Novanta

Vectria 30 Scan Head

User Manual

Read carefully before using.
Retain for future reference.

Manufacturer

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Customer service

Before contacting us for assistance, please review appropriate sections in this manual that may answer your questions. After consulting the manual, please submit a request through our website: https://novantaphotonics.com/technical-support-request-form-header/

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1 HOW TO USE THIS DOCUMENT

1.1 SYMBOLS AND SIGNAL WORDS

Please be sure that you understand the meanings of the symbols and signal words described below before you move on.

DANGER

… indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.[1]

WARNING

… indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.[1]

CAUTION

… indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.[2]

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[1] Serious injury includes blindness, wounds, burns (low and high temperature), electric shock, fractures, and poisoning, etc. which have long-lasting consequences or require hospitalization and/or long-term treatment.

[2] Minor or moderate injury includes wounds, burns, electric shock, etc. not requiring hospitalization and/or long-term treatment.

NOTICE

... indicates a potentially hazardous situation which, if not avoided, could result in property damage and other problems, but not personal injury.

IMPORTANT

... indicates important information.

TIP

... indicates a practice that facilitates work.

Procedure

... indicates a required action step. After this signal word you must execute one or more steps. Warning sections omit this signal word, as avoidance procedures are mandatory.

1.2 NOTATION CONVENTIONS

This user manual uses the following notation conventions.

Notation conventions

Notation	Meaning
Underlined	clickable cross-reference or hyperlink
[⟨Number⟩]	cross reference to a list of further reading on page 64
Bold	element in the graphical user interface that the user shall click
Italic	name of element in the graphical user interface or emphasized text
`Typewriter`	text to be typed in by the user, filename, or path

1.3 STORAGE AND REPLACEMENT

- Keep this manual with the product so it is available throughout the product's lifetime.
- You can request a replacement copy of this manual. It is available as a PDF.
- This manual is part of the product. If ownership changes, this manual must accompany the product.

1.4 SPECIFICS AND STRUCTURE

Novanta reserves the right to update this manual at any time without prior notification.

This manual covers installation and commissioning, troubleshooting, and maintenance.

- Be mindful of the environment, do not print if you do not need to.

1.5 TARGET AUDIENCE AND QUALIFICATION

IMPORTANT

Only the target audience specified at the beginning of each instruction section in the following chapters is authorized to perform the activities described.

All personnel who perform the activities described in this manual must be of legal working age in the country of installation and must comply with applicable local regulations.

The qualification of the target audience is defined below.

Laymen

without special qualification, who e.g., transport and store the boxed product.

Operators

who are trained by the company that is operating the laser unit, where the product is incorporated, in the use of that laser unit and who confirmed the training by signature.

Experts

in electrical engineering or mechatronics, who are successfully trained in handling highly sensitive electronic and optical equipment. Experts must be trained by the company that is operating the laser unit, where the product is incorporated, in the use of that laser unit, and must confirm this training by signature.

2 GENERAL SAFETY INSTRUCTIONS

This chapter lists important precautions which users of the scan head (and anyone else) must observe to avoid injury and damage to property, and to ensure safe and correct use of the scan head.

2.1 INTENDED USE

The scan head is delivered as an OEM component for integration into a laser unit that uses class 4 laser and that will be operated in a dry and clean indoor environment without electrically conductive contamination.

- Before installing and operating the scan head, carefully read this manual for your protection.
- Retain this manual for future reference.

IMPORTANT

Novanta has no influence over the employed laser device or the overall laser unit

- Customers must know and apply the rules and regulations for safe operation of lasers when installing and operating the scan head and the laser unit in which it is used.
- Customers assume full responsibility for maintaining a laser-safe working environment. Original equipment manufacturer (OEM) customers assume full responsibility for CDRH (Center for Devices and Radiological Health) certification or other local health and compliance standards.
- The laser unit manufacturer bears responsibility for complying with the standards and guidelines required for the CE (European Conformity) label.
- Please contact Novanta for further information about this scan head and applicable guidelines.

2.2 REASONABLY FORESEEABLE MISUSE

It is considered a misuse if you use the scan head without incorporating it into a laser unit that complies with the standards required for the CE (European Conformity) label.

2.3 HAZARDS

2.3.1 LASER RADIATION

The scan head is intended for use in combination with a class 4 laser.

WARNING

Visible or invisible laser radiation can cause severe retinal and corneal burns, burns to the skin, and may pose a risk of fire.

- To avoid injury and reduce risk of fire, follow the control measures and safety guidelines provided by the laser's manufacturer, and those established by your Laser Safety Officer (LSO), Radiation Safety Officer (RSO), or safety department of your business or institution.
- The integrator must take appropriate protective measures to reduce the risks of exposure to laser radiation.
- The integrator must take appropriate protective measures to reduce fire and explosion hazards of laser processed materials.

2.3.2 LASER-GENERATED AIR CONTAMINANTS

During laser material processing, matter is evaporated. Laser-generated air contaminants can consist of a multitude of hazardous substances, such as nickel, chromium, alumina, zinc, butanol, toluene, xylene, and formaldehyde. The concentration, particle size, and quantity of these aerosols and particles can vary.

WARNING

Laser generated air contaminants, even if respired in lowest concentrations over long time or brought to skin contact, can cause skin irritations, contact eczema, sickness, vomiting, cauterization of the respiratory tract, nervous diseases, allergic reactions, spasms, and cancer.

- To avoid injury, follow the control measures and safety guidelines provided by the respective material safety datasheet, and those established by your Laser Safety Officer (LSO), Radiation Safety Officer (RSO), or safety department of your business or institution.
- The integrator must take appropriate protective measures to reduce risks of exposure to dust and fumes from laser processing.

2.3.3 BERYLLIUM MIRRORS

The scan head contains Beryllium mirrors. Under normal circumstances, i.e., if the housing and protective windows and the Beryllium mirrors are undamaged and if the product is handled and used properly then the Beryllium mirrors present no danger. Danger may only arise if the Beryllium mirrors are damaged, as the damage may have produced small quantities of Beryllium dust that may not be visible.

WARNING

Beryllium is classified as carcinogenic substance of category 1B and hazard class STOT RE1. This applies especially to Beryllium as dust or vapor, i.e., if the Beryllium mirrors are damaged. Beryllium causes eczema, berylliosis and cancer when getting in contact with skin or inhaled.

- DO NOT open the scan head. DO NOT remove the protective windows.

If the Beryllium mirrors are damaged, then immediately follow the response procedure in section 8.2 on page 61.

2.3.4 ZINC SELENIDE OPTICS

The scan head contains optical components, like the protective window, consisting of Zinc Selenide. Under normal circumstances, i.e., if the housing and protective windows and the optics are undamaged and if the product is handled and used properly then the Zinc Selenide optics present no danger. However, damage resulting from mechanical impact or thermal decomposition may compromise the material's integrity and potentially release hazardous substances. Appropriate precautions must be taken to avoid such conditions during installation, operation, and maintenance.

WARNING

Zinc Selenide is classified as hazard class STOT RE2. This applies especially to Zinc Selenide as dust or vapor, i.e., if the Zinc Selenide optics are mechanically damaged. Zinc Selenide is toxic in contact with skin, if swallowed or if inhaled.

- DO NOT open the scan head. DO NOT remove the protective windows.

If the Zinc Selenide optics are damaged, then immediately follow the response procedure in section 8.3 on page 62.

Thermal destruction may lead to decomposition of Zinc Selenide and release of small quantities of toxic selenium compounds, like Hydrogen Selenide.

2.3.5 HOT LASER-PROCESSED MATERIAL

During materials processing with lasers, strong heating of the processed material may arise.

⚠ CAUTION

Hot laser-processed material can cause skin burns.

- If you are a system integrator, then place a sign at the laser processing area that warns about hot surfaces.
- When handling material by hand that was laser-processed shortly before then wear heat resistant protective gloves.

2.3.6 COOLANT AND COOLANT ADDITIVES

The scan head has a cooling loop and may use a special coolant or coolant additives, like calcination inhibitors, algae inhibitors, anti-corrosion, and anti-freeze agents. For more information on the recommended additives see section 4.3.2.

⚠ CAUTION

Coolant or coolant additives might give rise, amongst other things, to allergies, eczema, and other irritations if they get in contact with the skin or mucous membranes.

- To avoid injury, follow the control measures and safety guidelines provided by the respective material safety datasheet, and those established by your Laser Safety Officer (LSO), Radiation Safety Officer (RSO), or safety department of your business or institution.

2.3.7 ELECTROSTATIC DISCHARGE

The scan head contains parts that are sensitive to electrostatic discharge.

NOTICE

Electrostatic discharge (ESD) can damage the scan head which is an electrostatic discharge-sensitive device.

- Transport equipment only in anti-static packaging and packaging equivalent to that received with the shipment.
- Keep the scan head sealed until within an ESD-controlled environment.

A proper static control station should include:

- ☐ A soft grounded conductive tabletop or grounded conductive mat on the tabletop
- ☐ A grounded wrist strap with the appropriate (1 MΩ) series resistor connected to the tabletop mat and ground
- ☐ An adequate earth ground connection, such as an uncoated water pipe or AC ground
- ☐ Conductive bags, trays, totes, racks, or other storage
- ☐ Properly grounded power tools
- ☐ Personnel handling ESD items must wear ESD protective garments and ground straps

2.4 MODIFICATIONS AND SPARE PARTS

Modifications to the scan head are not permitted. This includes but is not limited to water connectors.

