xMark™ Microplate Spectrophotometer User Manual

This Instrument for
Laboratory Use Only

BIO·RAD

xMark System, including Microplate Manager 6 software   Catalog Number 168-1150

Microplate Manager 6 software   Catalog Number 168-9520

Checkmark Performance Validation Kit   Catalog number 168-6940

Terasaki Plate Adapter   Catalog Number 168-2000

Bio-Rad Technical Services Department
Open Monday–Friday, 8:00 a.m. to 4:00 p.m., Pacific Standard Time.

Phone: (800) 424-6723, option 2, option 3
           (510) 741-6576
Fax: (510) 741-5802
E-mail: LSG.TechServ.US@Bio-Rad.com (U.S.)
           LSG.TechServ.Intl@Bio-Rad.com (International)

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Warranty and Regulatory Notices

Warranty Statement

This warranty may vary outside of the continental United States. Contact your local Bio-Rad office for the exact terms of your warranty.

Bio-Rad Laboratories warrants that the xMark system will be free from defects in material and workmanship, and will meet all performance specifications for the period of one year from the date of shipment. This warranty covers all parts and labor.

In the event that the instrument must be returned to the factory for repair under warranty, the instrument must be packed for return in the original packaging.

Bio-Rad shall not be liable for any incidental, special, or consequential loss, damage, or expense directly or indirectly arising from the use of the xMark system. Bio-Rad makes no warranty whatsoever in regards to products or parts furnished by third parties, such being subject to the warranty of their respective manufacturers. Service under this warranty shall be requested by contacting your nearest Bio-Rad office.

This warranty does not extend to any instruments or parts thereof that have been subject to misuse, neglect, or accident, or that have been modified by anyone other than Bio-Rad or that have been used in violation of Bio-Rad instruction.

The foregoing obligations are in lieu of all other obligations and liabilities, including negligence and all warranties, of merchantability, fitness for a particular purpose or otherwise, expressed or implied in fact or by law, and state Bio-Rad's entire and exclusive remedy for any claims or damages in connection with the furnishing of goods or parts, their design, suitability for use, installation, or operation. Bio-Rad will in no event be liable for any special, incidental, or consequential damages whatsoever, and Bio-Rad's liability under no circumstances will exceed the contract price for the goods for which liability is claimed.

Regulatory Notices

This instrument is designed to meet the Class-A emissions and immunity levels of the EN61326 product family standard for the CE mark. This rating requires that it only be used in a laboratory environment.

Important: This Bio-Rad instrument is designed and certified to meet EN61010-1 requirements, which are internationally accepted electrical safety standards. Certified products are safe to use when operated in accordance with the instruction manual. This instrument should not be modified or altered in any way. Alteration will:

- Void the manufacture's warranty
- Void the regulatory certification
- Create a potential safety hazard

Note: This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Table of Contents

1. General Information

1.1 Introduction

The xMark™, Microplate Spectrophotometer provides all the flexibility required for absorbance assay. The xMark has the capability to perform standard colormetric ELISA and kinetic readings for general cell screening with 6, 12, 24, 96, 384, and 1536-well microplate formats. The xMark uses a "filter-less" design, with a wavelength range of 200–1000 nm. xMark is also provided with an optional incubation feature with a temperature range up to 45°C. The optical design provides verifiable results up to 4.0 OD. The "filter-less" monochromator design allows the user to set the reading at any wavelength in the 200– 1000 nm region, as well as to perform a spectral scan within 200 – 1000 nm to find the absorbance curve.

1.2 xMark Specifications

Light source	Xenon Flash Lamp
Photo detectors	Two silicon photodiodes for measurement and reference
Indication range	0–4.000 OD
Resolution	0.001 OD
Spectral range	200–1000 nm
Monochromator capacity	Any wavelength within the spectral range, with 1 nm step size
Monochromator bandwidth	5 nm FWHM (typical)
Wavelength accuracy	$\pm$ 2.0 nm
Wavelength repeatability	$\pm$ 0.2 nm
Optical photometric methods	Single or dual wavelength
Compatible plates	6- to 1,536-well microplate with dimensions 128 mm (length) x 86 mm (width) Plate height cannot exceed 21 mm
Accuracy	$\pm$ 1.0 % or 0.015 OD from 0–3.0 OD at 490 nm single wavelength reading
Linearity	96-well plate: $\leq$ 2.0 %, 0 to 3.000 OD at 405 nm 384-well plate: $\leq$ 2.5 %, 0 to 3.000 OD at 405 nm 1536-well plate: $\leq$ 2.0 %, 0 to 2.000 OD at 405 nm
Reproducibility	96-well plate: $\leq$ 1.0 % or 0.005 OD from 0 to 3.000 OD at 405 nm 384-well plate: $\leq$ 1.5 % or 0.010 OD from 0 to 3.000 OD at 405 nm 1536-well plate: $\leq$ 2.0 % or 0.015 OD from 0 to 2.000 OD at 405 nm
Uniformity	96-well plate: $\leq$ 2.0 % or 0.005 OD, from 0 to 3.000 OD at 405 nm 384-well plate: $\leq$ 2.5 % or 0.010 OD, from 0 to 3.000 OD at 405 nm 1536-well plate: $\leq$ 3.0 % or 0.015 OD, from 0 to 2.000 OD at 405 nm

