to access the screw.

7. Use your fingers to remove the transport lock screw.

Connecting Instrument Cables

The power cord and USB cable connect to the ports on the rear of the instrument.

Illustration	Part Number	Description
	VZ 000 014	USB computer connection cable, 3 meter (9.8 foot)
	4400-0002 or 4400-0036	Power cord, 1 meter (3.3 foot)

Note: Before you connect or disconnect the power cord, make sure that the power switch on the rear of the instrument is in the Off position.

To connect the instrument cables:

1. Make sure that the power switch on the rear of the instrument is in the Off position.
2. Connect one end of the supplied USB cable to the USB port on the rear of the instrument and the other end to a USB port on the computer.
3. Connect the supplied power adapter to the power port on the rear of the instrument and then connect the other end to a grounded electrical wall outlet.

Chapter 3: Getting Started

3

Now that you installed the SoftMax Pro Software on the computer, removed the transport locks, and connected the cables, it is time to get started.

Before you operate the instrument or perform maintenance operations, make sure that you are familiar with the Safety Information on page 4.

1. Set the power switch on the rear of the instrument to the On position. The instrument performs a start up sequence where the indicator lights on the front of the instrument illuminate and the plate drawer opens.
2. Start the software on the computer. To start the software under normal conditions, wait for the instrument to complete the start-up sequence, and then double-click the **SoftMax Pro** icon on the desktop to start the program.

When you first set up the instrument it might be necessary to install USB drivers included with the SoftMax Pro Software.

Power off the instrument when not in use.

Selecting the Instrument in the Software

If the instrument is properly connected and turned on, the icon for the instrument displays on the Home tab on the SoftMax Pro Software main window and the correct instrument displays as selected.

Note: It is not necessary to be physically connected to an instrument to create a protocol. If you are not connected to an instrument, you can work offline or in simulation mode. See the *SoftMax Pro Data Acquisition and Analysis Software User Guide* or the application help.

The instrument icon displays the connection status between the software and the instrument.

Icon	Status
	Instrument Connected
	Instrument Disconnected
	Instrument Simulated

If the instrument status displays as disconnected, check to make sure that the instrument is powered on and that the connections between the instrument and the computer are secure.

To select the instrument:

1. Select the Home tab and click the **Instrument** icon to display the Instrument Connection dialog.
2. From the **Available Instruments** list, select the communication port to which you connect the instrument.

   If the communication port does not appear in the list, click **Refresh**.
3. Click **OK**.

SoftMax Pro Protocol Settings

The SoftMax Pro Software Settings dialog enables you to define the instrument settings to read the plate.

1. Turn on the instrument and start the SoftMax Pro Software. See Getting Started on page 13.
2. Select an instrument. See Selecting the Instrument in the Software on page 13.
3. In the Navigation tree, select a Plate section.
4. On the Home tab, click **Acquisition Settings**  to display the Settings dialog.
5. Select a read type.
6. Select the **Wavelengths** category:
   a. Click the **Number of Wavelengths** drop-down and select to use up to six wavelengths.
   b. Click the drop-down for each wavelength and select the wavelengths from the list of installed filters.
7. Select the **Read Area** category:
   - To read all the wells in the plate, select the **Select All** check box.
   - To select a contiguous, rectangular region on the plate, drag the cursor to select the wells to be read. Columns do not need to start with “1” but must be contiguous. If you select a subset of wells, the instrument reads the entire plate, but reports the data for the wells you select only.
8. For the Kinetic read type, select the **Timing** category:
   - In the **Total Read Time** field, enter the amount of time for the total run.
   - In the **Interval** field, enter the amount of time to wait between reads.
   - The software calculated the minimum interval when calibrating based on the total run time and the interval you enter and displays the interval before the first read, before each read, and the number of reads. The calculation depends on many factors including the number of wavelengths, the number of wells to read, and the distance the instrument filter wheel must move.

   OR
   - Click **Single Point Read** to set the Total Run Time and the Interval to the same value. Use this to only read one time point.
9. Click **OK**.

