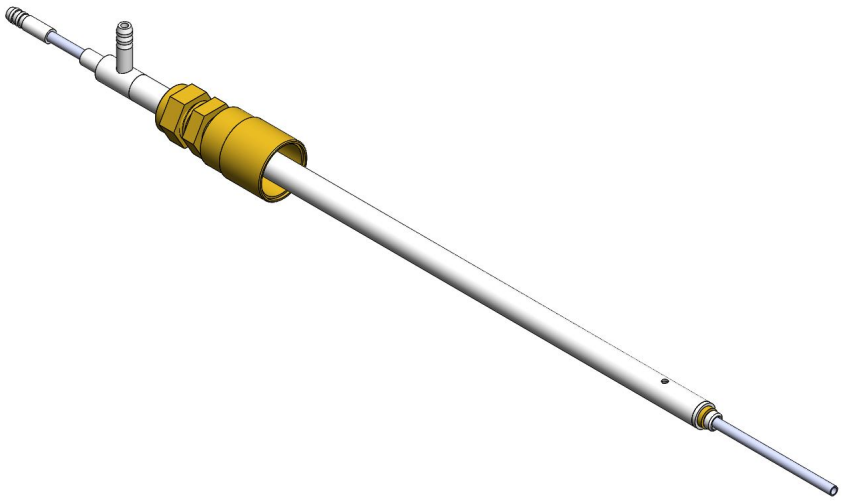
Nitrogen Side Arm

1.0 rev 07 May 2024



User Guide

Accessory for models: Optistat CF-X, Optistat CF-V, MicrostatHe, Microstat HeR, Microstat HiRes

Section 1 - Safety and Warning Information

Caution

PLEASE READ THIS INFORMATION FIRST BEFORE USING YOUR PRODUCT

1. If the equipment is used in a manner not specified by Andor, the protection provided by the equipment may be impaired.
2. Asphyxiation: Nitrogen can displace the oxygen from air and cause death by asphyxiation. Ensure that adequate ventilation is provided.
3. Flammable Liquids: Atmospheric oxygen can condense on cryogenically cooled objects. Oxygen can cause flammable substances to ignite in the presence of heat or arcing, risking severe injury. Further, oxygen enrichment may cause spontaneous combustion.
4. Slipping hazards: During normal operation ice may form on parts of the system. Upon warm up, this ice may melt and pool by the system. Drip trays should be placed around the system to catch any water runoff. Additionally, warning signs should be placed around the system.
5. Product not suitable for use with self-pressurised liquid nitrogen dewars.
6. Adhere to the personal safety equipment guidelines detailed in "Personal Safety Equipment" on page 4.
7. Before using the product, please follow and adhere to all warnings, and safety, manual handling, and operating instructions located either on the product, or in this manual.
8. Keep this manual in a safe place for future reference.
9. For Optistat or Microstat information, refer to the relevant manual available at andor.oxinst.com/downloads. The general safety precautions required when working with cryogenic systems are given in Oxford Instruments' Safety Matters document; all users should read this document. Please also read

Practical Cryogenics.

10. Users must be authorised and trained personnel only; otherwise, this may result in personal injury, and/or equipment damage and impaired system performance.
11. There are no user-serviceable parts inside the product and the enclosure must not be opened. Only authorised service personnel may service this equipment.
12. No parts should be replaced by the customer, except for the PTFE seal see "Regular Checks " on page 21.
13. This product is designed to be used in an indoor environment. If the customer chooses to use this outside, then it is their responsibility to provide adequate protection. Andor assumes no liability for damage or obligation to repair under warranty relating to use outside of the environmental requirements specified in "Environmental Specifications" on page 25.
14. This product is a precision scientific instrument containing fragile components. Always handle it with care.
15. Do not wet or spill liquids on the product, and do not store or place liquids on the product.
16. If spillage occurs on the product, stop the cryogen flow immediately, and allow the system to return to room temperature before wiping with a dry, lint-free cloth.
17. See "General Cleaning and Decontamination Information" on page 21.
18. Do not expose the product to open flames.
19. Do not allow objects to fall on the product.

1.1 Specific hazard symbols

The following symbols are used throughout this manual to identify specific hazards.

Symbol	Hazard
	**COLD OBJECTS and CRYOGENS** Contact with cold objects and cryogens can cause serious injury to exposed skin. Skin may adhere to cold objects.

