



Vanta iX Family

X-Ray Fluorescence Analyzer

Installation Guide

10-019116-01EN — Rev. 4
September 2022

This instruction manual contains essential information on how to use this Evident product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed. Keep this instruction manual in a safe, accessible location.

Evident Scientific Inc., 48 Woerd Avenue, Waltham, MA 02453, USA

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This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

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List of Abbreviations

ALARA	as low as reasonably achievable
EFUP	environment-friendly use period
GPIO	general purpose input/output
TLD	thermoluminescent dosimeter
XRF	X-ray fluorescence

Important Information — Please Read Before Use

Intended Use

The Vanta iX in line X-ray fluorescence analyzer is an energy dispersive X-ray fluorescence spectrometer that provides customizable, continual measurements on any surface. Do not use the Vanta iX for any purpose other than its intended use.

Instruction Manual

This instruction manual contains essential information on how to use this product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

Keep this instruction manual in a safe, accessible location.

IMPORTANT

Some of the details of components illustrated in this manual may differ from the components installed on your instrument. However, the operating principles remain the same.

Instrument Compatibility

The Vanta iX is primarily a self-contained unit. However, it does have a series of I/O ports that can be used to connect compatible peripherals. The Vanta iX interfaces with a PC using an Ethernet connection. The unit derives its required DC input power from the AUX DC port or Power over Ethernet (PoE) port.



CAUTION

Always use equipment and accessories that meet Evident specifications. Using incompatible equipment could cause equipment malfunction and/or damage, or human injury.

Repair and Modification

The Vanta iX contains only one user-serviceable part: the measurement window. If the measurement window is damaged or contaminated, the window assembly should be replaced as soon as possible. For more details, see “Measurement Window Replacement” on page 59.



CAUTION

In order to prevent human injury and/or equipment damage, do not open the instrument housing or modify the Vanta iX.

Safety Symbols

The following safety symbols might appear on the instrument and in the instruction manual:



General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.



Radiation warning symbol (International)



Radiation warning symbol (Canada)



Radiation warning symbol (China)

These symbols are used to alert the user to the presence of potentially harmful ionizing radiation generated within the XRF or XRD analyzer. All safety messages that follow this symbol shall be obeyed to avoid possible harm.



Shock hazard caution symbol

This symbol is used to alert the user to potential electric shock hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm.

Safety Signal Words

The following safety signal words might appear in the documentation of the instrument:



DANGER

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to could result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.



WARNING

The **WARNING** signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to could result in death or serious personal injury. Do not proceed beyond a **WARNING** signal word until the indicated conditions are fully understood and met.



CAUTION

The **CAUTION** signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like that if not correctly performed or adhered to may result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a **CAUTION** signal word until the indicated conditions are fully understood and met.

Note Signal Words

The following note signal words could appear in the documentation of the instrument:

IMPORTANT

The **IMPORTANT** signal word calls attention to a note that provides information that is important or essential to the completion of a task.

NOTE

The **NOTE** signal word calls attention to an operating procedure, practice, or the like, that requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

TIP

The **TIP** signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or that provides hints on how to effectively use the capabilities of the product.

Safety

Before turning on the instrument, verify that the correct safety precautions have been taken (see the following warnings). In addition, note the external markings on the instrument, which are described under “Safety Symbols.”

Warnings



WARNING

General Warnings

- Carefully read the instructions contained in this instruction manual prior to turning on the instrument.
- Keep this instruction manual in a safe place for further reference.
- Follow the installation and operation procedures.
- It is imperative to respect the safety warnings on the instrument and in this instruction manual.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the safety features of the equipment could be impaired.
- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Service instructions, when applicable, are for trained service personnel. To avoid the risk of electric shock, do not perform any work on the instrument unless qualified to do so. For any problem or question regarding this instrument, contact Evident or an authorized Evident representative.
- Do not allow metallic or foreign objects to enter the device through connectors or any other openings. Otherwise, a malfunction or electric shock may result.



Radiation Safety Warning

Do not open the system, disassemble, or modify any internal components. These actions could result in serious damage to the system and a health hazard to the operator.



WARNING

Electrical Warnings

If an unauthorized electrical connections are made to power the instrument, Evident cannot guarantee the electrical safety of the equipment.

Equipment Disposal



CAUTION

Instruments with a damaged X-ray tube must be returned to your local distributor or the manufacturer.

Before disposing of the Vanta iX, check your local laws, rules, and regulations, and follow them accordingly.

CE (European Community)



This device complies with the requirements of directive 2014/30/EU concerning electromagnetic compatibility, directive 2014/35/EU concerning low voltage, and directive 2015/863 which amends 2011/65/EU concerning restriction of hazardous substances (RoHS). The CE marking indicates compliance with the above directives.

UKCA (United Kingdom)



This device complies with the requirements of the Electromagnetic Compatibility Regulations 2016, the Electrical Equipment (Safety) Regulations 2016, and the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012. The UKCA marking indicates compliance with the above regulations.

WEEE Directive



In accordance with European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), this symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to your local distributor for return and/or collection systems available in your country.

China RoHS

China RoHS is the term used by industry generally to describe legislation implemented by the Ministry of Information Industry (MII) in the People's Republic of China for the control of pollution by electronic information products (EIP).



The China RoHS mark indicates the product's Environment-Friendly Use Period (EFUP). The EFUP is defined as the number of years for which listed controlled substances will not leak or chemically deteriorate while in the product. The EFUP for the Vanta iX has been determined to be 15 years.

Note: The Environment-Friendly Use Period (EFUP) is not meant to be interpreted as the period assuring functionality and product performance.

“中国 RoHS”是一个工业术语，一般用于描述中华人民共和国信息工业部（MII）针对控制电子信息产品（EIP）的污染所实行的法令。



电气电子产品
有害物质
限制使用标识

中国 RoHS 标识是根据“电器电子产品有害物质限制使用管理办法”以及“电子电气产品有害物质限制使用标识要求”的规定，适用于在中国销售的电气电子产品上的电气电子产品有害物质限制使用标识。

注意：电气电子产品有害物质限制使用标识内的数字为在正常的使用条件下有害物质不会泄漏的年限，不是保证产品功能性的年限。

产品中有害物质的名称及含量

部件名称		有害物质					
		铅及其化合物 (Pb)	汞及其化合物 (Hg)	镉及其化合物 (Cd)	六价铬及其化合物 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
主体	机构部件	×	○	○	○	○	○
	光学部件	×	○	○	○	○	○
	电气部件	×	○	○	○	○	○
附件		×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

Korea Communications Commission (KCC)



이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

KC (South Korea Community)

This device complies with the requirements of KN 61000-6-2 and KN 61000-6-4 concerning electromagnetic compatibility. The KCC marking indicates compliance with the above standards.

EMC Directive Compliance

This equipment generates and uses radio-frequency energy and, if not installed and used properly (that is, in strict accordance with the manufacturer's instructions), may cause interference. The Vanta iX has been tested and found to comply with the limits for an industrial device in accordance with the specifications of the EMC directive.

FCC (USA) Compliance

NOTE

This product has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the product is operated in a commercial environment. This product generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this product in a residential area may cause harmful interference, in which case you will be required to correct the interference at your own expense.

IMPORTANT

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the product.

FCC Supplier's Declaration of Conformity

Hereby declares that the product,

Product name: Vanta iX

Model: Vanta iX-MR or Vanta iX-CW

Conforms to the following specifications:

FCC Part 15, Subpart B, Section 15.107 and Section 15.109.

Supplementary information:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Responsible party name:

EVIDENT SCIENTIFIC INC.

Address:

48 Woerd Avenue, Waltham, MA 02453, USA

Phone number:

+1 781-419-3900

ICES-001 (Canada) Compliance

This Class A digital apparatus complies with Canadian ICES-001.

Cet appareil numérique de la classe A est conforme à la norme NMB-001 du Canada.

Code de la santé publique (France)

Conformément aux articles L. 1333-4 et R. 1333-17 du Code de la santé publique, l'utilisation ou la détention de ces analyseurs sont des activités soumises à autorisation de l'Autorité de sûreté nucléaire.

Packing and Return Shipping

If the Vanta iX is not returned in its transport case, it could be damaged during shipping. Evident reserves the right to void the warranty on instruments damaged while in transit if they are shipped without their transport case. Prior to returning any units, contact Customer Service to obtain the required RMA number(s) and any important shipping information.

Follow the steps below to return your Vanta iX:

1. Pack the Vanta iX back into the box that it came in using the original packing materials.
2. Include the RMA in the case, and reference the RMA number in your shipping documents.
3. Secure the box with packing tape.

Open Source Software

This product may include (i) open source software; and (ii) other software whose source code is intentionally published (collectively, hereinafter referred to as "OSS").

The OSS included in this product shall be licensed and distributed to you subject to the terms and conditions applied to the OSS. Please see such terms and conditions of the OSS at the following URL:

<https://www.olympus-ims.com/support/vanta-open-source-software-download/>

The copyright owners of the OSS are listed at the above URL.

THERE IS NO WARRANTY FOR THE OSS, TO THE EXTENT PERMITTED BY APPLICABLE LAW. THE OSS IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A

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Some of the OSS licenses associated with this product may permit you to obtain source code for certain software which Evident has an obligation to provide in accordance with the terms and conditions applied to the OSS. You may obtain a copy of this source code at the following URL. This offer is valid for a period of three (3) years from the date of original purchase. Evident has no responsibility to provide any source code except the source code for certain software.

<https://www.olympus-ims.com/support/vanta-open-source-software-download/>

Evident does not respond to any inquiries related to any of the source codes obtained at the above URL.

Warranty Information

Evident guarantees your Evident product to be free from defects in materials and workmanship for a specific period, and in accordance with conditions specified in the Terms and Conditions available at <https://www.olympus-ims.com/terms/>.

The Evident warranty only covers equipment that has been used in a proper manner, as described in this instruction manual, and that has not been subjected to excessive abuse, attempted unauthorized repair, or modification.

Inspect materials thoroughly on receipt for evidence of external or internal damage that might have occurred during shipment. Immediately notify the carrier making the delivery of any damage, because the carrier is normally liable for damage during shipment. Retain packing materials, waybills, and other shipping documentation needed in order to file a damage claim. After notifying the carrier, contact Evident for assistance with the damage claim and equipment replacement, if necessary.

This instruction manual explains the proper operation of your Evident product. The information contained herein is intended solely as a teaching aid, and shall not be used in any particular application without independent testing and/or verification by the operator or the supervisor. Such independent verification of procedures becomes increasingly important as the criticality of the application increases. For this reason, Evident makes no warranty, expressed or implied, that the techniques, examples, or procedures described herein are consistent with industry standards, nor that they meet the requirements of any particular application.

Evident reserves the right to modify any product without incurring the responsibility for modifying previously manufactured products.