Spare parts specified, supplied, or approved by Novanta are only permitted for use with this scan head.

2.5 FIRE EXTINGUISHER RECOMMENDATION

A carbon dioxide (CO_2) fire extinguisher must be used. Ensure the fire extinguisher used is compatible with the entire laser unit. Prior to installing the scan head, ensure the fire extinguisher is available and observe its instructions for use including its hazard notes.

3 OVERVIEW

Vectria 30 and its complementary controller, ScanMaster Controller (SMC), can target large areas with exceptional accuracy and speed.

3.1 LABELS

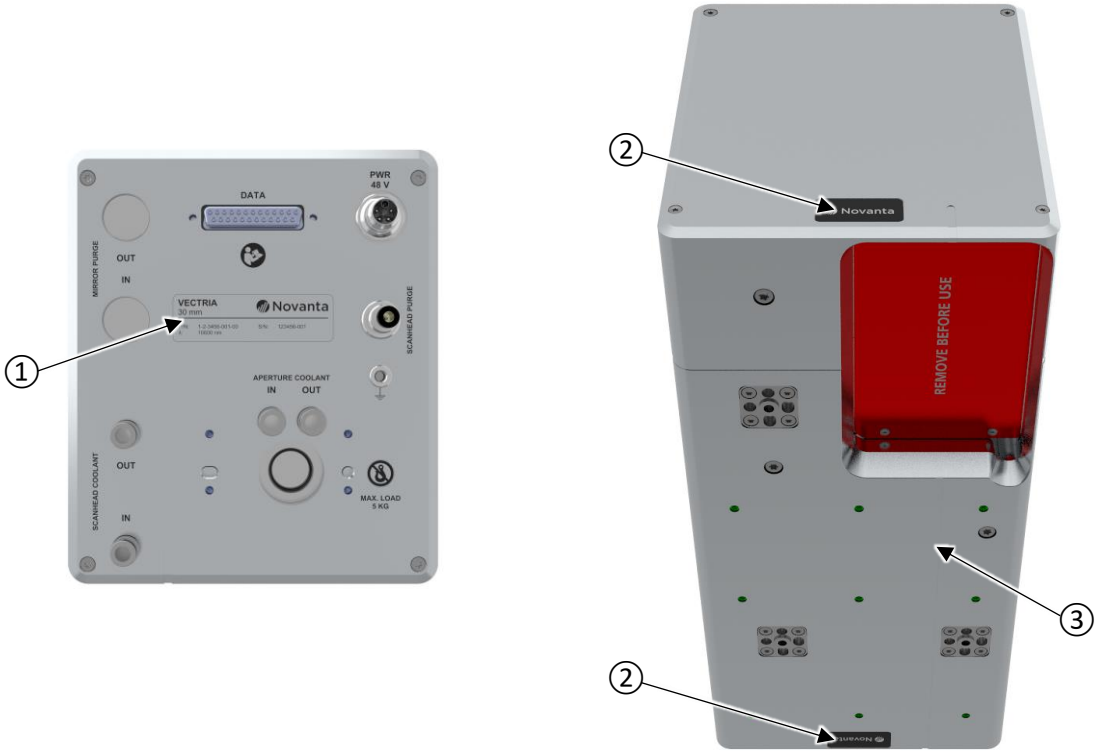
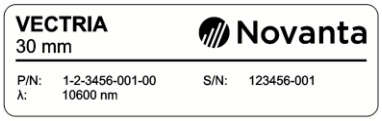


Figure 1: Position of labels

Legend to Figure 1

No.	Label	Description
1		Type label
2		Warranty label
3		*Warning of laser beam* label

3.2 INTERFACES

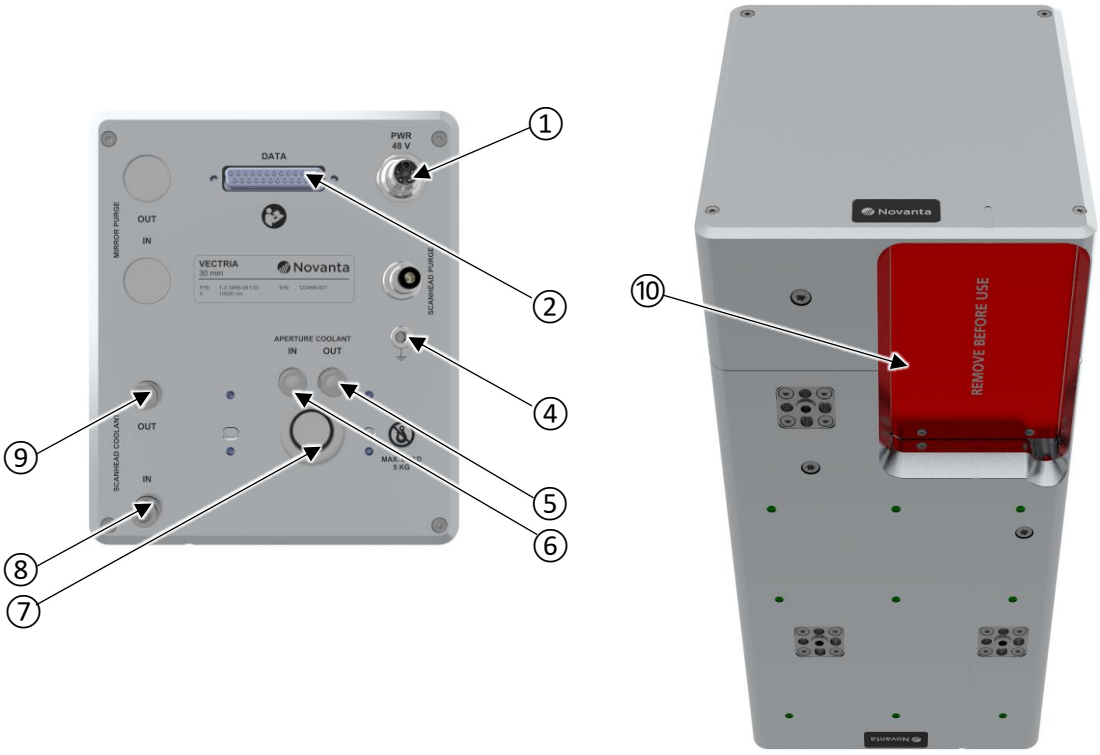


Figure 2: Position of interfaces

Legend to Figure 2

No.	Marking / function	See section	On page
1	PWR 48 V / Power supply (in) for the scan head	4.3.5	36
2	DATA / Communication with the controller	4.3.4	34
3	SCANHEAD PURGE / Purge gas port	4.3.3	32
4	⏚ / Housing ground	4.3.5	36
5	APERTURE COOLANT OUT / Cooling fluid from the aperture	4.3.2	28
6	APERTURE COOLANT IN / Cooling fluid to the aperture	4.3.2	28
7	- / Laser beam input	4.4.1	41
8	SCANHEAD COOLANT IN / Cooling fluid to the scan head	4.3.2	28
9	SCANHEAD COOLANT OUT / Cooling fluid from the scan head	4.3.2	28
10	- / Laser beam output	4.4.1	41

3.3 CONTROLS AND INDICATORS

There are no controls or indicators on the scan head.

4 PREPARING FOR USE

This chapter describes all procedures necessary to get the scan head ready for use.

4.1 TRANSPORTING AND STORING

Target audience and qualification

Laymen, operators, and experts

Requirements

Table 1: Environment (transport and storage)

Characteristic	Specification
Conditions	Dry and clean indoor environment without electrically conductive contamination
Storage temperature	-35-60 °C (238-333 K)
Humidity	max. 80 % RH, non-condensing

Procedure

- Transport and store the scan head in its sealed original packaging or an equivalent packaging.

4.2 UNPACKING AND VERIFYING THE SCOPE OF DELIVERY

Target audience and qualification

Experts

Have ready

☐ Utility knife

Procedure

1. If any shock indicator is present and triggered, then block the delivery, and inform the sender.
2. While carefully unpacking the scan head, keep in mind that you want to retain the packaging for future use.

   In case it will become necessary to return the scan head, we recommend documenting the unpacking e.g., by taking photographs.

> **NOTICE**
>
> Contamination can damage optics.
>
> - Leave any protective covers in place for as long as possible to keep the optics clean.

3. Check with the delivery note whether all parts are present, undamaged and whether the serial numbers correspond. If one of these is untrue, then block the delivery and inform the sender.
4. The scan head may be shipped together with an optional cable and hose package (PN 419-2003539-00). The contents of this optional package are listed in Table 13 on page 60.
5. Retain the original packaging for future use.

4.3 INSTALLING

This section summarizes the procedures required to mount the scan head in the laser unit and connect all supply lines. Perform the subsections in order (mounting → cooling → purge gas (if used) → controller/data → power → laser/controller integration (if applicable) → software).

