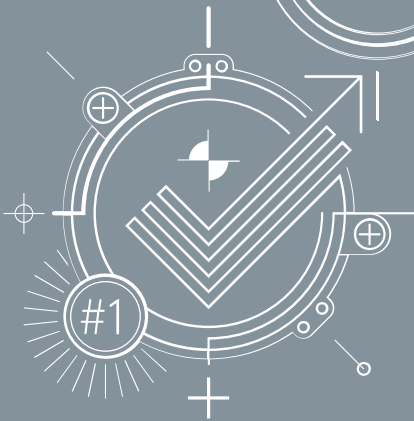




edwardsvacuum.com

On-Board® /S Cryopump

INSTRUCTION MANUAL

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Associated publications

Publication title	Publication number
On-Board® IS Controller Quick Installation Guide	8040726
On-Board® IS Controller with EtherCAT communication Quick Installation Guide	504035
On-Board® IS 1000 Compressor Quick Installation Guide	8040645
On-Board® IS Remote Quick Installation Guide	8040664
On-Board® IS - 2000V Quick Installation Guide	175178
On-Board® IS - 1800 XVS Compressor	501324
On-Board® IS - 1800 XVS Quick Installation Guide	501365
On-Board® IS Cryopump System Operation Manual	8040647
On-Board® IS - 1000 Compressor Installation, Operation, and Maintenance Instructions	8040597
On-Board® IS Command Set Document	8040677
On-Board® IS Controller with EtherCAT communication Overview	504207

Contact us for the Quick Install Guides and Installation/Interface documents of the Cryopump.

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We accept no liability for loss of profit, loss of market or any other indirect or consequential loss whatsoever.

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You must use this product as described in this manual. Read the manual before you install, operate, or maintain the product.

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1. Safety and compliance

For safe operation from the start, read these instructions carefully before you install or commission the equipment and keep them safe for future use. Read all the safety instructions in this section and the rest of this manual carefully and make sure that you obey these instructions.

The instruction manual is an important safety document that we often deliver digitally. It is your responsibility to keep the instruction manual available and visible while working with the equipment. Please download the digital version of the instruction manual for use on your device or print it if a device will not be available.

1.1 Definition of Warnings and Cautions

Important safety information is highlighted as warning and caution instructions which are defined as follows. Different symbols are used according to the type of hazard.

WARNING:

If you do not obey a warning, there is a risk of injury or death.

CAUTION:

If you do not obey a caution, there is a risk of minor injury, damage to equipment, related equipment or process.

NOTICE:

Information about properties or instructions for an action which, if ignored, will cause damage to the equipment.

We reserve the right to change the design and the stated data. The illustrations are not binding.

These safety recommendations are basic guidelines. If the facility where the product is installed has additional safety guidelines they should be followed, along with the applicable national and international safety codes.

1.2 Trained personnel

For the operation of this equipment “trained personnel” are:

- skilled workers with knowledge in the fields of mechanics, electrical engineering, pollution abatement and vacuum technology and
- personnel specially trained for the operation of vacuum pumps

 Note:

The equipment must only be operated and maintained by trained personnel. Contact us for training information.

1.3 Safety Data Sheets (SDS)

The On-Board® IS Cryopump does not expose the user to hazardous materials during normal operation. Materials that are used by service personnel for maintenance may be considered hazardous and the proper Safety Data Sheet is available for those materials.

The facility where the On-Board® IS Cryopump is used is responsible for the maintenance and distribution of each SDS. Make sure that there is a copy of SDS in each workplace for all hazardous materials involved in the operation and maintenance of the On-Board® IS Cryopump.

Read and understand the Safety Data Sheet (SDS) for each material used in relation to the On-Board® IS Cryopumps, refer to <https://www.edwardsvacuum.com/en-us/health-and-safety/safety-data-sheets>.

The following hazardous materials are contained within the On-Board® IS Cryopump:

- Carbon, Granular Activated Coconut Charcoal Shell
- Shot Lead-Antimony.

1.4 Safety symbols

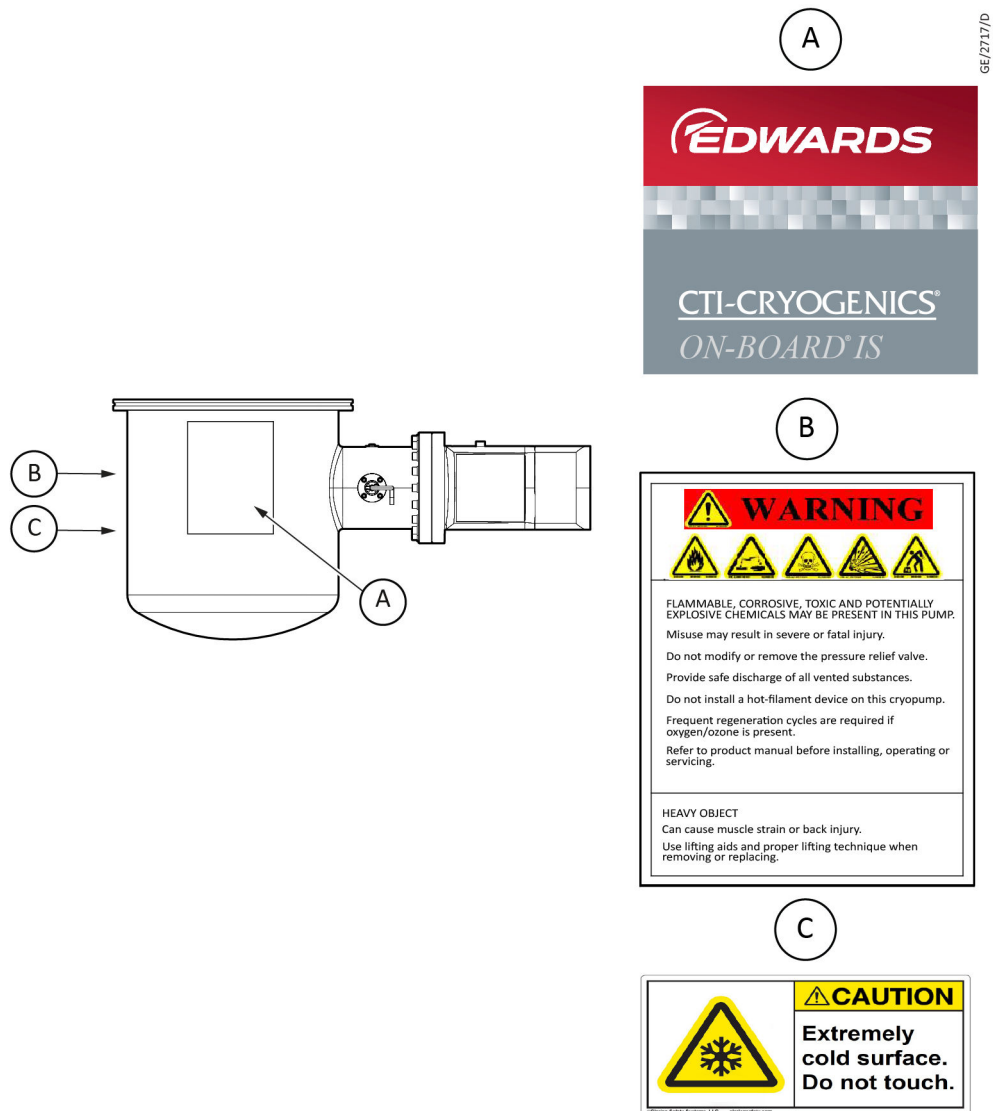
The safety symbols on the products show the areas where care and attention is necessary.

The safety symbols that we use on the product or in the product documentation have the following meanings:

	Warning/Caution Risk of injury and/or damage to equipment. An appropriate safety instruction must be followed or a potential hazard exists.
	Warning - Dangerous voltage Risk of injury. Identifies possible sources of hazardous electrical shock.
	Warning - Flammable material Risk of fire. Identifies possible sources of flammable gases, liquids or materials.
	Warning - Heavy object Risk of injury or damage to equipment. Identifies a possible hazard from a heavy object.
	Warning - Pressurised Risk of injury or damage to equipment. Identifies equipment containing pressurised gases or liquids.
	Warning - Risk of explosion Risk of injury or damage to equipment. Identifies a situation that could result in an explosion.
	Caution - Extremely cold surface There is a risk of cold burns due to cold surface.

