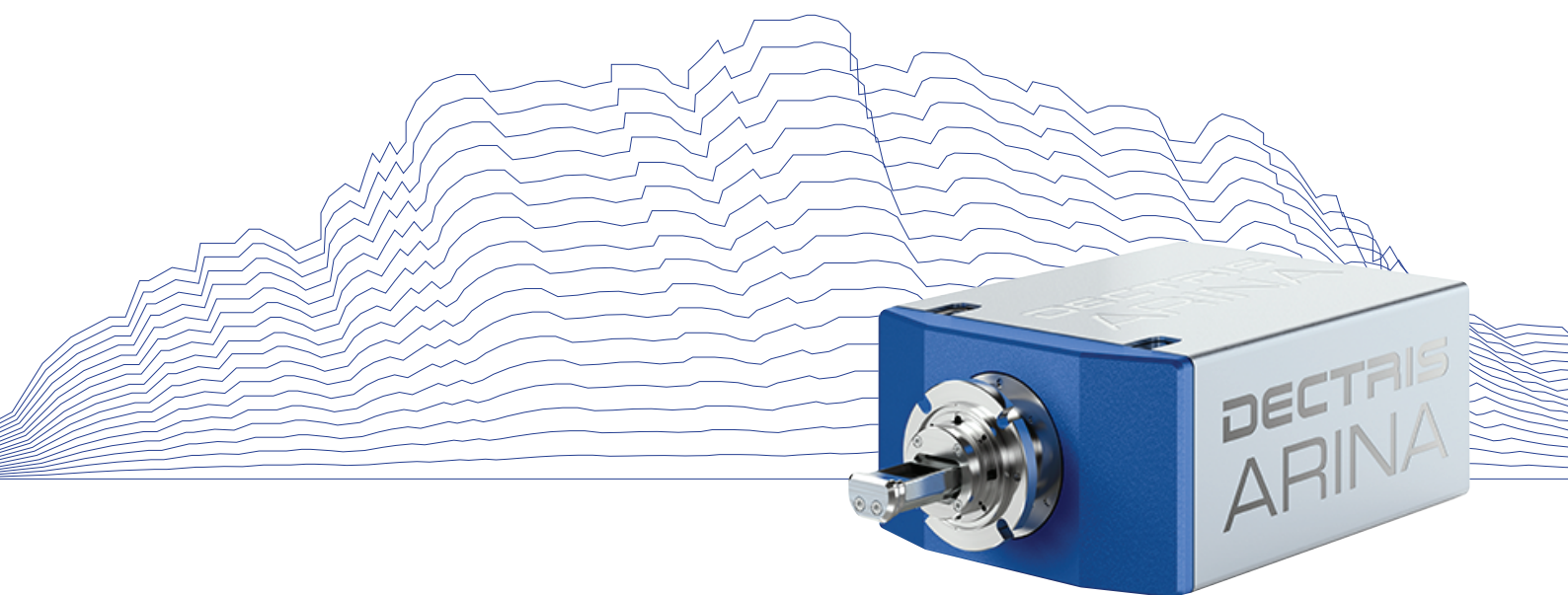


**DECTRIS**



# Technical Specifications

## DECTRIS ARINA<sup>®</sup> Si

DECTRIS Ltd.

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Switzerland  
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# 1. GENERAL INFORMATION

## 1.1. Contact and Support

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Phone:	+41 56 500 21 02	+1 267 924 5179	+81 79 280 9585
Website:	www.dectris.com		
Email:	support@dectris.com		

Should you have questions concerning the system or its use, please contact us via telephone, e-mail or fax.

## 1.2. Explanation of Symbols

### 1.2.1. Symbols in the Manual

Danger	#0
--------	----



Danger blocks are used to indicate immediate danger or risk to personnel or equipment.

Warning	#0
---------	----



Warning blocks are used to indicate danger or risk to personnel or equipment.

Caution	#0
---------	----



Caution blocks are used to indicate danger or risk to equipment.

Information	#0
-------------	----



Information blocks are used to highlight important information.

### 1.2.2. Symbols on the Detector

Attention	#0
-----------	----



Before operating the detector, please consult the user documentation.

Danger	#0
--------	----



Touching the cover foil or sensors can cause an electrical shock. Disconnect power before servicing the detector!

### 1.3. Warranty Information

Caution

#1



Do not ship the system back before you receive the necessary transport and shipping information.

### 1.4. Disclaimer

DECTRIS® has carefully compiled the contents of this manual according to the current state of knowledge. Damage and warranty claims arising from missing or incorrect data are excluded.

DECTRIS® bears no responsibility or liability for damage of any kind, also for indirect or consequential damage resulting from the use of this system.

DECTRIS® is the sole owner of all user rights related to the contents of the manual (in particular information, images or materials), unless otherwise indicated. Without the written permission of DECTRIS® it is prohibited to integrate the protected contents in this publication into other programs or other websites or to use them by any other means.