10. Save the settings as a data file or a protocol file. See the *SoftMax Pro Data Acquisition and Analysis Software User Guide* or the application help.
    - Data files contain the experiment settings, the raw data the instrument collects, and the data analysis you define for the experiment.
    - Protocol files contain the plate well layout assignments and all other instrument configuration settings, but no data.

After you create and save the settings for the experiment, you can insert the prepared plate in the plate carrier and start the read. See Loading and Unloading Plates on page 15.

Loading and Unloading Plates

The plate carrier on the EMaxPlus moves in and out of the read chamber during the read, and then returns to the home position after the read ends. When the plate carrier is in the home position, the round key on the front of the instrument fits into the front of the carrier to open the plate clamps. When the carrier moves toward the read chamber, the clamps hold the plate securely in the carrier. See the *SoftMax Pro Data Acquisition and Analysis Software User Guide* or the application help.

To load a plate into the instrument:

1. Make sure that the plate carrier is in the home position. If the plate carrier is not in the home position, select the Operations tab and click **Initialize**.
2. Insert the prepared plate in the plate carrier with well A1 in the upper-right position.

3. Select the Home tab and click  . The instrument calibrates the lamp and then moves the plate carrier into the read chamber to start the read.
4. After the read ends, the plate carrier returns to the home position. If the plate carrier is not in the home position, select the Operations tab and click **Initialize**.

Note: Between multiple-wavelength or kinetic reads, the carrier waits in the home position before the read continues. Do not try to remove the plate until the software indicates that the entire read is complete.

Plate Recommendations

The instrument can read 96-well, clear-bottom plates and strip wells. For most applications use plates with flat bottom or round bottom wells.

You should not use V bottom plates unless an application specifically requires their use. Irregular plastic density in the tip of the well can cause inaccurate measurements.

The type of plate and the way you handle it can have an effect on the measurement performance of the instrument. Select a plate type with properties suited for the application.

CAUTION! To prevent damage to the instrument, the height of the plate must not exceed 15 mm.

General plate handling guidelines:

- Never touch the clear well bottom of plates.
- Visually inspect the bottom and rim of the plate before use to make sure that they are free of dirt and contaminants.
- Keep unused plates clean and dry.
- Make sure that the strips on strip plates are inserted correctly and level with the frame.
- Do not use V-bottom plates unless the performance has been tested and validated with this instrument. Irregular plastic density in the tip of the well can cause inaccurate measurements.

Chapter 4: Maintenance

4

Perform only the maintenance tasks described in this guide. Contact a Molecular Devices service engineer to inspect and perform a preventive maintenance service on the instrument each year. See Obtaining Support on page 21.

Before you operate the instrument or do maintenance operations, make sure you are familiar with the safety information in this guide. See Safety Information on page 4.

CAUTION! Maintenance procedures other than those specified in this guide must be performed by Molecular Devices. When service is required, contact Molecular Devices technical support.

To ensure optimal operation of the instrument, perform the following preventive maintenance procedures as needed:

- Wipe off visible dust from exterior surfaces with a lint-free cloth to avoid dust build-up on the instrument.
- Wipe up all spills immediately.
- Follow applicable decontamination procedures as instructed by your laboratory safety officer.
- Respond as required to all error messages displayed by the software.
- When the instrument is not in use, keep it covered with the supplied dust cover.

Power off the instrument when not in use.

Cleaning the Instrument

WARNING! BIOHAZARD. It is your responsibility to decontaminate components of the instrument before you request service by a service engineer or you return parts to Molecular Devices for repair. Molecular Devices does not accept items that have not been decontaminated where applicable to do so. If parts are returned, they must be enclosed in a sealed plastic bag that states that the contents are safe to handle and are not contaminated.

WARNING! BIOHAZARD. Always wear gloves when operating the instrument and during cleaning procedures that could involve contact with either hazardous or biohazardous materials or fluids.

Do the following before you clean equipment that has been exposed to hazardous material:

- Contact the applicable Chemical and Biological Safety personnel.
- Review the Chemical and Biological Safety information contained in this guide. See Chemical and Biological Safety on page 6.