1.5 Safety labels and label location

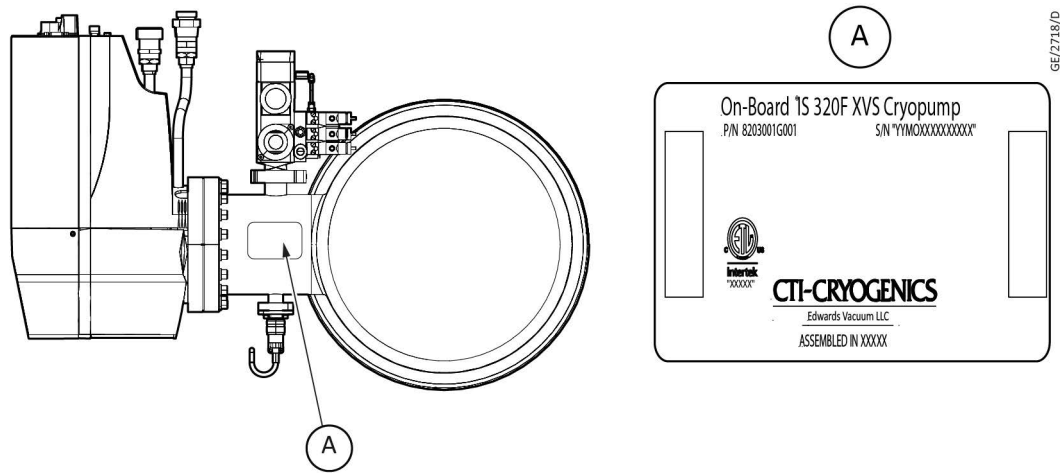
Figure 1 Label location



- A. Product label
C. Caution label (Back side)

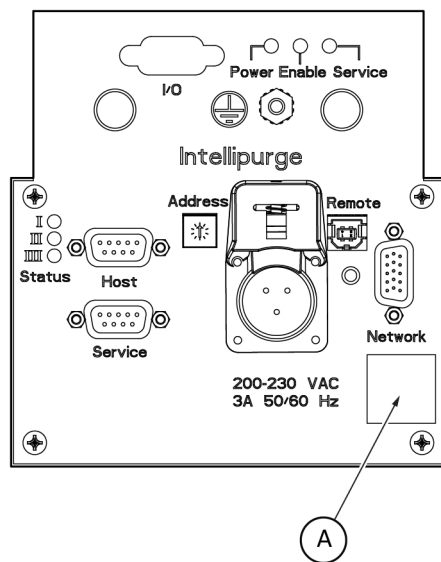
- B. Hazard label (Back side)

Figure 2 Serial number label



A. Serial number label

Figure 3 Attention label



A. Attention label

2. Introduction

The On-Board® IS Cryopump provides fast and clean pumping of all gases in the 10^{-3} to 10^{-9} torr range by condensing gas at low temperatures to achieve low vapor pressures, allowing high pumping speeds and throughputs.

The On-Board® IS Cryopump is highly reliable and requires less maintenance. The cryopump does not expose moving parts, operating fluids, or backing pumps to the vacuum, so there is no possibility of system or process contamination from the cryopump.

Damage resulting from improperly performing a procedure is not covered under warranty or service agreement.

2.1 Installation instructions

The installation instructions for the On-Board® IS Cryopump provides easy accessible information. All personnel with maintenance responsibilities should become familiar with the contents of these instructions to make sure high performance, safe and reliable operation of the cryopump.

2.2 On-Board® IS control system

The On-Board® IS Cryopump control system allows monitoring and control of a wide range of important vacuum system functions. Refer to the On-Board® IS Cryopump system operation guide (publication number - 8040647) supplied with the On-Board® IS Controller for a complete description of the operational functions that are available.

2.3 Remote operation options

The On-Board® IS Cryopump can be controlled remotely with an RS-232 protocol. Multiple cryopumps can be networked to an On-Board® IS Controller. In this configuration, the networked cryopumps are managed as a group by the On-Board® IS Controller, which coordinates group regeneration cycles and provides a standardised communication link to the process tool host computer. The On-Board® IS Controller allows all cryopumps to be addressed by the host system through a single RS-232 port. With this configuration, control of the networked cryopumps can be fully integrated with the process tool control through RS-232 communication.

2.4 Theory of operation

The On-Board® IS Cryopump consists of a refrigerator or cold head, vacuum vessel, electronics, valves, heaters and temperature and pressure sensors to control and monitor the cryopump. See [Figure: On-Board® IS 8F \(flat\) cryopump](#) on page 13, [Figure: On-Board® IS 8 \(straight\) cryopump](#) on page 14, [Figure: On-Board® IS 250F and 250FE cryopump](#) on page 14 and [Figure: On-Board® IS 320F and 320FE cryopump](#) on page 15 shows the On-Board® IS Cryopumps.

Cryopumps operate on the principle that gas molecules encountering a sufficiently cold surface (array) will be condensed and held at an extremely low vapor pressure, effectively trapping the molecules and preventing them from returning to the vacuum

chamber. Gas molecules that travel into a cryopump are condensed or adsorbed on the cryogenically-cooled arrays and thereby are removed or pumped from the vacuum chamber.

The On-Board® IS Cryopump contains two arrays. The first stage array or inlet array normally operates at temperatures between 65 -120 K and is primarily used to pump water vapor.

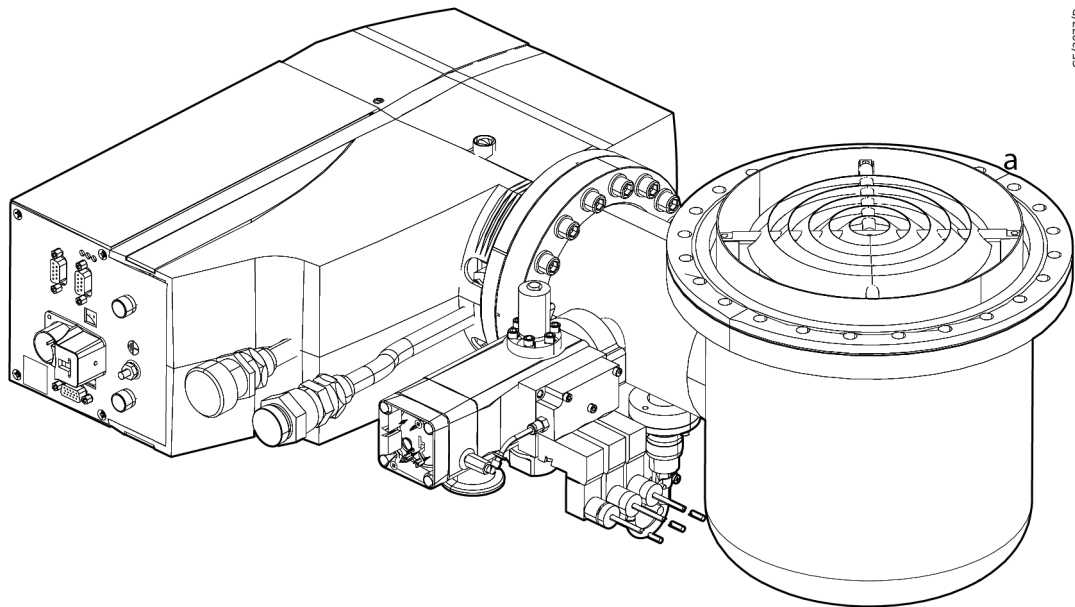
The first stage temperature can be operated outside the normal operating temperature range. Contact us for more information.

The second stage array operates at temperatures between 10-20 K and is used to pump air gases such as nitrogen, argon, and oxygen. Activated charcoal is attached to the second stage array, and is used to cryoadsorb hydrogen, helium, and neon. The cryopump arrays are cooled using a closed cycle, Gifford McMahan refrigeration cycle utilizing compressed gaseous helium as the refrigerant.

Since the cryopump is a capture pump, it requires a regeneration cycle when it reaches capacity. The On-Board® IS Cryopump uses an integrated microprocessor, variable speed motor and heaters to provide a fast and thorough regeneration cycle.

The On-Board® IS Cryopump system consists of the cryopump and a remotely located On-Board® IS compressor which provides the compressed helium. The On-Board® IS compressor can provide helium for multiple cryopumps through helium supply and return lines. The On-Board® IS Controller coordinates all intercomponent network communications. A typical On-Board® IS Cryopump system is shown in [Figure: Typical On-Board® IS cryopump system](#) on page 16.