DECTRIS® reserves the right, at its own discretion and without liability or prior notice, to modify and/or discontinue this publication in whole or in part at any time, and is not obliged to update the contents of the manual.

## 2. USE OF THE DECTRIS ARINA®

The DECTRIS ARINA® detector system has been designed for the detection of electrons. It is intended for indoor use only. For other applications, please contact DECTRIS® technical support for additional information.

Caution

#2



Improper use of the DECTRIS® detector system can compromise its safety and its functionality is no longer guaranteed.

Caution

#3



When operating the detector system on a Transmission Electron Microscope strictly follow the instructions given in this document.

### 2.1. Product Return and Recycling

We recycle DECTRIS® detector systems that are no longer suitable for use. If you are not using your DECTRIS® detector system any more, send it back to us. We will make sure that your system is responsibly and safely recycled. This service is free for customers who purchased a new DECTRIS® detector system.

## 3. TECHNICAL SPECIFICATIONS

### 3.1. Specifications

#### 3.1.1. Detector

Table 3.1: Technical Specifications


Sensor	Reverse-biased silicon diode array
Sensor material	Silicon (Si)
Pixel size (W x H)	100 $\mu\text{m}$ x 100 $\mu\text{m}$ = 10 000 $\mu\text{m}^2$
Pixel array format (W x H)	192 px x 192 px = 36 864 px
Active area (W x H)	19.2 mm x 19.2 mm = 368.64 mm <sup>2</sup>
Image bit depth	16 bit, 32 bit
Readout bit depth	12 bit
Maximum count rate	1 $\times$ 10 <sup>8</sup> electrons/pixel/s
Electron energies	30 keV to 200 keV <sup>1</sup>
Number of thresholds	1
Readout time	continuous readout, with 100 ns dead time
Maximum frame rate	20 kHz 30 kHz, in-pixel compression 80 kHz, 2x2 binning 120 kHz, in-pixel compression, 2x2 binning
Connection to control unit	1 x LC/UPC duplex connectors
Power supply	External power supply unit
Software interface	HTTP REST interface (via network connection)
Dimensions (W x H x D)	230 mm x 120 mm x 183 mm
Weight	10.3 kg (without shipping nose)
Overvoltage category	II
Means of protection	I (power supply)
Pollution degree	II
Maximum operating altitude	2000 m a.s.l.

<sup>1</sup> Count-rate correction available for 30, 40, 60, 80, 100, 120, 160, 200 and 300 keV

## 3.2. Ratings

### 3.2.1. Detector

Table 3.2: Power Ratings

Detector power input	+12 V DC, 30 W
Detector external trigger input	High level: 2.1 – 5.0 V Low level: 0.0 – 0.8 V
<div style="background-color: #f4a460; padding: 5px; display: flex; justify-content: space-between;"> <span>Warning</span> <span>#1</span> </div> <div style="margin-top: 5px;">  Absolute maximum is 5 V. Applying a higher voltage will damage the detector.                 </div>	
External trigger input impedance	47 kΩ
Detector trigger output	High level: 2.3 V to 3.3 V Low level: 0.0 V to 0.6 V Max. current: 24 mA

### 3.2.2. Power Supply Unit


<div style="background-color: #f4d03f; padding: 5px; display: flex; justify-content: space-between;"> <span>Caution</span> <span>#4</span> </div> <div style="margin-top: 5px;">  Only use the power supply delivered with the DECTRIS ARINA®.                 </div>	
--	--

Table 3.3: Power Supply Unit Ratings

Power supply unit power	<b>Input</b> 85 VAC to 264 VAC 47 Hz to 63 Hz 1 A to 1.85 A  <b>Output</b> 12 VDC max. 11.5 A 138 W
AC connector	IEC-320-C14 input inlet
Case dimensions (W x H x D)	72 mm x 35 mm x 175 mm
Weight	0.7 kg

### 3.2.3. Detector Control Unit

Information	#1
-------------	----



Please consult the user documentation of the DELL PowerEdge R7615 for details.

**Table 3.4:** Detector Control Unit Ratings

Detector control unit power input	2 x 100 V to 240 V AC, 50/60 Hz, 5 A to 10 A, 1400 W (Platinum) 1+1 redundant, hot swappable power supply unit
Dimensions (W x H x D)	482.4 mm x 86.8 mm x 758.29 mm
Weight	20 kg
Chassis	2U

### 3.2.4. Thermal Stabilization Unit

The DECTRIS ARINA® detector is optionally equipped with one of the two Thermal Stabilization Units given in 3.5.

Information	#2
-------------	----



Please consult the user documentation of the thermal stabilization unit for details.

Caution	#5
---------	----



DECTRIS ARINA® was verified with the chillers provided in 3.5. Using alternative chillers may result in a deterioration of performance.