Technical Support

Evident is firmly committed to providing the highest level of customer service and product support. If you experience any difficulties when using our product, or if it fails to operate as described in the documentation, first consult the user's manual, and then, if you are still in need of assistance, contact our After-Sales Service. To locate the nearest service center, visit the Service Centers page on the Evident Scientific Web site.

Introduction

The Vanta iX X-ray fluorescence (XRF) analyzer is a energy dispersive X-ray fluorescence spectrometer that provides customizable, sequential measurements on any surface. In an automated factory or processing plant, the system provides accurate chemical analysis for quality control applications.

Main Applications

The Vanta iX XRF analyzer delivers fast and precise identification and analysis of elements from magnesium to uranium (Mg to U), depending on the selected model and method. An ultra-rugged design allows diverse analysis testing under severe operating conditions.

The analyzer provides accurate chemical analysis for industrial use, including:

- Alloy grade analysis
- Positive material identification
- Mining and grade control

Analyzer Features

Certain features are available only on certain analyzer models. Table 1 on page 23 describes the analyzer models and their available features.

Table 1 Analyzer features

Feature	Vanta iX C series	Vanta iX M series
Tube anode material	Tungsten (C)	Rhodium (M)

Table 1 Analyzer features (continued)

Feature	Vanta iX C series	Vanta iX M series
Detector	SDD	Large area performance SDD
IP rating ^a	IP54	IP54
Heat rating	-10 °C to +50 °C	-10 °C to +50 °C
MIL-STD 810G vibration, shock, and transit test	✓	✓
Processor	Dual core ARM	Dual core ARM
Barometer/Air density correction	✓	✓

- a. This rating is achieved only when using the supplied mating cables or connector covers.

1. Safety Information

This chapter contains important safety information for using the Vanta iX XRF analyzer.

1.1 Radiation Safety Information

IMPORTANT

Always make operational safety your highest priority. Heed all warning labels and messages.

The Vanta iX XRF analyzer is a secure and dependable instrument when used according to Evident recommended testing techniques and safety procedures. However, the Vanta iX produces ionizing radiation, and as such, it should only be used by individuals trained in correct operating techniques and authorized to use X-ray producing devices.

The radiation detected on any outside surface (excluding the window area) is below limits for an unrestricted area (See “Radiation Profile” on page 71).



WARNING

The X-ray tube in the Vanta iX XRF analyzer can emit ionizing radiation. Prolonged exposure can cause serious illness or injury. It is the responsibility of Evident customers to follow the operating instructions and safety recommendations in this manual and good radiation control practices.

1.2 Radiation Safety Program

Evident strongly recommends that organizations who use Vanta iX XRF analyzers implement a formal radiation safety program that includes the following:

- Dose monitoring of critical personnel
- Monitoring of area radiation levels
- Information specific to the site and application of the XRF system
- An annual review (and update, if necessary)

1.3 X-Ray Safety

X-ray safety is a priority at all times and in all testing situations.



WARNING

- Evident analyzers must be used by trained and authorized operators in accordance with proper safety procedures. Improper usage may circumvent safety protections and could potentially cause harm to user.
- **Canada:** All users shall be certified in accordance with the requirements of NRC Standard CAN/CGSB-48.9712-2014 / ISO 9712:2012.
- Pay attention to all warning labels and messages.
- The Vanta iX owner is responsible to ensure that the analyzer is properly registered with the appropriate authorities in their location.

- Do not use the Vanta iX if it is damaged. In such case, arrange for qualified personnel to perform a radiation safety test. Contact Evident or its authorized service representative to repair any damage to the analyzer.
-

1.4 Safety Features

To control X-ray emissions and thereby minimize the possibility of accidental exposure, the Vanta iX XRF analyzer has a rate-based proximity sensor:

Within three seconds of starting a test, the Vanta iX detects the sample in front of the measurement window. If no sample is detected, the test aborts to prevent excessive accidental exposure and the X-rays shut off. The tube current decreases to 0.0 μA , and the radiation LED extinguishes. Also, if the XRF analyzer or the sample is removed while a test is in progress, testing stops within three seconds.

IMPORTANT

The LED is a failsafe measure, and if the LED fails no X-rays will be emitted. Before X-rays can be emitted, the Evident-provided X-ray warning LED must be attached and functioning. Connect the LED cable before the device is powered up, if the cable is not detected at power-up no x-rays will be emitted even if the cable is later connected.

IMPORTANT

Before X-rays can be emitted, the interlock signal must be properly connected, and the interlock circuit must be complete. Evident recommends that the interlock be used to establish an exclusion zone around the Vanta iX.

As an owner of a Vanta iX XRF analyzer, you should implement the following recommended safeguards:

- Limited access
Keep the Vanta iX in a controlled location to which only trained and authorized users have access.

- Trained operators
Post a sign near the Vanta iX indicating that it must only be used by operators who have completed a training course provided by your company, or who have attended an Evident training course and comply with any other requirements stipulated by local regulatory authorities.
- Shielding issues
The Vanta iX emits a tightly collimated beam of X-ray radiation. Although attenuation occurs, the beam trajectory may extend up to many meters through open air.

IMPORTANT

Refer to governing regulations for compliance requirements applicable to the installation area, dose limits, etc. Requirements differ depending on the region of your particular country. Do not rely solely on this manual for instructions.

Adequate shielding is achieved by implementing the following measures:

- Establishing a no-access zone at a sufficient distance from the Vanta iX measurement window, which will allow air to attenuate the beam.
- Enclosing the beam working area with protective panels (3.0 mm stainless steel panels are capable of attenuating the beam to background levels).

Contact your sales representative for assistance and recommendations on interlocks and operating procedures that limit radiation exposure.

1.5 General Precautions

Comply with the precautions indicated in this chapter to reduce the following risks:

- Users
 - Physical injury
 - Electric shock
 - Radiation exposure
- Equipment damage
 - Measurement window
 - Overheated electronics and other internal components

1.6 Service Considerations

Except as expressly noted in this document, do not service any Evident product yourself. Opening or removing the external housings may expose you to electric shock and subject the instrument to mechanical damage, and it also voids the warranty.

IMPORTANT

Any required servicing must be performed by Evident or one of its authorized service representatives. Failure to observe this condition could result in voiding of the warranty. The **ONLY** exception to this rule is the replacement of a measurement window. See “Maintenance and Troubleshooting” on page 59 for more details.

Types of problems or conditions that require service are, but not limited to, the following:

- Damaged power cords
- Excessive spills or corrosive liquids on the instrument
- An instrument that has been dropped or physically damaged
- A Vanta iX XRF analyzer that does not operate normally when operating instructions are followed

1.7 Electrical Precautions

The following list of guidelines is essential for safe electrical operation of the Vanta iX XRF analyzer and its accessories:

- Use the correct power cord for the Vanta iX XRF analyzer.
- Make sure that the DC voltage is appropriate for operation of the Vanta iX. See “Specifications” on page 69 for electrical specifications.
- Do not exceed 80 % of the branch circuit rating.

1.8 Power Cables and Cords

The Vanta iX XRF analyzer is delivered standard with one AC power adaptor, one DC power cable, and one Ethernet cable.

The AC power adaptor cable has a standard IEC 3 conductor power cord that includes a safety grounding plug. The power cord and plug are chosen in compliance with local electrical codes and standards.

The DC power cable connects from the 2.5 mm output jack of the power supply to the 10–18 VDC connector on the Vanta iX.

The Ethernet cable has Power over Ethernet (PoE+ 802.3aT Type2) enabled and connects to an Ethernet network capable of providing 30 W input power. Providing power via the Ethernet cable does not provide a ground wire.

IMPORTANT

The Vanta iX requires a good electrical ground connection to the chassis to ensure safe and reliable operation. This can be achieved by using to mounting holes to fix the equipment to a grounded metal structure, or by attaching a ground cable (minimum 12 gauge wire) between a mounting point and a convenient electrical ground. Although the instrument may operate without this ground connection, it would not be protected from ESD, power surges, or other electrical failures.


Safe and proper handling of cables and cords

- Connect the power cords to a properly grounded and easily accessible power outlet.
- Do not defeat or bypass the ground conductor.
- Install all cords in accordance with applicable regulations.

1.9 Indicators and Statuses

The Vanta iX XRF analyzer has several indicators that alert the operator to the status of the unit.

1.9.1 Power Indicator

The power button () is back lit, so it also serves as the power indicator.

NOTE

The power button will begin flashing when power is initially provided to indicate power is present.

1.9.2 Radiation Being Emitted

A failsafe radiation LED is connected to the LED port through the radiation LED cable assembly.

NOTE

The LED indicator assembly must be connected prior to instrument startup, or no x-rays will be emitted. Only the red LED indicates emission of x-rays. The yellow and green LEDs indicate various states during a software upgrade.

When the red radiation LED is ON:

- The X-ray tube is powered and operating. In some instances, such as a CalCheck, x-rays may not be emitted through the measurement window because the shutter is closed.
- The Vanta iX is emitting X-ray radiation through the measurement window.
- The factory Output GPIO has a pin designated as “RAD_ON”. This pin is active when the instrument is emitting x-rays. The installer can configure it to trigger any other external warning or monitoring systems desired.

1.10 Safety Administration

This section provides information regarding the following radiation safety measures:

- Radiation safety training recommendations

- Dosimeter badges
- Dosimeter safety program
- Dosimeter suppliers
- Registration requirements

1.10.1 Radiation Safety Training Recommendations

Your respective country or region has specific regulations and guidelines for using ionizing radiation generated by X-ray tubes. It is important to inform yourself about these rules.

NOTE

For the convenience of clients, Evident has compiled a list of recommendations. These recommendations:

- Provide generic guidance on the ALARA (as low as reasonably achievable) approach to radiation safety.
 - Do not replace specific policies of any government entity or organization.
-

Personal Monitoring

Radiation control regulations may require implementation of a radiation monitoring program, in which each instrument operator wears a film badge or thermoluminescent dosimeter (TLD) for an initial period of one year to establish a baseline exposure record. Continued radiation monitoring after this period is recommended but may be discontinued if accepted by radiation control regulators. See “Dosimeter Suppliers” on page 35 for a list of film badge providers.

Specific Controls

The Vanta iX can be operated remotely controlled over your network and could start without warning. It is critical that the system is interlocked and cannot be operated if people are inside the restricted area.

**CAUTION**

The system must be interlocked with an entry control system so that it cannot be operated if people are inside the restricted area near the X-ray beam.

During operation, make sure that the Vanta iX remains under the direct control of a factory-trained, certified operator. Set and protect the login password for each user of any control system.

Time, Distance, and Shielding Policies

Operators should limit the amount of time they spend around the energized Vanta iX XRF analyzer, maximize their distance from the analyzer window, and shoot into high-density materials whenever possible.

Preventing Exposure to Ionizing Radiation

All reasonable measures, including labeling, operator training and certification, and the concepts of time, distance, and shielding, should be implemented to limit radiation exposure to as low as reasonably achievable (ALARA).