1.2 Personal Safety Equipment

The following items are recommended for safe operation of any system:

- Personal protective equipment, including thermally insulated gloves, face protection, body protection and protective footwear. Cryogens can act like water, soaking into clothing and causing severe burns
- Hazard warning signs, barriers or controlled entry systems to ensure that personnel approaching the system are aware of the potential hazards.
- Oxygen monitors should be fitted in the laboratory to warn personnel if the concentration of oxygen in the air falls below safe levels.

Symbol	Hazard
	**WEAR PROTECTIVE FOOTWEAR** Industrial environments can contain heavy objects, and slip hazards, oil and water can be present. Correct footwear is essential, open toes shoes or shoes with porous surfaces are not recommended as cryogens can spill and enter the footwear causing severe burns.
	**WEAR PROTECTIVE GLOVES** Cold and hot surfaces can be present on these systems, temperatures between 100°C and -196°C can be present on the surfaces of the system. Wear non-absorbent gloves as cryogens can penetrate and soak into permeable gloves causing severe burns.
	**WEAR A FACE SHIELD** When transferring cryogens it is good practice to wear face protection as the unexpected and sudden ejection of cold gas or liquid could cause severe damage to eyes and face.

1.3 Labels Symbols

	Contact with cold objects and cryogens can cause serious injury to the skin. Skin may adhere to cold objects. Ensure that any cryogenic or coolant delivery systems are designed to prevent contact with the cold components.

1.4 Unpacking Information

Carefully unpack the unit and retain the packaging materials to transport or return equipment if required:

- If the equipment appears damaged in any way, return it to sales outlet in its original packaging.
- No responsibility for damage arising from the use of non-approved packaging will be accepted.
- Ensure all items and accessories specified at the time of ordering and as detailed on the packing list are present: if any items are missing, please contact your sales representative.

1.5 Revision History

Version	Released	Description
1.0	07 May 2024	Initial release.

1.6 Updates to the Manual

Changes are periodically made to the product, and these will be incorporated into new editions of the manual. Please check for new releases of the manual at: andor.oxinst.com/downloads. If you find an issue in this manual, please contact your customer support representative with a description of the issue.

Section 2 - Introduction

Nitrogen can be used as the cryogen with your Oxford Instruments cryostat. We offer an LLT Siphon or a Nitrogen Side Arm (NSA) to easily and safely transfer nitrogen to the cryostat.

This manual contains useful information and advice to ensure that you know how the accessory works, and how to use it effectively. The manual should be read in conjunction with those provided for other relevant parts of your cryostat system, the "Safety Matters" guide and Practical Cryogenics.

If you have any questions regarding your Nitrogen Side Arm, please feel free to contact Andor directly, or via your local representative or supplier.

2.1 Technical Support

If you have any questions regarding the use of this equipment, please contact the representative from whom your system was purchased, or:

Europe

Oxford Instruments Andor

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Northern Ireland

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USA

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Concord

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USA

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Asia-Pacific

Oxford Instruments KK

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China

Oxford Instruments, China - Beijing

Floor 1, Building 17,

No.31 Xishiku Street, Xicheng Dist.

Beijing 100034

China

Tel: +86 (0)10 5884 7900

The latest contact details for your local representative can be found on our website andor.oxinst.com/support

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Manufacturers Information

Oxford Instruments Andor

Andor Technology Ltd., Belfast, BT12 7AL, UK.

2.5 Supplied Components

Description		Quantity
	Nitrogen side arm	1

Section 3 - Product Overview

The Nitrogen Side Arm is designed principally to be used with continuous flow cryostats. Continuous flow cryostats do not have an internal reservoir to store a supply of cryogen. Instead, the cryogens are supplied to the cryostat from a separate storage vessel using a LLT Siphon or a Nitrogen Side Arm (NSA). The NSA delivers cryogens directly to the cryostat's heat exchanger which provides the cooling for the cryostat.

