FLUIDIGM

PN 400308 A6

# Hyperion Tissue Imager

## SITE REQUIREMENTS GUIDE

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PN 400300

IMC-SRG-02 rev 6

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# Contents

# About This Guide

**CAUTION** ABBREVIATED SAFETY ALERTS. Hazard symbols and hazard types specified in procedures may be abbreviated in this document. For complete safety information, see Appendix A.

## Safety Alert Conventions

This guide uses specific conventions for presenting information that may require your attention. Refer to the following safety alert conventions.

### Safety Alerts for Chemicals

Fluidigm follows the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS) for communicating chemical hazard information. GHS provides a common means of classifying chemical hazards and a standardized approach to chemical label elements and safety data sheets (SDSs). Key elements include:

- Pictograms that consist of a symbol on a white background within a red diamond-shaped frame. Refer to the individual SDS for the applicable pictograms and warnings pertaining to the chemicals being used.

- Signal words that alert the user to a potential hazard and indicate the severity level. The signal words used for chemical hazards under GHS:

  **DANGER** Indicates more severe hazards.

  **WARNING** Indicates less severe hazards.

### Safety Alerts for Instruments

For hazards associated with instruments, this guide uses the following indicators:

- Pictograms that consist of a symbol on a white background within a black triangle-shaped frame.

- Signal words that alert the user to a potential hazard and indicate the severity level. The signal words used for instrument hazards:

**DANGER** Indicates an imminent hazard that will result in severe injury or death if not avoided.

**WARNING** Indicates a potentially hazardous situation that could result in serious injury or death.

**CAUTION** Indicates a potentially hazardous situation that could result in minor or moderate personal injury.

**IMPORTANT** Indicates information necessary for proper use of products or successful outcome of experiments.

# Safety Data Sheets

Read and understand the SDSs before handling chemicals. To obtain SDSs for chemicals ordered from Fluidigm Corporation, either alone or as part of this system, go to fluidigm.com/sds and search for the SDS using either the product name or the part number.

Some chemicals referred to in this user guide may not have been provided with your system. Obtain the SDSs for chemicals provided by other manufacturers from those manufacturers.

# Introduction and Specifications

**WARNING** Only Fluidigm trained personnel or Fluidigm Field Service Engineers may access the instrument when the doors are open or the covers have been removed.

## Introduction

The Hyperion™ Imaging System is a high-parameter imaging system capable of analyzing up to 50 individual parameters at single-cell resolution in tissue sections. The Hyperion Imaging System comprises a Hyperion Tissue Imager, a Helios and the Hyperion software for data acquisiton and visualization. Do not attempt to operate the instrument before reading this Site Requirements Guide for all the safety information.

The Hyperion Tissue Imager is classified as a Class 1 laser product containing a Class 4 laser encased in the optical enclosure. This is based on the maximum output power available for the intended use. Therefore the laser is exempt from user control measures. Your facility may have its own guidelines and recommendations on the safe use of lasers.

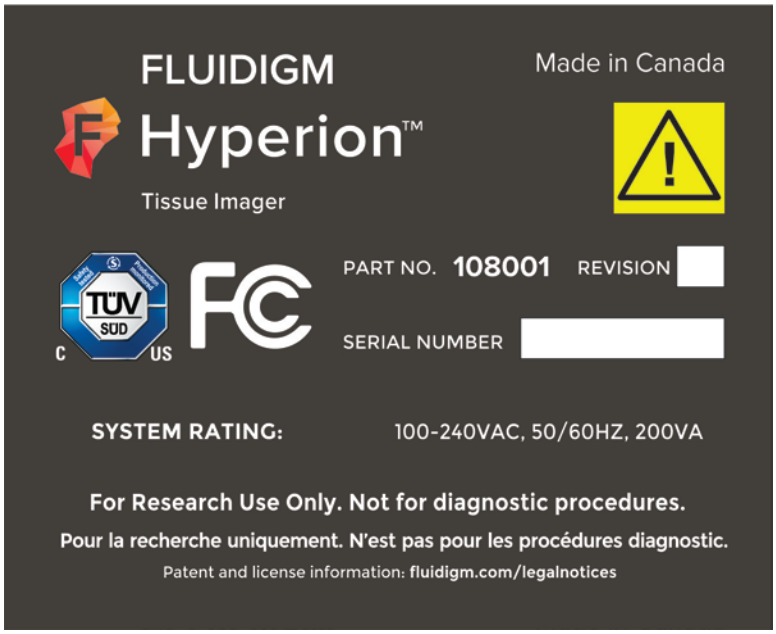


Figure 1: Instrument label.