Figure 4 On-Board® IS 8F (flat) cryopump



GE/2077/D

Figure 5 On-Board® IS 8 (straight) cryopump

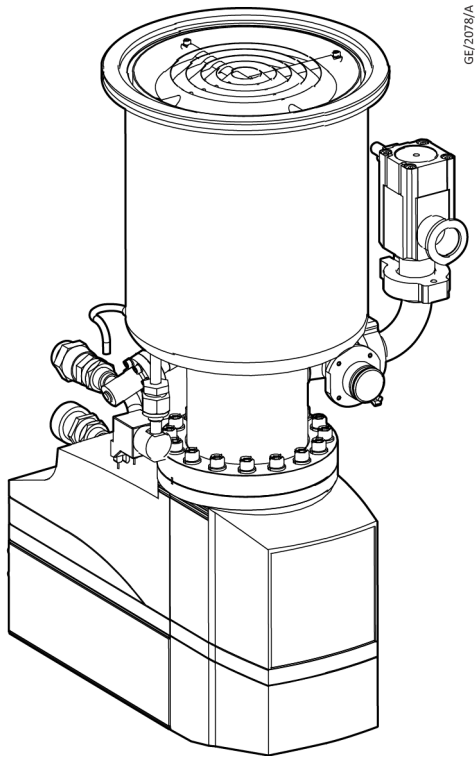


Figure 6 On-Board® IS 250F and 250FE cryopump

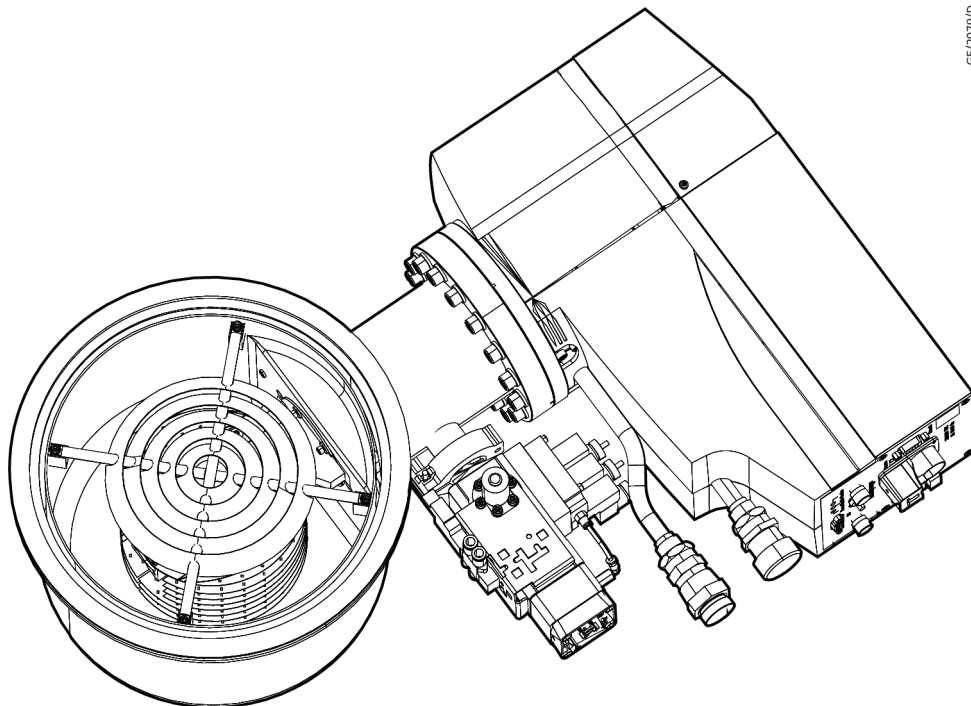
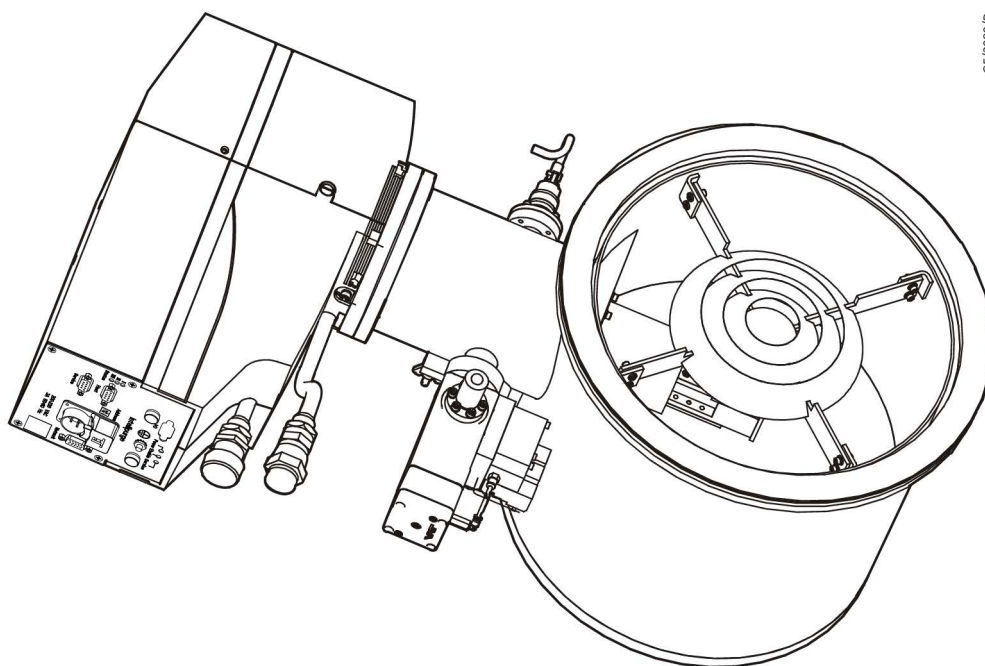
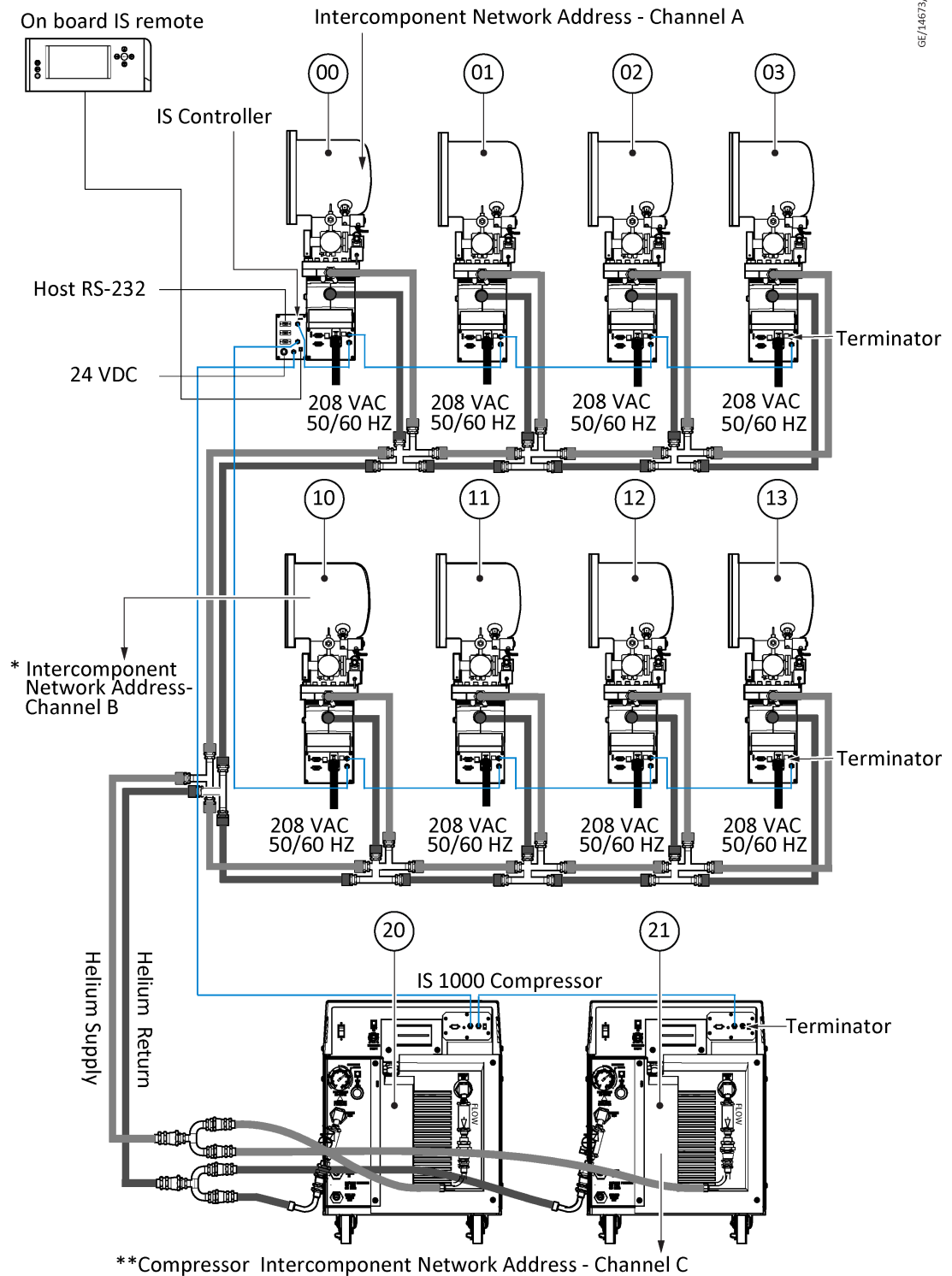