**Table 3.5:** Thermal Stabilization Unit Options

Thermal stabilization unit	SMC HEC 002-A5B Closed circuit air-water thermal stabilization unit
Thermal stabilization unit	SMC HEC 003-W5B Closed circuit water-water thermal stabilization unit

**Table 3.6:** Thermal Stabilization Unit Ratings

	SMC HEC 002-A5B	SMC HEC 003-W5B
Power input	Single phase 100 VAC to 240 VAC, allowable voltage range ±10 %, 50/60 Hz	
Current consumption	8 A (100 VAC) to 3 A (240 VAC)	5.5 A (100 VAC) to 2.5 A (240 VAC)
Dimensions (W x H x D)	270 mm x 393 mm x 436 mm	246 mm x 390 mm x 482 mm
Weight	17.5 kg	12 kg

**Table 3.6:** Thermal Stabilization Unit Ratings - continued

	SMC HEC 002-A5B	SMC HEC 003-W5B
Typical flow	1 L min <sup>-1</sup>	1 L min <sup>-1</sup>
Maximum operation pressure	3 bar	3 bar
Piping port	Rc 1/4	Rc 3/4

DECTRIS ARINA® requires a minimum flow rate of 0.3 L min<sup>-1</sup>.

### 3.2.5. Scan Generator

The DECTRIS ARINA® detector can optionally be equipped with one of the following scan generators.

- Point Electronic Revolon
- TVIPS Universal Scan Generator

#### Information

#3



Please consult the user documentation of the manufacturer for details.

**Table 3.7:** Universal Scan Generator Ratings

Power input	Powered by the user workstation
I/O Port Ratings	
Analogue in	± 10 V
Analogue out	± 10 V
Digital in	5 - 50 mA @ 2 - 12V or 0 - 5 V <sup>2</sup>
Digital out	500 mA or 0 - 5 V <sup>2</sup>
Dimensions (W x H x D)	345 mm x 105 mm x 265 mm
Weight	3 kg

**Table 3.8:** Revolon Ratings

Power input	100 VAC to 240 VAC, allowable voltage fluctuation ±10 %, 50 – 60 Hz, connector type: C14 male
Power consumption	40 W max.
I/O Port Ratings	
SCAN OUT	± 2.2 V to ± 7.5 V or ± 0.65 V to ± 2.2 V
ANALOG I/O (scan)	± 3.5 V to ± 12 V
ANALOG I/O (ext. blank/scan)	GND, 5 V or 15 V
Synchronization	TTL
Dimensions (W x H x D)	450 mm x 90 mm x 290 mm
Weight	approx. 4.7 kg

<sup>2</sup> Most digital I/Os are configurable to support both, current and voltage signals. Voltage signals are 0-5 V, while current signals employ solid state relays rated at 500mA

### 3.2.6. User Computer

The DECTAIS ARINA® detector is optionally equipped with a User Computer. This can be either a HP Z6 or DELL Precision 7875 tower workstation.

Information #4



Please consult the user documentation of the HP Z6 or DELL Precision 7875 workstation.

**Table 3.9:** HP Z6 Ratings

User Computer power input	100 - 127 VAC, 50 / 60 Hz, 12 A 200 - 240 V AC, 50 / 60 Hz, 6.3 A
Dimensions (W x H x D)	169 mm x 445 mm x 386 mm
Weight	11 kg

**Table 3.10:** DELL Precision 7875

User Computer power input	90 – 264 VAC, 47 - 63 Hz, 13.6 A (max)
Dimensions (W x H x D)	176.50 mm x 446.60 mm x 487.50 mm
Weight	25.57 kg (max)

### 3.3. Ambient Conditions

**Table 3.11:** Detector Operating Ambient Conditions

Ambient Condition	Value
Operating temperature	+20 °C to +35 °C
Operating humidity	<80 % at 20 °C, non-condensing
Storage temperature	+15 °C to +40 °C
Storage humidity	<40 % at 20 °C, non-condensing

Caution #6



Please consider the following points when storing the detector

- Make sure the temperature and the humidity inside the transport box does not exceed the specified range (use of a drying agent is required).
- Ensure that no condensation moisture develops if the detector is stored at low temperature.



### 4.1.2. Front Side of the Detector

Danger #1



**Danger of electric shock. The sensor is operated at high voltages. Do not touch the sensor. Touching the sensor can cause an electrical shock.**

The detector comes with a protection cover. It protects the sensor from dust and being touched when not mounted to a microscope.



Figure 4.2: The DECTRIS ARINA® Detector with the Cover Removed (front view)

### 4.1.3. Connector Side of the Detector



Figure 4.3: The DECTRIS ARINA® Detector (bottom view)

#### 4.1.4. Status LEDs

Table 4.1: The Meaning of the Status LEDs on the Detector

LED	Behavior	Description
EN	Orange	Indicates the detector is acquiring.
STATUS	Green steady	Detector running and hardware OK.
	Green blinking	Detector hardware OK, detector in Standby or Startup mode. ⇒ Press power button to turn on the detector.
	Red blinking and Detector in error state	Detector may be overheating ⇒ Check cooling system
	Red blinking	HV interlock might be triggered ⇒ Check the HV interlock connector
	Off	Detector has no power ⇒ Check the power adapter and mains connection.