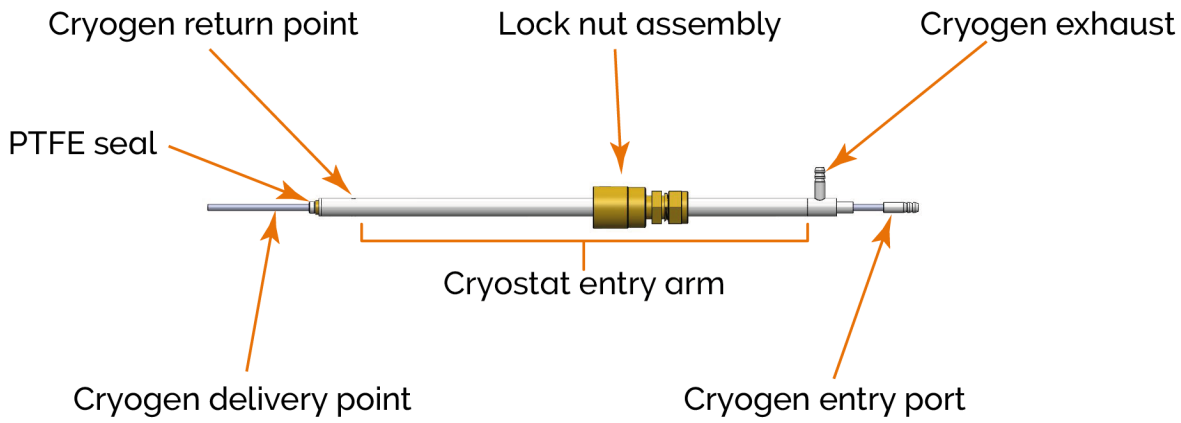


Figure 1:Key features of the Nitrogen side arm.

Warning

The following items are recommended for safe operation of any system:

- **Personal protective equipment, including thermally insulated gloves, face protection, body protection and protective footwear. Cryogens can act like water, soaking into clothing and causing severe burns. See "Personal Safety Equipment" on page 4 for further guidance.**
- **Water can condense on cold surfaces and create puddles, be aware of slip hazards.**
- **The NSA does not have insulation like the cryostat or standard LLT Siphons, it is not advised to touch any part of the NSA with bare skin whilst cooling down, in use or during warm up as it may be at -200°C.**
- **Product not suitable for use with self-pressurised liquid nitrogen dewars.**

Section 4 - Installation

4.1 NSA Adjustment

System cryogen flow should be stopped before connecting the NSA, VCU flow meter and vacuum pump. It is not advised to adjust the NSA locking arrangement (running nut, fixed nut and olive) whilst the pump is running in case nitrogen liquid or gas escapes from the circuit.

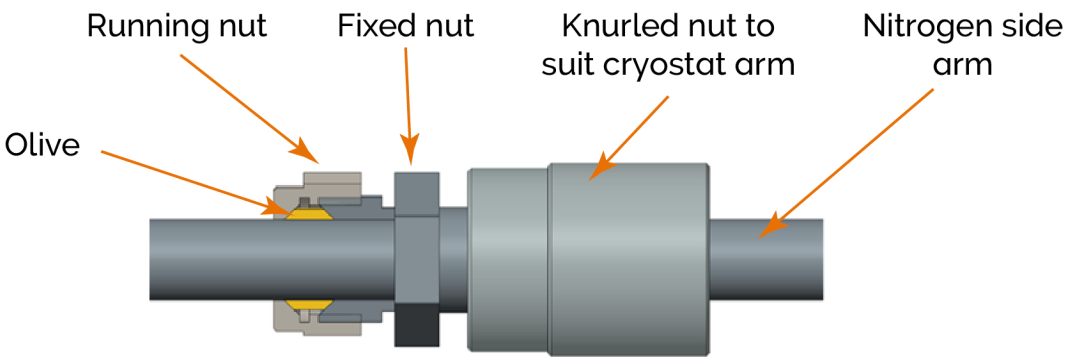


Figure 2:Partial cross section of the NSA locking arrangement.

If the NSA has been supplied with your system the NSA length should be correct. If your NSA has been used with a different system or has not been used on your system before, then adjustment may be required. To change the NSA's cryostat entry arm length, the position of the locking arrangement on the entry arm can be adjusted.

A running nut and olive on the NSA, as shown in"Partial cross section of the NSA locking arrangement." above, allow for adjustment and locking at the required length. This arrangement firmly fixes the knurled nut, that interfaces with the cryostat, in place on the NSA.