## Cover Safety Interlock

The two doors on the top cover of the Hyperion Tissue Imager are equipped with safety interlocks that are triggered by contact closure with the frame. If doors of the top cover are open, the interlock will be engaged to prevent the laser from firing.

**WARNING** The cover of the Hyperion Tissue Imager functions as a safety interlock. When the cover is off, the AC connection to the laser will be disengaged.

# Solid-State Laser Specifications

The following are specifications of the solid state laser installed in the Hyperion Tissue Imager.

Table 1: Specifications for the solid state laser

| Performance Specifications | |
|---|---|
| Laser Type | Nd:YAG |
| Wavelength | 213 nm |
| Energy Output | ≤ 3 µJ |
| Optimal Repetition rate | 100, 200 Hz |

# Hyperion Tissue Imager Specifications

Table 2: Operation specifications for the Hyperion Tissue Imager

| Operation Specifications | |
|---|---|
| Power | 200VA |
| Operating voltage | 100-240 VAC |
| Operating frequency | 50/60 Hz |
| Power dissipation, full load | < 75 W |
| Recommended Operating Temperature | 18–25 °C |
| Optimal Temperature | 21 °C ± 1 °C |

Table 3: Instrument dimensions for the Hyperion Tissue Imager

| Instrument Dimensions | |
|---|---|
| Height | 134 (53) cm (in) |
| Operating Height | 132 (51) cm (in) |
| Width | 56 (22) cm (in) |
| Depth | 56 (22) cm (in) |
| Weight | 170 (375) kg (lbs) |

Table 4: Input and output connections for the Hyperion Tissue Imager

| Input and Output Connections | |
|---|---|
| Input | AC Power, Argon Gas, Helium Gas, Sample Slide |
| Output | Ablated Sample, USB 2.0 communication cable, USB 3.0 camera, Trigger (Data acquisition card) |

# Requirements

## Space Requirements

The recommended general footprint for installation of the Hyperion Tissue Imager attached to the Helios system is illustrated below. Ensure there is adequate space for the Hyperion Tissue Imager instrument, the Helios instrument, computer, and accessories. The frame of the Hyperion Tissue Imager is 56 cm wide and 56 cm deep and should be placed directly in front of the Helios instrument. A Fluidigm field service engineer will be on hand to unpack and install the Hyperion Tissue Imager, the Helios instrument, and its accessories.