#### 4.1.5. Connectors and Connecting Cables/Pipes

Table 4.2: Electric Connectors and Connecting Cables




Connector	Description
DATA	<p>1 x LC/UPC duplex connectors DATA → det1</p> <p>The unused data ports are closed with an EMI plug. Do not remove the plugs.</p> <p>Use Single Mode fiber optic patch cable with LC/UPC duplex connectors at both ends. We recommend to use the optic patch cables that are supplied with the detector system.</p> <p>Detector and detector control unit are equipped with 10GBASE-LR Single Mode SFP+ optical transceivers. Do not replace the optical receivers, as proper function of the detector system cannot be guaranteed otherwise. Please contact support@dectris.com if you need replacement transceivers.</p> <div style="background-color: #FFD700; padding: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>Caution</span> <span>#7</span> </div> <p> There must be a 1 x LC/UPC duplex point-to-point connection between detector and detector control unit.</p>
POWER	DC power connector (see tables 3.2 and 3.3)
EXT IN	External trigger input (see table 3.2) Use a Lemo® Type 00 (NIM/CAMAC) cable.
EN OUT	Enable out, high when counting is enabled. Use a Lemo® Type 00 (NIM/CAMAC) cable.

Table 4.2: Electric Connectors and Connecting Cables - continued

Connector	Description
	Functional ground <div style="background-color: #003366; color: white; padding: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>Information</span> <span>#6</span> </div> <div style="margin-top: 5px;">  The detector can be grounded additionally via the functional ground connector at the bottom to establish a defined grounding.         </div>
INTERLOCK	High voltage interlock. For more information see section 4.1.6. Use a LEMO FGG.0B.302.CYCD42 connector.
CONTROL	Connector for the DECTRIS ARINA® control user interface For more information see section 4.1.7
CDA	Compressed dry air input for retractable pneumatics 4 mm push-in fittings, pressure range: 6 - 7 bar
COOLANT IN/OUT	Inlet and outlet for water coolant, 6 mm push-in fittings

#### 4.1.6. High Voltage Interlock

The high voltage (HV) interlock is intended to protect the sensor from damage during pump/vent procedures. An open interlock will cause an immediate HV discharge/power off.

Table 4.3: Interlock actions

State change	Description
Opening the interlock	The high voltage on the sensor quickly reaches 0 V. As long as the interlock is open, the detector status LED flashes red.
Closing the interlock	The high voltage on the module quickly reaches the functional voltage. The detector status LED returns to solid green if the detector was initialized before the interlock was opened and blinks green otherwise. If the LED stays red, check the troubleshooting steps in chapter 7.

Warning
#2



The interlock is not a safety feature for personal protection. With the interlock open and the HV disabled the detector still has to be treated as if the HV is present.

Information
#7



An interlock state change during data acquisition will lead to corrupted data, without any notification in the file. The user is responsible to track the interlock status and to modify the acquisition accordingly.



The interlock may only be opened for exceptional cases (max. a few times per day).

#### 4.1.7. Detector Control User Interface

The DECTRIS ARINA® User Interface controls the retraction and insertion of the detector head.



Figure 4.4: The DECTRIS ARINA® Control User Interface Box


Table 4.4: The Meaning of the Status LEDs on the User Interface Box

Button	Description
INSERT	Inserts the detector head with the sensor into the optical-axis
<div style="background-color: #FFD700; padding: 5px; display: inline-block;"> <p>Caution #9</p> </div>	
<div style="display: flex; align-items: center;"> <p>Make sure all other detectors in the same plane are retracted before inserting DECTRIS ARINA®.</p> </div>	
RETRACT	Retracts the detector head


Table 4.5: The Meaning of the Status LEDs on the User Interface Box

LED	Behavior	Description
RETRACTED	Green	The detector is in a fully retracted state
MOVING	Orange	The detector is neither fully inserted nor fully retracted
INSERTED	Green	The detector is fully inserted

**Table 4.5:** The Meaning of the Status LEDs on the User Interface Box - continued


LED	Behavior	Description
COLLISION	Red	Indicates a collision with another detector. DECTAIS ARINA® will automatically retract and stay retracted. Before re-inserting DECTAIS ARINA® the collision has to be acknowledged by the user by pressing the RETRACT button or by issuing the Simplon API command <code>retract_sensor</code> .
		Caution #10
		 Collision detection serves as a safety mechanism. Collisions should never be forced.

Information
#8



The Status LEDs will only be active when the detector is in an initialized state.

Information
#9




Starting with SW version v2025.1, insertion and retraction can now be controlled via the Simplon API (see user manual for details).

## 4.2. Detector Control Unit

### 4.2.1. Configuration

Caution
#11



Do not access or modify the operating system of the detector control unit.