The length of the NSA's entry arm is adjusted as follows:

1. Using spanners on the fixed nut and running nut, slacken off the running nut enough so that the assembly can slide freely along the cryostat entry arm.
2. Push the NSA entry arm fully into the cryostat, so that the PTFE seal meets the mating surface inside the cryostat.

3. Screw the knurled nut fully onto the thread on the cryostat, and then unscrew it by two or three turns.
4. Gently push and hold NSA into the cryostat to make sure that the PTFE seal is seated (or the entry arm is pushed as far as possible into the cryostat) and tighten the running nut by hand.
5. Using spanners on the fixed nut and running nut, tighten the running nut to fix the length of the entry arm.
6. Once the length of the entry arm has been set up correctly remove the NSA and see "Integrating NSA in System" below.

4.2 Integrating NSA in System

Caution
Before adding the NSA to the cryostat check that the PTFE seal on the end of the NSA cryostat entry arm is clean, de-greased and undamaged. The position of the PTFE seal is shown in "Key features of the Nitrogen side arm." on page 15

1. Connect tubing to the **cryogen entry port**, this will go to the liquid nitrogen dewar (see "Key features of the Nitrogen side arm." on page 15) Use tubing of internal diameter 1/4", 6.35 mm and a suitable material for cryogenic applications, like fluorocarbons e.g. PTFE or FEP
2. Connect tubing to the **cryogen exhaust port**, this will go to the VCU flow meter. For further details on connecting to the flow meter see individual cryostat manual and VCU flow meter manual.
3. Push cryostat entry arm onto the cryostat, adjust and lock in place by turning the knurled nut, see position in "Partial cross section of the NSA locking arrangement." on the previous page
4. See individual cryostat manual for setting up the other system accessories.

Warning
Failure to use correct tubing material and size may result in injury to personnel. **Ensure that the tubing has been approved for cryogenic use by the manufacturer.** **Tubing may become brittle during operation and should be supported.**

Caution
Do not lift the cryostat system using the NSA, it is not designed to carry the weight of the system and may be damaged.

Section 5 - Operation

Follow the instructions provided in your cryostat manual and ensure you read the section on using the cryostat with nitrogen. The flow rate can be controlled manually with the needle valve on the flowmeter. The NSA does not have a needle valve.

During low temp operation the cryostat entry arm of the NSA will reduce in length, meaning the PTFE ring is no longer creating a tight seal. It may be necessary to tighten the knurled nut on the NSA during operation to ensure the correct flow path is achieved. See "Key features of the Nitrogen side arm." on page 15

Warning

The cryostat siphon arm, the NSA and attached tubing will be very cold (-200°C) only touch whilst wearing appropriate PPE. See "Personal Safety Equipment" on page 4

Care should be taken to not bend tubing whilst it is cold in case of fractures.

5.1 Warming up the System

There is no need to remove the NSA from the system whilst warming up, follow the instructions in your cryostat user guide to warm up the entire system.

If you would like to remove the NSA, the knurled nut must be loosened by one turn whilst the system is still warming up, this is to ensure easy dismantlement once the system has warmed up to room temperature. For next steps please see "Disassembly" on the next page.

5.2 Disassembly

Warning

If the system has been recently used it may still be cold. Ensure appropriate PPE is worn. See "Personal Safety Equipment" on page 4

Disassembly at Room Temperature

If you would like to remove the NSA from the system, the knurled nut must be loosened by one turn whilst the system is still warming up. Once the system is at room temperature unscrew the knurled nut until the NSA can be easily removed.

Disassembly whilst Still Cold

Loosen the knurled nut and then unscrew until the NSA can be easily removed. Set aside in a safe place to warm up and dry.

Note

Please also refer to the full manual for your cryostat available at andor.oxinst.com/downloads

Section 6 - Maintenance

6.1 General Cleaning and Decontamination Information

All stainless-steel surfaces may be cleaned with water or IPA (Isopropyl Alcohol). A mild abrasive may also be used like "Scotchbrite" on matte or unpolished surfaces. All painted surfaces and labels should be cleaned with warm water and soap. No solvents or abrasives should be used.

6.2 Regular Checks

- Do not use equipment that is damaged.
- Check the PTFE seal before use and replace it if it becomes damaged or perished. Replacement PTFE seals can be ordered from the Oxford Instruments e-commerce store.

Section 7 - Troubleshooting

7.1 Blockages in the Nitrogen Side Arm

If the NSA becomes blocked during use, turn off the pump and remove it from the cryostat.