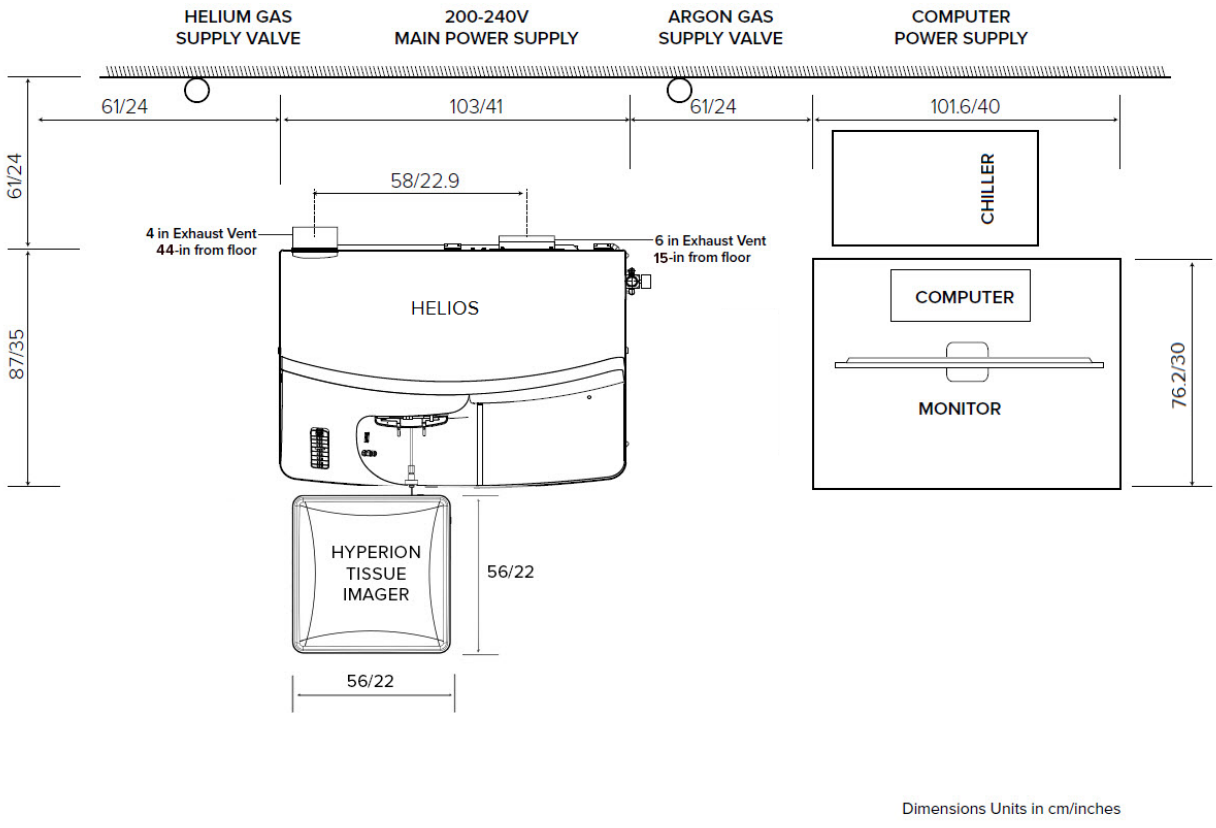


Figure 2: Footprint of the Hyperion Tissue Imager, Helios, and accessories.

# Laser Ablation System Packaging

The Hyperion Tissue Imager is shipped with the following items:

- Sample coupling assemblies
- Calibration/tuning slides
- Monitor
- Power and communication cables
- Gas connection lines

## Crate Information

The Hyperion Tissue Imager is shipped in one fully packaged crate and two boxes. A standard pump truck with minimum rating for 1,600 lb to 1 ton is recommended for moving the crates and box if necessary. Once you have received the shipment, store in a dry place not exposed to weather until the scheduled installation date. Table 4 provides the contents of the instrument crate and boxes.

Table 5: Components of the shipping crate of the Hyperion Tissue Imager.

| Crate | Components | | | | | | |
|---|---|---|---|---|---|---|---|
| Crate 1 | Hyperion Tissue Imager | | | | | | |
| Box 1 | Monitor | | | | | | |
| Box 2 | Auxiliary power cable | Signal communication cables | Argon/Helium gas connection lines | Data acquisition card | Sample coupling assemblies | Tuning slide | Injector |

Table 6: Crate dimensions of the Hyperion Tissue Imager.

| Component | Depth cm (in) | Width cm (in) | Height cm (in) | Weight kg (lbs) |
|---|---|---|---|---|
| Crate Dimensions | 135 (53) | 74 (29) | 155 (61) | 347 (765) |

# Environmental Requirements

The laboratory where the Hyperion Tissue Imager is installed should meet the following environmental requirements.

Table 7. Environmental Requirements for the Hyperion Tissue Imager

| Environmental Requirements | |
|---|---|
| Recommended Operating Temperature | 18–25 °C |
| Optimal Temperature | 21 °C ± 1 °C |
| Humidity | 10–85 % |
| Vibration Environment | VC-A |

**IMPORTANT** The Hyperion Imaging System should perform according to specifications in vibration environments at or above VC-A.

- Free of smoke, dust, and corrosive fumes
- Out of direct sunlight and away from heating system

# Electrical Requirements

Be aware that high voltages are present in the Hyperion Tissue Imager control box once the AC power is switched on.