4.3.1 INCORPORATING THE SCAN HEAD INTO THE LASER UNIT

Target audience and qualification

Experts

Have ready

- ☐ Machine bolts suitable for mounting the scan head in the laser unit; see Figure 3 on page 25.
- ☐ Suitable screwdriver, hexagon socket screw key set, Torx key set

Requirements

Table 2: Environment (operation)

Characteristic	Specification
Conditions	Dry and clean indoor environment without electrically conductive contamination
Operating temperature	15-40 °C (288-313 K)
Humidity	25-80 % RH, non-condensing

Table 3: Physical

Characteristic	Specification
Wavelength	10.2 to 10.6 µm
Optical power input Beryllium Mirror	 500 W
Entrance Beam Aperture[3]	9.5 mm clear aperture
Dry weight	10 kg
Dimension (L x W x H)	347 x 145 x 171.3 mm

Safety precautions

- ☐ Ensure fire extinguishing equipment is available and follow its instructions; see also section 2.5 on page 17.
- ☐ Switch off the laser unit, where the scan head is incorporated. Switch off the laser device, power supply, cooling and particularly disable moving parts.

Procedure

NOTICE

Contamination by burned protective covers can damage optics.

- Remove protective covers at the last possible moment during the installation procedure.

- To mount the scan head on its place in the laser unit, use the 3-point mounting as indicated in Figure 3 on page 25.

[3] Optical path designed for incoming collimated gaussian laser beams of d = 9.5 mm ($1/e^2$)

Specifics of the interface

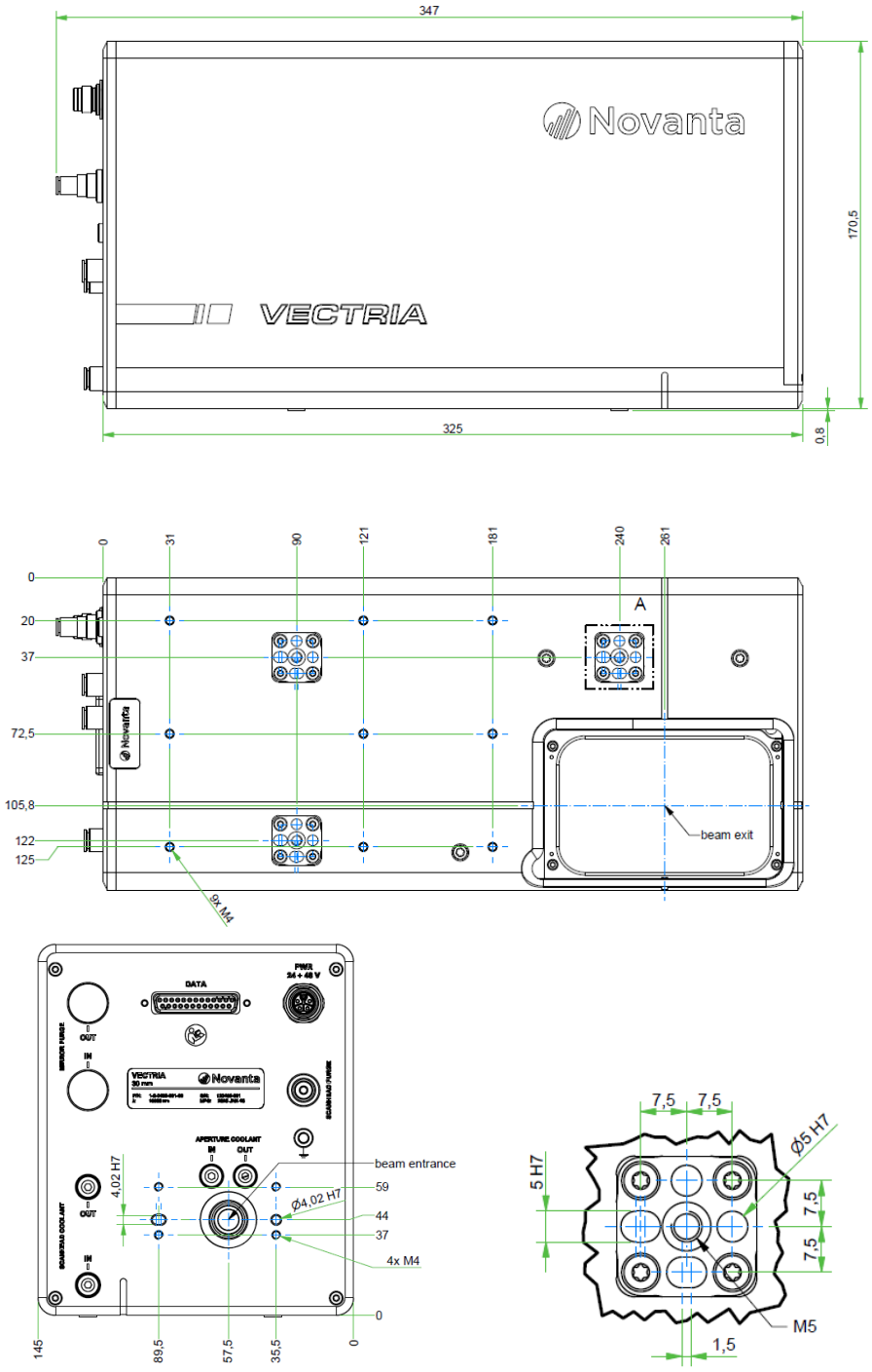


Figure 3: Dimensions in millimeter and mounting

The native coordinate system of the scan head is shown in Figure 4. Be aware that the effective coordinate orientation may change depending on the controller and controller settings used.

Figure 4: Native coordinate system of the Vectria scan head

NOTICE

To set the correct working distance always measure the distance between the lowest point of the scan head and the material surface. DO NOT measure from the indentation at the side of the output window.

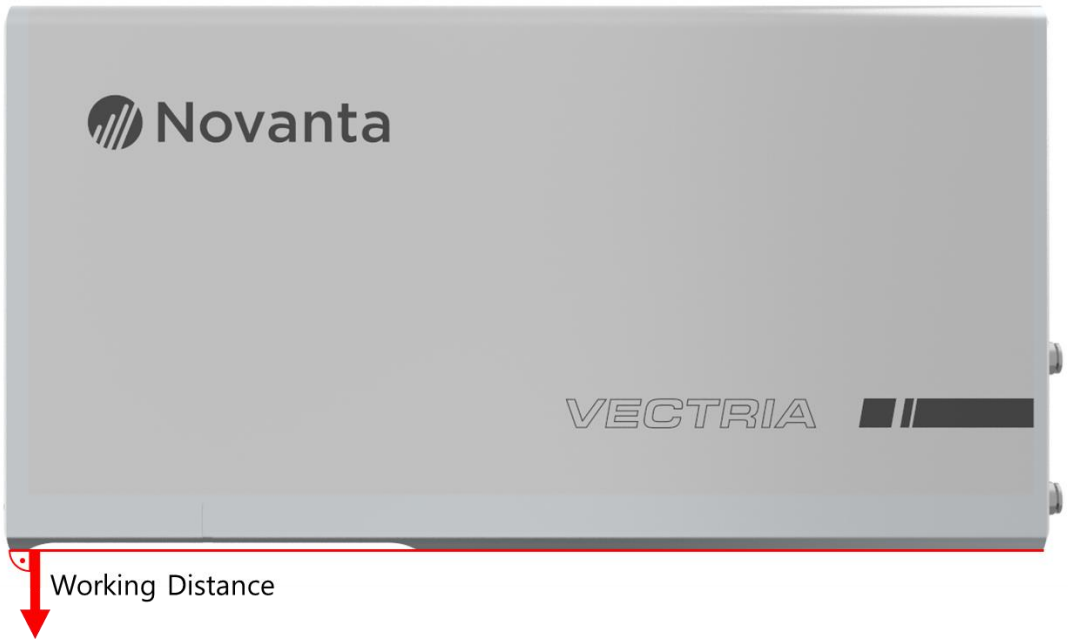


Figure 5: Reference plane for measuring the working distance (lowest point of scan head to material surface).

4.3.2 CONNECTING THE COOLING

The scan head has two separate internal cooling circuits (scan head and aperture). The scan head is delivered with a pre-installed bridge between SCANHEAD COOLANT OUT and APERTURE COOLANT IN, allowing both circuits to be connected to a single external cooling system.

IMPORTANT
Water cooling is strongly recommended for all installations and is mandatory to achieve the specified performance of the scanning head. In addition, aperture cooling is required for all applications using optical laser powers **above 100 W**.

Limited operation without water cooling (supported only within limits): If water cooling cannot be provided, limited operation without active cooling may be possible only when verified by a thermal assessment and when operated within conservative limits. The assessment should consider the following factors:

- Optical laser power used
- Process time as a percentage of the total machine cycle time (duty cycle)
- Ambient machine temperature
- Application-specific power consumption of the scanning head

Operation without water cooling outside the assessed limits may result in degraded performance and/or damage.

Rule of thumb: As a general guideline, a vector marking application at up to 100 W optical power, with an on/off duty cycle of approximately 80 %, and ambient temperature below 25 °C, will typically not result in critical internal temperatures when operated without water cooling.

If your application approaches these boundaries, uses non-standard operating conditions, or exceeds 100 W optical power, implement water cooling.

IMPORTANT

- The above guidance is indicative only and does not replace proper thermal validation.
- Higher ambient temperatures, increased duty cycles, higher optical power, or elevated scan head power consumption will significantly increase thermal load and may lead to excessive drift, reduced lifetime, or system damage.
- Continuous operation close to the assessed limits without water cooling is not recommended.