CAUTION! Do not use abrasive cleaners. Do not spray cleaner directly onto the instrument or into any openings. Do not let water or other fluids drip inside the instrument.

Always turn the power switch off and disconnect the power cord from the main power source before using liquids to clean the instrument.

- Periodically clean the outside surfaces of the instrument using a lint-free cloth that has been lightly dampened with a 70% ethanol or 0.5% bleach solution.
- If needed, clean the plate carrier by placing a lint-free cloth that has been lightly dampened with a 70% ethanol or 0.5% bleach solution on the mechanism and letting it soak for approximately 30 minutes.
- If a bleach solution has been used, wipe the instrument using a lint-free cloth that has been lightly dampened with water to remove the bleach residue.

After you clean the instrument with a liquid, always wipe the surface dry with a lint-free cloth.

Replacing the Halogen Lamp

During a plate read, the halogen lamp flashes to read each well. When the instrument is not reading a plate, the lamp remains off. Over time, the halogen lamp decreases in brightness and must be replaced. You can order a replacement halogen lamp assembly (part number 5032335) from Molecular Devices. See Obtaining Support on page 21.

The halogen lamp assembly is located behind the cover plate on the bottom of the instrument.

WARNING! HIGH VOLTAGE Power off the instrument and disconnect the power cord before you do maintenance procedures that require removal of a panel or cover or disassembly of an interior instrument component.

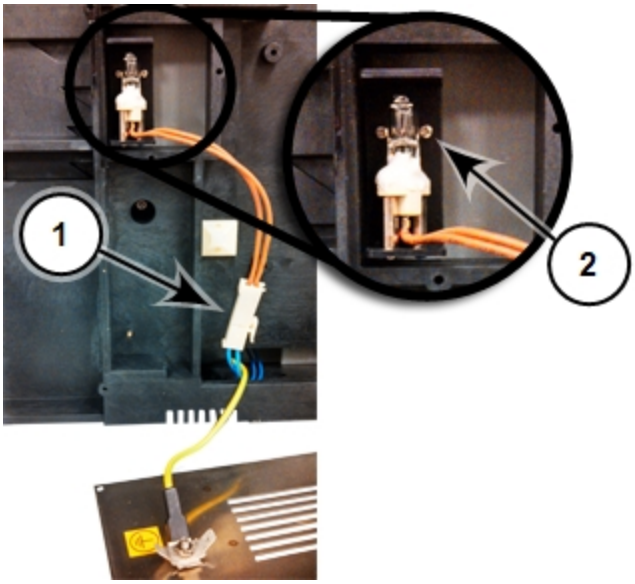
CAUTION! Do not touch or loosen screws or parts other than those specifically designated in the instructions. Doing so could cause misalignment and possibly void the warranty.

1. Switch the power switch on the rear of the instrument to the off position.
2. Disconnect the power adapter from the power port on the rear of the instrument.
3. Disconnect the USB cable from the USB port on the rear of the instrument.
4. Carefully tilt the instrument onto its right side.
5. Use a Phillips screwdriver to remove the six screws that attach the cover plate to the bottom of the instrument.

6. Carefully set the cover plate on the workbench. Some wires remain attached to the cover plate.

WARNING! WARNING! The halogen lamp can become hot when in use. Before touching the area near the lamp, make sure that the lamp has had time to properly cool to a safe temperature.

7. Disconnect the white wire connector between the halogen lamp assembly and the power supply.



Wire Connector and Halogen Lamp Assembly

Item	Description
1	Wire Connector
2	2 Screws on halogen lamp assembly

8. Use a Phillips screwdriver to remove the two screws that attach the halogen lamp assembly to the instrument.
9. Remove the old halogen lamp assembly from the instrument.
10. Place the new halogen lamp assembly into position, being careful not to touch the halogen lamp.

CAUTION! Placing foreign objects such as oils from the skin on the surface of the halogen lamp can cause premature failure of the lamp.