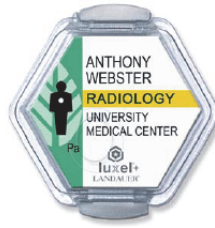
1.10.2 Dosimeters

Dosimeters record accumulated radiation exposure over a specific period of time (Figure 1-1 on page 34). Dosimeters are used to monitor individuals who work with devices that emit ionizing radiation or who work in close proximity to someone else working with such devices.

Badge lanyard style



Badge clip-on style



Ring style



Figure 1-1 Dosimeters – Various styles

When purchasing badges or rings, always select the type used for X-ray and low-energy gamma radiation.

IMPORTANT

Dosimeter badges are required in some countries or regions, and are optional in others. Evident recommends that all Vanta iX analyzer operators wear a dosimeter (badge or ring) for at least the first year of operating their analyzer(s).

NOTE

Every country (including each region, state, or province within a country) may have different regulations. Always consult your local Radiation Protection Authority or Evident for information and recommendations.

1.10.3 Dosimeter Safety Program

A typical dosimeter-based safety program follows the steps listed below:

1. The company develops a dosimeter program with an independent service contractor. Together, they establish the quantity of badges needed and the frequency of analysis (a monthly or quarterly interval).

2. The company receives the first lot of badges and distributes them to its analysts/operators.
3. At the end of the interval:
 - a) The company collects the badges and returns them to the service contractor for analysis.
 - b) At the same time, the service contractor delivers another lot.
4. The company distributes the new set of badges, thereby maintaining a continuous protection/monitoring program for its employees.
5. The service contractor prepares a report for the company. The report tabulates any X-ray dose received, and identifies any persons with readings that exceed typical background radiation.
6. The safety monitoring cycle is repeated from steps 1 to 5. Any dose which exceeds limits set by the program (determined by monitoring use patterns) must be investigated and, if sufficiently high, reported to your regulatory agency.

IMPORTANT

The service contractor's written records are very important to a company's overall safety documentation plan.

1.10.4 Dosimeter Suppliers

Some of the leading dosimeter service companies are listed below (Table 2 on page 35).

IMPORTANT

Suppliers approved for use in Canada are listed in Table 3 on page 36.

Table 2 Dosimeter suppliers

Company	Location	Telephone
AEIL	Houston, Texas	1-713-790-9719
Sierra Dosimetry	Escondido, CA	1-866-897-8707

Table 2 Dosimeter suppliers (continued)

Company	Location	Telephone
Mirion Dosimetry Services	Irvine, California	1-800-251-3331 (toll free US/CAN)
Landauer	Glenwood, Illinois	1-708-755-7000
Landauer, Inc.	Oxford, England	44 1865 373008
Nagase Landauer, ltd.	Japan	81 33-666-4300
LCIE Landauer	Paris, France	33 1 40 95 62 90
Landauer	Beijing, China	86 10 6221 5635

Canadian Approved

Dosimeter service companies currently approved by Canadian Federal, Provincial, and Territorial Radiation Protection committees are listed below (see Table 3 on page 36).

Table 3 Canadian Approved Dosimeter suppliers

Company	Location	Telephone
Mirion Dosimetry Services	Irvine, CA	1-800-251-3331
Landauer	Glenwood, Illinois	1-708-755-7000
National Dosimetry Services (Health Canada)	Ottawa, Canada	1-800-261-6689

1.10.5 Registration Requirements

Contact Evident for assistance with locating registration requirements.

United States of America and Most Other Countries

- Most states require some form of registration and generally require registration to be submitted within 30 days of receipt of the system.
- Some states require advance notification.

Canada

- To use the Vanta iX as an “open beam” XRF analyzer, the Natural Resources Canada government agency requires that operators be licensed to its standards. Note that neither the XRF analyzer itself nor its location need to be licensed unless your province has additional requirements. Always check with your local authorities.
- See “ICES-001 (Canada) Compliance” on page 18 for Agency Statement of Compliance information and relevant contact points.

All Countries

- Customers are advised to consult their local Radiation Protection Authority for specific regulatory information.

Typical Device Registration Information

The following information is usually requested by a licensing agency:

Purpose of device

Industrial. Make sure that you inform the government registration office that the Vanta iX will NOT be used for radiography or medical use.

NOTE

Canada: See “ICES-001 (Canada) Compliance” on page 18 for operating and qualification requirements.

Radiation safety officer

List the person who monitors training and safe use and who controls access to the Vanta iX XRF analyzer.

Authorized users

List the analysts/operators who have been trained and authorized to operate the XRF equipment by the instrument owner and/or regulatory agency.

Operating parameters of the Vanta iX XRF analyzer

8–50 kV; 5–200 μ A max (depending on the model), 4 W maximum power output.

Type of system

Small industrial

User training specification

Indicate that only individuals who have received manufacturer training documented by a manufacturer training certificate can operate the XRF analyzer. Additional training may be required. Contact local regulatory agencies to determine the level and type of training required.

Personal monitoring

Many government-agency registration forms ask you to indicate whether or not you intend to perform dosimeter monitoring.

IMPORTANT

Always keep the following documentation on hand at the job site:

- A copy of License Registration
 - Other pertinent government-agency documentation
 - Copies of any dosimeter analysis reports
 - A copy of the installation manual for this equipment
-

2. Package Contents

A complete Vanta iX package consists of an XRF analyzer and standard accessories. This chapter lists and describes the various components.

2.1 Unpacking the Vanta iX

Vanta iX XRF analyzers and accessories are shipped in a standard cardboard box with foam packing material.

To unpack the Vanta iX

1. Open the box, locate the shipping papers, documentation, and then remove them from the box.
2. Inspect all items for damage.



WARNING

If there is any damage to any of the components, do not attempt to use the Vanta iX XRF analyzer. Contact your local sales representative immediately.

2.2 Case Contents

The items in Table 4 on page 40 are included in the Vanta iX package.

Table 4 Case contents

Item	Vanta iX C Series	Vanta iX M Series
Vanta iX XRF Analyzer	✓	✓
AC power adaptor 18 V, (P/N: 103508)	✓	✓
DC power cable (P/N: 10-020010-00)	✓	✓
Ethernet cable (P/N: 10-013295-00)	✓	✓
Radiation LED assembly (P/N: 10-014685-00)	✓	✓
Evident I/O cable (P/N: 10-013294-00)	✓(2)	✓(2)
GPIO breakout board (P/N: 10-021277-00)	✓	✓
Network port cap (P/N: 10-013297-00)	✓	✓
USB port cap (P/N: 10-013298-00)	✓	✓
I/O port cap (P/N: 10-013300-00), Qty: 2	✓	✓
DC port cap (P/N:10-013299-00)	✓	✓
Extra windows (P/N: 10-011890-00 [C series] or P/N: 10-015963-00 [M series])	✓(10)	✓(10)

2.3 Optional Accessories

The optional accessories in Table 5 on page 40 are available for use with the Vanta iX.

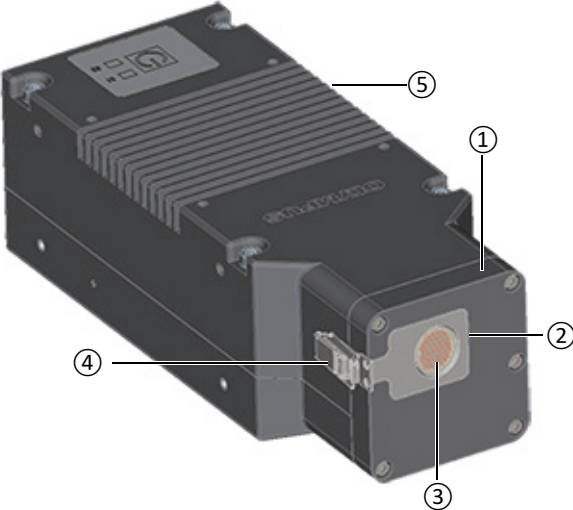

Table 5 Optional accessories

Item	Vanta iX C Series	Vanta iX M Series
Customer I/O cable (P/N: 10-013294-00)	✓	✓
PoE+ network hub/switch (P/N: 10-021941-00)	✓	✓
PoE+ Injector (P/N: 10-021940-00)	✓	✓
E-stop switch - one piece (P/N: 10-024589-00)	✓	✓
Integrator development package - includes GPIO box, I/O cables, connection cables (P/N: 10-021975-00)	✓	✓

2.4 Analyzer Components

Table 6 on page 41 lists the Vanta iX XRF analyzer's components.

Table 6 Components

Component key	Vanta iX XRF analyzer
1 Probe 2 Measurement window plate 3 Measurement window 4 Latch 5 Heat sink	
6 Power button and Status Lights (See "Status Lights" on page 51.) 7 I/O panel (See "I/O Panel" on page 43.)	

3. Installation

This chapter provides information about installing the Vanta iX.



WARNING

Carefully read “Safety Information” on page 25 before applying power to the Vanta iX XRF analyzer. Misuse of the Vanta iX could result in serious illness or injury.

3.1 I/O Panel

The I/O panel contains all of the Vanta iX I/O connectors (Figure 3-1 on page 44):

1. DC power connector
2. USB A connector
3. Ethernet connector
4. LED (radiation, light emitting diode) connector
5. Customer I/O connector
6. Evident I/O connector

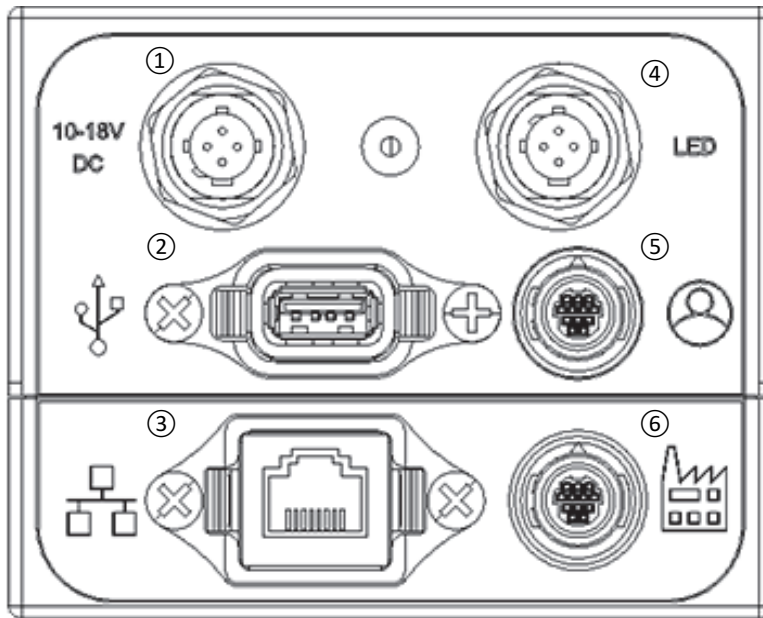


Figure 3-1 I/O panel connectors

3.1.1 Power Connectors and Cables

The power connectors enable you to connect DC power to the Vanta iX.