Target audience and qualification

Experts

Have ready

☐ Utility knife to cut hoses in length

☐ Tissues to wipe small amounts of coolant

Requirements

Because the scan head cooling channels are made of aluminum, the preferred configuration is a dedicated scan head cooling circuit without wetted copper or other heavy-metal components. When a shared cooling circuit with copper or other heavy metals is used, the use of a coolant with suitably effective corrosion inhibitors is mandatory. The inhibitor package shall prevent metal-ion contamination and shall protect the aluminum cooling channels against accelerated corrosion. Table 4 on page 30 lists examples of suitable inhibitors; obtain expert guidance from the cooling system manufacturer to meet any regional regulations or requirements.

Table 4: Cooling

Characteristic	Specification
Coolant (recommended)	Filtered (max. 100 µm particle size) distilled water mixed with *Coolflow DTX* (28 % concentration) – OR – Filtered (max. 100 µm particle size) distilled water mixed with Nalco 73199 or similar corrosion inhibitor – OR – 90 % of filtered (max. 100 µm particle size) distilled water with 10 % of *OptiShield Plus* or similar corrosion inhibitor – OR – ***COOL****FLUX 42*
Inlet temperature (recommended) [4]	18–20 °C (291–293 K)
recommended pressure	3–4 bar (3000–4000 hPa)
Volume flow	1.5–1.8 l/min

Safety Precautions

- ☐ Wear personal protective equipment (safety goggles, waterproof assembly gloves) to prevent eye and skin irritations caused by coolant or coolant additive.

Procedure

1. Note the flow direction; see Figure 6 on page 31.
2. Push the hose into the fittings as far as they will go.
3. Gently pull on the hoses to check that they are tight.

[4] If operational temperatures outside the range given are required, please consult with your Novanta representative to determine whether this might be possible.

NOTICE

Leaking coolant can cause a short circuit and/or damage optics.

4. Check for leakage by opening the return line first and then carefully turning on the cooling water supply line and watching the connections.
5. If coolant is leaking immediately turn off the supply line, disconnect the leaking connection, wipe away any leaked coolant, correct the fault and redo the connection.

   – OR –

   If coolant is not leaking, then let it flow until the scan head is filled with water.

6. Turn off the coolant supply line first and then the return line.
7. During commissioning (section 4.4.2), you will turn the cooling back on.

Specifics of the interface

Marked:	SCANHEAD/APERTURE COOLANT IN/OUT
Connector:	manufacturer: Legris; part number: 3181 06 19
Recommended hose:	Polyurethane; $Ø_{out}$ = 6 mm, $Ø_{in}$ = 4 mm

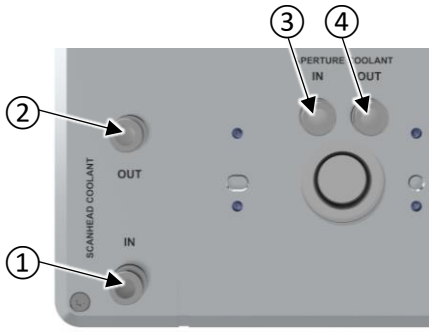


Figure 6: Position of the coolant supply and return connectors

Legend to Figure 6

No.	Labeling / function
1	SCANHEAD COOLANT IN / cooling fluid to the scan head
2	SCANHEAD COOLANT OUT / cooling fluid from the scan head
3	APERTURE COOLANT IN / cooling fluid to the aperture
4	APERTURE COOLANT OUT / cooling fluid from the aperture

4.3.3 CONNECTING THE PURGE GAS

A gas purge is highly recommended when operating the Vectria 30. Purging the scan head creates positive pressure that prevents dirt and debris from accumulating on optical surfaces inside the housing. In condensing atmospheres, a gas purge helps to reduce the potential for condensation damage.

Target audience and qualification

Experts

Have ready

- ☐ Utility knife to cut hoses in length

Requirements

The gas purge port on the Vectria 30 must be connected to a source of nitrogen or clean, dry air only; do not use any other gases for purging.

Table 5: Purge gas

Characteristic	Specification
Purge gas pressure	13.8–34.5 kPa
Purge gas flow rate	0.85–1.7 m^3/h

Characteristic	Specification
Purge gas	
Nitrogen	High Purity Grade ≥ 99.9500 % purity; filtered to ISO Class 1 particulate level
Air	Breathing Grade ≥ 99.9996 % purity; filtered to ISO Class 1 particulate level
Air	Compressed Instrument-grade air filtered and dried to ISO 8573-1:2010 Class 1, 2, 1 (≤ 10 1.0-5.0 µm particles/m^3; ≤ -40 °F dew point; ≤ 0.01 mg/m^3 oil vapor)

Procedure

1. Push the tube into the fitting as far as it will go.
2. Gently pull on the tube to check that it is tight.
3. Check for leakage by slowly turning on the purge gas and watching the connections.
4. If you hear the gas escaping at the connector turn off the supply line, disconnect the tube, correct the fault and redo the connection.

– OR –

5. If the connection is leak-tight, set the purge gas pressure to the specification provided in Table 5 on page 32.
6. Turn off the purge gas supply.
7. During commissioning (section 4.4.2), you will turn the purge gas back on.

Specifics of the interface

Marked:	SCANHEAD PURGE
Connector:	manufacturer: Legris; part number: 3181 04 55
Recommended hose:	Polyurethane; $Ø_{out}$ = 4 mm

4.3.4 CONNECTING THE CONTROLLER

It is assumed that the Vectria 30 will be used with the ScanMaster Controller (SMC). Connect the SMC to the scan head's DATA Interface by using a communication cable.

Target audience and qualification

Experts

Have ready

- ☐ ScanMaster Controller (SMC)
- ☐ Cable: manufacturer: Amphenol; part number: CS-DSPMDB25MM-015; length: 5 m; male/male

Procedure

NOTICE

"Hot connection/disconnection" of any power or data source is not advised and can result in damage to the product.

1. Connect the SMC according to the following information and only when the power is off.

Specifics of the interface

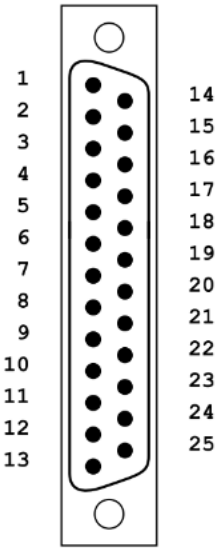
Marked:	DATA
Connector:	D-sub 25-pin, female
Data cable:	D-sub 25-pin, male connector It is recommended to keep the cable length below 10m.

Notes

The data connector supports the following two interface protocols:

- XY2-100
- NVL-100

Table 6: Pin assignment of the DATA connector[5]



Pin	XY2-100	NVL-100	Pin	XY2-100	NVL-100
1	CLOCK_N	DNC	14	CLOCK_P	DNC
2	SYNC_N	DNC	15	SYNC_P	DNC
3	POS-X_N	DNC	16	POS-X_P	DNC
4	POS-Y_N	IN1_N	17	POS-Y_P	IN1_P
5	POS-Z_N	IN2_N	18	POS-Z_P	IN2_P
6	STAT_N	OUT1_N	19	STAT_P	OUT1_P
7	DNC	DNC	20	DNC	DNC
8	STAT2_N	OUT2_N	21	STAT2_P	OUT2_P
9	NIC	NIC	22	NIC	NIC
10	NIC	NIC	23	NIC	NIC
11	NIC	NIC	24	NIC	NIC
12	NIC	NIC	25	NIC	NIC
13	NIC	NIC			

[5] DNC: Do not connect (reserved), NIC: No internal connection

4.3.5 CONNECTING POWER

Target audience and qualification

Experts

Requirements

Table 7: Electrical supply

Characteristic	Specification
Supply voltage	+48 V DC; Tolerance ±2 V DC
Input power	≥ 350 W

Have ready

- ☐ Power supply; recommended: Mean Well LRS-350-48
- ☐ Cable: manufacturer: PHOENIX CONTACT; part number: 1414805; Length 5 m; female unterminated
  An adequate cross-section of 2.5 mm^2 is recommended.
  It is recommended to keep the cable length below 10 m.

Procedure

NOTICE

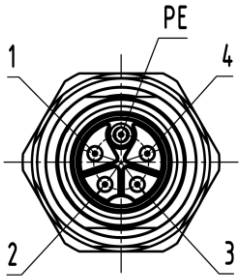
"Hot connection/disconnection" of any power or data source is not advised and can result in damage to the product.

1. Connect the power lines according to the following information and only when the power is off.

Specifics of the interface

Marked: PWR 48 V
Connector: manufacturer: Harting; part number: 21033091530;
M12, male 5-pin K-coded

Table 8: Pin assignment of the PWR 48 V connector[6]

	Pin	Signal
	1	DNC
	2	Digital Ground
	3	Power Ground
	4	VDC (48 V)
	5 (PE)	Chassis

- If the power cable from the optional cable package is used: the cable is not color-coded (only PE is yellow-green). The other wires are numbered according to the pin numbers in Table 8.
- Digital Ground and Power Ground should be shorted at the power supply.
- Chassis should be shorted to Ground at the power supply and connected to PE (protective earth of the mains) at the power supply.
- Connect the power cable shield to PE.
- The Vectria 30 enclosure should have a reliable low-impedance connection to the machine frame, and the machine frame should be properly grounded (to PE).
- Vectria 30 and the ScanMaster Controller should be connected to the same ground potential. Their grounds should be shorted at the power supply.
- Vectria 30 and the ScanMaster Controller should be powered up and down simultaneously.
- To prevent excessive inrush currents, the DC power supply must not be switched directly using a contactor. Instead, utilize the soft-start feature of the power supply and perform switching on the AC input side of the power supply.