11. Use a Phillips screwdriver to attach the two screws to the halogen lamp assembly and the instrument.
12. Connect the white wire connector between the halogen lamp assembly and the power supply.
13. Place the cover plate into position being careful not to damage the attached wiring.
14. Use a Phillips screwdriver to attach the six screws to the cover plate and the bottom of the instrument.
15. Carefully place the instrument upright on the workbench.
16. Connect the USB cable to the USB port on the rear of the instrument.
17. Connect the power adapter to the power port on the rear of the instrument.
18. Turn on the power to the instrument.
19. Start the SoftMax Pro Software and do a lamp adjustment.

Note: After you replace the halogen lamp, if the new lamp does not flash during a read or the lamp adjustment fails, contact Molecular Devices technical support. See Obtaining Support on page 21.

Adjusting the Lamp

To adjust the halogen lamp, select the Operations tab and click **Configure** to display the Configuration dialog. You can adjust the intensity of the lamp for each of the installed filters in the instrument. You can view the positions and wavelengths of the installed filters. This dialog lists other instrument information including the serial number and firmware version.

The installed filters are available for selection in the Settings dialog.

To adjust the intensity of the lamp for each of the filters, click **Adjust Lamp**. The software and instrument step through each filter one at a time to adjust the lamp intensity for the best implementation of the filter wavelength.

Note: The Configuration dialog must remain open until the lamp adjustment completes.

Obtaining Support

Molecular Devices is a leading worldwide manufacturer and distributor of analytical instrumentation, software, and reagents. We are committed to the quality of our products and to fully supporting our customers with the highest level of technical service.

Our Support website, www.moleculardevices.com/service-support, has a link to the Knowledge Base, which contains technical notes, software upgrades, safety data sheets, and other resources. If you still need assistance after consulting the Knowledge Base, you can submit a request to Molecular Devices Technical Support.

Please have your instrument serial number or Work Order number, and your software version number available when you call.

WARNING! BIOHAZARD. It is your responsibility to decontaminate components of the instrument before you return parts to Molecular Devices for repair. Molecular Devices does not accept items that have not been decontaminated where it is applicable to do so. If parts are returned, they must be enclosed in a sealed plastic bag stating that the contents are safe to handle and are not contaminated.

Appendix A: Instrument Specifications

Absorbance Measurement Specifications

Item	Description
Wavelength range	400 nm to 750 nm
Wavelength selection	Filters
Installed filters	405 nm, 450 nm, 492 nm, 562 nm, 570 nm, 595 nm, 620 nm, 650 nm
Photometric range	0.000 to 3.300 OD
Photometric resolution	0.001 OD
Photometric accuracy, 1.0 OD at 450 nm	0.5%
Photometric precision (repeatability), 1.0 OD at 450 nm	0.25%
Photometric linearity, from 0.1 OD to 2.5 OD at 492 nm	0.25% and 0.0025 OD
Read speed	25 seconds
Calibration	Automatic before each read
Read cycle, including pre-read calibration	45 seconds
Optical alignment	None required
Light source	Tungsten halogen lamp
Average lamp lifetime (Based on specifications from the manufacturer. Individual average lamp lifetime can vary.)	1000 service hours, approximately 100000 reads or approximately 2 years of normal operation
Photodetector	Single-channel silicon photodiode

Physical Specifications

Physical Specifications

Item	Description
Environment	Indoor use only
Power requirements, main unit	12 VDC, 4 amps (50 VA)
Power requirements, power adapter	100 VAC to 240 VAC ±10%, 1.5 amps, frequency range: 50/60 Hz
Dimensions	31.50 cm W x 18.20 cm H x 43.50 cm D (12.40 in. W x 7.17 in. H x 17.13 in. D)
Weight	6.60 kg (14.55 lbs)
Power disconnect clearance (rear)	20 cm to 30 cm (7.9 in. to 11.8 in.) between the rear of the instrument and the wall
Ambient operating temperature	15°C to 40°C (59°F to 104°F)
Ambient storage temperature	–20°C to 50°C (–4°F to 122°F)
Humidity restrictions	15% to 85%, non-condensing
Altitude restrictions	Up to 2000 m (6562 ft)
Sound pressure level (maximum)	45 dB
Installation category	II
Pollution degree	2
Data connection	One (1) USB 2.0 port

Electromagnetic Compatibility

Regulatory for Canada (ICES/NMB-001:2006)

This ISM device complies with Canadian ICES-001.