Figure 7 On-Board® IS 320F and 320FE cryopump



GE/2086/D

Figure 8 Typical On-Board® IS cryopump system

GE/14673/A

**If the address is set to 0, it shows as 10 on channel B.*

***If the address is set to 0, it shows as 20 on channel C.*

2.4.1 Cold head

The cold head consists of a motor, helium supply and return valves, first and second stage displacer assembly and a cylinder. The cylinder is a welded stainless steel cylinder

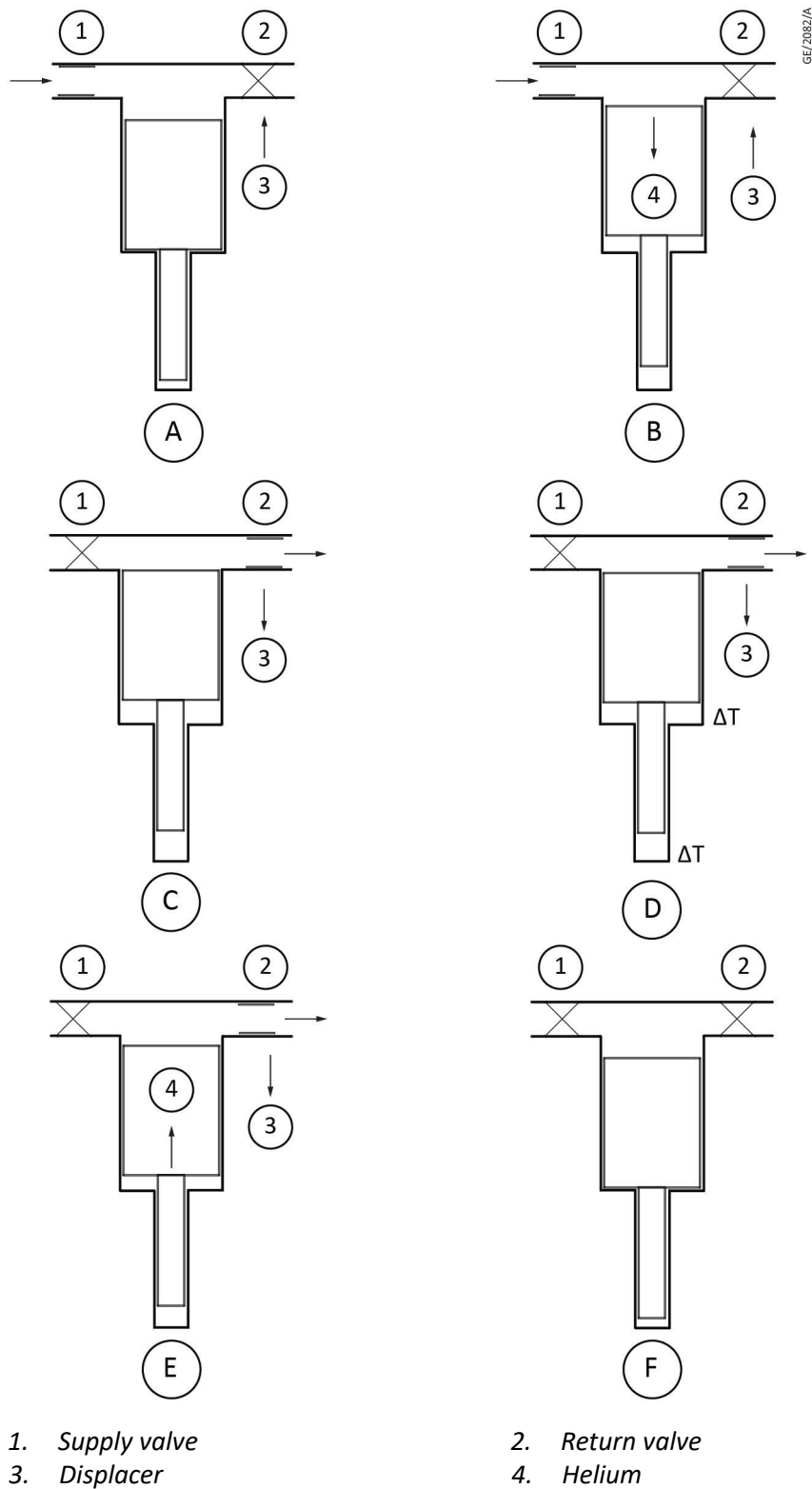
that is installed in the cryopump vacuum vessel. The first and second stage arrays are secured to the cylinder inside the cryopump vacuum vessel.

The displacer assembly is made up of a first and second stage displacer. The displacers are packed with a heat exchange matrix that is used as a thermal reservoir. Each displacer has a seal that causes the helium to flow through the heat exchange matrix inside the displacers rather than between the displacer and the cylinder wall.

Within the cold head, the motor cycles the displacer assembly up and down the cylinder and actuates the helium supply and return valves. The motor is a direct-drive variable-speed motor, operating between 40-144 rpm.

The following steps and [Figure: Gifford McMahan refrigeration cycle](#) on page 18 describe the Gifford McMahan refrigeration cycle:

- A. When the displacer is at the bottom of the cylinder, the helium supply valve opens allowing high pressure helium to fill the cylinder.
- B. As the displacer rises, the helium flows through the matrix in the displacers to the bottom of the cylinder.
- C. When the displacer reaches the top of the cylinder, the supply valve closes and the return valve opens allowing the gas to expand and cool.
- D. The temperature drop in the expanded helium cools the heat stations, cooling the cryopump arrays.
- E. The cooled helium passes out through the return valve, cooling the matrix in the displacers as the displacers move toward the bottom of the cylinder.
- F. Step A to step E are repeated continuously. With each cycle, the incoming helium is pre-cooled by the matrix as it flows through the displacers, providing an additional increment of refrigeration.

Figure 9 Gifford McMahan refrigeration cycle

2.5 Component description

The On-Board® IS Cryopump is driven by a variable speed motor and controlled by an On-Board® IS module. The On-Board® IS module conditions the input power and

provides RS-232 serial communication. The communication protocol and commands are compatible with all On-Board® RS-232 and network commands.

2.5.1 Inlet port

The inlet port is the opening of the vacuum vessel through which process gases enter the cryopump. The inlet port is connected to the vacuum chamber via the gate valve.

2.5.2 Vacuum vessel

The vacuum vessel contains the first and second stage condensing arrays which are cooled to condense process gases.

2.5.3 First stage array

The first stage array is the first condensing array that a process gas molecule comes across within the cryopump. Gases such as water vapor and hydrocarbons are condensed onto the first stage array which operates at 65 to 120 K.

2.5.4 Second stage array

The second stage array condenses gases such as N₂, O₂, Ar, CO₂, and CO and operates at temperatures from 10 to 20 K. Activated charcoal is attached to the second stage array which cryo-adsorbs H₂, He, and Ne.

2.5.5 Cold head

The cold head through the GM cycle generates the cryogenic temperatures.

2.5.6 First and second stage heaters

The first and second stage heaters are mounted to the cold head cylinder, are used to warm the cryopump during a regeneration cycle and help maintain array temperature settings.

2.5.7 Thermocouple (TC) gauge

The TC gauge measures cryopump pressure during a regeneration cycle and sends pressure information to the On-Board® *IS* module.