The user interface of the detector control unit is accessible using a web browser. The detector control unit does not need any connections other than the power and network cables.

The detector control unit has to be connected point-to-point to the detector via 1 x LC/UPC duplex connectors. The detector control unit can be integrated into the site network infrastructure using one of the interfaces described in table 4.6. The detector control unit is optimized for performance and stability of operation. In order to achieve these goals we deliver the detector control unit with fixed firmware (BIOS etc.) and software (OS) version. The detector control unit must not be operated in an environment where unauthorized access is possible. The detector control unit does not provide authentication mechanisms and is not protected against malicious acts by unauthorized third parties.

Using the Web User Interface, it is possible to restart the ARINA control service, trigger an update, and to shut down and to reboot the detector control unit. All further control of the detector is carried out via the SIMPLON API (see separate documentation).



Figure 4.5: Front view of the detector control unit (not in actual configuration).

Caution #12



Pushing the power button on the front panel longer than 2 seconds will immediately halt the detector control unit. All image data on the detector control unit will be permanently lost.

Information #10



Briefly pushing the power button on the front panel will shut down the detector control unit. May take up to 1 min. Keep in mind that this action will NOT power down the detector.

Warning #3



When powering off the DCU, the detector stays initialized. Therefore, a pump/vent action can still cause a high voltage discharge and damage the sensor.

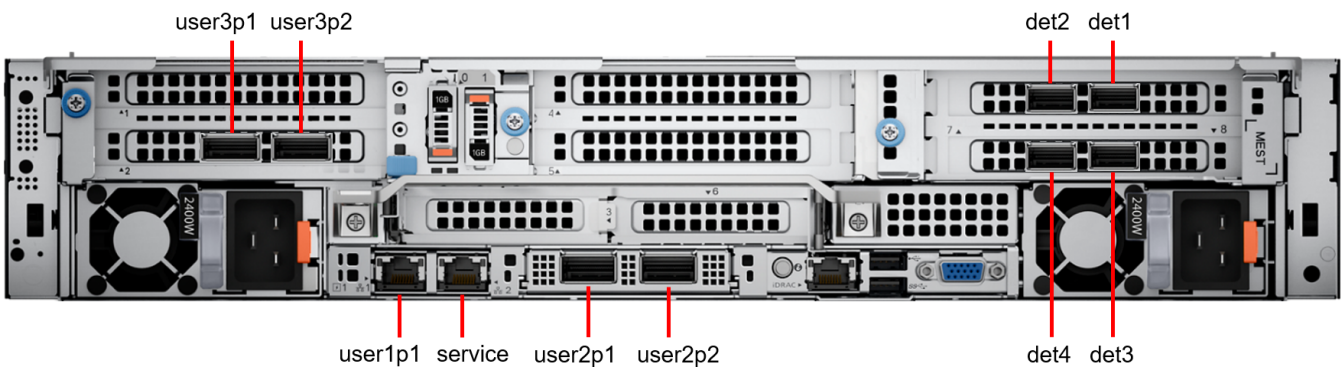


Figure 4.6: Back view of detector control unit with labeled network interfaces.

## 4.2.2. Connectors

Table 4.6: Detector Control Unit Connectors

Connector	Description
user1p1 (Integrated NIC)	Interface name: user1p1 (1 GBase-T) User configurable GbE network interface Preconfiguration: DHCP
service (Integrated NIC)	Interface name: service (1 GBase-T) Fallback GbE network interface Preconfiguration: Static 169.254.254.1 (Netmask 255.255.255.0)
user2p1 (Integrated NIC)	Interface name: user2p1 (10 GbE SFP+) User configurable 10 GbE network interface Preconfiguration: DHCP
user2p2 (Integrated NIC)	Interface name: user2p2 (10 GbE SFP+) User configurable 10 GbE network interface Preconfiguration: DHCP
user3p1 (Slot 2)	Interface name: user3p1 User configurable 100 Gb QSFP28 network interface
user3p2 (Slot 2)	Interface name: user3p2 User configurable 100 Gb QSFP28 network interface
Data	Detector interface ports DATA → det1 The unused data ports are closed with an EMI plug. Do not remove the plugs.
2 x Power	AC Connector (redundant power supply)

See DELL owner's manual for further details.

## 4.3. Thermal Stabilization Unit

A thermal stabilization unit is required for the operation of the DECTRIS ARINA® detector system. A list of compatible thermal stabilization units is given in 3.5.







The detector comes with an adapter that provides self-sealing valves. The adapter is required to connect the detector to one of the optionally available thermal stabilization units.

The tubing should be kept as short as possible to ensure the best flow.