IMPORTANT

The Vanta iX requires a good electrical ground connection to the chassis to ensure safe and reliable operation. This can be achieved by using the mounting holes to fix the equipment to a grounded metal structure, or by attaching a ground cable (minimum 12 gauge wire) between a mounting point and a convenient electrical ground. The instrument may operate without this ground connection, but would not be protected from ESD, power surges, or other electrical failures.

The DC power connector (10–18 VDC) accepts a DC power cable to supply power to the instrument see Figure 3-2 on page 45. The 2 meter DC power cable comes with a barrel connector on one end to connect to the instrument, and a barrel connector on the other end to interface with the standard 18 VAC adapter (supplied).

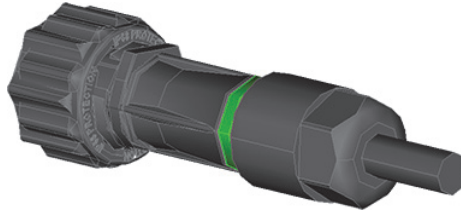



Figure 3-2 DC power cable

The Ethernet connector () is an Ethernet connector that has Power over Ethernet (PoE+ compliant with IEEE 802.3at) enabled. For full operation the Vanta iX needs PoE+ (30 W). The connector enables you to power the instrument over the network connection. This is the recommended mode for powering the analyzer. Providing power via the Ethernet cable does not provide a ground wire.

NOTE

If your network does not support PoE+ then you can use the AUX DC connector (18 VDC) to provide power, and a standard Ethernet cable (data connection only) to send the power on/off signal.

The connector accepts an Ethernet cable (Figure 3-3 on page 45) that provides Power over Ethernet (PoE+ compliant with IEEE 802.3aT) and also controls the flow of power to the instrument (on/off).

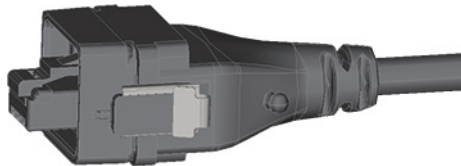


Figure 3-3 Ethernet (PoE+) cable

NOTE

If the port on your Ethernet network does not supply power, you can use a PoE+ network switch (P/N: 10-021941-00), or a PoE+ port injector (P/N: 10-021940-00). Both of these items supply PoE+.

NOTE

You can control the Vanta iX start/stop function through the Ethernet connection, or through the Evident I/O connector via discrete wiring by a PLC or similar type of controller.

3.1.2 LED Connector and Cable Assembly

The LED connector enables you to use the radiation LED cable assembly to indicate when the X-ray tube is energized or radiation is being emitted.

The Vanta iX comes standard with one LED cable assembly (Figure 3-4 on page 46). The assembly comes with a connector on one end to connect to the Vanta iX I/O panel. The other end includes an LED to indicate when the X-ray tube is energized and radiation is being emitted. The cable length is 2 meters.



Figure 3-4 Radiation LED assembly

NOTE

The radiation LED assembly must be connected to the Vanta iX before operation. The device checks for the presence of the LED at power-up, and X-rays cannot be produced unless the radiation LED assembly is connected to the instrument at that checkpoint. If you require additional x-ray notification, the Evident IO has a RAD_ON connector to which you can connect an additional notification device.

3.1.3 Customer I/O Connector and Cable

The customer I/O connector (Ⓜ) enables you connect for signals to the GPIO board or other interface. Vanta iX XRF analyzers come optional with one customer (CUST) I/O cable (Figure 3-5 on page 47). The cable comes with a 12-pin connector on one end to connect to the Vanta iX I/O panel. The other end is unfinished (bare wire) for connection to the GPIO board. The cable length is 2 meters.



Figure 3-5 CUST I/O cable

NOTE

The customer I/O cable and Evident I/O cable are identical. However, the pinouts differ between the customer I/O connector and the Evident I/O connector.

3.1.4 Evident I/O Connector and Cable


The Evident I/O connector () enables you connect bi-directional signals to the GPIO board or other interface. Vanta iX XRF analyzers come standard with one Evident (OLY) I/O cable (Figure 3-6 on page 48). The 2 meter cable comes with a connector on one end to connect to the Vanta iX I/O panel. The other end is unfinished (bare wire) for connection to the GPIO board.



Figure 3-6 OLY I/O cable

NOTE

The Evident I/O cable and customer I/O cable are identical. However, the pinouts on the Evident I/O connector differ from the customer I/O connector.

3.1.5 GPIO Breakout Board

The Vanta iX comes standard with one general purpose input/output (GPIO) breakout board (Figure 3-7 on page 49). The GPIO breakout board is intended to enable you to quickly install and easily configure, test, and change the Vanta iX external wiring as needed.

IMPORTANT

The GPIO breakout board is meant to be temporary and is added as a convenience to the installer. Once the wiring is determined a dedicated cable should be constructed and used.

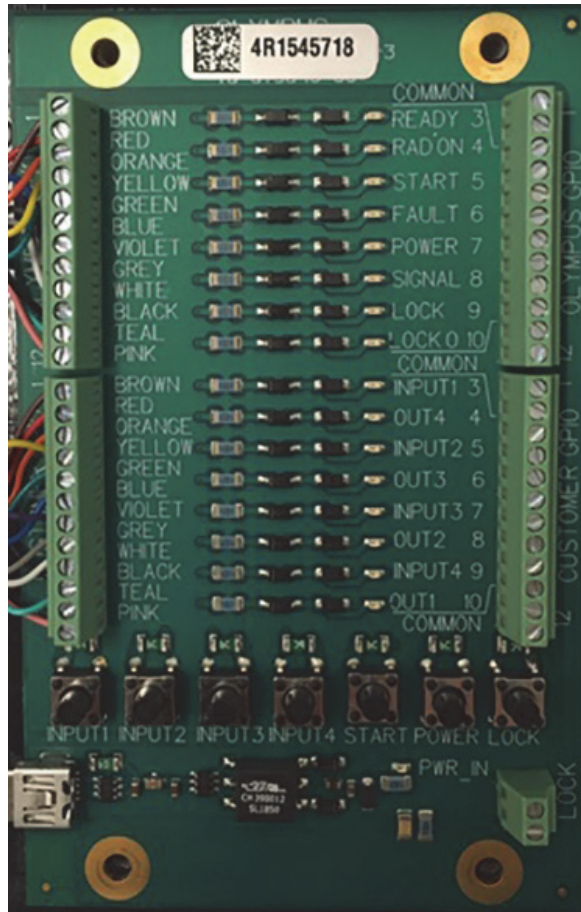


Figure 3-7 GPIO board

The connectors on the top half of the breakout board are intended for the standard Evident I/O. The connectors on the bottom half of the breakout board are intended for customer configured I/O. The left and right sides are equivalent. Connect the Vanta iX to one side, and connect the other side to your interlocks, PLC, or other type of control system.


3.2 Power Button

The power button manually turns on and off power to the Vanta iX after a power source (DC or PoE+) is connected to the instrument.

To power on the XRF analyzer

- ◆ Press and hold the flashing power button () until the light stops flashing and becomes solid.


To power off the XRF analyzer

- ◆ Issue the Shutdown command from the login screen for the device control software. This ensures that all tests have stopped, files are saved, and shutdown happens in a predictable manner. You can also press the device power button (), or the GPIO board power button, which sends a signal to the device control software to shutdown safely. You will be asked to confirm your action through a message displayed in the software.

To power off the XRF analyzer under emergency conditions

NOTE

If the radiation LED remains illuminated or blinking, and you believe that the Vanta iX is “locked” in an on state, follow the instructions listed below.

- ◆ Press and hold the power button () for >5 seconds. The green LED on the Warning LED cluster will illuminate. After the green LED is solid, the system initiates a shutdown procedure, signaled by blinking amber/yellow lights on the LED cluster.
- ◆ If an optional E-Stop is properly installed, test exposures can be halted by pressing the E-Stop button.

NOTE

At the end of the shutdown process, the LED cluster will be off, and the white power LED will be blinking. This indicates that the system is still powered but is not running. It is now safe to remove the DC or PoE+ power cables to power off the instrument.

3.3 Status Lights

The status lights consist of one green LED and one red LED. Each LED can be on, off, or blinking.

Table 7 Status Lights

LED Color	Off	On	Blinking
Green	No Status	Ready for Test	Task Being Executed
Red	No Status	Device Failure	Temporary Error (Example: Temperature Out of Range)

3.4 Mounting Instructions

TIP

Mount the Vanta iX horizontally or facing down so that material and dust do not accumulate on the measurement window. Chassis grounding can be accomplished by grounding any mounting plate, as the mounting screws will provide adequate conductivity to the ground.

The drawings in Figure 3-8 on page 53 to Figure 3-12 on page 57 show the following:

- Dimensions of the Vanta iX
- Locations of the mounting holes

- Compatibility information for selecting the correct screw type for the mounting holes

All dimensions are in millimeters unless otherwise noted.