2.5.8 Diode temperature sensors

The diode temperature sensors are mounted on the first and second stage arrays of the cryopump. The diodes measure the first and second stage array temperatures. Array temperature information is sent to the On-Board® *IS* module.

2.5.9 On-Board® *IS* Cryopump valve operation

The following describes the operation of the valves in the On-Board® *IS* Cryopumps.

Purge valve

The purge valve controls the flow of nitrogen to the cryopump vessel. During a regeneration cycle, the purge valve opens and allows nitrogen to flow through the vessel to dilute and remove the cryopump gases.

Roughing valve

The roughing valve connects to a system rough pump. The rough valve is used during the cryopump regeneration cycle to rough the cryopump to rough vacuum (approximately 50-100 microns) before the cryopump begins to cool down.

Exhaust purge valve

PVD: The exhaust purge valve purges room temperature nitrogen across the O-ring of the cryopump relief valve to prevent the O-ring from getting too cold during regeneration. The exhaust purge valve actuates whenever the cryopump rough valve is actuated.

Implant: The exhaust purge valve suppresses oxygen in the exhaust line during regeneration.

2.5.10 Vacuum vessel pressure-relief exhaust valve

The vacuum vessel pressure-relief exhaust valve is a spring loaded valve which releases process gases during a regeneration cycle. The relief valve opens at approximately 2-3 psi(g).

2.5.11 On-Board® IS Cryopump Multifunction valve operation

The multi function valve combines the functions of the rough valve, pump purge valve, exhaust purge valve, and relief valve. The basic functions as described previously also apply, except that all valves on the Multifunction valve are piloted, and therefore require high pressure air for operation.

2.5.12 Helium supply fitting

The helium supply fitting provides a connection for high pressure compressed helium from the compressor to the cryopump.

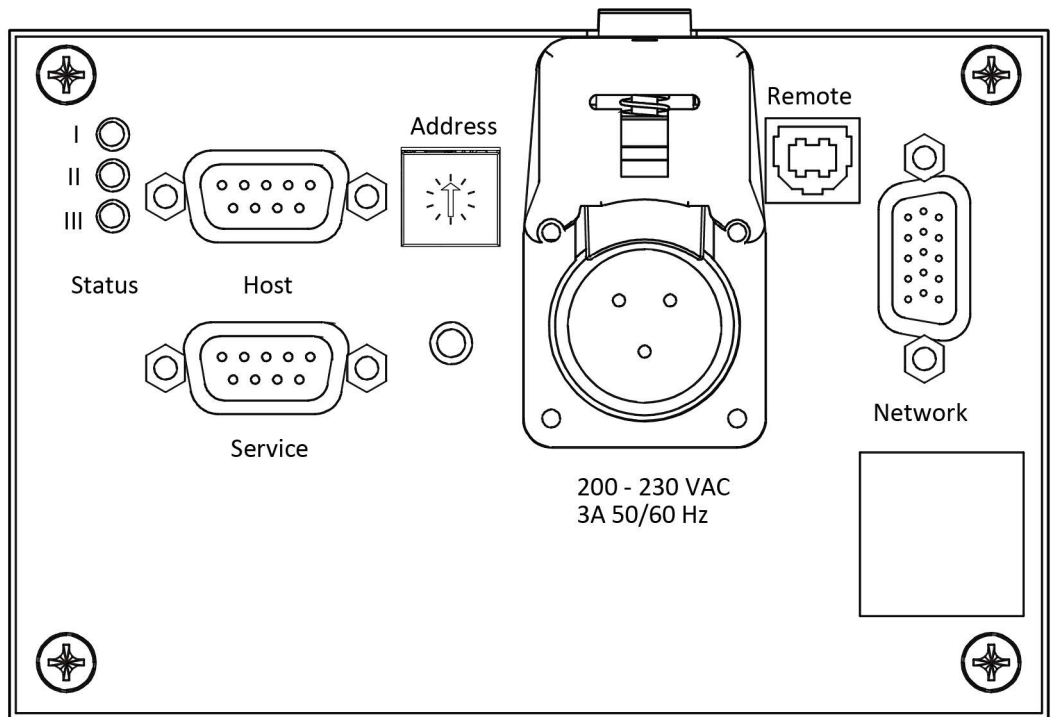
2.5.13 Helium return fitting

The helium return fitting provides a connection to return low pressure helium which has been cycled through the cryopump to the compressor.

2.6 On-Board® IS module

The On-Board® IS module controls the operation and provides status of the On-Board® IS Cryopump. It also includes the RS-232 communication interface for a host computer.

Figure: On-Board® IS module components on page 21 shows the On Board® IS module components.

Figure 10 On-Board® IS module components

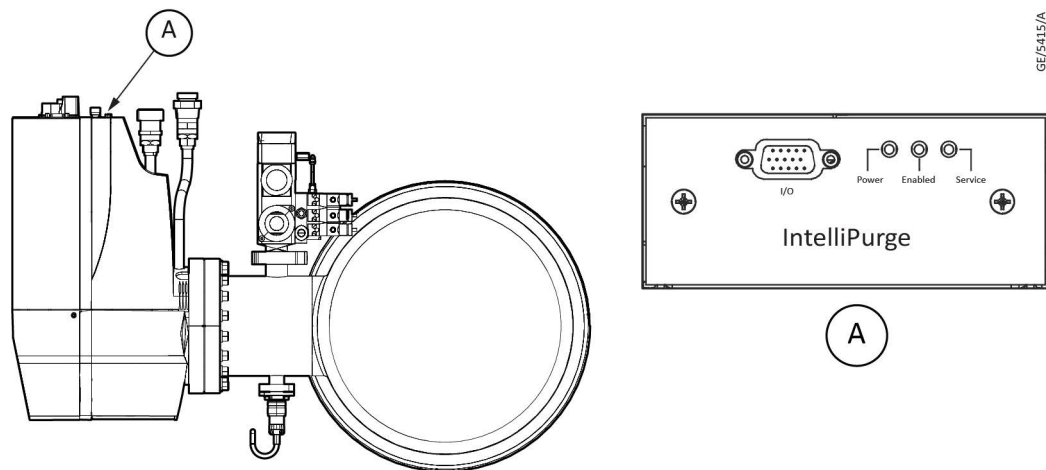
2.7 Status LEDs

The [Table: Status LED description](#) on page 21 provides details for the status LEDs on the On-Board® IS Cryopump module.

Table 1 Status LED description

LED	Purpose	LED States		
		OFF	Amber	Green
I	Cryopump status	Motor OFF	1 st and/or 2 nd stage temperature control is OFF	Motor ON and 1 st and 2 nd stage temperature control ON.
II	Regen status	Normal operation	Fast regeneration cycle in progress	Full regeneration cycle in progress.
III	Network communication status	No network communication	Heater fault interrupt	Blinking LED - normal network communication.

**Second stage temperature control is only available on the implant version of the On-Board® IS Cryopump.*

Figure 11 IntelliPurge plate

GE/5415/A

A. IntelliPurge plate

The [Table: IntelliPurge status LED description](#) on page 22 description provides details for the On-Board® IS Cryopump IntelliPurge.

Table 2 IntelliPurge status LED description

LED	Normal operation	During power fail	Fault
Power LED	Green when unit is powered	Off	Green or Off
Enabled LED	Fully green when unit is fully charged	Fading green as unit discharges	Green or Off
Service LED	Off	Off	Steady red when there is a fault in the redundant circuit. Flashing red when there is a significant component failure. UPS circuit may not work.

2.8 On-Board® IS module components

The following sections describe the control module components on the On-Board® IS Cryopumps.

2.8.1 Host

The host connector allows the On-Board® IS Cryopump to communicate with a host computer using the cryopump command set (refer to On-Board® IS command set document publication - number 8040677). Refer to [Table: RS-232 communication information](#) on page 22 for additional information on the communication protocol.

Table 3 RS-232 communication information

Parameter	Value
Baud rate	9.6 kbps
Data bits	7
Parity	Even
Number of stop bits	1

Note:

The RS-232 communication cable part number 8132157-TX or equivalent.

2.8.2 Service

The service RS-232 port allows cryogenics service personnel to connect diagnostic equipment to On-Board® IS Cryopump.

2.8.3 Address selector switch

The address selector switch establishes the network address (0 - 9) of the On-Board® IS Cryopump on the intercomponent network. Use On-Board® IS Controller channel B for pumps 10-19.

2.8.4 Input power

The input power connector allows 208 VAC to be connected directly to the On-Board® IS Cryopump.

