VPixx Technologies
Vision Science Solutions

X-Rite i1Pro Spectrophotometer
(VPX-ACC-8000)

User Manual

Version 1.0

Phone : (514) 328-7499

1 (844) 488-7499 - Toll Free USA/Canada

EMAIL: support@vpixx.com

www.vpixx.com

IMPORTANT

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For more information about our company and products, visit our Web site at **www.vpixx.com**

For information, comments or suggestions, please contact us by e-mail at **support@vpixx.com**

Our offices are located at:

630 Clairevue West suite 301
Saint-Bruno, Qc
Canada, J3V 6B4

Version History of this document

Version Updated to	Date	Author	Reason
1.0	2014/11/04	P.Kakos	v1.0 release

Document Icons

The use of icons emphasizes helpful, caution or warning notes. Below is a list of the icons available.

Icon	Type	Description
	Helpful Hint	*Information to help out during assembly, installation or usage*
	Caution Notice	*Important Information to prevent misuse and/or damage to equipment*
	Warning	***Critical information to prevent damage to equipment and/or personnel***

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Overview

This manual provides installation, usage and maintenance information for the i1Pro spectrophotometer.

For technical questions or product support information, do not hesitate to contact the VPixx support team by phone or by sending an E-mail at support@vpixx.com

> By creating your *MyVPixx* account on the VPixx Technologies website, you will have access to additional product documentation, demos, source code examples and the latest firmware and software drivers.

WARNING - SAFETY INFORMATION & PRECAUTIONS

LED illumination

This device contains LEDs, which are classified as Exempt (no risk) under IEC62471-1:2006 or Risk Group 1 (low risk) under EN62471-1:2008. Hazard group "Blue-Light Small Source" may pose a low risk under EN62471. To minimize risk avoid looking directly at the light. If cleaning is required, first use a lens blower brush to remove loose dust, then GENTLY wipe the lens with a soft lint-free cloth.

Equipment information

Use of this equipment in a manner other than that specified by X-Rite, Incorporated may compromise design integrity and become unsafe.

This equipment is intended for use only with UL listed ITE equipment.

> *All spectrophotometers must be protected from prolonged exposure to humidity and direct light. After each use, place the i1Pro in its protective case. Failure to do so may result in the spectrophotometer requiring premature recalibration.*

> *Never use water, solvents or detergents to clean the lens or body of the device as these may cause damage or deformation.*

To maintain the measurement performance of your i1Pro over its lifetime, it is important to observe the following rules and to periodically clean certain parts that are critical to measurement performance.

- A clean white reference ceramic tile is essential in providing accuracy to your measurements. The protection cover should always be closed when the white reference ceramic tile is not in use. If necessary you can clean the white reference ceramic tile with isopropyl alcohol and a soft clean cloth.
- The i1Pro device is sensitive to mechanical shocks. To avoid damage during transport the i1Pro **MUST** be shipped in its original packaging.
- Do not store or operate the i1Pro device in dirty, greasy or dusty environments. Do not use the i1Pro in environments with temperatures higher than 35°C (95ºF) or less than 10°C (50ºF). Do not store the i1Pro in environments with temperatures higher than 50°C (122ºF) or less than -10°C (14ºF).
- The plastic housing of the device may be cleaned using a cloth dampened in water with a soap solution if necessary.

Compliance Information

For European Countries

CE

DECLARATION OF CONFORMITY

Manufacturer's Name: X-Rite, Incorporated
Authorized Representative: X-Rite, Incorporated
Siemensstraße 12b • 63263 Neu-Isenburg • Germany
Phone:+49 (0) 61 02-79 57-0 • Fax: +49 (0) 61 02 -79 57-57
Model Name: i1Pro
Directive(s) Conformance: EMC 2004/108/EC LVD 2006/95/EC

The following information is only for EU member states:

The mark shown to the left is in compliance with the Waste Electrical and Electronic Equipment directive 2012/19/EU (WEEE). The mark indicates the requirement NOT to dispose of the equipment as unsorted municipal waste. For more information call VPixx Technologies Inc. or email us at support@vpixx.com

Declaration of RoHS Compliance

RoHS This product has been designed and manufactured in compliance with Directive 2002/95/EC of the European Parliament and the Council on restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive).

