FIBER TIGER Scan Head

User Manual

Read carefully before using.
Retain for future reference.

Novanta PHOTONICS

Manufacturer

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Customer support

Before contacting us for assistance, please review appropriate sections in this manual that may answer your questions. After consulting the manual, please contact one of our world-wide offices between 9 AM and 5 PM local time.

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Contact: https://www.novantaphotonics.com/support

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1. How to use this document

1.1. Symbols and signal words

This manual uses the following symbols and signal words for information of importance.

⚠ WARNING

… indicates a hazardous situation with *average degree of risk* which *could* result in *death* or *serious injury*, if not avoided.

⚠ CAUTION

… indicates a hazardous situation with *low degree of risk* which *could* result in *minor or moderate injury*, if not avoided.

⚠ NOTICE

… indicates a hazardous situation which is not related to personal injury and which *could* result in *material damage*, if not followed.

IMPORTANT

… indicates information considered important but not directly hazard related.

TIP

… indicates a practice which facilitates work.

Procedure
... indicates a call to action. One or more steps to be executed are following this signal word. An exception has been made for warning notices, where this signal word has been omitted.

1.2. Notation conventions

This manual uses the following notation conventions that are given in the following table.

Notation conventions

Notation	Meaning
Underlined	click-able cross reference or hyper link (only visible on-screen)
[⟨Number⟩]	cross reference to a list of further reading on page 50
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 or file name or path

1.3. Storage and replacement

- **Keep this manual with the product to access it at any time during the product's lifetime.**
- **You can request replacement for this manual at the manufacturer. You can request the manual as PDF-file and as print.**
- **This manual is part of the product. If the product ownership changes then this manual must accompany the product.**

1.4. Specifics and structure

We reserve the right to update this manual at any time without prior notification.

This manual is limited to installation and commissioning instructions, troubleshooting and maintenance.

- **For the sake of the environment print this PDF file only if necessary.**

  This PDF file forces duplex printing, if your printer can do that.

1.5. Target audience and qualification

IMPORTANT

Only the target audience, who is listed in the beginning of each instructing section in the following chapters, may perform the activities described there.

The persons, who are performing these activities, need to be of age.

The qualification of the target audience is defined below.

Laymen without special qualification, who e. g. transport and store the boxed scan head

Operators, who are trained by the company that is operating the laser unit, where the scan head is incorporated, in the use of that laser unit and who have 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 scan head is incorporated, in the use of that laser unit, and must confirm the training by signature

2. General safety instructions

2.1. Normal use

- **The scan head is delivered as an OEM component for integration into a laser unit that is used in a dry and clean indoor environment without electrically conductive contamination.**
- **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. Since Novanta has no influence over the employed laser device or the overall laser unit, the customer is solely responsible for the laser safety of the entire laser unit. 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.**
- **Before installing and operating the scan head, carefully read this manual for your protection.**
- **Retain this manual for future reference.**

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. Duty of care by the customer

IMPORTANT

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.

2.4. Hazards

2.4.1. 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 on the skin, and may pose a fire risk.

- 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.

2.4.2. Laser generated air contaminants

During laser material processing matter is being evaporated. Laser generated air contaminants can compose of multitude hazardous products, such as nickel, chrome, alumina, zinc, butanol, toluol, xylene, and formaldehyde. The concentration, size, and the quantity of these aerosols and particles are variable in a wide range.

⚠ 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.**

2.4.3. 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.**

2.4.4. Coolant and coolant additives

Some controllers have a cooling loop and use perhaps a special coolant or coolant additives, like calcination inhibitors, algae inhibitors, anti-corrosion, and anti-freeze agents.

⚠ CAUTION

Coolant or coolant additives
may 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.**

2.4.5. Electrostatic discharge

The controller contains parts that are sensitive to electrostatic discharge.

⚠ NOTICE

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

- **Transport equipment only in anti-static packaging and a packaging equivalent to that received with the shipment.**
- **Keep the controller sealed until you are at a proper static control station.**

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**

2.5. Modifications and spare parts

You are not allowed to modify the scan head.

You are not allowed to use spare parts other than specified by Novanta.

2.6. Fire extinguishing media

- **Use carbon dioxide (CO_2) as the fire extinguishing media for the scan head.**
- **The scan head uses internally a direct-current voltage of 48 V. Pay attention to the minimum distance between the fire extinguishing media aperture and live parts.**
- **Harmonize the fire extinguishing media of scan head and laser unit.**
- **Prior to installing the scan head, provide fire extinguishing equipment and observe its instructions for use and its hazard notes.**

3. Overview

A scan head is a device for laser beam shaping and laser beam guidance.

The FIBER TIGER Scan Head is an extremely compact and robust scan head for robot-assisted laser processing and other "on-the-fly" type applications in the mid to high kW range.

The scan head can be operated with all commercially available single- or multi-mode fiber lasers. It is driven by an ARGES system controller and the InScript software or rather by your own software and the *ControllerLib* application programming interface.

The scan head features a highly dynamical Z-axis for ultrafast and precise 3D laser material processing. It has been designed especially for precise welding and cutting applications and can be employed in a wide range of industrial sectors, for example automotive, aerospace and machine construction. The FIBER TIGER Scan Head is suitable for industrial-scale processing of all commonly used materials, such as metals, plastics and ceramics.

3.1. Labels

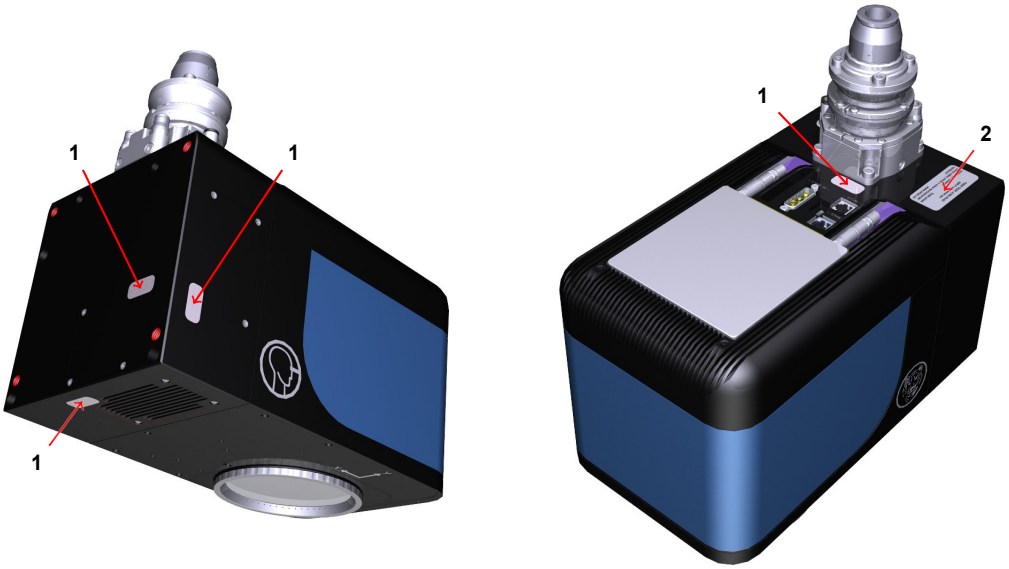


Figure 3.1.: Position of labels

Legend to figure 3.1

No.	Label	Description
1	WARRANTY VOID IF SEAL IS BROKEN	Warranty seal
2	FIBER TIGER SCAN HEAD INPUT ####-#### nm SERIAL NO. ####### YEAR #### ARGES GMBH, WERK 4, 92442 WACKERSDORF GERMANY WWW.ARGES.DE	Type plate; in particular designates the laser wave-length that the scan head is build for, the serial number, the year of manufacture and the manufacturer's address