2.8.5 Remote

The remote connector allows a remote keypad/display to be connected to the On-Board® IS Cryopump.

2.8.6 Network

The network connectors allow the On-Board® IS Cryopump to be connected to the intercomponent network.

3. Technical data

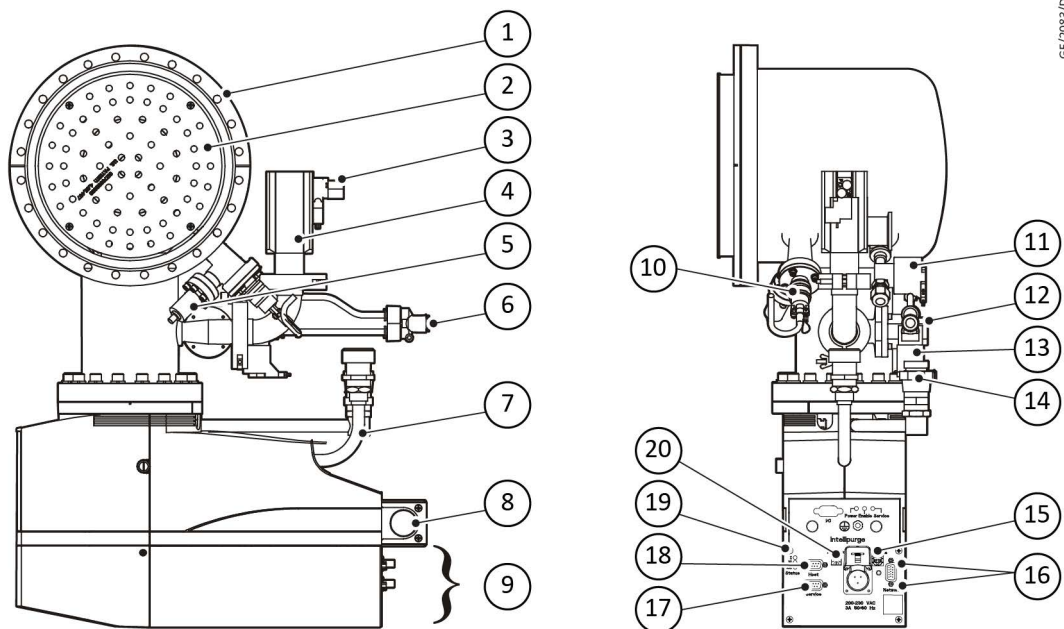
The following tables provide technical data for certain pumps. Contact us or visit our website for information on On-Board® IS pumps not included in this manual.

3.1 Component location and facility requirements

This section includes examples of typical cryopump configurations. See the Installation/Interface diagram for details of your specific cryopump.

3.1.1 On-Board® IS 8F Cryopump component location and facility requirements

Figure 12 On-Board® IS 8F Cryopump component identification

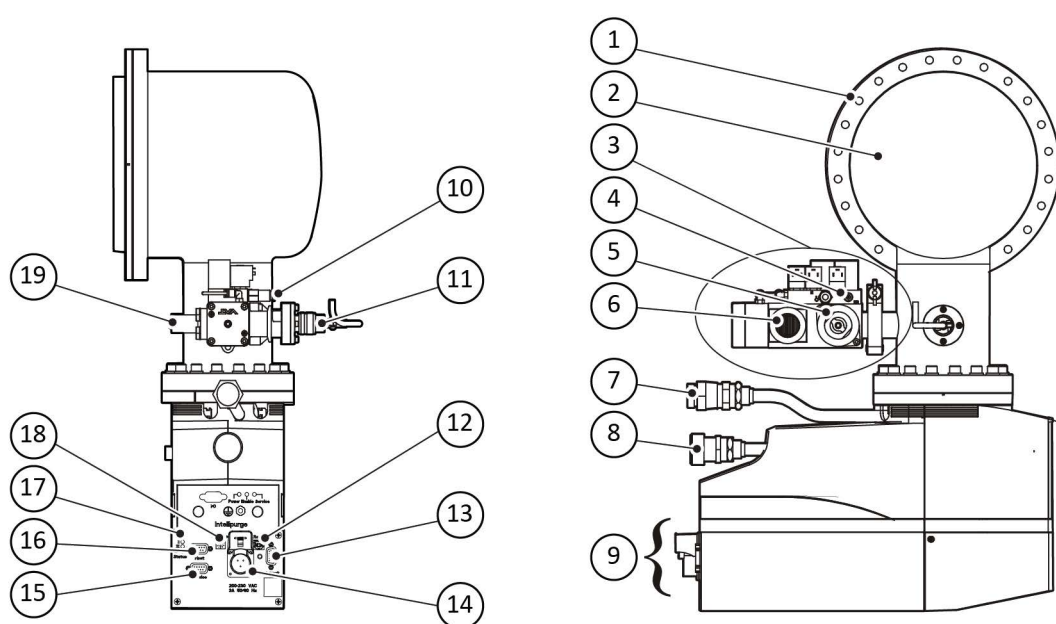


Sr.no	Component name	Facility requirement or specification	
1	Vacuum vessel mounting flange	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
2	Cold throttle plate (covers first stage array)	N/A	
3	Roughing valve pilot	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
4	Roughing valve	NW-25 ISO KF flange	10 cfm
5	TC gauge	N/A	
6	Pump purge valve and exhaust purge valve nitrogen connection	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
7	Helium return fitting	See Figure: Helium supply and return fitting connections on page 39.	

Sr.no	Component name	Facility requirement or specification	
8	Module power	208 VAC (range: 180 - 253 VAC) 5 A 50/60 Hz	Single phase Also see Figure: On-Board® IS module components on page 21.
9	Communication module	N/A	
10	Diode connector	N/A	
11	Pump purge valve	See Figure: On-Board® IS 8F Cryopump component identification on page 24	
12	Pressure relief valve adapter	1/2" female NPT (for pressure relief valve, internal component)	
13	Exhaust purge valve	See Figure: On-Board® IS 8F Cryopump component identification on page 24	
14	Helium supply fitting	See Figure: Helium supply and return fitting connections on page 39	
15	On-Board® IS remote connector	See Figure: On-Board® IS module components on page 21	
16	Intercomponent network connectors		
17	Service (RS-232) connector		
18	Host (RS-232) connector		
19	Status LEDs		
20	Address switch		

3.1.2 On-Board® IS 8F Cryopump, with the Multifunction valve, component location and facility requirements

Figure 13 On-Board® IS 8F Cryopump, with the Multifunction valve, component identification