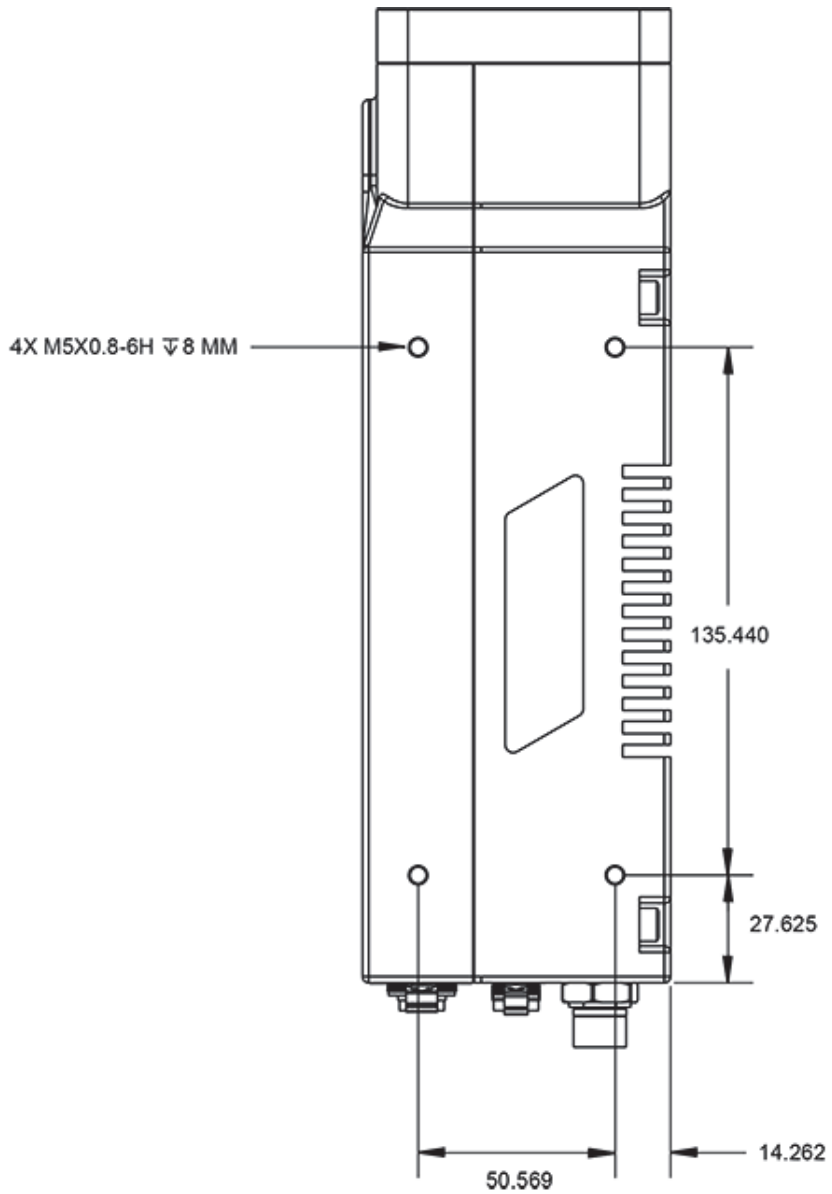


Figure 3-8 Vanta iX left side

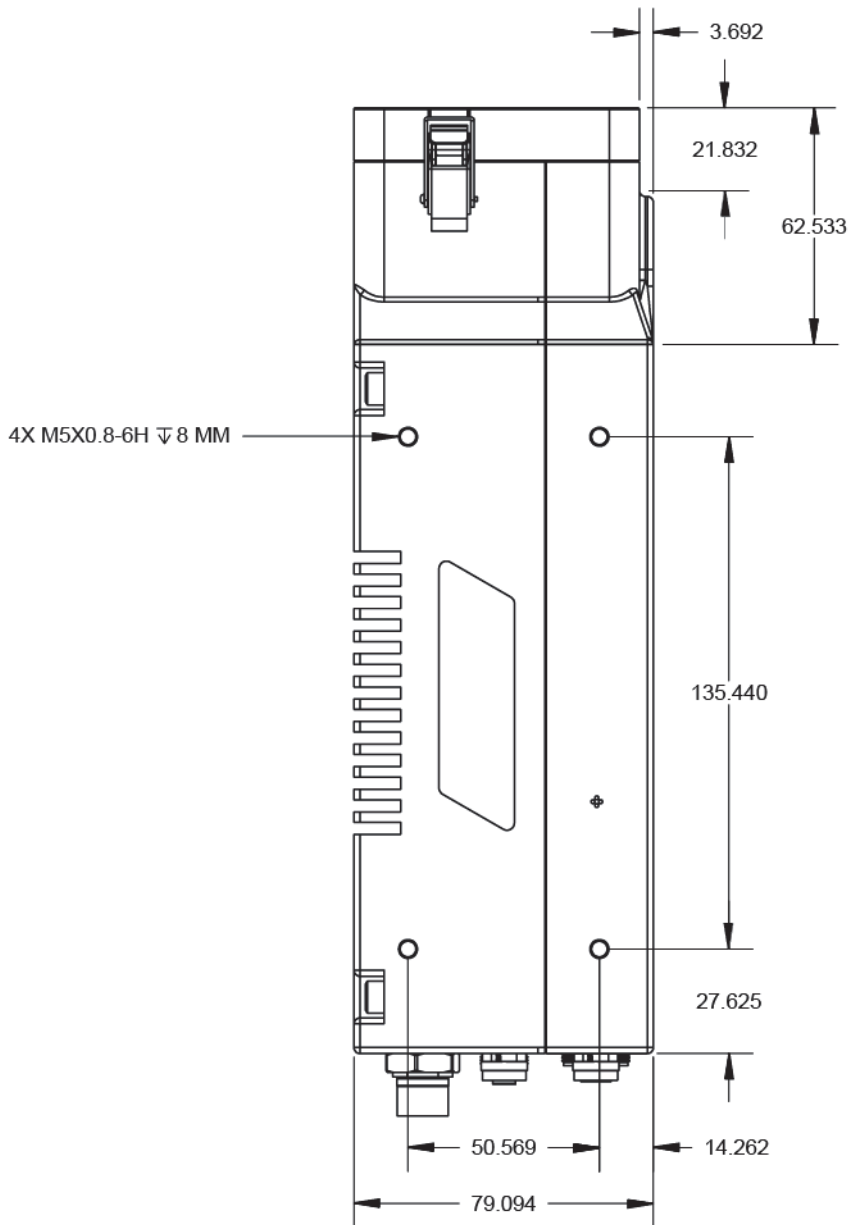


Figure 3-9 Vanta iX right side

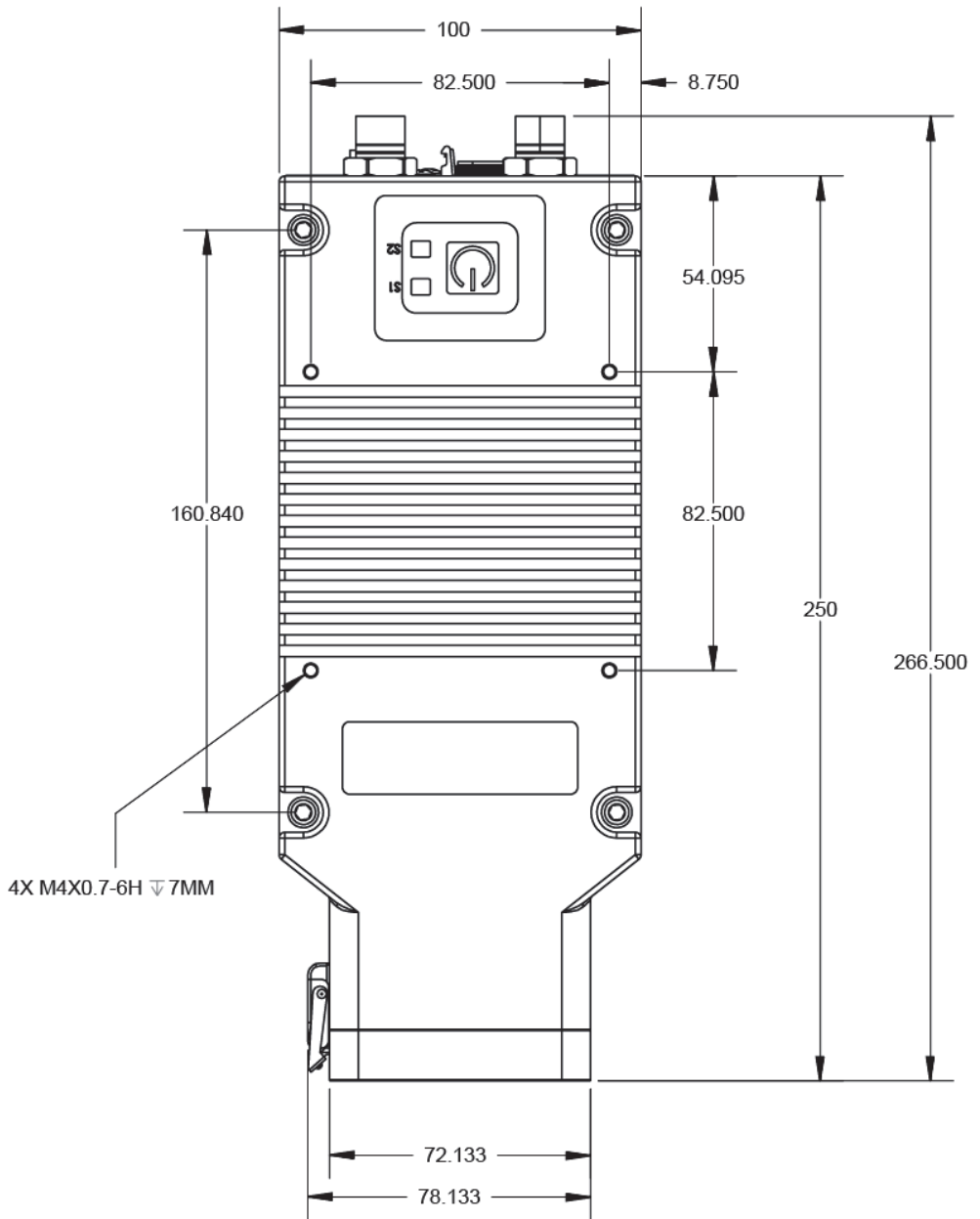


Figure 3-10 Vanta iX top

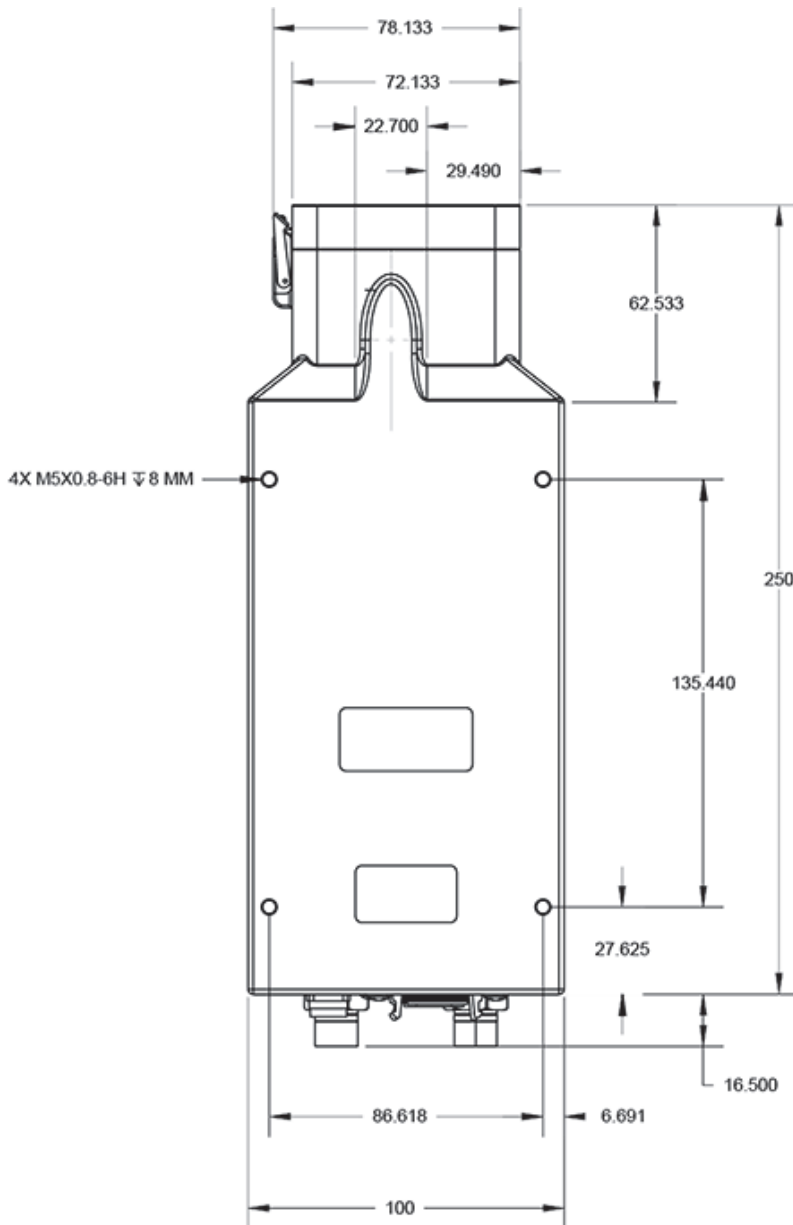


Figure 3-11 Vanta iX bottom

4. Maintenance and Troubleshooting

This chapter contains maintenance procedures and some possible ways to resolve issues that you may face during operation of the Vanta iX XRF analyzer.