Table 4.7: Operating Conditions

Condition	Definition
Operating temperature	The thermal stabilization unit has to be set to a temperature of 20 °C for normal operation.
Maximum operating pressure	3 bar

Table 4.7: Operating Conditions - continued

Condition	Definition
Coolant	Use ~2/3 distilled water and ~1/3 ethylene glycol with 2–5% corrosion inhibitor (free of borates, phosphates, nitrites, amines and silicates).
	<div style="background-color: #f06292; padding: 5px; display: flex; justify-content: space-between;"> <span>Danger</span> <span>#2</span> </div>
	 Ethylene glycol can be seriously harmful to your health or fatal if handled incorrectly. Consider the packaging and safety instructions provided by your local supplier.
Information <span style="float: right;">#11</span>	
	Before operating the thermal stabilization unit, please read the User Manual of the thermal stabilization unit.
Caution <span style="float: right;">#13</span>	
	When connecting or disconnecting the cooling hoses, turn off the detector and the thermal stabilization unit.
Caution <span style="float: right;">#14</span>	
	When operating the detector, the thermal stabilization unit must always be turned on and the pump has to be activated (see user documentation of thermal stabilization unit).
Caution <span style="float: right;">#15</span>	
	Use opaque hoses to avoid the growth of algae.
Caution <span style="float: right;">#16</span>	
	Do not set the temperature of the thermal stabilization unit below the recommended operating temperature. Condensing moisture can develop and damage the detector.

## 5. INSTALLING THE DETECTOR SYSTEM

### 5.1. Transport Considerations

Warning

#4



Avoid vibration and shock when moving the detector.

The detector has been delivered in a robust transport box. Please keep this transport box for transport or storage purpose.

### 5.2. Mounting

The detector should be mounted to the Transmission Electron Microscope by qualified personnel only. Please contact [support@dectris.com](mailto:support@dectris.com) for support.

Caution

#17



Make sure the transport cover is attached with the provided screws when the detector is not in use.

Danger

#3



Make sure that the power is disconnected before mounting / unmounting the detector to / from the microscope or attaching / removing the protection cover.

Caution

#18



Make sure to use silver-plated screws when mounting the detector to a camera box.

### 5.3. Grounding of the Detector

Caution

#19



Connect the main plug of the external power supply unit to a properly grounded power outlet. It is recommended to use the microscope's grounding.

The detector can be grounded additionally via the functional ground connector.

## 5.4. Fiber Optic Cable Installation

The connection between the detector head and the detector control unit uses fiber optic cables in order to provide best connectivity during operation. However, special care has to be taken when installing the fiber optic cables. Fiber optic cables are sensitive to dirt on the connectors and excessive bending, squeezing, or pinching of the cables.

The DECTRAIS ARINA® is delivered with a 30 m long optical fiber cable. The connection to the detector consists of 1 x LC/UPC duplex connectors.

### 5.4.1. Installing the Cables

The fiber optic cables come with a pulling eye to make cable installation easier and a cable sock to protect the connectors. Use the pulling eye to pull the cable until its destination. Once the cable is properly installed, the cable sock can be removed.

The minimal bending radii are  $10 \times$  diameter for static and  $20 \times$  diameter for dynamic bends. The diameter of the fiber trunk is ca. 5 mm while the diameter of the 0.5 m long fiber breakout at both ends of the cables is ca. 3 mm. We therefore recommend avoiding both static and dynamic bending radii smaller than 10 cm – make sure not to exceed this bending radius during the course of the fiber cable installation. Use cable trays or similar to guide the cables and protect them. Stepping on the cables can damage the cables. Also make sure that there is no tension on the connectors.

### 5.4.2. Checking the Connection

The ARINA web interface offers a way to assess the quality of the connection between the detector control unit and the detector head. The User Manual explains how to access the web interface.

In order for the cable check to work properly, the detector has to be initialized first. The cable check shows the active connections and the transceiver Rx and Tx power. Rx values below 0.25 mW point towards a problem in the connection. Dirty connectors are the most likely reason for bad connections. Follow the instructions in section 5.4.3 in case of any issues with the connection.

### 5.4.3. Cleaning the Connectors

Dirty fiber connectors are the most common reason for bad connections. Any dirt or dust particle on the connector can lead to poor signal and may also lead to permanent fiber and/or connector damaged when plugged. We recommend to always clean the fiber optic connectors before connecting them. Make sure to clean both the connector and the transceiver modules, as both can be dirty.

It is recommended to first use dry cleaning technique like a fiber optic cable cleaning pen. These pens are easy to use for both the connectors and the transceivers. Fiber optic inspection microscopes can help assess if the optical fiber connectors are clean. If dry cleaning did not help, wet cleaning can be used. However, make sure to use wet cleaning kits designed specifically for fiber optic connectors and follow the manufacturers instructions.

Always cover the connectors and transceivers when they're unplugged. The cables and transceivers all come with covers which can be used for this purpose.


## 5.5. Connection to Thermal Stabilization Unit

A thermal stabilization unit is required for the operation of the DECTRAIS ARINA® detector system. A list of compatible thermal stabilization units is given in 3.5.

The detector comes with an adapter that provides self-sealing valves. The adapter is required to connect the detector to one of the optionally available thermal stabilization units.