TIP

Later on, during installation, you will affix some warning labels; see section 4.3.2 on page 18.

3.2. Interfaces

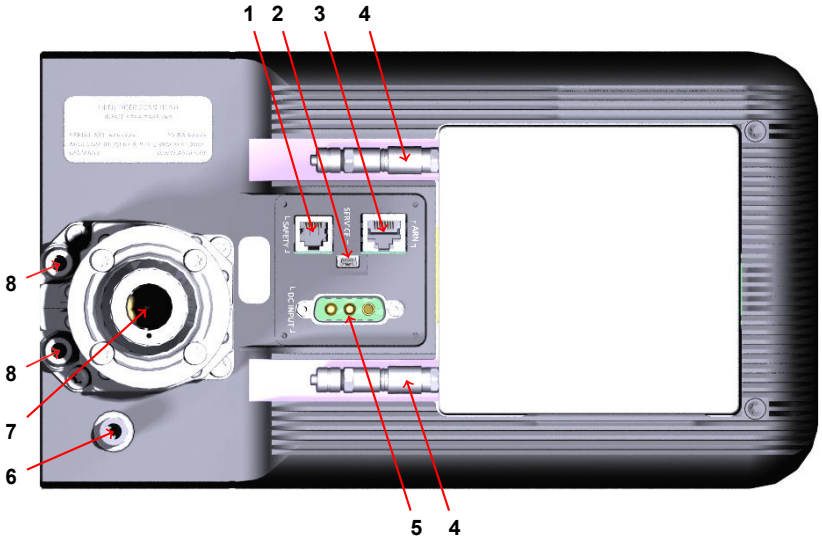


Figure 3.2.: Position of interfaces at the top

Legend to figure 3.2

No.	Marking / function	See section	On page
1	SAFETY	4.3.8	29
2	SERVICE	4.3.9	29
3	ARN	4.3.5	25
4	Scan head cooling water supply / return	4.3.3	19
5	DC INPUT	4.3.6	26
6	Purge gas inlet	4.3.4	23
7	Fiber coupling	4.3.7	27
8	Fiber coupling cooling water supply / return	4.3.3	19

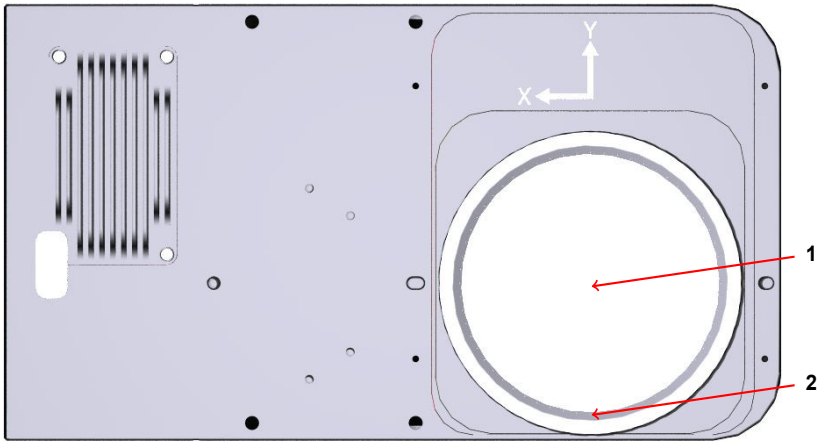


Figure 3.3.: Position of interfaces at the bottom

Legend to figure 3.3

No.	Marking / function	See section	On page
1	Protective window andlaser aperture	6.2	37
2	Purge gas outlet	4.3.4	23

3.3. Controls and indicators

The scan head has no physical controls. Operate the scan head as described in chapter 5 on page 34.

The LEDs at the ARN interface are the only direct indicators. They show rudimentary information about the data link between the product and the ARGES system controller; see figure 3.4 on page 12.

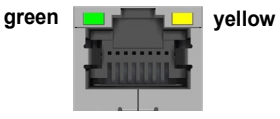


Figure 3.4.: LEDs at the ARN interface and their meaning:
green = link, yellow = active

4. Preparing for use

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

4.1. Transporting and storing

Target audience and qualification
Laymen, operators, and experts

Requirements

Table 4.1.: Environmental conditions for transporting and storing in the original packaging

Characteristic	Specification
Packaging dimensions	640 mm × 560 mm × 310 mm
Packaging volume	0.12 m^3
Mass (incl. scan head)	approx. 16 kg
Temperature	0 to 50 °C (273 to 323 K)
Humidity	max. 85 %; non-condensing
Atmospheric pressure	min. 0.65 bar (65 kPa); This corresponds to a height of approximately 3,500 m. In general the atmospheric pressure does not fall below this value for air freight.
Vibration and shock	[to be defined]

Procedure

- Transport and store the scan head in its sealed original packaging with the environ-

mental conditions that are given in table 4.1 on page 13.

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 for some reason later, we recommend documenting the unpacking e.g. by taking photographs.

   ⚠ NOTICE

   Contamination
   can damage optics and the laser.

   - Leave the protective covers in place as long as possible to keep the optics clean.

3. Check by the delivery note, whether all parts are present, in an evidently immaculate mechanical state and whether the serial numbers correspond. If one of these is untrue, then block the delivery and inform the sender.
4. Retain the original packaging for future use.

4.3. Installing

This section summarizes procedures necessary to mount the scan head in the laser unit and to connect all supply lines.

4.3.1. Incorporating the scan head into a superordinate machine

Target audience and qualification
Experts

Have ready

- ☐ **Choose which mounting threads you want to use either at the front (4× M8) or bottom (4× M5) side and then the respective screws; see figure 4.1 on page 16. Head shape and length are depending on the design of your counterpart**
- ☐ **Suitable screwdriver**

Requirements

Table 4.2.: Environmental conditions for installation and operation

Characteristic	Specification
Environment	Operate the scan head only indoors in a dry and clean environment without conductive contamination.
Degree of protection by enclosure	IP54; when using purge gas
Temperature	10 to 40 °C (283 to 313 K)
Humidity	max. 80 %; non-condensing
Altitude	max. 2,000 m
Acceleration	max. 2.5 g

Procedure

1. Find the dimensions for mounting the scan head in the superordinate machine in table 4.3 on page 16 and figure 4.1 on page 16.