4.1 Measurement Window Replacement

This section explains how to replace a Vanta iX measurement window. Evident recommends changing the window if it is dirty, contaminated, broken, or torn.

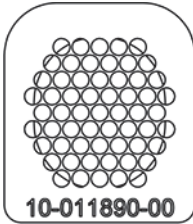
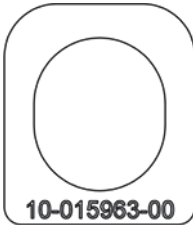
IMPORTANT

- Never conduct any test using a broken or torn window.
 - Immediately replace any broken or torn window.
 - For best results, regularly replace the window.
 - Make sure the replacement window matches your Vanta iX series and method. The correct window is required to achieve proper operation and accurate results.
-

4.1.1 Measurement Window Types

Table 8 on page 60 describes the measurement window types. You must specify the proper film material to match your Vanta iX and your method (calibration).

Table 8 Measurement window types

Material	Image	Vanta iX series	Part number
Kapton mesh/reinforced prolene		ICW	10-011890-00
Prolene, 6 µm		IMR	10-015963-00

**CAUTION**

To avoid damage to the analyzer, comply with the instructions below:

- Do not touch or damage any internal components.
- Do not insert anything into the Vanta iX.
- Keep dust and foreign materials out of the Vanta iX.
- Make sure that your hands are clean.
- Position the Vanta iX so that any debris or loose screws will not fall into the analyzer.
- Do not touch the measurement window film.

4.1.2 Measurement Window Removal

This procedure requires that you unlatch the measurement window faceplate from the Vanta iX probe.

To unlatch the measurement window faceplate

1. Turn off the Vanta iX.

IMPORTANT

Evident recommends that you remove the power source cable (PoE+ or DC) before removing the measurement window to be sure that the Vanta iX cannot be powered up.

2. Locate the window faceplate latch at the front of the instrument (Figure 4-1 on page 61).

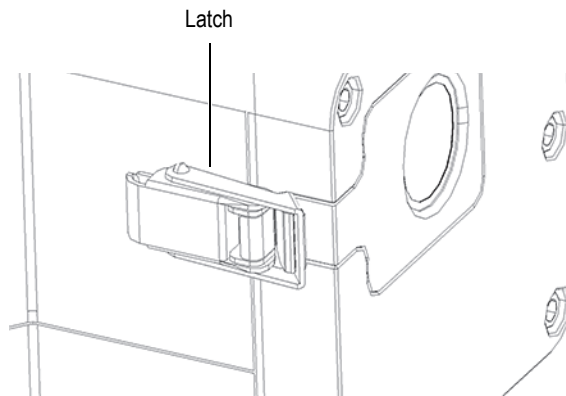


Figure 4-1 Window faceplate latch

3. Pull out the rear of the latch to release the tension on the faceplate (Figure 4-2 on page 62).

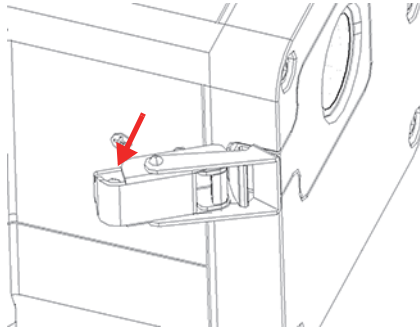


Figure 4-2 Latch pulled out

4. Pull out the front of the latch to fully open the faceplate latch (Figure 4-3 on page 62).

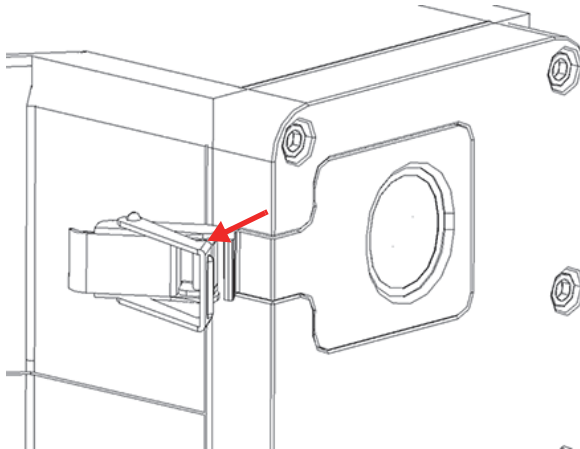


Figure 4-3 Faceplate latch fully open

5. Pull the faceplate slightly to the left until the alignment tab is fully visible (Figure 4-4 on page 63), then lift the faceplate away from the instrument.

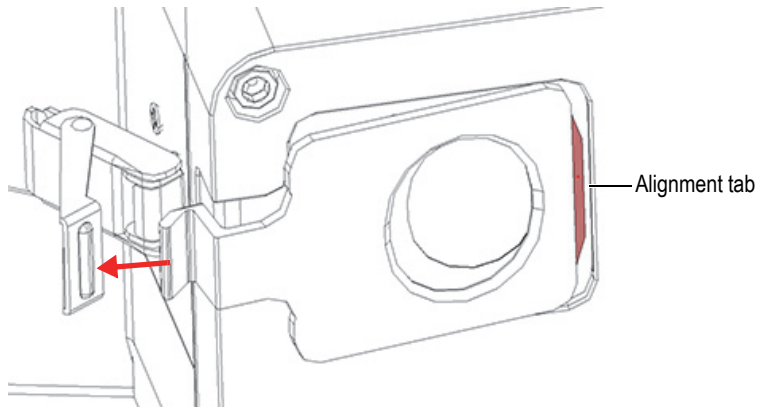


Figure 4-4 Faceplate alignment tab fully visible

4.1.3 Measurement Window Replacement

The measurement window is attached by an adhesive to the back of the faceplate (Figure 4-5 on page 63). This procedure requires that you peel off the old window and place the new window.

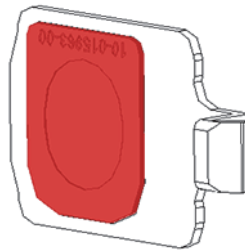


Figure 4-5 Measurement window on faceplate

To remove the window

- ◆ Peel a corner of the measurement window and pull it off the faceplate (Figure 4-6 on page 64).



Figure 4-6 Peeling the window (left) and pulling it off (right)

To replace the window

1. Remove the window from its packaging and peel the backing material completely off the window (Figure 4-7 on page 64).

IMPORTANT

The back of the measurement window is coated with a sticky adhesive. Do not touch the back of the window after removing the backing material.

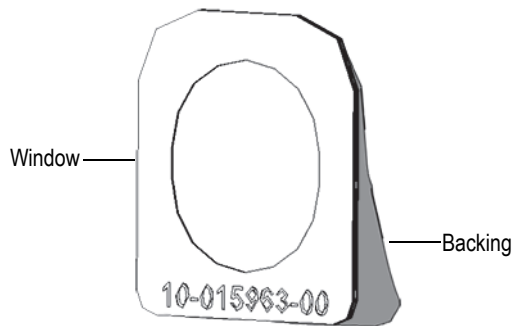


Figure 4-7 Peeling the window from its backing

2. Align and carefully press the window onto the faceplate (Figure 4-8 on page 65).

IMPORTANT

Handle the window by the edges to prevent contamination of the measurement area.

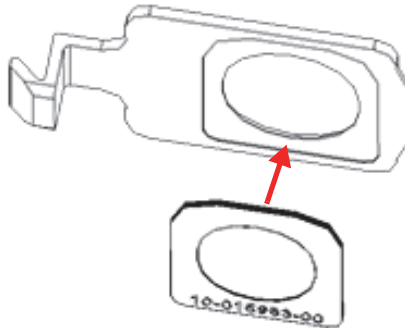


Figure 4-8 New window aligned with faceplate

3. Orient the faceplate with the latch and the cutout on the probe (Figure 4-9 on page 66).

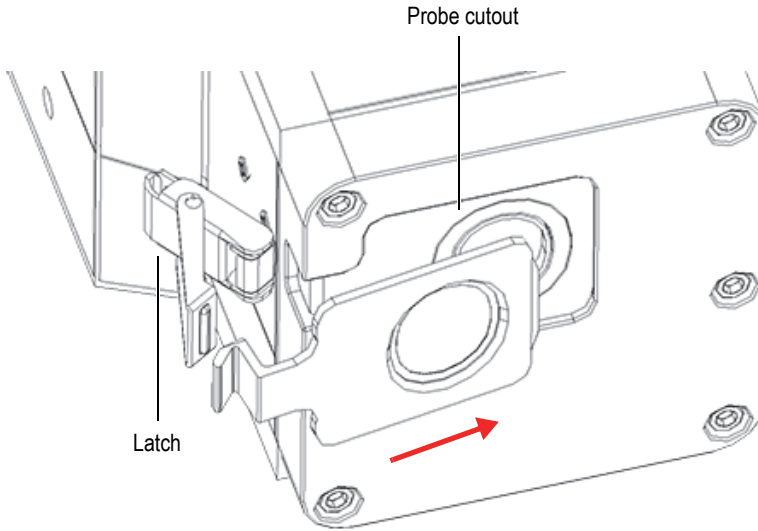


Figure 4-9 Orienting faceplate with latch and probe cutout

4. Slide the faceplate into the cutout on the probe, making sure the faceplate alignment tab is inserted into the tab slot (Figure 4-10 on page 66).