For the United States of America

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help
• Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

For Canada

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

NOTE: the USB interface cable (2.0 m) shipped with this device must be used in order to maintain compliance with the desired CE mark requirements, FCC Part 15 Rules, and Canadian ICES-003.

General specifications

The X-Rite i1Pro is a true spectrophotometer, featuring greater accuracy than tri-stimulus photometers which are based on color filters. A new innovative Swiss-engineered design makes the i1Pro much more affordable than previous generations of spectrophotometers.

The i1Pro is a contact spectrophotometer and includes hardware for holding the sensor against the region of the display being calibrated. The i1Pro connects to your computer over a USB interface, allowing your own software to initiate automated measurements and acquire data. The i1Pro can return CIE Lxy data for photometry measurements and can also return raw spectral data between 380 nm and 730 nm at 10 nm intervals for radiometry applications. The i1Pro includes a calibration base allowing the photometer to be automatically recalibrated before each use.

Figure 1 X-Rite i1Pro spectrophotometer

The i1Pro connects to your computer over a USB interface, allowing your own software to initiate automated measurements and acquire data. Software support includes a low-level ANSI C API as well as MATLAB/Octave and Python libraries for use under Mac OS X, Microsoft Windows and Linux.

The i1Pro device is equipped with two device status indicators on its top housing. The device status indicators provide feedback on the current status of the device and guide you through the measurement process.

Figure 2 Status indicator

SPECTRAL ENGINE SPECIFICATIONS

Spectral analyzer: Holographic diffraction grating with 128-pixel diode array

Spectral Range: 380 - 730 nm

Physical sampling interval: 3.5 nm

Optical resolution: 10 nm

Spectral reporting: 380 ... 730 nm in 10 nm steps

OPTICS

Measurement geometry: 45°/0° ring illumination optics, ISO 13655:2009

Measurement aperture: 4.5 mm (0.18") diameter

Illumination Spot Size: 3.5 mm (0.14")

Light source: Gas-filled tungsten (illuminant type A) and UV LED

REFLECTANCE MEASUREMENT

Data Format: Spectral Reflectance [dimensionless]

Calibration: Manual on external ceramic white reference

Inter-instrument agreement: 0.4 ΔE94* average, 1.0 ΔE94* max.

Short-term repeatability: 0.1 ΔE94* on white (D50,2°, mean of 10 measurements every 3 seconds on white)

EMISSIVE MEASUREMENT

Data format: Spectral radiance (mW/nm/m2 /sr); Luminance Y (cd/m2)

Measurement range: 0.2 - 1200 cd/m2 on a typical LCD-Monitor

Short-term repeatability: x,y: +/- 0.002 typical (5000°K, 80 cd/m2)

AMBIENT LIGHT MEASUREMENT

Data Format: spectral irradiance [mW/nm/m2], illuminance [lux]

Type: Cosine-corrected diffuse light measurement head

INTERFACE, DIMENSIONS AND WEIGHT

 Interface: USB 1.1

Power supply: device powered by USB. No additional charger or battery required. USB 1.1 high power device

i1Pro device: Length 155 mm, width 66 mm, height 67 mm (6.1" x 2.6" x 2.6")

Weight i1Pro device: 245 g (8.6 oz)

i1Pro installation

Cable installation

Connect the USB cable between the X-Rite i1Pro and your computer.

⊘	**The X-Rite i1Pro will not function if it is connected to the USB port on your keyboard or to a USB hub without an external power supply. i1Pro power rating: 5 Vdc - 500 mA.**

Device detection

Your computer should detect the X-Rite i1Pro and prompt you for the installation procedure. On a Mac OS X system, no driver is required; under Microsoft Windows, a driver must be installed for the X-Rite i1Pro.

⊘	After you have completed the software installation process, attach your i1Pro device to your computer's USB port. If connected successfully, both status indicators light up solid white. A solid red indicator indicates a hardware problem (often caused by USB power of 500 mA or less). To avoid interference between the device status indicators and the measurement process, the device status indicators are switched off during measurement.

Software Installation Instructions for Mac OS X

Insert the CD labeled **"VPixx Technologies Software/Documentation"** in your CD/DVD reader and copy the *Software Tools for MAC* folder into the OS X or Linux user folder.