   Choose which mounting threads you want to use either at the front (4× M8) or bottom (4× M5) side.

Table 4.3.: Mechanical data

Characteristic	Specification
Length × width × height	285 × 160 × 270.3 mm^3
Mass	approx. 13 kg

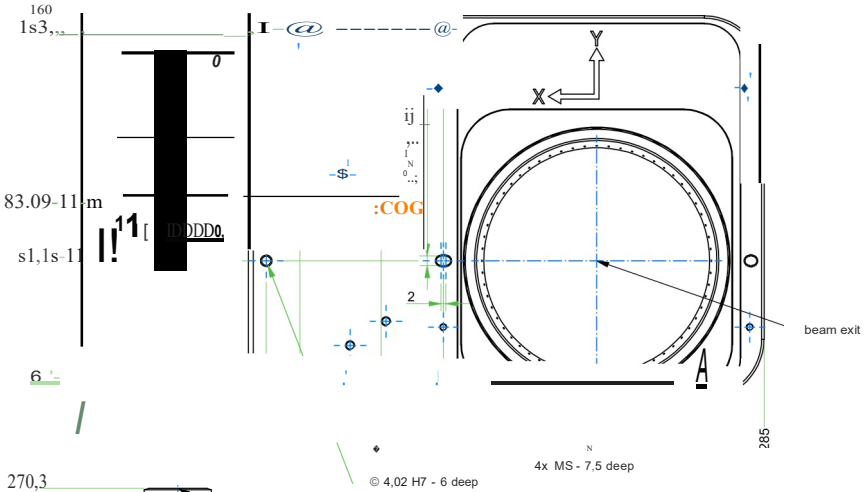
Figure on next page

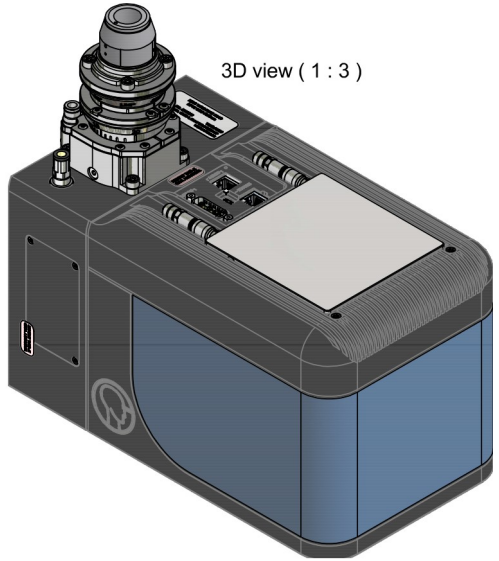
Figure 4.1.: Dimensions and mounting

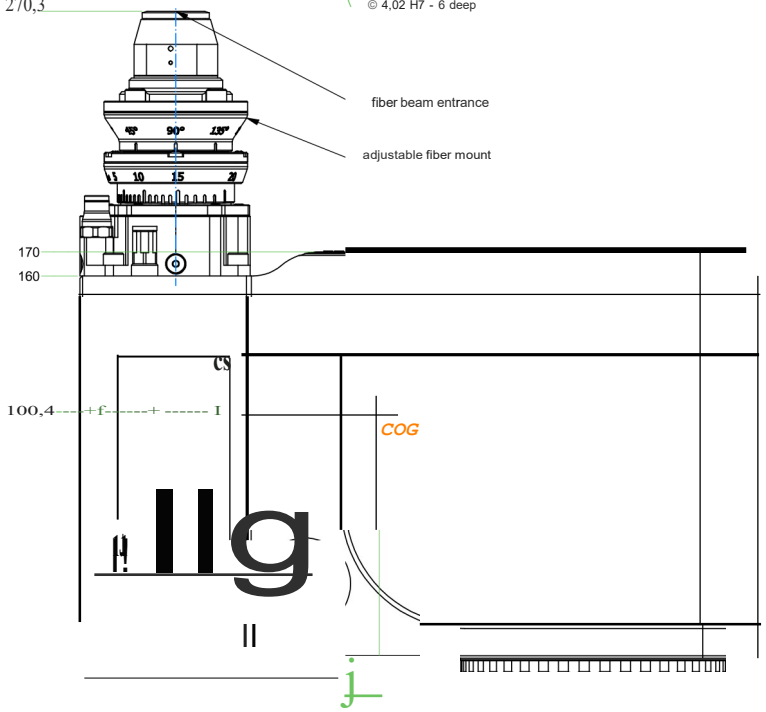
⚠ CAUTION

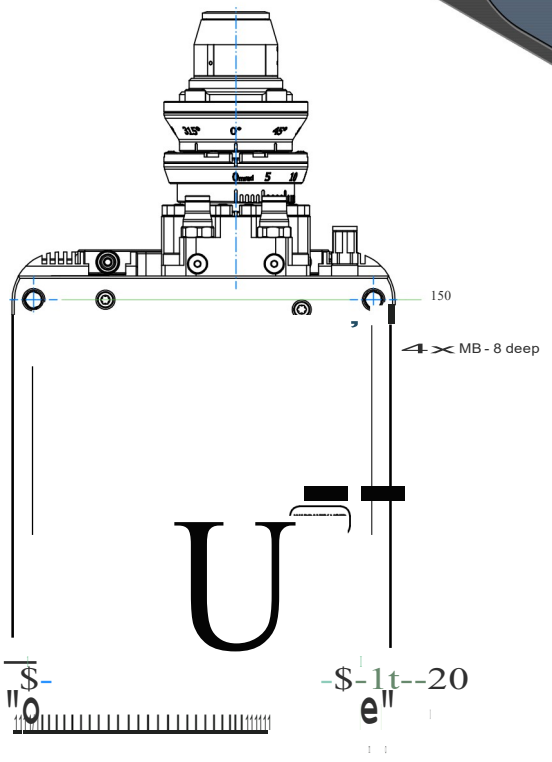
Heavy weight
Risk of injury
- Work together with a second person.

2. Place the scan head into the superordinate machine.
3. Fasten the 4 mounting screws.









TITLE:

FIBER TIGER 36 - 1080 nm -WD 600 - 1kW -adjustable FM -watercooled

003 -1133220 • 00

@ARGES

CAD-File:1133220.dwg

4.3.2. Affixing warning labels

The scan head itself is not a laser device but it is used together with a class 4 laser. Therefore you have to affix warning labels clearly visible to the laser device where the scan head will be incorporated. As we cannot know the installation situation you have to determine by yourself where to place the warning labels on the laser device.