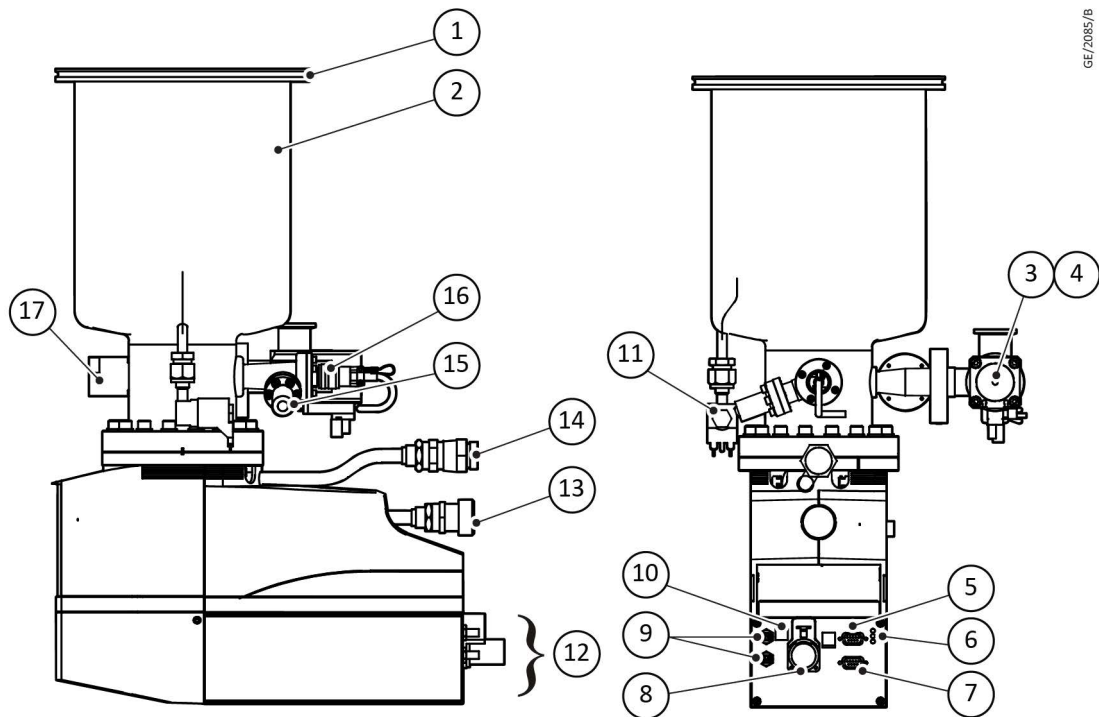


Sr.no	Component name	Facility requirement or specification	
1	Vacuum vessel mounting flange	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
2	First stage array (visible on the front)	N/A	
3	*Multifunction valve pilot	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
4	*Pump purge valve and exhaust purge valve nitrogen connection	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
5	*Pressure relief valve adapter	1/2" female NPT (for pressure relief valve, internal component)	
6	*Roughing valve	NW-25 ISO KF flange 10 cfm	
7	Helium supply fitting	See Figure: Helium supply and return fitting connections on page 39	
8	Helium return fitting		
9	Communication module	N/A	
10	Multifunction valve		
11	Diode connector		
12	On-Board® IS remote connector	See Figure: On-Board® IS module components on page 21	
13	Intercomponent network connectors		
14	Module power connector/module interlock	208 VAC (range: 180 - 253 VAC) 5 amps	50/60 Hz Single phase. Also see Figure: On-Board® IS module components on page 21
15	Service (RS-232) connector	See Figure: On-Board® IS module components on page 21	
16	Host (RS-232) connector		
17	Address switch		
18	Status LEDs		
19	*TC gauge	N/A	
	*Pump purge valve (not shown)	See Figure: On-Board® IS 8F Cryopump, with the Multifunction valve, component identification on page 25.	
	*Exhaust purge valve (not shown)		

* Part of Multifunction valve.

3.1.3 On-Board® IS 8 Cryopump component location and facility requirements

Figure 14 On-Board® IS straight 8 Cryopump component identification



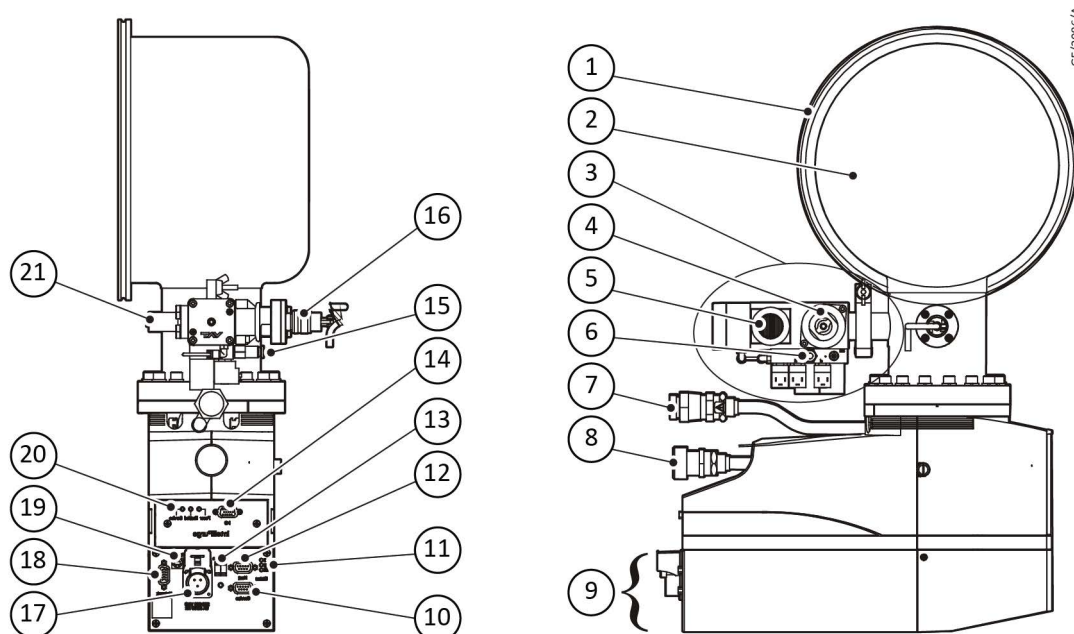
GE/2085/B

Sr.no	Component name	Facility requirement or specification	
1	Vacuum vessel mounting flange	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
2	Vacuum vessel	N/A	
3	Roughing valve	N/NW-25 ISO KF flange	10 cfm
4	Roughing valve pilot	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
5	Address switches	See Figure: On-Board® IS module components on page 21	
6	Status LEDs		
7	Host (RS-232) connector		
8	Module power connector/ module interlock	208 VAC (range: 180 - 253 VAC) 5 amps	50/60 Hz single phase. Also see Figure: On-Board® IS module components on page 21
9	Intercomponent network connectors	See Figure: On-Board® IS module components on page 21	
10	On-Board® IS remote connector		
11	Pump purge valve	Contact us for the installation/interface drawing. Refer to Technical support on page 3	
12	Communication module	N/A	

Sr.no	Component name	Facility requirement or specification
13	Helium return fitting	See Figure: Helium supply and return fitting connections on page 39.
14	Helium supply fitting	
15	TC gauge	N/A
16	Diode connector	
17	Pressure relief valve adapter	1/2" female NPT (for pressure relief valve, internal component)
18	Service (RS-232) connector (not shown)	See Figure: On-Board® IS module components on page 21

3.1.4 On-Board® IS 250F & 320F pump configurations Cryopump component location and facility requirements

Figure 15 On-Board® IS 250F and 320F component identification



Sr.no	Component name	Facility requirement or specification
1	Vacuum vessel mounting flange	Contact us for the installation/interface drawing. Refer to Technical support on page 3
2	First stage array (visible on the front)	N/A
3	Multifunction valve	N/A
4	*Pressure relief valve adapter	1/2" Female NPT (for pressure relief valve, internal component)
5	*Roughing valve	NW-25 ISO KF flange 17 - 20 cfm
6	*Pump purge valve and exhaust purge valve nitrogen connection	Contact us for the installation/interface drawing. Refer to Technical support on page 3
7	Helium return fitting	See Figure: Helium supply and return fitting connections on page 39.

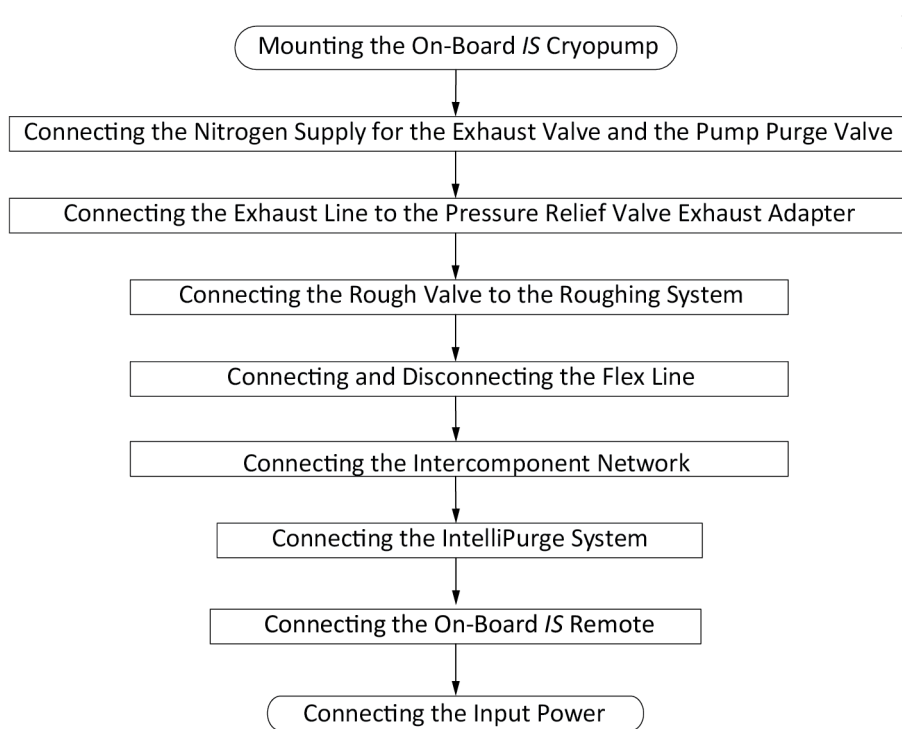
Sr.no	Component name	Facility requirement or specification
8	Helium supply fitting	See Figure: Helium supply and return fitting connections on page 39.
9	Communication module	N/A
10	Host	See Figure: On-Board® IS module components on page 21
11	Status LEDs	
12	Service (RS-232) connector	
13	Address switch	
14	IntelliPurge I/O connection	High-density DB-15. See Table: IntelliPurge pin descriptions on page 42 for pin descriptions.
	*Pump purge valve (not shown)	See Figure: On-Board® IS 250F and 320F component identification on page 28
	*Exhaust purge valve (not shown)	
15	*Multifunction valve pilot	Contact us for the installation/interface drawing. Refer to Technical support on page 3
16	Diode connector	N/A
17	Module power connector/module interlock	208 VAC (range: 180 - 253 VAC) 5 amps
18	Intercomponent network connectors	See Figure: On-Board® IS module components on page 21
19	On-Board® IS remote connector	
20	IntelliPurge LEDs	See Figure: On-Board® IS module components on page 21
21	*TC gauge	N/A

* Part of Multifunction valve.