[6] DNC: Do not connect (reserved)

4.3.6 CONNECTING A LASER TO SCANMASTER CONTROLLER

It is assumed that the Vectria 30 scan head will be used with the ScanMaster Controller in a system setup like the example shown in Figure 7 on page 38.

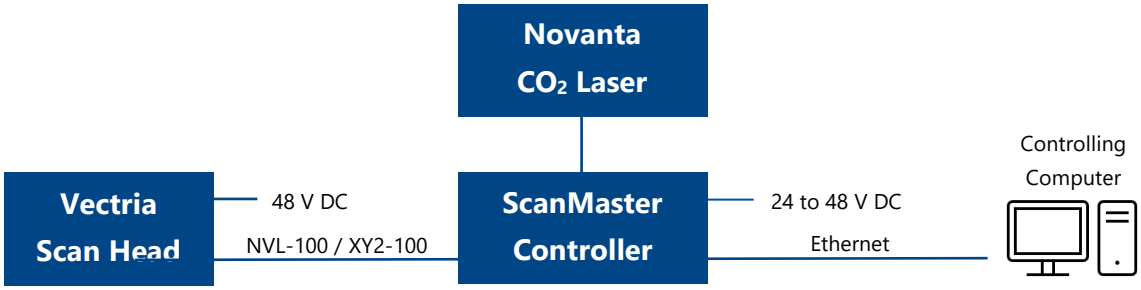


Figure 7: Example of a system setup with a Novanta CO_2 laser

Target audience and qualification

Experts

Procedure

IMPORTANT

The connections given have been tested with a Novanta CO_2 laser. The information provided is correct at the time of writing. However, the user is responsible for verifying that the specified connections are suitable for the laser in use, including Novanta CO_2 lasers, as product changes may have been introduced by the manufacturer.
Other laser types may require different connections or methods of operation. Novanta recommends that the user check the interface requirements of the laser used in all cases. Novanta does not accept any liability for damage caused through incorrect connections, the information provided here is for guidance purposes only.

1. Before connecting the laser to the ScanMaster Controller, consult with the laser manufacturer's documentation.

NOTICE

"Hot connection/disconnection" of any power or data source is not advised and can result in damage to the product.

2. Connect the laser only when the power is off and according to the following information.

3. Connect the Synrad CO2 Laser adapter (SMC-LSR-03) to J18 of the SMC.
4. Connect the BNC cable coming from the laser to the adapter.

4.3.7 INSTALLING THE SOFTWARE

It is assumed that the Vectria 30 scan head will be used with ScanMaster Controller (SMC). Use the following software to fully utilize the capability and performance of the system. The software listed within this section represents a core set of applications and APIs that will allow the user to use Vectria 30 in several different ways. Depending on the end user installation it is likely that not all these software solutions will be required.

Target audience and qualification

Experts

Procedure

1. Download all (recommended) software listed in Table 9 on page 40.

   The software can be obtained from your local Novanta representative or from: https://novantaphotonics.com/secure-download-scanmaster/

2. Install the software applications on the controlling computer that is connected via Ethernet to the ScanMaster Controller. You will need administrator rights on the controlling computer to install the software packages.

3. As a general guide it is usually good practice to install *ScanMaster SDK* first followed by *ScanMaster API* and lastly *ScanMaster Designer*.
   Calibration Wizard and *TuneMaster Lite* can be installed independently.

4. There is additional detailed documentation contained within each software application, accessible once installed, which the reader is urged to study.

Table 9: Software list

Software application	Minimum version required	Purpose	User level
ScanMaster SDK, incl. Device Config. Editor, Broadcast Monitor, Firmware Loader, Remote Admin.	5.0.0.x	Low level communication to the SMC, configuration, and legacy API functionality	Software engineer / Process engineer
ScanMaster API	5.0.0.x	.net Framework compliant API for all new designs	Software engineer
ScanMaster Designer	5.0.0.x	User friendly desktop application for developing scan projects	User / All
Calibration Wizard	V2.2.5 V3.0.0.x	Calibration software to set up the scan head field correction	Process engineer

4.4 COMMISSIONING

This section describes how to commission the scan head, i.e., what must be done when switching it on for the first time.

NOTICE

Uncontrolled laser emission can lead to property damage.

- The integrator must implement supervision of the scan head state and stop laser emission in fault condition.
- If necessary, the integrator must take additional appropriate protective measures to prevent damage by uncontrolled laser emission.

Contamination by burned protective covers can damage optics.

- Remove protective covers at the last possible moment during the installation procedure.

4.4.1 FEEDING IN THE LASER BEAM

The laser beam shall run along the scan head's optical axis. This can be achieved by at least 2 mirrors positioned, in beam direction, before the scan head.

Order and designation of optical elements in the beam path from the laser in direction to the work piece: Laser > mirror 1 > mirror 2 > scan head > work piece.

Target audience and qualification

Experts

Requirements

Table 10: Laser beam supply

Characteristic	Specification
Wavelength	10.2 to 10.6 µm
Optical power input Beryllium Mirror	 500 W
Entrance Beam Aperture[7]	9.5 mm clear aperture
Working Distance	250 to 1000 mm

Have ready

- ☐ Laser safety glasses that are appropriate for the laser in use
- ☐ Wire-mesh mode screen, which fits into the scan head and mirror aperture
- ☐ Optional: A suitable indicator card to make the invisible laser beam visible

Safety precautions

- ☐ Restrict the working area for personnel not involved in commissioning the scan head
- ☐ Shield the working area to prevent direct or scattered laser radiation from escaping
- ☐ Any personnel present within the restricted area must wear protective glasses appropriate to the laser in use

Procedure

IMPORTANT

It is required that the procedure is done on site and the laser or scan head must not be separated from the laser system afterwards.

[7] Optical path designed for incoming collimated gaussian laser beams of d = 9.5 mm ($1/e^2$)

WARNING

Visible or invisible laser radiation can cause severe retinal and corneal burns, burns to the skin, and may pose a risk of fire.

- To avoid injury and reduce risk of fire, follow the control measures and safety guidelines provided by the laser's manufacturer, and those established by your Laser Safety Officer (LSO), Radiation Safety Officer (RSO), or safety department of your business or institution.
- For adjustment, parametrize the laser with a duty cycle set as low as possible and a frequency set to 5 kHz.

1. Ensure the scan head is in a safe state (e.g., safe mirror position) and that laser emission is disabled.
2. Activate laser emission.
3. Align mirror 1 such that the laser beam is centered on mirror 2.
4. Align mirror 2 such that the laser beam is centered on the scan head beam entry.
5. With the laser beam entering the scan head, align the beam to the scan head optical axis. This alignment shall be performed iteratively by sequential adjustment of mirror 1 and mirror 2 until the beam is centered at both positions. The beam-walking procedure is beyond the scope of this manual.

4.4.2 SWITCHING ON FOR THE FIRST TIME

Target audience and qualification

Experts

Requirements

☐ The installation has been completed as described in section 4.3 on page 23 ff. Please check the installation once again to ensure this.

Procedure

1. Check the cooling settings (see Table 4 on page 30). Then turn on the cooling system: open the coolant return line first, then carefully open the coolant supply line.
2. Switch on the power.
3. Commission Vectria 30 via the controlling computer as described in the following sections.

   Find further reading about commissioning and controlling the scan head and the laser in the respective documentation.

5 OPERATING

5.1 OPERATIONAL PROCEDURES

The scan head cannot be directly controlled.

Target audience and qualification

Operators and experts

Requirements

- ☐ You have successfully finished all necessary commissioning procedures.
- ☐ The laser unit, where the scan head is incorporated, complies with the standards and directives that are required by the declarations of incorporation of all laser unit components.

Procedure

- Control the scan head and the laser via the controlling system.

  Please find further reading in the documentation of the installed hardware and software components.

5.2 OBSERVABLE SIGNALS

Vectria 30 does not provide any visual or audible means to indicate whether the product is operational.

5.3 TROUBLESHOOTING

Target audience and qualification

Experts

Safety precautions

Vectria 30 does not provide any visual or audible means to indicate whether the product is operational.

Vectria 30 contains a high-performance beam steering system, which is designed to emit high power laser beams with a wavelength of 10.6 µm at powers up to 500 W.

During normal operation high power laser emission is expected and exposure must be avoided.

⚠ WARNING

Visible or invisible laser radiation can cause severe retinal and corneal burns, burns to the skin, and may pose a risk of fire.

- DO NOT look through the exit window to view the mirrors and determine whether the mirrors move under command. Instead follow the procedure given below.
- Switch off the laser emission.
- Wear appropriate laser safety glasses.
- Restrict access to the area where the alignment is done, to the people who perform the adjustment and who wear appropriate laser safety glasses.
- To avoid injury and reduce risk of fire, follow the control measures and safety guidelines provided by the laser's manufacturer, and those established by your Laser Safety Officer (LSO), Radiation Safety Officer (RSO), or safety department of your business or institution.

The scan head contains Beryllium mirrors.

⚠ WARNING

Beryllium is classified as carcinogenic substance of category 1B and hazard class STOT RE1. This applies especially to Beryllium as dust or vapor, i.e., if the Beryllium mirrors are damaged. Beryllium causes eczema, berylliosis and cancer when getting in contact with skin or inhaled.