The tubing should be kept as short as possible to ensure the best flow.

Table 5.1: Operating Conditions

Condition	Definition
Operating temperature	The thermal stabilization unit has to be set to a temperature of 20 °C for normal operation.
Maximum operating pressure	3 bar
Coolant	Use ~2/3 distilled water and ~1/3 ethylene glycol with 2–5% corrosion inhibitor (free of borates, phosphates, nitrites, amines and silicates).
	<div style="background-color: #f06292; padding: 5px; display: flex; justify-content: space-between; align-items: center;"> <span>Danger</span> <span>#4</span> </div> <p> Ethylene glycol can be seriously harmful to your health or fatal if handled incorrectly. Consider the packaging and safety instructions provided by your local supplier.</p>

Information
#12



Before operating the thermal stabilization unit, please read the User Manual of the thermal stabilization unit.

Caution
#20



When connecting or disconnecting the cooling hoses, turn off the detector and the thermal stabilization unit.

Caution
#21



When operating the detector, the thermal stabilization unit must always be turned on and the pump has to be activated (see user documentation of thermal stabilization unit).

Caution
#22



Use opaque hoses to avoid the growth of algae.

Caution
#23



Do not set the temperature of the thermal stabilization unit below the recommended operating temperature. Condensing moisture can develop and damage the detector.

## 5.6. Mounting the Detector Control Unit

Caution

#24



Make sure that the detector control unit has adequate ventilation.

---

The detector control unit can be mounted in a standard 19 inch rack, which has to be properly grounded.

## 6. OPERATION PROCEDURE


### 6.1. Operation at a Transmission Electron Microscope

Before operating the detector, make sure you have read the Technical Specifications and the User Manual. The typical reachable vacuum for the detector head is  $10^{-6}$  mbar. The outgassing rate and content are not specified.

#### 6.1.1. Ambient Conditions for In-Vacuum Use

For operation of the detector the following conditions must be fulfilled:

Table 6.1: In-Vacuum Operating Conditions

Operation Condition	Definition
Pressure during operation	above 200 mbar or less than $10^{-3}$ mbar 1 bar $10^{-3}$ mbar  $10^5$ Pa $10^{-1}$ Pa
Detector mounting plate temperature during operation	16 °C to 25 °C
Thermal stabilization unit set temperature	20 °C
Chamber temperature during "bake-out" (detector powered off)	max. +60 °C

#### 6.1.2. Getting Started

Make sure the vacuum conditions in table 6.1 are met and follow below procedures for venting and pumping down the detector chamber of the Transmission Electron Microscope.

**Warning** #5



Prior to pumping down and venting:  
 Always make sure the detector has NO POWER and is WARMED UP to room temperature. Otherwise it could be damaged through electrical discharge or condensation.

**Caution** #25




Make sure that the detector is connected to the central power line of the microscope.

## Detector Installation

- Ensure that the detector and scan generator are installed at the Transmission Electron Microscope by qualified personnel.
- Make sure the detector is POWERED OFF by disconnecting the power supply.
- Pump down the detector chamber.
- Once the pressure inside the vacuum chamber is below  $10^{-3}$  mbar set the temperature on the thermal stabilization unit to 20 °C and turn on the thermal stabilization unit (pumping down a warm detector prevents condensation issues).

## Startup Procedure

- Make sure the thermal stabilization unit has reached the set value and the pressure inside the vacuum chamber is sufficiently low to meet the operating conditions
- Power up the detector by connecting the power supply and pressing in the standby button  on the detector
- Turn on the detector control unit. Wait at least 5 min before trying to connect.
- Turn on the User Computer and wait until it started completely
- Press the power button on the Scan Generator

The detector is now ready to use.

### Information

#13




The software start-up procedure is described in detail in the User Manual.

## Venting the Detector Chamber

- Turn OFF the power to the detector by disconnecting the power supply.
- Make sure the system is warmed up to 20 °C
- Use dry air or nitrogen to vent the detector chamber.

## 6.2. Turning Off the Detector

To turn off the detector:

- Push the standby button  to release it and return the detector to the standby state.
- The detector power cable can now be disconnected if needed.
- Power off the scan generator by pushing the power button
- Turn OFF the detector control unit.
- Turn OFF the user computer

### Warning

#6



As long as the detector power cable is connected, the detector has to be considered under power.

### 6.3. Storing the Detector

Please follow these instructions:

- Put the detector in a plastic bag, add at least 200 g of drying agent (i.e. silica gel) into the bag and seal it air-tight.
- Check the humidity and change the drying agent frequently for compliance with the storage requirements in section 3.3.

### 6.4. Cleaning and Maintenance

Caution

#26



The sensor must not be touched or cleaned. If it is damaged, please contact DECTRIS® technical support.

The housing can be cleaned with a soft tissue.

The DECTRIS ARINA® detector does not require any maintenance. It is recommended to change the coolant in the cooling loop annually for longevity.