Table 8: Electrical specifications for the Hyperion Tissue Imager and accessories

| Electrical Specification | |
|---|---|
| Power Supply | 24 VDC (120 V max) |
| Operating Voltage | 100–240 V AC |
| Peak Current (per circuit) | 200 VA |
| Operating Frequency | 50/60 Hz |
| Operating Mode | Single phase operation |
| Power Dissipation, Full Load | < 75 W |

## Power Cord Requirements

The power cord set supplied with the instrument will meet the requirements for your country. Power to the Hyperion Tissue Imager is to be delivered from one 2 A single-phase 100–240 V AC, 50/60 Hz auxiliary electrical branch circuit. The equipment is designed for connection to the 2 Amp Auxiliary outlet on the electrical panel on the right side of the Helios instrument.

**WARNING** Do not disable the grounding feature of this instrument. Always connect to the three prong cable. Do not replace detachable mains supply cords by inadequately rated cords.

Table 9: Plug information for the Hyperion Tissue Imager and accessories

| Accessories | Voltage (V AC) | Current (A) |
|---|---|---|
| Hyperion Tissue Imager | 100–240 | <1 |

**WARNING** Be aware that high voltages are present in the laser box once AC power is switched on.

# Gas Requirements

## Argon Gas

The Hyperion Tissue Imager instrument has been designed to utilize argon and helium as the sample carrier gases. Argon is supplied by the make-up gas line on the Helios instrument.

Table 10: Argon Gas Specifications

| Argon Gas Specification | |
|---|---|
| Purity | ≥99.996% |
| Supply Pressure | 85 ±5 psi |
| Flow Rate | 20.5 L/min |

**IMPORTANT** An average argon gas cylinder with a pressure of 2600 psi would last approximately 7 hours of continuous use of the Hyperion Imaging System. A standard 280 L liquid argon dewar would last approximately 140 hours of continuous system use.

**IMPORTANT** Liquid argon is recommended for longer acquisitions on the Hyperion Imaging System.

**NOTE** We recommend installing a 350 psi pressure relief valve with the liquid argon Dewar.

## Helium Gas

Research grade helium gas is recommended for use with the Hyperion Tissue Imager instrument.

Table 11: Helium Gas Specifications

| Helium Gas Specification | |
|---|---|
| Purity | ≥99.999% (Grade 5.0) |
| Supply Pressure | 30 ±5 psi |
| Flow Rate | 0.25 L/min |

**WARNING** The laboratory should be able to accommodate a full-size compressed gas tank or have other provisions for supplying helium to the laser. The recommended helium supply pressure is approximately 30 ±5 psi. Ensure that all gas connections are tight prior to powering up the laser and the software.

**WARNING** We recommend installing an oxygen sensor in the room where the operator and gas storage are located.

**NOTE** The helium regulator must be capable of handling 1 SLPM constant flow, providing a pressure range of 0–50 psi and a ¼ inch Swagelok® tube adapter. A dual stage model regulator is recommended for more constant pressure.

## Safe Handling of Gas Cylinders

The permanent installation of gas supplies is the responsibility of the user and should conform to local safety and building codes. Observe the following safety precautions when handling argon gas cylinders:

- Fasten all gas cylinders securely to an immovable bulkhead or a permanent wall.
- When gas cylinders are stored in confined areas, ventilation should be adequate to prevent dangerous accumulations. Move or store gas cylinders only in a vertical position with the valve cap in place.
- Locate gas cylinders away from heat or ignition sources, including heat lamps. Cylinders have a pressure relief device that will release the contents of the cylinder if the temperature exceeds 52 °C (125 °F).

- When storing cylinders external to a building, the cylinders should be stored so that they are protected against temperature extremes (including direct rays of the sun) and stored above ground on a suitable floor.
- Gas cylinders should be clearly marked to identify the contents and status (e.g., full, empty).
- Do not attempt to refill gas cylinders.
- Use only approved mechanical regulators and hose connectors. Left-hand thread fittings are used for fuel gas tank connections whereas right-hand fittings are used for oxidant and support gas connections.
- Arrange gas hoses away from foot traffic to avoid damage.
- Perform periodic gas leak tests by applying a soap solution to all joints and seals.

## Regulators

Contact your gas supplier for recommendations on the Helium regulator that is compatible with the cylinders they provide.

**IMPORTANT** The regulator must be capable of handling 1 SLPM constant flow, providing 30 psi, low pressure output to a ¼ inch swagelok (or compatible) female fitting. A dual stage model regulator is recommended for more constant pressure.

# Exhaust Requirements

The Hyperion Tissue Imager is designed to allow minimal venting of any gases from the left side of the instrument.  There are no specific requirements for exhaust.