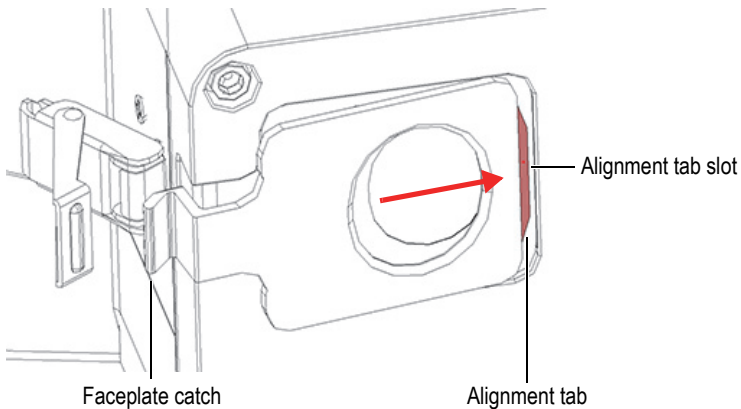


Figure 4-10 Inserting alignment tab into tab slot

5. While holding the faceplate in place, push down the front of the faceplate latch over the faceplate catch, (Figure 4-11 on page 67).

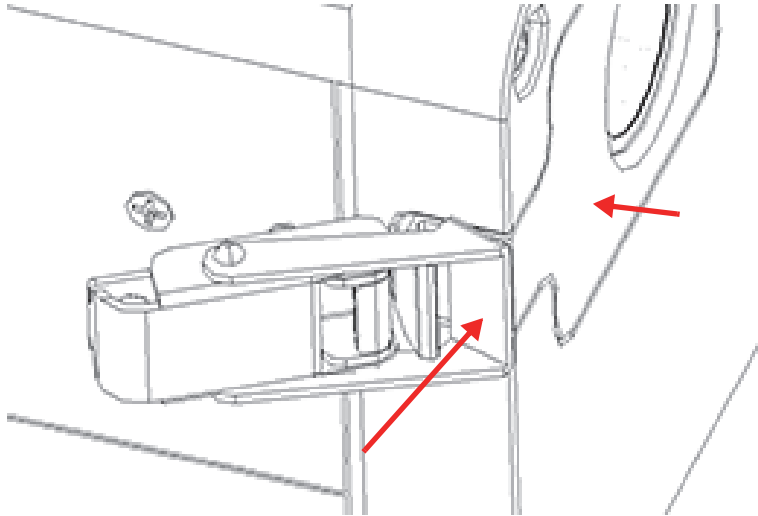


Figure 4-11 Latch over faceplate catch

6. Push down the back of the latch to lock it.

4.2 Troubleshooting

This section proposes some possible solutions to problems you may experience during operation of the Vanta iX (Table 9 on page 68). If these measures do not restore the Vanta iX to full functionality, please contact Evident After-Sales Service. When contacting a service center, please provide the instrument model, serial number, current software version, and a brief description of your issue.

TIP

For more troubleshooting information, visit GitHub (<https://github.com/Evident-Scientific>) for the Vanta iX.

Table 9 Troubleshooting guide

Problem	Possible solutions
The Vanta iX does not turn on.	Check the PoE+ or DC power connection to the Vanta iX.
The analysis results do not match with the expected values.	<ul style="list-style-type: none">• Test certified reference material.• Ensure that the measurement window is clean and free of contamination.• Ensure that the sample is clean, homogeneous, and free of contamination.• Inspect the spectrum to confirm that peaks are present for the element of interest.

Appendix A: Specifications

This appendix outlines the specifications for the Vanta iX XRF analyzer, its docking station, and its accessories (Table 10 on page 69 and Table 11 on page 70).

Table 10 Analyzer specifications

Item	Specifications
Excitation source	X-ray tube — Rh or W anode (application optimized) 5–200 μ A MR: 8–50 keV (4 W max) VCW: 8–40 keV (4 W max)
Primary beam filtration	Eight filter positions automatically selected per beam per method
Detector	M series: Large area silicon drift detector C series: Silicon drift detector
Power requirements	DC power in: 10–18 VDC, 3.9 A OR Power over Ethernet (PoE+) IEEE 802.3at Type 2 Class 4
Elemental range	MR = Mg–U VCW = Ti–U (with standard window and calibration)
Pressure correction	Built-in barometer for automatic altitude and air pressure correction
Operating environment	Temperature –10 °C to +50 °C continuous duty cycle Humidity: 10 % to 90 % relative humidity, noncondensing
IP rating	IP54
Operating system	Linux
Application software	Evident proprietary data acquisition and processing package
USB interface	USB 2.0 type A host port for accessories such as USB flash drives

Table 10 Analyzer specifications (continued)

Item	Specifications
Dimensions (W×L×H)	10.0 cm × 26.6 cm × 7.9 cm
Weight	2.4 kg

Table 11 Accessory specifications

Accessory	Specifications
External power supply (P/N: 103508)	100–240 VAC, 1.5 A, 50–60 Hz input 10–18 VDC, 3.9 A output
PC software	Facilitates manual analyzer control, fleet management of instrument profiles, data download, and spectral review. Comes standard with all Vanta iX analyzers
USB drive	Loaded with documentation
Measurement window films (P/N: 10-011890-00 [C series] or P/N: 10-015963-00 [M series])	Composition depends on the model and the application
Ethernet cable (P/N: 10-013295-00)	Ethernet connector allows data connection, API control, or Power over Ethernet (PoE+)
RAD LED cable (P/N: 10-014685-00)	Includes an LED indicator
Customer I/O cable (P/N: 10-013294-00)	Connects bi-directional signals to the GPIO board
Evident I/O cable (P/N: 10-013294-00)	Connects bi-directional signals to the GPIO board
PoE+ network switch (P/N: 10-021941-00)	Supplies PoE+
PoE+ port injector (P/N: 10-021940-00)	Supplies PoE+

Appendix B: Radiation Profile

The tables below represent upper bounds on the worst case maximum power and minimum beam filtration using a 316 stainless steel target. More specifically, the Vanta iX was operating at either 40 kV, 100 μA w/2 mm Al filter (model VIX-CW); or, 50 kV (model VIX-MR), 80 μA , 350 μm Cu filter. Note that these beam conditions do not represent typical use values or a combination of settings typically available from the factory.

Table 12 Maximum Leakage radiation measured at 40 kV in $\mu\text{Sv/h}$

Surveyed location	Close	10 cm	30 cm
Front	BK ^a	BK [*]	BK [*]
Left Side (front of scatter plane)	24	4.8	1.2
Right Side (front of scatter plane)	11.1	1.9	BK [*]
Top (up to front cover seam)	16.7	2.9	1.1
Left Side (behind scatter plane)	BK [*]	BK [*]	BK [*]
Right Side (behind scatter plane)	BK [*]	BK [*]	BK [*]
Top (rear up to scatter plane)	BK [*]	BK [*]	BK [*]
Bottom	BK [*]	BK [*]	BK [*]

a. BK = background reading (< 1 $\mu\text{Sv/h}$). To convert from $\mu\text{Sv/h}$ to mR/h, divide value by 10.

Table 13 Maximum Leakage radiation measured at 50 kV in $\mu\text{Sv/h}$

Surveyed location	Close	10 cm	30 cm
Front	22.8	7.4	2.6
Left Side (front of scatter plane)	14.3	2.0	BK ^a
Right Side (front of scatter plane)	9.6	1.9	BK [*]
Top (up to front cover seam)	27.6	2.8	1.2
Left Side (behind scatter plane)	BK [*]	BK [*]	BK [*]
Right Side (behind scatter plane)	BK [*]	BK	BK [*]
Top (rear up to scatter plane)	BK [*]	BK	BK [*]
Bottom	BK [*]	BK [*]	BK [*]

a. BK = background reading ($< 1 \mu\text{Sv/h}$). To convert from $\mu\text{Sv/h}$ to mR/h, divide value by 10.

B.1 Profile Testing Information

Date: November 17, 2020

Survey Instrument: Ludlum model 2241 (S/N 289346) with probe model 44-3 (S/N PR326341)

Survey Last Updated: November 10, 2020

B.2 Test Setup and Survey Locations

The following survey locations are indicated on the diagram in Figure B-1 on page 73:

1. Front
2. Scatter plane
3. Left side (front of scatter plane)
4. Right side (front of scatter plane)
5. Front cover seam

6. Top (up to front cover seam)
7. Left side (behind scatter plane)
8. Right side (behind scatter plane)
9. Top (rear up to scatter plane)
10. Bottom (under the instrument)

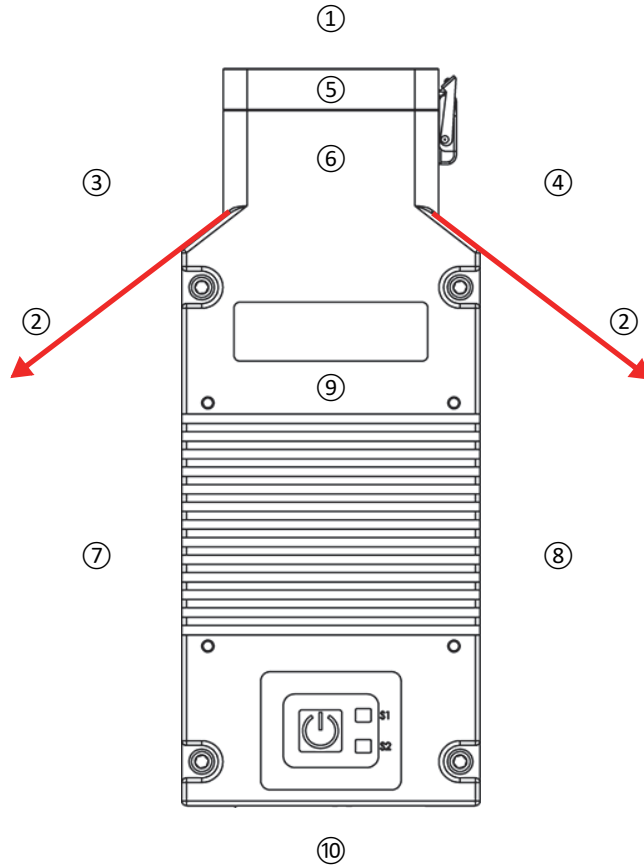


Figure B-1 Test setup and survey diagram

Appendix C: Alloy Grade Libraries

Every Vanta iX XRF analyzer is supplied with four libraries:

- The Factory Grade library specific to every model
- User library #1
- User library #2
- The Residuals (tramp) settings

NOTE

Libraries are editable. However, Evident does not recommend that users edit the Factory Grade library. Instead, copy the Factory Grade library to a user library, then make your edits.

C.1 Residuals Settings

Every Vanta iX XRF analyzer is shipped with Residuals (tramp) settings comprised of seven base alloys (Table 14 on page 76). The Residuals settings support other grade libraries.

Residual limits can be set, element by element, alloy base by alloy base, to meet specific requirements.

A single click can globally select or deselect the Residuals features.