Note that the menitioned warning labels are not included in delivery.

Procedure

1. Affix the label from figure 4.2 on page 18 clearly visible near the laser aperture of the scan head.

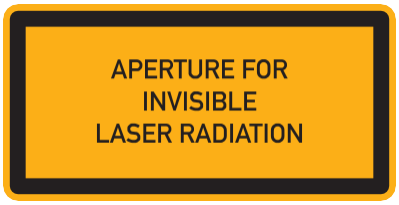


Figure 4.2.: APERTURE label

We suggest one of the following 3 locations; marked in red in figure 4.3 on page 18.

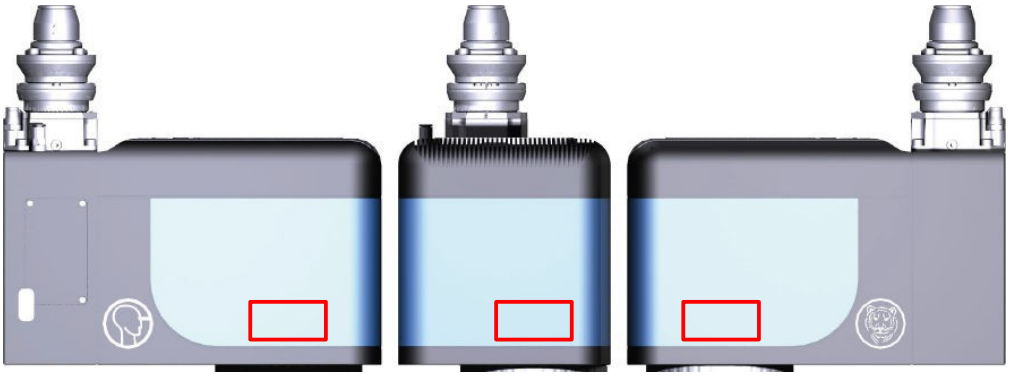


Figure 4.3.: Suggested locations for the APERTURE label

2. Inscribe the laser parameters into one of the labels in figure 4.4 on page 19.

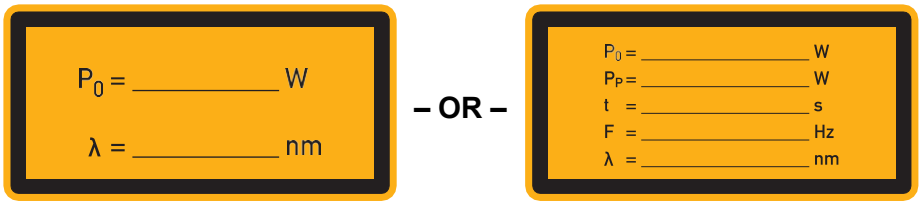


Figure 4.4.: Laser parameter label; left for continuous wave lasers or right for pulsed lasers

3. **Affix the labels from figures 4.4 on page 19 and 4.5 on page 19 clearly visible to the laser device.**

Figure 4.5.: Warning labels for laser radiation and laser class

4.3.3. Connecting the cooling

Cool the fiber coupling and the scan head with water.

Target audience and qualification
Experts

Requirements

Table 4.4.: Cooling water

Characteristic	Specification
Quality	DI-water, filtered, particle size <100 µm
Pressure drop	3 to 4 bar (300 to 400 kPa)
Volume flow	1.2 to 2.2 l/min
Inlet temperature	max. 30 °C (303 K)
Recommended hose material	Polyetherurethane; ¢o 6 mm; ¢i 4 mm

Characteristic	Specification
Specifics	The cooling unit is DI-water-proofed with corrosion-resistant types of steel.

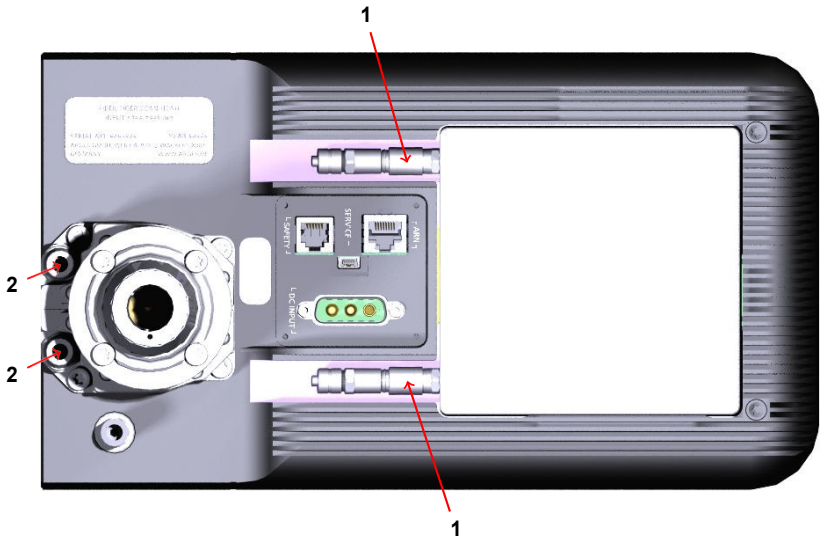


Figure 4.6.: Positioning of cooling water supply and return lines of scan head (1) and fiber coupling (2) at the top

Procedure

TIP

We recommend to connect the cooling line for the fiber coupling in series with the cooling line for the scan head.

The direction of flow does not matter neither at the fiber coupling nor at the scan head.

1. Connect the lines:

   How to connect the self-sealing quick connectors at the scan head (1)

a) Unscrew the cap nut A from the coupling plug B; see figure 4.7 on page 21. Push the cap nut on the hose. Push the hose tip on the coupling plug and screw the cap nut to the coupling plug again. Proceed the same way with the second hose.

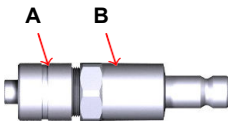


Figure 4.7.: Self-sealing coupling plug to be connected to cooling water hose (cap nut A and coupling plug B)

b) Press the coupling plugs beyond the resistance into the self-sealing quick connectors.

How to connect the quick connectors at the fiber coupling (2)

- Press the hose tip beyond the resistance into the quick connector.

NOTICE

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

a) **Check if the connections are fixed by trying to pull the hoses from the quick connectors.**

b) **Check for leakage by opening the return line first and then carefully turning on the cooling water supply line and watching the connections.**

If cooling water is leaking then immediately stop the procedure, disconnect the respective connection, see the procedure further below, and redo the connection.