Stability & Drift	$\leq$ 0.010 OD at OD=1 at 490 nm single wavelength reading
Warm-up time	3 minutes
Minimum kinetic read interval	96-well plate: 8 seconds single wavelength 384-well plate: 15 seconds single wavelength 1536-well plate: 35 seconds single wavelength
Shaking	Programmable time period: 0–999 seconds Shaking mode: Linear and Orbital Shaking speed: High, medium, low and manual speed
Incubation	25°C to 45°C, programmable in 0.1°C increments Set point must be 4°C above ambient temperature. Set point accuracy: $\leq$ 0.5°C when set point=37°C at RT=25°C Well-to-well uniformity: $\leq$ 0.5°C when set point=37°C at RT=25°C Chamber warm-up time: $\leq$ 25 minutes when set point=37°C at RT=25°C
Imaging	Maximum imaging area: 124 x 82 mm Resolution: 0.50, 0.75, 1.00 mm per defined wavelength
Wavelength scanning	Range: 200–1000 nm, Minimum increment: 1 nm per defined plate well
Environmental operating range	10–40°C, max. relative humidity 95% noncondensing
Power	100–240 V, 60/50 Hz, 350 VA max
Dimensions	544 mm (W) x 440 mm (D) x 219 mm (H), including feet
Weight	27.5 Kg, including incubator
Computer interface	USB 2.0 communication port
Software compatibility	Windows XP, Vista, Mac OS 10.X

1.3   External Features
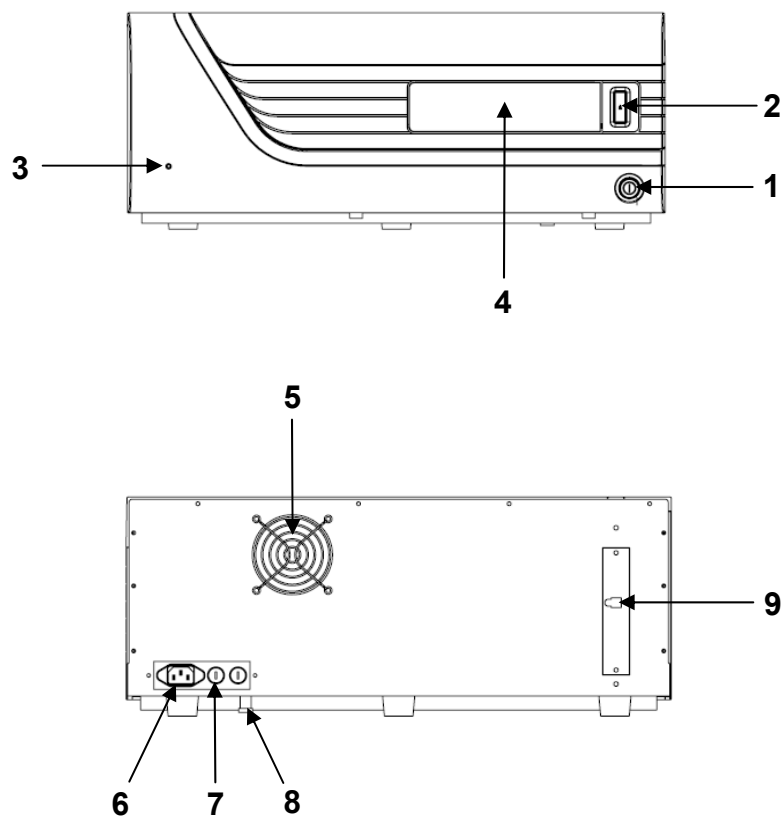
1. Power switch

2. Open/Close button

3. Status LED (Green = idle, Orange = plate reading or working, Red = Error)

4. Door of the plate loader

5. Cooling fan

6. Power cord receptacle

7. Fuse φ 5.2 x 20, 6.3A/AC 250V, time lag type

8. Docking bolt

9. USB 2.0 communication port

1.4   Environmental Conditions

The xMark™ Microplate Spectrophotometer should be used under the following conditions:

- Indoor use only

- Altitude up to 2000 m

- Temperature 10 to 40℃

- Maximum relative humidity 95%

- Main supply voltage fluctuations up to ±10% of the nominal voltage

- Transient overvoltages typically present on the main supply

- NOTE: The normal level of transient overvoltages is impulse withstand (overvoltage) category of IEC 60364-4-443

- Applicable rated pollution degree 2

2. Equipment Set-up and Installation

2.1 Unpacking the xMark™

Prior to opening the box, check for any outer damage. Document any damage, if present.