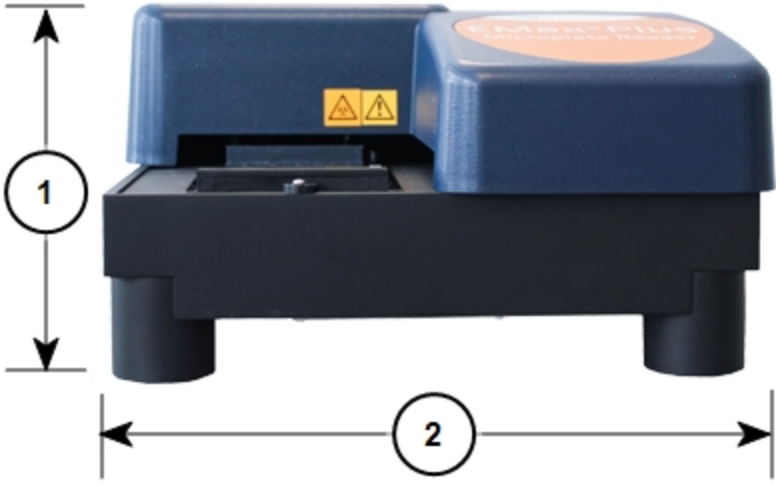
Cet appareil ISM est confomre à la norme NMB-001 du Canada.

ISM Equipment Classification (Group 1, Class A)

This equipment is designated as scientific equipment for laboratory use that intentionally generate and/or use conductively coupled radio-frequency energy for internal functioning, and are suitable for use in all establishments, other than domestic and those directly connected to a low voltage power supply network which supply buildings used for domestic purposes.

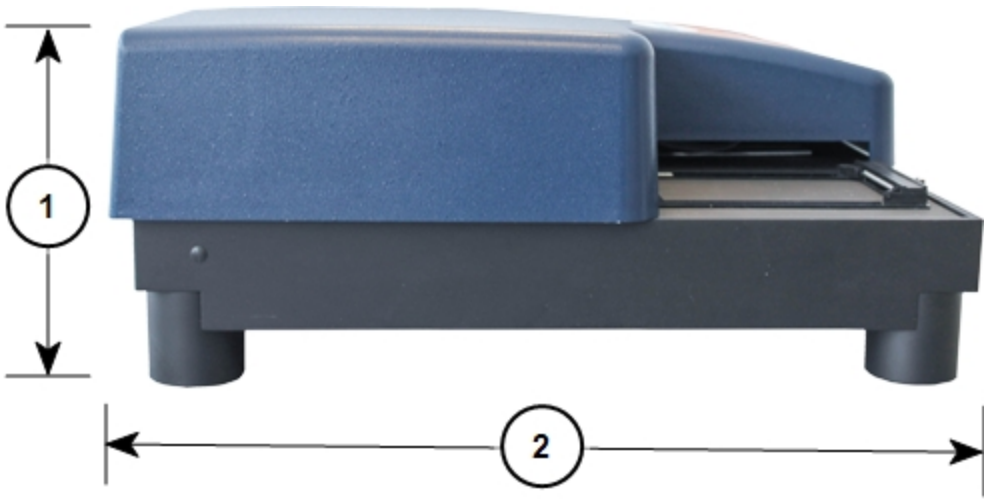
System Dimensions

In the following drawings, the dimensions are show in centimeters and inches.



Front View Dimensions

Item	Description
1	Height: 18.20 cm (7.17 in.)
2	Width: 31.50 cm (12.40 in.)



Side View Dimensions

Item	Description
1	Height: 18.20 cm (7.17 in.)
2	Depth: 43.50 cm (17.13 in.)

Contact Us

Phone: +1-800-635-5577
Web: moleculardevices.com
Email: info@moldev.com

Visit our website for a current listing of worldwide distributors.

5032018 C