How the Residuals settings work

1. Residual grades are matched to alloy bases rather than specific grades.

- Each sample is determined to be one of seven possible base alloys (Table 14 on page 76).
 - The analyzer applies the residual grade/base-specific residual limits from the matching residual grade.
2. These residual or “alloy-base-specific” limits are applied when an element is detected in a specific grade.
 - But, the nearest grade match has no specification for that element, and;
 - The concentration of the sample is less than the max limit specified by the matching residual grade.
 3. When the conditions for step 2 are met, the element reported on the Vanta iX screen:
 - Is labeled as a residual material in the grade comparison table
 - The grade match; however, is not penalized.

Practical advantages of the Residuals settings approach

- Faster sorting
- Fewer ambiguous or incorrect matches
- Improved grade library integrity
- Prominent labeling of residual elements

Table 14 Residuals settings base alloys

Alloy base	Common residual elements
_AlAlloyBase	Pb, Bi, Sn, Fe, Cu, and Zn.
_CoAlloyBase	Al, Ti, V, Cu, Nb, Ta, and Zr.
_CuAlloyBase	S, As, Ag, Sb, and Sn; not as common Pb, Co, and Ni.
_FeAlloyBase	V, Co, Cu, Ni, and As; sometimes Si, W, and Nb.
_GenericAlloyBase	V, Co, Cu, Ni, and As; sometimes Si, W, and Nb.
_NiAlloyBase	V, Co, W, Zr, and Nb; sometimes Ta, Mo, Cr, and Cu.
_TiAlloyBase	Fe is common; Cu and Si show up at low levels.

C.2 Factory Grade Library: M and C Series

Table 15 Cast aluminum alloys—M and C Series

201	203	204	206	240	242
295	296	301	302	303	308
318	319	333	336	354	355
356	357	358	359	360	361
363	364	365	369	380	381
383	384	385	390	392	393
408	409	411	423	435	443
444	511	512	513	514	515
516	518	520	535	705	707
710	711	712	713	771	850
851	852	853			

Table 16 Cobalt alloys—M and C Series

AlnicoVIII	Cobalt	Elgiloy	F75	FSX-414	HS-1
HS-12	HS-188	HS-19	HS-21	HS-23	HS25-L605
HS-27	HS-3	HS-30	HS-31	HS-36	HS-4
HS-6B	I-783	Jetalloy	MarM302	MarM509	MarM905
MP35N	MPN159	Refract 80	Star J	Ultimet	Vic I
Vic II	WI-52				

Table 17 Copper alloys—M and C Series

Be Cu	C 110	C 122	C 151	C 155	C 186
C 190	C 194	C 195	C 197	C 210	C 220
C 226	C 230	C 240	C 260	C 270	C 274
C 280	C 310	C 314	C 330	C 332	C 340
C 342	C 353	C 360	C 377	C 405	C 411
C 413	C 422	C 425	C 443	C 464	C 482
C 485	C 505	C 510	C 511	C 519	C 521
C 524	C 534	C 544	C 623	C 630	C 638

Table 17 Copper alloys—M and C Series (continued)

C 642	C 654	C 655	C 663	C 664	C 667
C 669	C 673	C 675	C 687	C 688	C 704
C 706	C 710	C 713	C 715	C 722	C 725
C 735	C 740	C 743	C 745	C 752	C 757
C 762	C 770	C 782	C 814	C 833	C 83450
C 836	C 838	C 842	C 844	C 848	C 852
C 854	C 857	C 861	C 862	C 863	C 864
C 865	C 867	C 868	C 875	C 8932	C 89835
C 903	C 907	C 910	C 917	C 922	C 927
C 932	C 937	C 941	C 943	C 952	C 954
C 955	C 958	C 964	C 973	C 976	C 978
C14500	C14700	C17300	C17450	C17455	C17460
C17465	C17500	C17510	C17530	C17600	C18150
C18200	NarloyZ	SeBiLOYI	SeBiLOYII	SeBiLOYIII	

Table 18 Nickel alloys—M and C Series

Alloy 925	C-101	CMSX-2 or 3	CMSX-4	CMSX-6	D 979
D-205	Damron	Haynes 242	Haynes 59	HW6015	M252
Monel 401	N4M2	Duraloy22H	Super22H	Nim105	Nim115
PWA 1475	Refract 26	Rene 85	Thetalloy	Udimet 720	Hast BC1
GTD222	Ni 200	Monel400	MonelK500	HastF	HastX
NichromeV	HastG	HastC22	I-602	HastG30	Nim75
I-102	HastC2000	Haynes230	RA333	HastC4	I-600
I-601	I-617	I-625	HastS	I-686	I-690
HastG2	HastG3	Waspaloy	Rene41	Nim 80A	Nim 90
Haynes214	Nim263	Udimet500	Udimet520	I-702	I-713
I-718	I-720	I-722	I-725	I-750	I-754
20Mo4	I-800	I-801	I-825	I-706	I-901
HastB	HastN	HastW	HastC276	HastB2	HastB3
MarM200	IN100	Alloy 52	I-903	I-907-909	Colmonoy 6
HastR	HR160	HyMu80	I-49	I-700	I-738
I-792	I-939	MarM002	MarM246	MarM247	MarM421

Table 18 Nickel alloys—M and C Series (continued)

Monel411	MuMetal	Nim101	PWA1480	PWA1484	Rene125
Rene142	Rene220	Rene77	Rene80	Rene95	Supertherm
Udimet700	B 1900	B-1900 Hf	C-1023	GMR235	Alloy D
Duranickel	Permanickel 300	GH99			

Table 19 Low-alloy and tool steels—M and C Series

1 1-4 Cr	2 1-4 Cr	5 Cr	7 Cr	9 Cr	9 Cr+V
9 Cr+VW	3310	4130	4140	4340	4820
8620	9310	12L14	86L20	Alloy 53	Carb 1-2 Moly
Carbon Steel	A-10	A-2	A-6	A-7	A-9
D-2 or D-4	D-7	H-11	H-12	H-13	H-14
H-21	M-1	M-2	M-3 Class 1+2	M-34	M-35
M-36	M-4	M-42	M-48	M-50	M-52
O-1	O-2	O-6	O-7	S-1	S-5
S-6	S-7	T-1	T-15	T-4	T-5

Table 20 High-alloy and stainless steels—M and C Series

201	203	301	303	304	309
310	316	317	321	329	330
347	410	416	420	422	430
431	434	439	440	441	446
2003	2101	2205	2304	2507	13-8 Mo
14-4PH	15-5 PH	15-7 Mo	15Mn-17Cr	17-4 PH	17-7 PH
19-9DL	19-9DX	20Cb3	20Mo6	CN7M	25-4-4
254SMO	26-1	29-4	29-4-2	302HQ	303Se
410 Cb	654SMO	904L	A-286	Aermet100	AL6XN
Alloy42	AlnicoII	AlnicoIII	AlnicoV	AMS350	AMS355
CD4MCU	Cronidur3	Custom450	Custom455	Custom465	E-brite
Ferallium255	GreekAscoloy	Haynes556	HC	HD	HE
HL	HN	I-840	Invar 36	Invar 39	Kovar
M152	Maraging350	MaragingC200	MaragingC250	MaragingC300	N-155

Table 20 High-alloy and stainless steels—M and C Series (continued)

Ni-hard#1	Ni-hard#4	Ni-Resist1	Ni-Resist2	Ni-Resist3	Ni-Resist4
Ni-Resist5	Ni-Span902	Nitronic32	Nitronic33	Nitronic40	Nitronic50
Nitronic60	RA85H	ZeCor	Zeron100		

Table 21 Titanium alloys—M and C Series

CP Ti Gr 1	CP Ti Gr 2 and 3	CP Ti Gr 4	CP Ti Gr 11	CP Ti Gr 17	Ti Pd - Gr 7
CP Ti Gr 7	CP Ti Gr 16	Ti Gr 12	CP Ti Gr 13	Ti 5-2'5	Ti 5-5-5
Ti 6-2-4-2	Timetal 62S	Timetal 62S w Pd	Ti 2'25-11-5-1	Ti 8-1-1	Ti 5-1-1-1
Ti 8	Ti 6-2-1-1	Ti 6-22-22	Ti 6-2-4-6	Ti 3-2'5	Ti 3-2'5 w Pd
Ti 3-2'5 w Ru	Ti 6-4	Ti 6-4 w Pd	Ti 6-4 w Ru	Ti 6-4 w Pd	Ti 10-3-2
Ti 4-3-1	Ti 6-6-2	Ti 6Al-7Nb	Ti 7-4	Ti 13-11-3	Ti Beta III
Ti 12-6-2	Ti 13-13	Ti 15-3-3-3	Ti 15-3-2'5	TiBetaC	Ti Beta C w Pd
Ti 5-22-44	Ti 5-5-5-3	Ti 8-8-2-3			

Table 22 CP and misc alloys—M and C Series

CP Ag	CP Au	CP Bi	Cp Cr	CP Hf	CP Mn
CP Mo	CP Nb	CP Pb	CP Pd	CP Ni	CP Re
CP Sb	CP Se	CP Sn	CP Ta	CP V	CP W
Cp Zn	CP Zr	AZ31	AZ91	Cb 103	60Sn-40Pb
63Sn-37Pb	96Sn-4Ag	SAC 300	SAC 305	SAC 400	SAC 405
SN 100C	90Ta 10W	70W 30 Mo	Densalloy	Hevimet	Mal 1000B
Mal 3000	Mal 3950	TungCarb C	TungCarb S	90Zn 10Al	Zr 2
Zr 4	Zr 702	Zr 704	Zr 705	B23 Babbitt	97-3
CB752	Pewter	ZAMAK 2	ZAMAK 3	ZA-8	ZA-12
ZA-27					

Table 23 Wrought aluminum alloys—M and C Series

1100	2001	2002	2004	2005	2007
2009	2011	2012	2014	2018	2021

Table 23 Wrought aluminum alloys – M and C Series (continued)

2024	2025	2030	2031	2034	2036
2090	2091	2094	2095	2097	2111
2117	2124	2195	2197	2214	2218
2219	2297	2519	2618	3002	3003
3004	3005	3009	3010	3011	3105
3107	3203	4004	4006	4007	4008
4009	4010	4013	4016	4018	4032
4043	4044	4046	4047	4145	4147
4343	4643	5005	5017	5042	5052
5058	5083	5086	5087	5154	5180
5210	5249	5252	5354	5451	5454
5505	5554	5556	5557	5654	5657
6002	6005	6008	6012	6013	6014
6018	6020	6040	6053	6061	6063
6066	6069	6070	6082	6111	6113
6205	6260	6262	7003	7004	7005
7009	7011	7012	7014	7016	7019
7024	7025	7026	7028	7029	7031
7032	7033	7039	7046	7049	7050
7055	7064	7068	7072	7075	7076
7090	7093	7108	7116	7136	7150
7249	7449	7475	8006	8007	8018
8019	8023	8030	8040	8050	8076
8077	8093	8130	8150	8176	

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