Warning
   **In an extreme case, there may be a sudden pressure rise which blows the rubber tube from the NSA.** **Ensure to position both ports of the NSA so that they are pointing away from yourself and others when following this procedure.**

1. Set the NSA on a desk, and remove the nitrogen inlet connection.
2. Connect a supply of clean room temperature helium gas to the delivery arm end of the NSA with a rubber tube and pressurise it to around 500 mbar.
3. Allow the NSA to naturally warm up, to speed up the process the NSA may be gently warmed up with a hot air gun or fan heater. Focussing the heat on the cryogen entry port and the narrowest section of the entry arm of the cryostat is likely to clear most blockages.
4. Once the NSA is at room temperature the blockage should be cleared. To check that the blockage has gone check that gas can be detected escaping through the cryogen entry port.
5. If constant blockages occur tubing seals may be damaged somewhere, check tubing.

Appendix

The following sections contain information on product specifications, including technical, environmental, mechanical and electrical specifications. In addition, detailed mechanical drawings are presented.

Appendix A: Technical Specifications

	Nitrogen Side Arm
Model compatibility	Optistat CF-X, Optistat CF-V, MicrostatHe, Microstat HeR, Microstat HiRes

Environmental Specifications

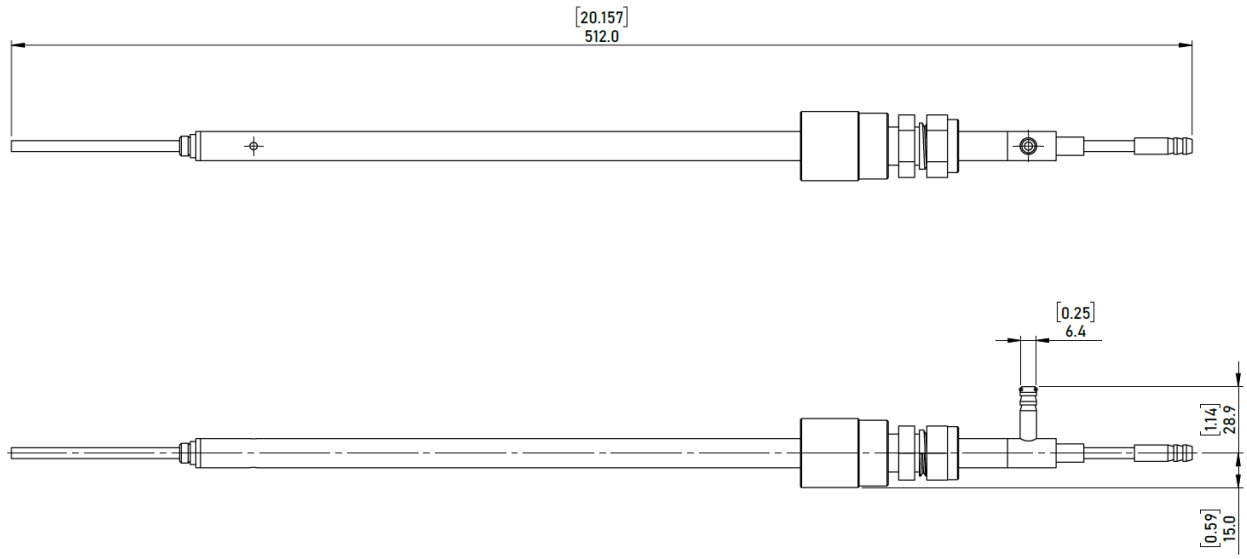
	Nitrogen Side Arm
Location to be used	Indoor use only
Altitude	Up to 2000 m
Operating temperature	0-45°C
Storage temperature	-40 to 70°C
Operating relative humidity	<70% (non-condensing)

Appendix B: Mechanical Specifications

	Nitrogen Side Arm
Weight	0.3 kg
Dimensions	See "Mechanical Drawings" on the next page

Appendix C: Mechanical Drawings

Dimensions cm [inches]



Appendix D: Other Information

Terms and Conditions of Sale and Warranty Information

The terms and conditions of sale, including warranty conditions, will have been made available during the ordering process. The current version for the US is available here, for all other regions (except Japan) please click here.

EU/UK REACH Regulation Statement

Andor's EU/UK REACH Regulation statement is available at the following link.