2. **Turn off the cooling water supply line first and then the return line, until the superordinate machine is switched on.**

How to disconnect the cooling water

1. **Turn off the cooling water supply line first and then the return line.**
2. **Relieve the pressure from the hoses.**

NOTICE

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

a) **Get some tissues or similar ready in order to absorb leaking cooling water immediately.**

b) **Deposit the open hose tips in a way that cooling water cannot leak or contain the cooling water in a tank.**

3. **Disconnect the lines as follows:**

How to disconnect the self-sealing quick connectors at the scan head (1)

- **Push the end piece (marked red in figure 4.8 on page 23) of the self-sealing quick connector in direction A, pull the coupling plug out B and immediately release the end piece again.**

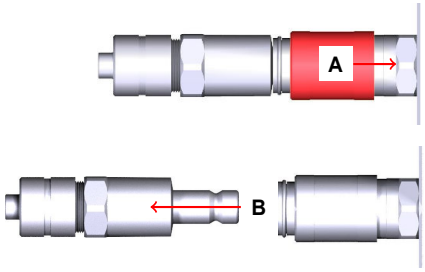


Figure 4.8.: Unplugging the self-sealing coupling

How to disconnect the quick connectors at the fiber coupling (2)

- **Press the end piece (marked red in figure 4.9 on page 23) into the quick connector, hold it pressed down and pull out the hose.**

Figure 4.9.: End piece of the cooling water quick connector (marked red)

4.3.4. Connecting the purge gas

Keep the scan head under low overpressure. Firstly less dust can enter the scan head that way. Secondly the purge gas outlet generates a flow away from the protective window and reduces that way its contamination.

Target audience and qualification
Experts

Requirements

Table 4.5.: Purge gas

Characteristic	Specification
Quality	Pressurized air (2:4:0 according to ISO 8573-1:2010) or nitrogen gas (N_2 4.0, oil- and particle-free)
Inlet pressure	max. 50 mbar (5 kPa)
Volume flow	typ. 2 l/min
Recommended hose material	Polyetherurethane; ¢o 4 mm; ¢i 2.5 mm (or ¢o 4 mm; i 2 mm)
Specifics	An internal restrictor limits the pressure to 1 bar (100 kPa). Small purge gas nozzles at the protective window serve as purge gas outlet.

Procedure

1. Press the hose tip of the purge gas supply line beyond the resistance into the quick connector 1; see figure 4.10 on page 24.

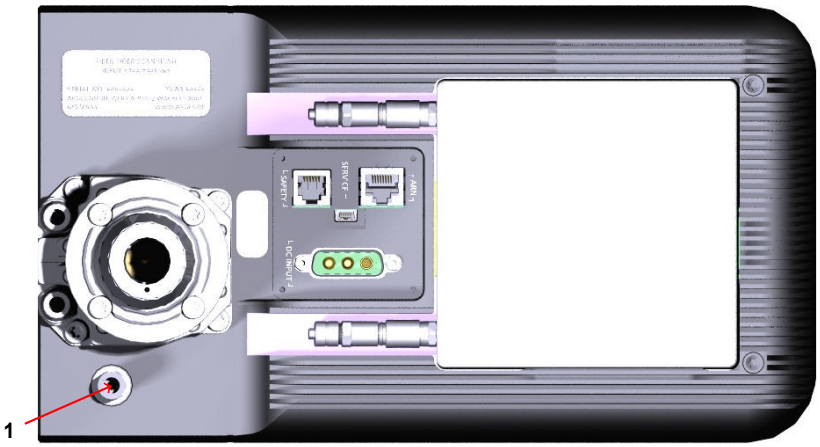


Figure 4.10.: Positioning of purge gas inlet (1) at the top

2. Check if the connection is fixed by trying to pull the hose from the quick connector.

3. Check for leakage by carefully turning on the purge gas and watching the connection.

   If purge gas is leaking then immediately stop the procedure, disconnect the purge gas, see the procedure further below, and redo the connection.

   Remark: The purge gas outlet is around the protective window of the laser aperture.

4. Turn off the purge gas until the superordinate machine is switched on.

How to disconnect the purge gas

1. Turn off the purge gas supply line.
2. Relieve the pressure from the hose.
3. Press the end piece (marked red in figure 4.11 on page 25) into the quick connector, hold it pressed down and pull out the hose.

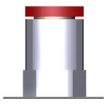


Figure 4.11.: End piece of the purge gas quick connector (marked red)

4.3.5. Connecting the ARGES system controller

Control the scan head via an ARGES system controller.

Target audience and qualification
Experts

Procedure

TIP

The ARGES system controller has several interfaces of connector type RJ45. When connecting the cables pay attention to the labeling on the housing.

- **Connect the ARN interface to the ARGES system controller's ↻0 interface (ARGnet 0). Use the delivered Cat 5e patch cable to do so.**

  Alternatively you may use an equivalent patch cable with a max. length of 100 m.

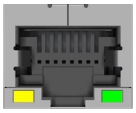


Figure 4.12.: Connector type of the ARN interface: RJ45 socket

4.3.6. Connecting the electric power supply

Supply the scan head with electrical power.

Target audience and qualification
Experts

Procedure

NOTICE

Voltage peaks and leakage currents, when hot plugging the power supply, destroy the scan head electronics.

- Before connecting the power supply to the scan head or disconnecting it from the scan head, ensure that no voltage is being applied to the connecting cable.

- Connect the DC INPUT 48 V interface to the ARGES system controller's POWER A interface. Use the delivered cable to do so.

  Alternatively you may connect this interface according to the specification to your own power supply.

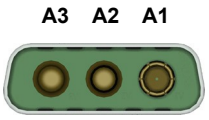


Figure 4.13.: Connector type of the DC INPUT 48 V interface: (D-Sub) DA-3W3S

Table 4.6.: Pin assignment of the DC INPUT 48 V interface

Pin	Name	Description
A1	PWR	+48 V DC, 10 A
A2	n. c.	Do not connect
A3	GND	Ground
S	GGND	Frame ground

4.3.7. Connecting the laser fiber

Connect the laser fiber.

Target audience and qualification
Experts

Requirements

Table 4.7.: Laser beam supply

Characteristic	Specification
Laser	standard industrial fiber laser in single- or multi-mode
Wavelength	1030 to 1080 nm
max. power	3 kW at 100 % duty cycle with single-mode fiber
	8 kW at 50 % duty cycle with multi-mode fiber
Fiber type	Single- or multi-mode fiber with standard industrial connector system

Procedure

1. Remove the protective cover from the laser beam exit of the scan head.
2. Keep the protective cover and the screws for future use.
3. Remove the protective caps from fiber coupling at the scan head and from the fiber tip of the laser fiber.
4. Keep the protective caps for future use.

⚠ NOTICE

Contaminated or damaged fiber tip
damages the fiber and/or the laser.

a) Ensure that fiber coupling and fiber tip are clean. If necessary clean the fiber coupling and the fiber tip.

b) Ensure the fiber tip is undamaged. If necessary replace the fiber.

c) Pay attention to the fiber's minimal bending radius.