- DO NOT open the scan head. DO NOT remove the protective windows.

If the Beryllium mirrors are damaged, then immediately follow the response procedure in section 8.2 on page 61.

IMPORTANT

DO NOT attempt to remove any covers or disassemble any part of the scan head. There are no user serviceable parts inside, and the warranty will be invalidated.

Procedure

1. Read and follow all sections within this manual, especially the steps and actions described within chapter 4 on page 21ff.
2. If Vectria 30 still does not function as expected, then check the following:
    a. Check fuses and circuit breakers in any mains power supply.
    b. Check if all cables are connected correctly, especially that the PHOENIX CONTACT cables are correctly and fully screwed in place to ensure a good connection is attained.
    c. Check for any damage to cables and connections.
    d. Check if the protective covers are removed from the main exit window on the base of the scan head.
    e. Confirm that after the ScanMaster Controller (SMC) is powered for more than 1 minute there are only 7 green LEDs and no red LEDs lit on the SMC, see Figure 8 on page 48.

This step might not be feasible as the SMC might be incorporated in a machine, so the LEDs are not visible.

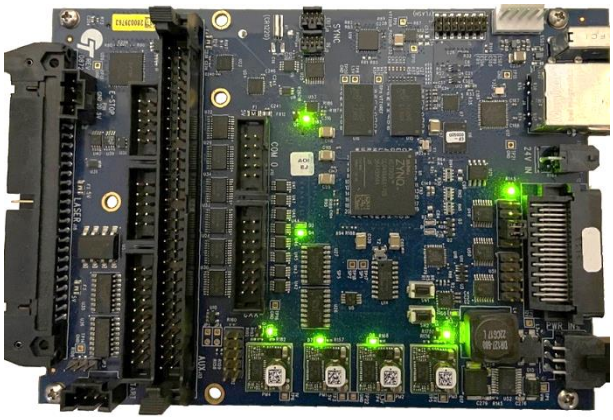


Figure 8: 7 green LEDs if the ScanMaster Controller is powered

f. Confirm that the SMC is powered. This is detectable using the *Broadcast Monitor* software. A screen like that shown in on page 48 should be seen if the SMC is powered and connected correctly.

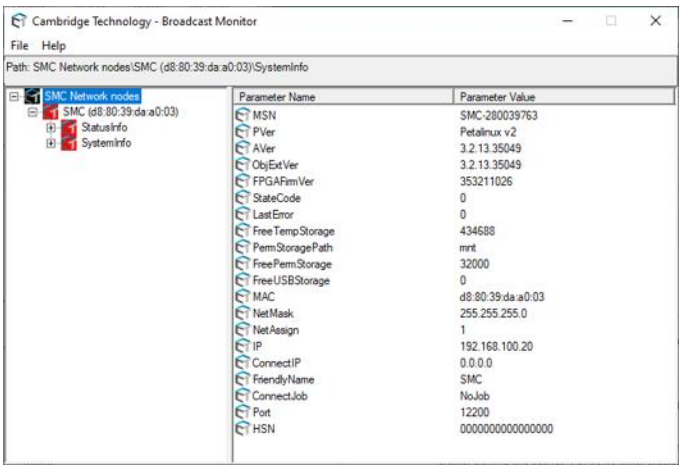
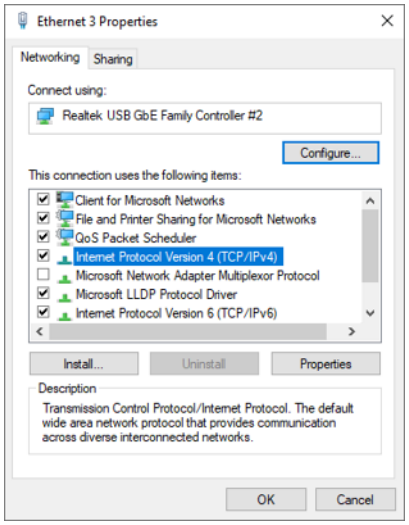
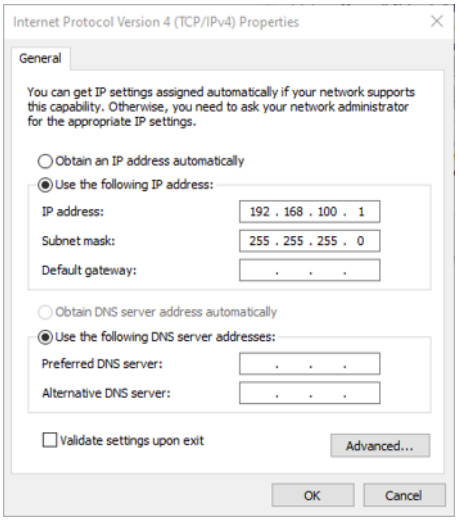


Figure 8: Example: Broadcast Monitor screen

g. Often the Ethernet IP settings of the computer connected to the SMC are configured incorrectly. This gives the impression that Vectria 30 is not functional. The Ethernet adapter properties shown below reflect a correct configuration for an SMC that is set to its default IP address of 192.168.100.20.





If no issues are identified whilst working through the procedure above, functionally the product should be operational. If the scan head still does not operate as expected after completing all steps above, refer to Table 11 on page 49, for a list of common problems, possible causes, and recommended corrective actions.

However, if this guide does not address the specific issue experienced, please contact your local Novanta representative for further guidance and support; see page 2.

Table 11: Troubleshooting table

Problem	Possible Cause	Solution
Laser processing quality deteriorates over time and/or laser power must be increased to maintain quality	Dirty protective output window	Clean as described in section 6.1 on page 51. Replace the protective window if it cannot be cleaned (see section 6.2.1 on page 53).
	Altered controller software parameters	Check input parameters in ScanMaster Designer.

	Dirty or damaged mirror	Check mirrors. Contact your local Novanta representative for further guidance and support; see page 2.
	Laser out of alignment	Align laser as described in section 4.4.1 on page 41.
No laser beam	Problem with the laser	Check laser power and alignment and electrical connections.
	Problem with the laser controller	Check electrical connection to the controller and communication cable between laser and controller.
	Laser beam path blocked or shutter closed	Check laser beam path or shutter connections.
Scan head does not steer laser beam in one or both directions	Problem with the scan head controller	Check all command and electrical connections to the controller. Restart the controller afterwards. Follow the trouble shooting procedure in section 5.3 on page 46.
Scan head stopped responding	Problem with scan head	Check all command and electrical connections to the scan head. Restart the controller afterwards. Follow the trouble shooting procedure in section 5.3 on page 46.

6 CLEANING, MAINTAINING, AND REPAIRING

Cleaning, maintaining, and repairing are limited to the procedures described in this chapter. If other measures are needed, please contact our customer support department; see page 2.

6.1 CLEANING

The exit protective window may require cleaning from time to time. The necessity for cleaning depends on how contaminated the protective window is, i.e., when the work results become unacceptable. It is good practice to clean the protective windows only if it really is necessary, as each cleaning degrades the quality of the optical coating.

Target audience and qualification

Experts

Have ready

- ☐ Cleaning supplies appropriate for cleaning precision optics

Safety precautions

- ☐ Switch off the laser unit, where the scan head is incorporated. Switch off the laser device, power supply, cooling and particularly disable moving parts.
- ☐ Wear personal protective equipment

Procedure

NOTICE

Exercise great care when handling infrared optics; they are much more fragile than common glass materials.

Optical surfaces and coatings are easily damaged by rough handling and improper cleaning methods.

Wear latex gloves or finger cots (powder-free) to prevent contamination of optical surfaces by dirt and skin oils.

1. The protective window shall only be removed if strictly necessary (e.g., for replacement); removal for cleaning purposes is not recommended.
2. To remove loose contaminants from the protective window, use a clean air bulb and direct a stream of air across the optic at a glancing angle. Ensure that the bulb does not come into contact with the surface. Repeat this process as needed.
3. To remove residues or buildup from the protective window, use cleaning supplies and procedures appropriate for cleaning precision optics.

6.2 MAINTAINING

We recommend creating a maintenance plan. The maintenance intervals depend on the degree of contamination in the work environment.

Table 12: Maintenance plan

Interval	Measure	See section	On page
Annually	Check the laser unit and the incorporated scan head according to standard EN 60204. Check the electrical safety of all connecting cables and particularly the mains cable.	–	–

Interval	Measure	See section	On page
	Check the cooling circuit and the concentration of corrosion inhibitor.		

6.2.1 REPLACING THE OUTPUT WINDOW

This section describes how to replace the output protective window. This procedure requires opening the scan head and is permitted only if the scan head does not have damaged beryllium mirrors. If mirror damage is suspected or confirmed, do not proceed—follow the beryllium response procedure in section 8.2.

Target audience and qualification

Experts

Have ready

- ☐ Replacement protective window (111-1171203-00)
- ☐ Tx8 torque screwdriver

Safety precautions

- ☐ Switch off the laser unit, where the scan head is incorporated. Switch off the laser device, power supply, cooling and particularly disable moving parts.
- ☐ Wear personal protective equipment

Procedure

WARNING

The scan head can contain Beryllium mirrors. (see section 2.3.3, page 14)

Before you start with the procedure:

1. Check whether the Beryllium mirrors are damaged
2. If the Beryllium mirrors are damaged, then instead of proceeding with this procedure follow the response procedure in section 8.2 on page 61.
   DO NOT open the scan head. DO NOT remove the protective windows.
3. The procedure described in this section is only allowed if the Beryllium mirrors are not damaged.