The information provided above covers site preparation requirements for the Hyperion Tissue Imager only. For complete information on the Helios component of the Hyperion Imaging System, please refer to:

- Helios, A CyTOF System User Guide PN 400100

# Additional Site Recommendations

## Institutional Network connectivity

Enabling network connectivity to the instrument workstation allows for more efficient transfer of instrument data through the Ethernet network port of the instrument workstation.  Contact your site IT Department.

**IMPORTANT** Data should not be written directly to a Network Drive during sample acquisition and must be written directly to the instrument workstation. Data may only be transferred/shared via network connection upon completion of sample acquisition.

## Internet connectivity

It is highly recommended that you have the Hyperion Imaging System computer on a network with internet connection so that the Fluidigm Support team can better assist you and your team and to facilitate remote diagnostics of the instrument. Please work with your IT department to ensure that internet connectivity can occur prior to installation. Access to the internet can greatly reduce instrument down time and unanticipated field service/repair costs. Under no circumstance will Fluidigm be able to access the instrument, or associated data stored on the workstation, without the end user's express permission.

## Telephone access

If internet connection is unavailable and mobile telephone reception is poor, it is recommended that you provide a landline phone  in the immediate vicinity of the instrument workstation.

# Appendix A: Safety

## General Safety

In addition to your site-specific safety requirements, Fluidigm recommends the following general safety guidelines in all laboratory and manufacturing areas:

- Use personal protective equipment (PPE): safety glasses, fully enclosed shoes, lab coats, and gloves.
- Know the locations of all safety equipment (fire extinguishers, spill kits, eyewashes/showers, first-aid kits, safety data sheets, etc.), emergency exit locations, and emergency/injury reporting procedures.
- Do not eat, drink, or smoke in lab areas.
- Maintain clean work areas.
- Wash hands before leaving the lab.

## Instrument Safety

Please refer to the latest Standards for the Safe User of Lasers document from the American National Standards Institute (ANSI Z136.1) for more detailed information to protect against hazards associated with the use of lasers.

**WARNING** Do not modify this device. Unauthorized modifications may create a safety hazard.

**WARNING** If this equipment is used in a manner not specified by Fluidigm Corporation, the protection provided by the equipment may be compromised.

**WARNING** BIOHAZARD. If you are putting biohazardous material on the instrument, use appropriate personal protective equipment and adhere to *Biosafety in Microbiological and Biomedical Laboratories* (BMBL) from the Centers for Disease Control and Prevention and to your lab's safety protocol to limit biohazard risks. If biohazardous materials are used, properly label the equipment as a biohazard. For more information, see the BMBL guidelines online at: cdc.gov/biosafety/publications/index.htm

## Instrument Symbols

| Symbol | English | Description |
|---|---|---|
|  | Warning | Indicates a hazardous situation that and result in death or serious injury if not avoided. |
|  | Pinch hazard | Indicates where pinch hazards exist. Exercise caution when operating around these areas. |
|  | Laser radiation | The Class 1 laser device is eye-safe under all operating conditions. This product includes lasers of a higher class whose beams are confined within a suitable enclosure so that access to laser radiation is physically prevented. |
|  | Finger Cut Hazard | Broken glass may cause injury or cutting of fingers or hands. Caution when loading and unloading the sample slides. |
|  | Tipping Hazard | Movement or impact with the instrument may cause tipping. |
|  | Trip Hazard | Indicates a tripping hazard. Trip hazards are lying about. Watch your step to avoid falling over objects. |
|  | Compressed gas hazard | Any material contained under pressure, including compressed gas, dissolved gas, or gas liquefied by compression or refrigeration. A compressed gas cylinder can become a projectile when ruptured with the potential to cause significant damage. |

# Chemical Safety

**WARNING** Read and comprehend all safety data sheets (SDSs) by chemical manufacturers before you use, store, or handle any chemicals or hazardous materials.

**WARNING** Wear personal protective equipment (gloves, safety glasses, fully enclosed shoes, lab coats) when handling chemicals.

**WARNING** Do not inhale fumes from chemicals. Use adequate ventilation, and return caps to bottles immediately after use.

**WARNING** Check regularly for chemical spills or leaks. Follow SDS recommendations for cleaning up spills or leaks.