5. Align the fiber tip with help of the red dots to the fiber coupling.
6. Insert the fiber tip as far as it will go into the fiber coupling.
7. Turn the bayonet ring in direction 1; see figure 4.14 on page 29.

8. Pull and turn the bayonet ring in direction 2; see figure 4.14 on page 29.
9. Attach the fiber to the fiber stress relief.

Figure 4.14.: Connector type of the fiber coupling: Optoskand QBH (here shown with plugged in fiber)

4.3.8. Do not connect the SAFETY interface

The SAFETY interface is inoperable.

Target audience and qualification
Novanta service personnel

Procedure

- Do not connect anything to the SAFETY interface.

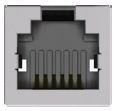


Figure 4.15.: Connector type of the SAFETY interface: RJ12 socket

4.3.9. Do not connect the SERVICE interface

The SERVICE interface is reserved for service purposes only.

Target audience and qualification
Novanta service personnel

Procedure

- **Do not connect anything to the SERVICE interface.**

Figure 4.16.: Connector type of the SERVICE interface: USB Mini-B socket

4.4. Commissioning

4.4.1. Adjusting the fiber coupling

TIP

Proceed with this procedure only if your scan head has a fiber coupling that is capable to compensate for the laser fiber's angular error; cf. the following figures. Skip this procedure otherwise.

To attain the goal you can tilt and rotate the fiber respective to optical axis. This is an iterative procedure that gradually approaches the best possible result.

Target audience and qualification
Experts

Requirements

- ☐ **The laser, the ARGES system controller and the scan head are incorporated in the superordinate machine and correctly connected.**
- ☐ **The superordinate machine complies with the standards that are required by the declaration of incorporation at the end of this document.**
- ☐ **The InScript software is installed and commissioned. The latter includes commissioning the ARGES system controller and the laser.**

Procedure

⚠ CAUTION

Visible and/or invisible laser radiation causes damage to eye or skin.

- **Wear suitable protective glasses.**
- **Do not expose eyes and skin to direct, reflected or scattered laser radiation.**
- **Set the laser power to the necessary minimum for adjustment.**

1. **Untighten the 8 screws (Torx, size 10), that are marked red in figure 4.17 on page 31, in a way that the adjusting ring from figure 4.18 on page 31 can be rotated.**
2. **Rotate the adjusting ring to set an angle that usually can be found on the fiber manufacturer's test report and check the result.**

   The graduation of the scale equals 1 mrad. The graduation is not equidistant.

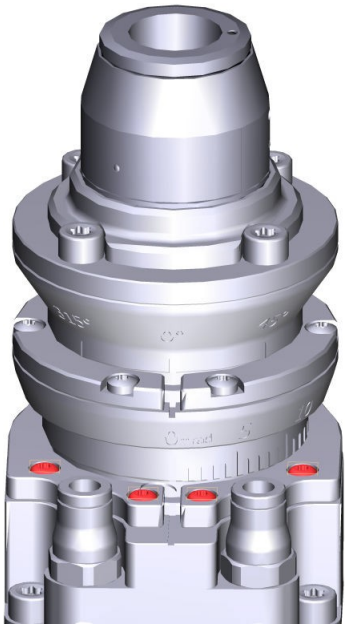


Figure 4.17.: Eight fixing screws for tilting

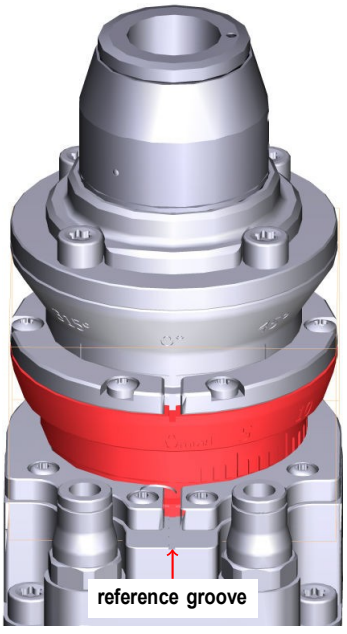


Figure 4.18.: Adjusting ring for tilting

3. **Preliminary tighten some of the screws so that the adjusting ring cannot be accidentally rotated.**
4. **Untighten the 6 screws (Torx, size 10) that are marked red in figure 4.19 on page 32 in a way that the adjusting ring from figure 4.20 on page 32 can be rotated.**
5. **Rotate the adjusting ring to the wanted position and check the result.**

   The graduation of the scale equals 45°.

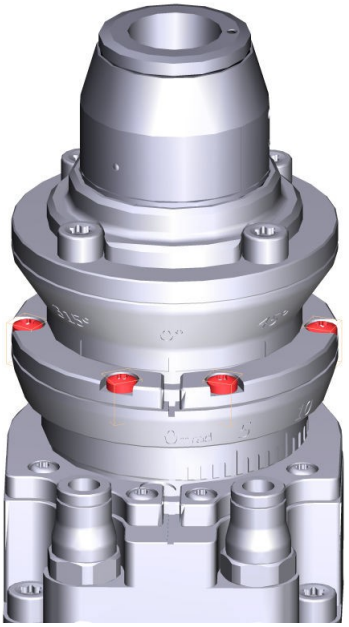


Figure 4.19.: Six fixing screws for rotation

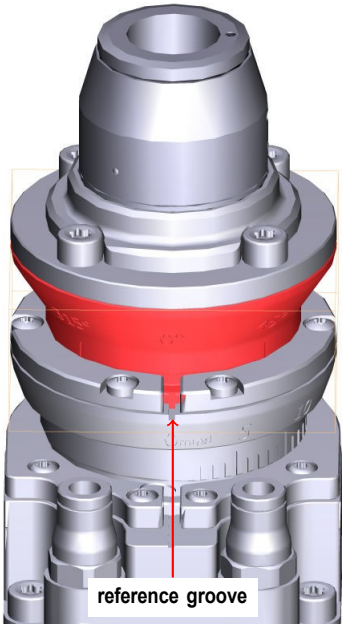


Figure 4.20.: Adjusting ring for rotation

6. **Preliminary tighten some of the screws so that the adjusting ring cannot be accidentally rotated.**
7. **If the result is not the best possible yet then repeat this procedure.**

   – OR –

   If you attained the best possible result then tighten all loose screws.

4.4.2. Correcting the scan field

In the InScript software, configure the scan head by the *head* device and correct the scan field then.