NOTICE

Exercise great care when handling infrared optics; they are much more fragile than common glass materials.

Optical surfaces and coatings are easily damaged by rough handling and improper cleaning methods.

Wear latex gloves when handling the protective window to prevent contamination of optical surfaces by dirt and skin oils.

1. The protective window and the window frame will come loose as two separate parts.
2. Hold the window frame in place while removing the four M2.5 × 6 socket head screws that secure the window frame and protective window to the bottom panel of the scan head. See Figure 9 on page 55 for the screw locations.
3. Carefully remove the window frame and protective window.
   Dispose of the protective window as hazardous waste in accordance with applicable regulations.

4. Clean the new output window under adequate illumination until no particles or streaks are visible on the surface.
5. Position the new protective window over the output aperture of the scan head. Ensure that the O-ring between the scan head housing and the window is in place and correctly seated.
6. Carefully place the window frame onto the protective window.
7. Insert the four M2.5 × 6 socket head screws and tighten them carefully in a crisscross (star) pattern. Gradually tighten the screws until fully secured.
   Final tightening torque: 79 Ncm.
8. Check the protective window again for cleanliness.

Specifics of the interface

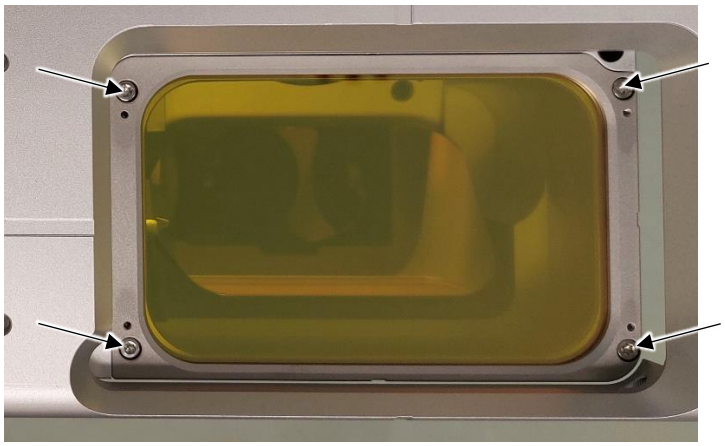


Figure 9: Protective window mounting screw location

6.3 REPAIRING

There are no user serviceable parts inside the scan head. Opening or disassembly of the scan head could risk your safety and safe operation of the scan head and will invalidate the warranty.

Please contact our customer support team for assistance; see page 2.

7 DECOMMISSIONING, RETURNING, AND DISPOSAL

7.1 DECOMMISSIONING

Target audience and qualification

Experts

Requirements

☐ Decommission the scan head only if you want to return it, were instructed to do so, or if you want to dispose of it.

Have ready

☐ Suitable screwdriver for the mounting screws

☐ Tissues or similar, to absorb leaking coolant immediately

☐ Original protective covers for the laser beam entrance and exit

Safety precautions

- Switch off the laser unit, where the scan head is incorporated. Switch off the laser device, power supply, cooling and particularly disable moving parts.

Procedure

1. Disconnect the power supply line from the scan head.
2. Disconnect the remaining electrical lines from the scan head.
3. Turn off the coolant supply line first and then the return line.

4. Relieve the pressure from the hose.

NOTICE

Leaking coolant can cause a short circuit and/or damage optics.

- Get some tissues or similar ready to absorb leaking coolant immediately.
- Deposit the open hose tips in a way that coolant cannot leak or contain the coolant in a tank.

5. Disconnect the cooling supply lines from the scan head.
6. Dismount the scan head from the laser unit.
7. Fix the protective covers over the laser beam entrance and exit.

   If you cannot find the original protective covers then we recommend Polyamide tape.

NOTICE

Temperatures lower than 0 °C (273 K) can cause frost damage to the cooling loop.

8. Blow-dry the scan head's cooling loop.

9. Clear the scan head of contamination with any dangerous materials prior to further handling.
10. Dispose of the coolant according to its material safety data sheet.

7.2 RETURNING

This section describes how to prepare the scan head if you want to return it.

Target audience and qualification

Laymen, operators, and experts

Requirements

- ☐ The scan head has been decommissioned; see section 7.1 on page 56.
- ☐ The scan head has been cleared of contamination with any dangerous materials prior to return to Novanta.

Have ready

- ☐ Original packaging or an equivalent packaging
- ☐ Parcel tape

Procedure

1. Find the contact information for customer support, see page 2, and contact us.

   You will receive instructions about how to proceed.

IMPORTANT

The scan head contains Beryllium mirrors; consider section 2.3.3 on page 14.

2. If you are instructed to return the scan head, then package it in its original or equivalent packaging to prevent damage during transport.

   As memory aid use the documentation that you may have taken during unpacking.

3. Arrange for return consignment.

7.3 DISPOSAL

This scan head is designed to be integrated into large-scale stationary industrial tools; therefore 2012/19/EU (WEEE) does not apply.

By ensuring the scan head is disposed correctly, you will help prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate waste handling of the scan head. The recycling of materials will help to conserve natural resources.

Target audience and qualification

Laymen, operators, and experts

Requirements

- ☐ The scan head has been decommissioned; see section 7.1 on page 56
- ☐ The scan head has been cleared of contamination with any dangerous materials prior to disposal

Procedure

The scan head contains Beryllium mirrors.

⚠ WARNING

Beryllium is classified as carcinogenic substance of category 1B and hazard class STOT RE1. This applies especially to Beryllium as dust or vapor, i.e., if the Beryllium mirrors are damaged. Beryllium causes eczema, berylliosis and cancer when getting in contact with skin or inhaled.

- DO NOT open the scan head. DO NOT remove the protective windows.

If the Beryllium mirrors are damaged, then immediately follow the response procedure in section 8.2 on page 61.

- Dispose of the scan head as hazardous waste and hand it over to the applicable collection point or to the manufacturer as described in section 7.2 on page 57.

For more detailed information, please contact your local city office, your disposal service, or our customer service; see page 2.

8 APPENDIX

8.1 ADDITIONAL EQUIPMENT

The following table lists additional equipment and replacement parts required for operating the scan head and supporting its installation, maintenance, and integration tasks.

Table 13: Required interfacing equipment

Description	Details
ScanMaster Controller	Primary hardware interface for managing scan head motion and laser timing, ensuring precise and synchronized execution of processing patterns. For part number information, contact your sales representative or our customer service; see page 2.
Cable and Hose Set (PN 419-2003539-00)	Optional set for connecting the scan head to the power supply, ScanMaster controller, and cooling system. • **Communication Cable (PN 419-2003594-00):** Gray command cable, DB25 male connectors on both ends, 5 m length. • **Power Cable (PN 419-2003593-00):** Orange power cable, free cable end on one side, straight M12 socket on the other, 5 m length. • **Cooling Tubes (PN 308-1005888-00):** Flexible transparent polyurethane tubes, 6 × 4 mm diameter, 10 m length.

Protective Window (PN 111-1171203-00)	Replacement protective window for the scan head's output aperture; ZnSe, optimized for low absorption at 10,600 nm, 100 × 64 mm.

8.2 BERYLLIUM RESPONSE PROCEDURE

Vectria 30 (PN 003-1171207-00) contains Beryllium mirrors. Under normal circumstances, i.e., if the housing and protective windows and the Beryllium mirrors are undamaged and if the product is handled and used properly then the Beryllium mirrors present no danger. Danger may only arise if the Beryllium mirrors are damaged as the damage may have produced small quantities of Beryllium dust that may not be visible.

Minimizing staff exposure and limiting the spread of any contamination can be achieved through the following simple containment procedure.

IMPORTANT

- Be prepared for an incident, prepare a response pack, and have it near the product. This enables a smooth response.

Response pack

We suggest a response pack containing the following simple equipment:

- ☐ Wet wipes
- ☐ Disposable coveralls, gloves, and overshoes
- ☐ Dust mask P2 (FFP3-4)
- ☐ Various warning signs
- ☐ Tape
- ☐ Pre-labelled heavy-duty disposal bags

Response procedure

1. Ensure that any nearby electrical supplies are isolated.

2. Locate the response pack, see above, and have it nearby.
3. Take a wet wipe and gently lay it over the damage area without disturbing it.
4. Put on the dust mask, gloves, overshoes, and coverall.
5. Envelop the damaged part into the wet wipe and place it into the disposal bag.
6. Clean the immediate area with clean wet wipes several times, until all contamination is removed. Used wipes go in a second disposal bag.
7. Remove your coverall, overshoes, gloves, and dust mask and place them into the second disposal bag.
8. Seal both disposal bags immediately, but do not squeeze out the air.
9. Label the disposal bags as hazardous waste.
10. Wash your hands.
11. Report the incident to your health and safety officer and to your company management.
12. Arrange for disposal and return consignment.

8.3 ZNSE RESPONSE PROCEDURE

The scan head contains the optical components, like the protective window, consisting of Zinc Selenide. Under normal circumstances, i.e., if the housing, protective windows and the optics are undamaged and if the product is handled and used properly then the Zinc Selenide optics present no danger. However, damage resulting from mechanical impact or thermal decomposition may compromise the material's integrity and potentially release hazardous substances. Appropriate precautions must be taken to avoid such conditions during installation, operation, and maintenance.