In the *Software Tools for MAC* folder can be found documentation, drivers, libraries and low level C API. By using the vputil application you can configure and operate your device on a basic level.

⊘	*For more information on VPixx software tools, please refer to the* **VPixx Software Tools user manual** *on MyVPixx.*

⊘	*For more information on calibrating with the* X-Rite i1Pro*, please refer to the* **VPixx Calibration user manual** *on MyVPixx.*

Driver and Software Installation Instructions for Windows

These instructions are for Windows 7. Installation under Windows Vista, XP or Windows 8 is similar, but not necessarily identical.

Insert the CD labeled **"VPixx Technologies Software/Documentation"** in your CD/DVD reader. In *Software Tools for Windows*, run the *setup.exe* application. When the following box appears, click *Next* and follow the instructions.

Figure 3 VPixx Tools Setup Wizard

When finished, you can toggle the power switch to the ON position and your device is ready for use.

A shortcut of *vputil.exe* is copied on the *Windows desktop* as well as the *Program Files* in the *VPixx Technologies* folder; documentation, drivers, libraries and low level C API folders are copied. By using the vputil application you can configure and operate your device on a basic level.

Once the installation is complete, the *VPixx Technologies* folder is located under C:\Program Files\

!	*For more information on VPixx software tools, please refer to the **VPixx Software Tools user manual** on MyVPixx.*

!	*For more information on calibrating with the* X-Rite i1Pro*, please refer to the **VPixx Calibration user manual** on MyVPixx.*

Software support

VPixx Software Tools include a low-level ANSI C API as well as Psychtoolbox MATLAB / Octave and Python libraries for Mac OS X, Windows XP, Windows 7, Windows 8 and Linux. In addition, the X-Rite i1Pro is directly supported by the VPixx high-level application.

We strongly recommend you create your MyVPixx account by visiting:

http://vpixx.com/register/

By registering, you will have access to the latest software versions, demos and user manuals to support all your VPixx products.

Monitor measurement

To prepare your i1Pro device for a display measurement you need to mount the i1Pro device on the display holder. Make sure your device is calibrated and the status indicators are pulsating white before you mount it. *The X-Rite i1Pro calibration is done with vputil software just before the measurement process.*

For display measurements, follow this procedure:

1. You can adjust the length of the counterweight of the display holder according to the size of your screen. The counterweight is equipped with hook-and-loop fasteners on both ends which allow you to shorten and lengthen the display holder to the correct length.

2. Mount the i1Pro measurement device on the display holder by inserting the mounting connector on the display holder in the mounting interface at the rear of the i1Pro device. Make sure that the nose of the i1Pro device sits firmly in the display holder.

3. Fix the i1Pro measurement device in the middle of your screen.

4. Run the vputil software for display measurement and start the measurement process in the application. Status indicator lights will switch off during measurement.

5. To remove the i1Pro device from the display holder, gently pull the mounting connector with the display holder out of the mounting interface at the rear of the i1Pro device.

	*For more information on vputil software tools, please refer to the **VPixx Software Tools user manual** on MyVPixx.*

vputil Software Tool

The vputil tool can be run from the main VPixx Technologies directory under the *Software Tools\vputil\bin* folder. This utility allows the user to control some of the VPixx equipment features. It can also be used to generate built-in test patterns from the equipment.

1. Toggle the power switch to the ON position
2. Run the vputil application

Figure 4 vputil application main screen

The vputil tool automatically detects all VPixx Technologies hardware connected to the computer. The main menu of the application can be displayed using the *help* command.

	*For more information on vputil software tools, please refer to the **VPixx Software Tools user manual** on MyVPixx.*

	For more information on calibrating with the X-Rite i1Pro*, please refer to the **VPixx Calibration user manual** on MyVPixx.*

Warranty

The i1Pro is warranted against manufacturing defects in materials and workmanship for one year for parts and labor from the date of purchase.

VPixx Technologies Inc.
630 Clairevue West suite 301
Saint-Bruno, Qc
Canada, J3V 6B4

TEL/FAX: (514) 328-7499
TOLL FREE: (844) 488-7499 (USA/CANADA)
EMAIL: sales@vpixx.com