Place the box upright with the TOP label facing up and open the box. Remove the instrument from the box in this position only.

Warning! Grasp the instrument firmly under the right and left sides before attempting to lift or carry the instrument out of the box.

Check the instrument for damaged or broken parts. Document any damage in detail.

Each xMark instrument includes the following accessories. Verify that they are present:

- 1 Microplate Manager (MPM) software with manual (packaged separately)
- 1 USB cable
- 1 power cord
- 1 Dust cover
- 2 Spare fuses
- 1 User manual
- 1 Warranty card

Verify that the serial number on the back of the instrument is the same as that on the outside of the box.

Located on the underside of the instrument is a docking bolt that must be unscrewed counter-clockwise prior to use. When the docking bolt cannot be turned any further, the scan arm is free inside the instrument.

The USB port is located on the back of the instrument. There is one connector, which allows the user to connect to one USB instrument.

Before switching the power on for the first time, allow the xMark to warm to room temperature for **6 hours** after unpacking, to prevent any condensation problems.

Plug the included power cord into the main power connector port. Ensure that the instrument is connected to a main power outlet with a grounded conductor.

2.2 Location of the Instrument

The xMark Microplate Spectrophotometer is a precise optical measuring instrument. The following conditions must be met to ensure maximum sensitivity:

- Place the instrument on a flat surface that is free of vibration
- Do not place the instrument in direct sunlight
- Make sure that the instrument is operated in a dust-free environment

In addition, keep a space of at least 15 cm between the rear of the instrument and the wall, to remove the power cord from the power cord receptacle.

3. Using the xMark™

The xMark is operated through the Protocol dialog boxes in Microplate Manager. See the **Microplate Manager User Guide** for instructions on specifying the wavelengths selection and operating the xMark through the Protocol dialogs.

3.1   Loading a Plate

To load a plate into the xMark, press the Open/Close button on the front of the instrument or click on the Reader Door: Open button in the Protocol dialog box in Microplate Manager. The front door of the reader will open and the plate loader will extend outwards.

Place your microplate in the plate loader. Press the Open/Close button again to close the reader door, or click on the Reader Door: Close button in the Protocol dialog in Microplate Manager.

➢   The xMark will accept any 6- to 1,536-well plate with the dimensions 128 mm (length) x 86 mm (width). Plate height cannot exceed 21 mm.

3.2   Selecting a Wavelength in the xMark

This section describes how to select the desired wavelength in the xMark. Since xMark is a monochromator-based system, there is no need to physically change any filter through hardware means.

Instead, all wavelength selections will be programmed with Microplate Manager (MPM) software.

Start up the MPM software. Within the MPM, select the desired scan method. A window will appear that allows the user to select either single or dual wavelength scanning. Within the window, any wavelength can be selected within the 200–1000 nm range. See the Microplate Manager User Guide for instructions.

3.3   Reading a Plate

Plate readings are controlled entirely by Microplate Manager. See the Microplate Manager User Guide for instructions.

To stop a plate reading in progress, press the Stop button in the Microplate Manager Protocol dialog box.

3.4   Incubator Controls

The incubator in the xMark is controlled from within Microplate Manager.
The incubator set point is set from within Microplate Manager.

4. Disinfection Procedure

All parts of this instrument that can come in contact with patient sera or positive samples must be handled as hazardous items. Bio-Rad Laboratories recommends using gloves when performing maintenance or working with the instrument.

➢ It is very important that the instrument undergo thorough disinfection before performing maintenance or before physical removal of the instrument from the laboratory. The instrument <u>must be disinfected</u> before sending to Bio-Rad Laboratories for service. For safety reasons, you must fill out a Disinfection Certificate and include it with the instrument. Without the Disinfection Certificate, Bio-Rad Laboratories will not accept any returned instruments.

Bio-Rad Laboratories recommends using a solution of 5% sodium hypochlorite solution (in water). Authorized persons wearing disposable gloves and protective clothes must perform the disinfection procedure. The location must possess adequate ventilation.

➢ When disinfecting, be sure to wear disposable gloves.

To disinfect the xMark, use the following procedure:

1. Remove the USB cable, power cord, and any accessories.
2. Clean the outside surface of the instrument carefully with a wad of cotton or a paper towel, which has been soaked in the 5% sodium hypochlorite solution.
3. Repeat the procedure for the disinfection on all accessories being returned with the instrument.
4. Package instrument, disinfection certificate, and accessories in the original box.

5. Product Information

| 168-1150 | xMark Microplate Spectrophotometer System, 110/230 V, with User Manual |
| 168-9520 | MPM 6.0 PC and Macintosh Software |

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Web site *www.bio-rad.com* **USA** *800 4BIORAD* **Australia** *61 02 9914 2800* **Austria** *01 877 89 01* **Belgium** *09 385 55 11* **Brazil** *55 21 3237 9400*
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