Minimizing staff exposure and limiting the spread of any contamination can be achieved through the following simple containment procedure.

IMPORTANT

- Be prepared for an incident, prepare a response pack, and have it near the product. This enables a smooth response.

Response pack

We suggest a response pack containing the following simple equipment:

- ☐ Wet wipes
- ☐ Disposable coveralls, gloves, and overshoes
- ☐ Dust mask P2 (FFP3-4)
- ☐ Various warning signs
- ☐ Tape
- ☐ Pre-labelled heavy-duty disposal bags

Response procedure

1. Ensure that any nearby electrical supplies are isolated.
2. Locate the response pack, see above, and have it nearby.
3. Take a wet wipe and gently lay it over the damage area without disturbing it.
4. Put on the dust mask, gloves, overshoes, and coverall.
5. Envelop the damaged part into the wet wipe and place it into the disposal bag.
6. Clean the immediate area with clean wet wipes several times, until all contamination is removed. Used wipes go in a second disposal bag.
7. Remove your coverall, overshoes, gloves, and dust mask and place them into the second disposal bag.
8. Seal both disposal bags immediately, but do not squeeze out the air.
9. Label the disposal bags as hazardous waste.
10. Wash your hands.

11. Report the incident to your health and safety officer and to your company management.
12. Arrange for disposal and return consignment.

8.4 FURTHER READING

Please refer to the documentation of the installed hardware and software components for additional information. This may include the ScanMaster Controller (SMC), ScanMaster Designer (SMD), or any other scan control system that supports the XY2-100 or NVL-100 protocol.

If you are using the ScanMaster Controller (SMC) and need to calibrate the scan field, consult the *Calibration Wizard User Manual*. The documentation is included with the software and becomes accessible after installation.

If you are using a different controller, refer to the corresponding controller documentation for calibration procedures.

8.5 DECLARATION OF INCORPORATION

-Translation-

Novanta

Declaration of incorporation within the meaning of the Machinery Directive 2006/42/EC Annex II 1B

Product	Vectria 30, 3-axis laser scan head Part number: 003-1171207-00		
Manufacturer	Novanta Europe GmbH Werk 4 92442 Wackersdorf Germany	The person authorized to compile the relevant technical documentation	Martin Hartmann (Director Engineering), manufacturer's address

The manufacturer declares that the above-named product is an incomplete machine within the meaning of the Machinery Directive. The product is exclusively intended to be incorporated into a machine or an incomplete machine and therefore does not comply with all the requirements of the Machinery Directive.

A list of the essential requirements of the Machinery Directive that apply to this product and with which it complies can be found in the Annex to this declaration.

Commissioning of the product is prohibited until it has been established that the machine into which the above-named product is incorporated complies with all essential requirements of the Machinery Directive.

The special technical documentation in accordance with Machinery Directive 2006/42/EG Annex VII Part B has been created. The person authorized to compile the technical documentation undertakes to send the documentation to the national authorities in response to a reasoned request. The documentation is sent by post in paper format or by electronic media.

The above-named product fulfills the requirements of the following EC Directives:

- RoHS Directive 2011/65/EU
- EMC Directive 2014/30/EU

The following harmonized European standards have been applied:

- DIN EN ISO 12100:2010 Safety of machinery – General principles for design – Risk assessment and risk reduction
- DIN EN 60204-1:2018 Safety of machinery – Electrical equipment of machines – Part 1: General requirements

- DIN EN 60825-1:2014 Safety of laser products
- DIN EN IEC 61000-6-4-2020 Electromagnetic compatibility (EMC)
- DIN EN 61000-4-2:2009 Electromagnetic compatibility (EMC)
- DIN EN 61000-4-3:2006 Electromagnetic compatibility (EMC)
- DIN EN 61000-4-4:2012 Electromagnetic compatibility (EMC)
- DIN EN 61000-4-5:2014 Electromagnetic compatibility (EMC)
- DIN EN 61000-4-6:2014 Electromagnetic compatibility (EMC)

Wackersdorf, 2026-05-18

Martin Hartmann (Director Engineering)

Annex to the declaration of incorporation

List of the essential health and safety requirements for the design and construction of machinery that apply to the product specified on page 1 and with which it complies.

Number Annex I	Heading	applicable	complied with	Comment
1	ESSENTIAL HEALTH AND SAFETY REQUIREMENTS	–	–	–
1.1.2	Principles of safety integration	Yes	Yes	
1.1.3	Materials and products	Yes	Yes	The scan head contains beryllium mirrors. DO NOT open the scan head. DO NOT remove the protective windows. For more information, see the manual.
1.1.4	Lighting	No		
1.1.5	Design of machinery to facilitate its handling	Yes	Yes	
1.1.6	Ergonomics	No		
1.1.7	Operating positions	No		
1.1.8	Seating	No		
1.2	CONTROL SYSTEMS	–	–	–
1.2.1	Safety and reliability of control systems	Yes	Yes	
1.2.2	Control devices	No		
1.2.3	Starting	No		
1.2.4	Stopping	–	–	–
1.2.4.1	Normal stop	No		
1.2.4.2	Operational stop	No		
1.2.4.3	Emergency stop	No		
1.2.4.4	Assembly of machinery	No		
1.2.5	Selection of control or operating modes	No		
1.2.6	Failure of the power supply	No		
1.3	PROTECTION AGAINST MECHANICAL HAZARDS	–	–	–
1.3.1	Risk of loss of stability	No		
1.3.2	Risk of break-up during operation	No		
1.3.3	Risks due to falling or ejected objects	No		
1.3.4	Risks due to surfaces, edges, or angles	Yes	Yes	
1.3.5	Risks related to combined machinery	No		
1.3.6	Risks related to variations in operating conditions	Yes	Yes	
1.3.7	Risks related to moving parts	Yes	Yes	
1.3.8	Choice of protection against risks arising from moving parts	–	–	–
1.3.8.1	Moving transmission parts	No		
1.3.8.2	Moving parts involved in the process	No		
1.3.9	Risks of uncontrolled movements	No		
1.4	REQUIRED CHARACTERISTICS OF GUARDS AND PROTECTIVE DEVICES	–	–	–
1.4.1	General requirements	No		
1.4.2	Special requirements for guards	–	–	–
1.4.2.1	Fixed guards	No		

Number Annex I	Heading	applicable	complied with	Comment
1.4.2.2	Interlocking movable guards	No		
1.4.2.3	Adjustable guards restricting access	No		
1.4.3	Special requirements for protective devices	No		
1.5	RISKS DUE TO OTHER HAZARDS	–	–	–
1.5.1	Electricity supply	Yes	Yes	
1.5.2	Static electricity	Yes	Yes	
1.5.3	Energy supply other than electricity	No		
1.5.4	Errors of fitting	Yes	Yes	
1.5.5	Extreme temperatures	Yes	Yes	
1.5.6	Fire	Yes	Yes	
1.5.7	Explosion	No		
1.5.8	Noise	No		
1.5.9	Vibrations	No		
1.5.10	Radiation	No		
1.5.11	External radiation	No		
1.5.12	Laser radiation	No		
1.5.13	Emissions of hazardous materials and substances	Yes	No	The integrator must consider dust, vapor and particle emission during material processing.
1.5.14	Risk of being trapped in a machine	No		
1.5.15	Risk of slipping, tripping, or falling	No		
1.5.16	Lightning	No		
1.6	MAINTENANCE	–	–	–
1.6.1	Machinery maintenance	No		
1.6.2	Access to operating positions and servicing points	No		
1.6.3	Isolation of energy sources	No		
1.6.4	Operator intervention	No		
1.6.5	Cleaning of internal parts	No		
1.7	INFORMATION	–	–	–
1.7.1	Information and warnings on the machinery	Yes	Yes	
1.7.1.1	Information and information devices	Yes	Yes	
1.7.1.2	Warning devices	No		
1.7.2	Warning of residual risks	No		
1.7.3	Marking of machinery	Yes	Yes	
1.7.4	Instructions	Yes	Yes	
1.7.4.1	General principles for the drafting of instructions	Yes	Yes	
1.7.4.2	Contents of the instructions	Yes	Yes	
1.7.4.3	Sales literature	Yes	Yes	
2	SUPPLEMENTARY ESSENTIAL HEALTH AND SAFETY REQUIREMENTS FOR CERTAIN CATEGORIES OF MACHINERY	No	–	Numbers 2 to 6 are collapsed as their sections are not applicable.
3	SUPPLEMENTARY ESSENTIAL HEALTH AND SAFETY REQUIREMENTS TO OFFSET HAZARDS DUE TO THE MOBILITY OF MACHINERY	No	–	
4	SUPPLEMENTARY ESSENTIAL HEALTH AND SAFETY REQUIREMENTS TO OFFSET HAZARDS DUE TO LIFTING OPERATIONS	No	–	

Number Annex I	Heading	applicable	complied with	Comment
5	SUPPLEMENTARY ESSENTIAL HEALTH AND SAFETY REQUIREMENTS FOR MACHINERY INTENDED FOR UNDERGROUND WORK	No	–	
6	SUPPLEMENTARY ESSENTIAL HEALTH AND SAFETY REQUIREMENTS FOR MACHINERY PRESENTING PARTICULAR HAZARDS DUE TO THE LIFTING OF PERSONS	No	–	

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Vectria 30 Scan Head
User Manual
1040–0043 Rev. 01