Please refer to the user documentation of the thermal stabilization unit for detailed information about the maintenance of your thermal stabilization unit.

## 7. TROUBLESHOOTING

Table 7.1 provides an overview of possible problems with the detector system and instructions in order to solve the problems. If the problem you are experiencing is not listed below or if the instructions do not help, please contact [support@dectris.com](mailto:support@dectris.com).

The LEDs at the bottom of the detector can provide valuable information for troubleshooting. Check section 4.1.4 for further information.

**Table 7.1:** Troubleshooting

Problem	Cause	Solution
Detector control unit does not start properly.	Detector control unit is not powered.	Check the User Documentation of the detector control unit (see section 3.2.3).
Communication error, the detector is not found at startup.	Data cable is not connected or defective.	<p>Check the connection between detector control unit and detector. Make sure that there is a direct, peer-to-peer connection between the detector control unit and the detector.</p> <p>Avoid tangling or strong bending of the data cable.</p> <p>Check the status of the LINK LED. If the detector control unit and the detector are powered and correctly connected, the LINK LED should be green (Takes up to 30 s after power up).</p>
Detector shuts down and cannot be initialized.	Temperature error.	<p>Check that the detector is properly supplied with coolant and check the temperature of the coolant at the front panel of the thermal stabilization unit.</p> <p>Wait until the detector cools down.</p> <p>Initialize the detector again.</p>
The detector fails to turn on.	The power cord is not connected or the plug is not completely inserted.	Connect the power cord firmly. Check the LED on the external power supply.
	The temperature is over the critical limit. The thermal protection was triggered.	Check the thermal stabilization unit. The detector will power on again, as soon as the temperature is within the allowed operating conditions.
Image acquisition not possible.	Detector is not properly initialized.	Initialise the detector via the SIMPLON API. (See API Reference)

Table 7.1: Troubleshooting - continued

Problem	Cause	Solution
Detector housing is humid.	Ambient humidity around the detector exceeds the operating conditions.	Shut down the detector immediately and check the humidity. Power up the detector only when the ambient humidity has been reduced.

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## 8. CREATE SUPPORT REQUEST

If you have any specific questions, you can request technical support using the contact information provided in Chapter section 1.1, or by sending an email to support@dectris.com.

DCU logs often play a crucial role in resolving technical issues, as they contain valuable information for debugging and identifying system misbehavior. Therefore, it is highly recommended to provide these logs when contacting our support team.

The following step-by-step instructions guide users through the process of creating a tarball of the current log files on the DCU:

- Open the ARINA web interface
- Navigate to Technical Support
- Access the Create a bug report menu and click on CREATE BUG REPORT
- Enter a title, description, and an appropriate log time window (Logs age [hours]), then click SAVE
- Click on the download symbol for the newly created report to download the generated log report
- Send the log report as Email attachment to the DECTRIS support team

Information #14



The bug report is not sent automatically.

Information #15



The log report only contains logs for the given Logs age.

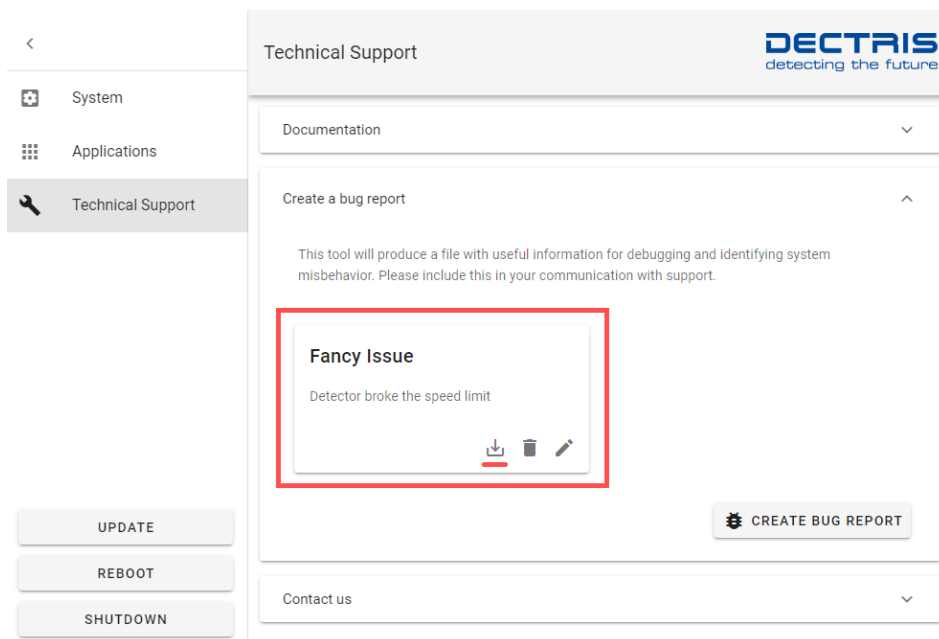


Figure 8.1: Created bug report ready for download

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