Target audience and qualification
Experts

Requirements

- ☐ **The laser, the ARGES system controller and the scan head are incorporated in the superordinate machine and correctly connected.**
- ☐ **The superordinate machine complies with the standards that are required by the declaration of incorporation at the end of this document.**
- ☐ **The InScript software is installed and commissioned. The latter includes commissioning the ARGES system controller and the laser.**

Procedure

> **TIP**
>
> **If you do not use the InScript 3 software yet, but still use the InScript 2 software, then consult the scan head manual [4], section *Commissioning*, instead of the following procedure.**

1. **In the InScript software in the *Navigator* view, open the context menu of the scan head's superordinate controller and click Manage scan field correction.**
2. **Follow the wizard's on-screen instructions.**

   If you need a more detailed description or instructions then click Info in the wizard's window.

5. Operating

5.1. Protection of persons and emergency measures are subject of the superordinate machine

The scan head is incorporated in a superordinate machine and integrated into its safety concept. The protection of persons and emergency measures are based on this superordinate machine.

5.2. Safe operation, safe functions and operational procedures

The scan head cannot be directly controlled.

Target audience and qualification
Operators and experts

Requirements

- ☐ **Operate the scan head only if it is incorporated into a superordinate machine. The superordinate machine has to comply with the standards that are required by the declaration of incorporation at the end of this document.**

Procedure

- **Control the scan head either**

  by *jobs* in the InScript software; see *InScript 3 Software – User Manual* [3] and *Firmware 3 – User Manual* [2]

  – OR –

  by the *ControllerLib* application programming interface;
  see *ARGES ControllerLib – User Manual* [1]

5.3. Observable signals

The scan head does not supply any direct acoustical or optical signals that are relevant in service. The LEDs at the ARN interface, see section 3.3 on page 12, are for troubleshooting, see section 5.4 on page 35.

Target audience and qualification
Operators and experts

Procedure

- **Observe the scan head's signals either**

  by the InScript software in its *head* device; see *InScript 3 Software – User Manual* [3] and *Firmware 3 – User Manual* [2]

  – OR –

  by the *ControllerLib* application programming interface;
  see *ARGES ControllerLib – User Manual* [1]

5.4. Troubleshooting

Target audience and qualification
Operators and experts

Procedure

1. Determine how an failure manifests (symptom).
2. In table 5.1 on page 36 find a matching measure and implement it then.
3. If troubleshooting is not possible or if you are not entitled to do so then refer to an expert first and then to the support.

Table 5.1.: Troubleshooting

Symptom	Potential root cause	Measure
[to be defined]	[to be defined]	Clean protective window; see sections 6.2 on page 37 and 6.3 on page 39
[to be defined]	[to be defined]	Replace protective window; see section 6.2 on page 37
[to be defined]	[to be defined]	Clean fiber tips; see section 6.4 on page 42
[to be defined]	[to be defined]	Replace fiber; see chapters 7 on page 43 and 4 on page 13
[to be defined]	[to be defined]	Replace scan head; see see chapters 7 on page 43 and 4 on page 13
[to be defined]	[to be defined]	Contact customer support; see page ii

6. Cleaning, maintaining and repairing

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

6.1. Maintenance plan

Novanta recommends to create a maintenance plan. The maintenance intervals depend on the work environment's degree of pollution.

Target audience and qualification
Operators and experts

Safety precautions

- **Switch off the superordinate machine (power supply, purge gas and cooling water), in particular the laser and moving parts.**

Procedure

- **Regularly check if the protective window at the laser aperture is contaminated and clean or replace it as the case may be; see section 6.2 on page 37.**

6.2. Removing and assembling the protective window

Remove the protective window only if it needs cleaning or if it is has to be replaced.

Target audience and qualification
Operators and experts

Have ready

- ☐ **Cotton gloves**

Safety precautions

- **Switch off the superordinate machine (power supply), in particular the laser and moving parts.**
- **Leave the purge gas on in order to protect the inner protective window.**

Procedure

1. **Provide a place where the protective window can be deposited without getting damaged.**
2. **Wear cotton gloves in order to prevent contamination of optics.**
3. **Turn the protective window bayonet socket counterclockwise.**
4. **Pull the socket from the scan head.**

   An O-ring holds the protective window alongside its circumference in the socket.
5. **Carefully press the protective window out of the socket.**
6. **If necessary replace the 2 O-rings in the socket.**
7. **Clean the protective window, see section 6.3 on page 39, or replace it.**
8. **Carefully press the protective window back into the socket.**
9. **Attach the protective window bayonet socket to the scan head and turn it clockwise until it locks.**

6.3. Cleaning the protective window

Clean the protective window only if it is really necessary. Keep in mind that cleaning also degrades the quality of the optical surface.

Target audience and qualification
Operators and experts

Have ready

- ☐ **Cotton gloves**
- ☐ **Dust-off aerosol can**
- ☐ **Cotton swabs with wooden stick**
- ☐ **Lens cleaning paper in the size of approximately 100×150 mm²**
- ☐ **Isopropanol with a purity grade of at least 99.8 % in a small dropper bottle**
- ☐ **Acetone with a purity grade of at least 99.9 % and a percentage of nonvolatile compounds of less than 0.0002 % in a small dropper bottle**
- ☐ **Bright light source**
- ☐ **Dark background**

Requirements

- ☐ **The protective window is removed from the scan head; see section 6.2 on page 37.**

Safety precautions

⚠ CAUTION

Isopropanol and Acetone are highly flammable
Risk of burns

- **Keep the liquids and their vapors away from ignition sources, e. g. electrostatic discharges.**

⚠ CAUTION

Isopropanol and Acetone are irritant to skin, eyes and the respiratory system
Risk of inflammation

- **Wear protective glasses.**
- **Do not breath in the vapors and provide adequate ventilation.**
- **Do not touch the liquids.**

Procedure

1. **Provide a place where the protective window can be deposited without getting damaged.**
2. **Wear cotton gloves in order to prevent contamination of optics.**
3. **Dust the protective window clear off with clean pressurized air from an aerosol can. Hold the aerosol can upright by doing so in order to prevent spraying liquid propellant on the surface.**
4. **If larger dust particles are present then remove them with a cotton swab that is soaked with Isopropanol.**

TIP

Use each cotton swab only once.

5. **If the protective window is heavily contaminated then wipe the surface of under very light pressure with lens cleaning paper that is soaked with Isopropanol.**
6. **Cover the surface, that is to be cleaned, with 1 layer of lens cleaning paper. Do not fold the paper.**
7. **Sparingly drop Isopropanol on the whole surface until it is covered just right. The lens cleaning paper may not float on the Isopropanol on no account.**
8. **Pull the lens cleaning paper slowly and with constant velocity to the side in a way that no liquid remains at the tear-off edge.**

   TIP

   Use each lens cleaning paper only once.

9. **Check if the protective window is clean. To do so illuminate it with a bright light source and examine it in front of a dark background.**

   The surface has to be undamaged, clean and free of streaks.
10. **If the surface is damaged then replace the protective window.**
11. **If the surface is still contaminated then clean the protective window with an new lens cleaning paper and Isopropanol as described above (put on lens cleaning paper, wet the surface and pull the lens cleaning paper to the side). If necessary repeat this step once.**
12. **If the surface is still contaminated then clean the protective window with a new lens cleaning paper and Acetone as described above (put on lens cleaning paper, wet the surface and pull the lens cleaning paper to the side).**
13. **If the surface is still contaminated then replace the protective window.**
14. **Carefully press the clean protective window back into the socket.**
15. **Attach the protective window bayonet socket to the scan head and turn it clockwise until it locks.**

6.4. Cleaning the fiber tips

Clean the fiber tips only if it is really necessary. Keep in mind that cleaning also degrades the quality of the optical surface.

Target audience and qualification
Experts

Safety precautions

- **Switch off the superordinate machine (power supply), in particular the laser and moving parts.**

Procedure

- **Please consult the fiber manufacturer's and respectively laser manufacturer's documentation.**

6.5. Replacing the fiber or scan head

When it becomes necessary to replace the fiber or the scan head then consult section 7.1 Decommissioning on page 43 and 4 Preparing for use on page 13 for the procedures that are necessary to do so.

7. Decommissioning, returning and disposal

7.1. Decommissioning

Decommission the scan head only if you want to return it to Novanta or if you want to dispose of it.

Target audience and qualification
Experts

Have ready

- ☐ **Protective caps for fiber tip and fiber coupling**
- ☐ **Protective cover for the laser beam exit (incl. screws)**
- ☐ **Tissues or similar, in order to absorb leaking cooling water immediately**
- ☐ **Suitable screwdriver for the 4 M8 mounting screws of the scan head**

Safety precautions

- **Switch off the superordinate machine (power supply, purge gas and cooling water), in particular the laser and moving parts.**

Procedure

1. Disconnecting the fiber:

   a) Unfasten the fiber from the fiber stress relief.

   b) Pull and turn the bayonet ring against direction 2; see figure 7.1 on page 44, and push it.

Figure 7.1.: QBH fiber coupling with plugged in fiber

   c) Turn the bayonet ring against direction 1; see figure 7.1 on page 44.

   d) Pull the fiber from the fiber coupling.

   e) Immediately and carefully plug the protective caps on fiber tip and fiber coupling in order to prevent contamination.

   f) Fix the protective cover to the laser beam exit.

⚠ NOTICE

Voltage peaks and leakage currents, when hot plugging the power supply, destroy the scan head electronics.

- Before connecting the power supply to the scan head or disconnecting it from the scan head, ensure that no voltage is being applied to the connecting cable.

2. Disconnect the electrical lines at the scan head at the interfaces DC INPUT 48 V, ARN and SAFETY where applicable.
3. Disconnecting the purge gas:
   a) Relieve the pressure from the hose.
   b) Press the end piece of the quick connector down and pull the tube out.
4. Disconnecting the cooling water:

⚠ NOTICE

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

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

   a) Relieve the pressure from the hoses.
   b) At both cooling water quick connectors press the end piece of the quick connector down and pull the tube out.
   c) Take care of the now open cooling water lines to prevent cooling water from leaking.
5. Dismount scan head:

⚠ CAUTION

Heavy weight
Risk of injury

- Work together with a second person.

   a) Unfasten the 4 mounting screws.
   b) Remove the scan head from the superordinate machine.

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 43.**

Have ready

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

Procedure

1. **Find the contact information for customer support on page ii, and contact us.**

   You will receive instructions about how to proceed.

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

By ensuring the scan head is disposed correctly, you will help prevent potential negative consequences for 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 43.**

Procedure

- **Do not treat the scan head as household waste. Instead hand it over to the applicable collection point for the recycling of electrical and electronic equipment or hand it over to Novanta; see section 7.2 on page 46.**

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

A. Spare parts

Table A.1.: List of spare parts

Figure	Description	Order number
	FIBER TIGER Scan Head (HSSI protocol)	003-1133010-00
	FIBER TIGER Scan Head (ARN protocol)	003-1137045-00
	FIBER TIGER protective window set	111-2002173-00
	Patch cable; Cat 5e; length 5 m	419-2001905-00
[not available]	Patch cable; Cat 5e; length 15 m; drag chain suitable	419-2001922-00
	Power supply cable; (D-Sub) DA-3W3S / DA-3W3P; length 5 m	419-1016187-00

A. Spare parts

Figure	Description	Order number
[not available]	Power supply cable; (D-Sub) DA-3W3S / DA-3W3P; length 15 m; drag chain suitable	419-2001921-00
	Tube; polyetherurethane; ϕ_o 6 mm; ϕ_i 4 mm; length 5 m; other lengths on request	308-1005888-00
	Tube; polyetherurethane; ϕ_o 4 mm; ϕ_i 2.5 mm; length 5 m; other lengths on request	308-1005887-00

B. Bibliography

[1] ***ARGES ControllerLib – User Manual.***
File `ARG_ControllerLib_manual_en.pdf`.

[2] ***Firmware 3 – User Manual.***
File `InScript_manual_on-screen_en_de.pdf`.

[3] ***InScript 3 Software – User Manual.***
File `InScript_<version>_manual_en.pdf`.

[4] ***Manual for all scan heads.***
See the file `scan_head_manual_en.pdf`.

(Translation)

Novanta

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

Product FIBER TIGER Scan Head	
Manufacturer Novanta Europe GmbH \Nerk4 92442 \Nackersdorf	The person authorized to compile the relevant technical documentation Martin Hartmann (Director Engineering), manufacturer's address

(Translation)

Novanta

Annex to the declaration of incorporation

List of the essential health andsafety requirements for the design and construction of machinerythat apply to the product specified on page1 and with which it complies_

	Heading			Comment

(Translation)

Novanta

	Heading			Comment
1.S.2	Static electricity	yes	yes	-
1.S.3	Energy supply other than electricity	no	-	-
1.S.4	Errors of fitting	yes	yes	-
J..S.S	Extreme temneratures	yes	yes	-
J..S.6	Fire	ves	ves	-
J..S.7	Explosion	no	-	
J..S.8	Noise	no		-
J..S.9	Vibrations	no	-	-

(Translation)

Novanta

	Heading			Comment
4	SUPPLEIVIENTARVESSENTIAL HEALTH AND SA FETV REQUIREIVIENTS TO OFFSET HAZARDS DUE TO LIFTING OPERATIONS	-	-	
S	SUPPLEIVIENTARVESSENTIAL HEALTH AND SAFETY REQUIREIVIENTS FOR M ACHINERV INTENDED FORUNDERGROUND WORK	-	-	
6	SUPPLEIVIENTARVESSENTIAL HEALTH AND SAFETY REQUIREIVIENTS FOR IVIACHINERV PRESENTING	-	-	

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FIBER TIGER Scan Head
Instruction manual (translation)
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