4. Installation

The flowchart in [Figure: On-Board® IS Cryopump installation process](#) on page 30 shows the On-Board® IS Cryopump installation process, which is explained in this chapter. An On-Board® IS 8F pump is used as an example in this section but the steps apply to all On-Board® IS model pumps. Refer to the pump specific installation/interface drawing to determine which steps are appropriate.

Figure 16 On-Board® IS Cryopump installation process



4.1 Mount the On-Board® IS Cryopump



WARNING: HEAVY OBJECT

Risk of injury. The cryopump is a heavy machine. Failure to take the proper precautions before you move this cryopump could result in personal injury. Use correct procedure to move heavy equipment.

The On-Board® IS Cryopump can be installed on the vacuum system Hi-Vac valve flange in any orientation without affecting its performance.

The OEM customer is responsible for seismic considerations as per SEMI S2 recommendation for integration of the cryopump to the vacuum chamber. Centre of gravity, dimensions and weight of the cryopump models are given in installation interface drawings. Contact us for specific cryopump model drawings.

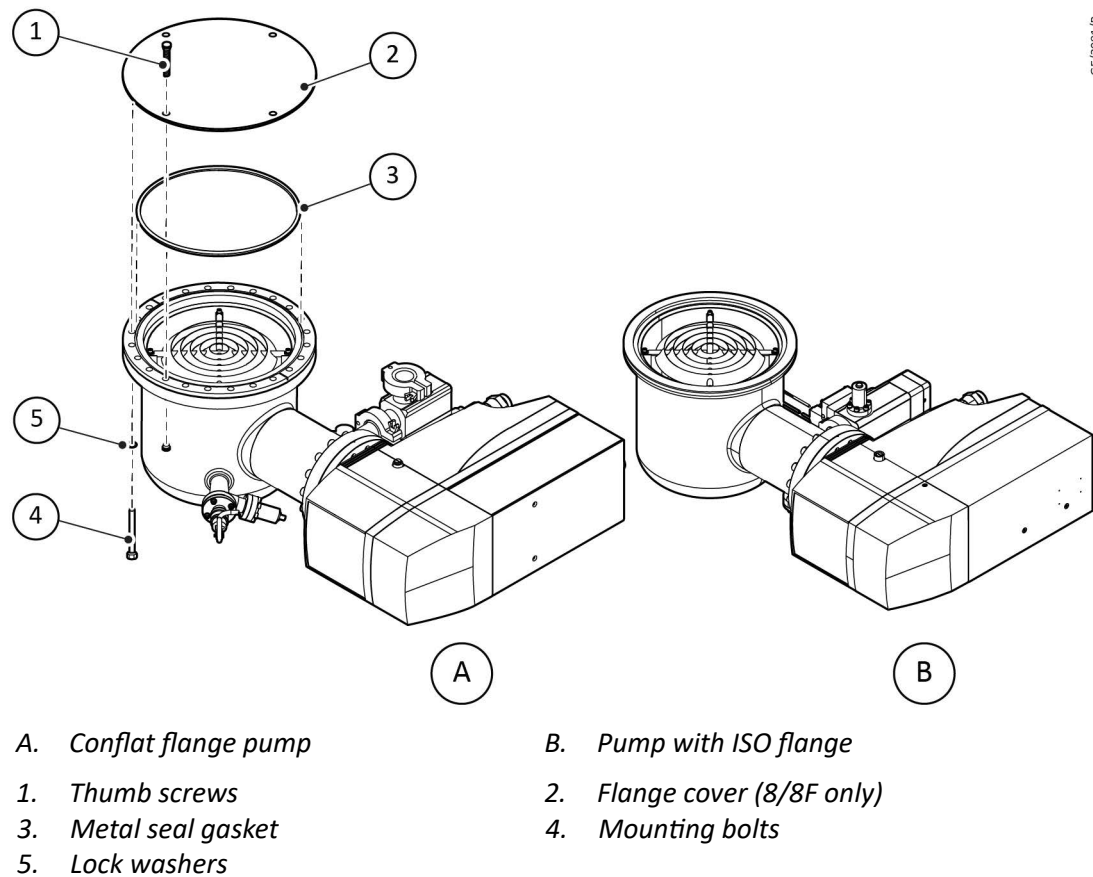
Before you mount the On-Board® IS Cryopump to the vacuum system, a high-vacuum isolation valve (Hi-Vac valve) should be installed between the On-Board® IS Cryopump

and the vacuum chamber to isolate the On-Board® IS Cryopump from the chamber during rough pumping, cooldown, and regeneration.

Install the On-Board® IS Cryopump on the vacuum system flange as shown in [Figure: On-Board® IS Cryopump and metal seal gasket installation \(8F cryopump\)](#) on page 31 and as follows:

1. Remove the protective cover from the vacuum vessel mounting flange of the On-Board® IS Cryopump.
2. Clean all sealing surfaces and install the metal seal gasket, centering ring (not shown), or O-ring.
3. Mount the On-Board® IS Cryopump on the Hi-Vac valve or vacuum chamber mounting flange.
4. Install all claw clamps (not shown) or mounting bolts and lock washers.
5. Tighten the mounting bolts to mounting flange specifications.

Figure 17 On-Board® IS Cryopump and metal seal gasket installation (8F cryopump)



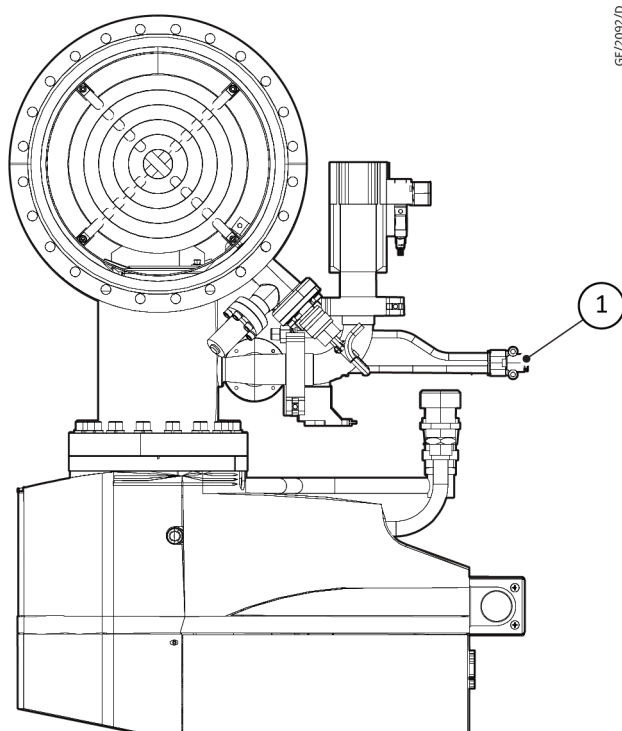
GE/20591/B

4.2 Connecting the nitrogen supply for the exhaust valve and the pump purge valve

Cryopumps create a vacuum by condensing and capturing gases, but the cryopumps have a finite capacity. Periodically they must be defrosted (regenerated) to restore full performance. A pressure relief valve on the cryopump vents the gases that are released during regeneration.

1. Connect the tubing to the nitrogen purge connection as shown in [Figure: Nitrogen connection](#) on page 32. See [Component location and facility requirements](#) on page 24 for component locations and facility requirements for each cryopump.
2. Adjust the nitrogen supply pressure regulator according to the specifications given in [Component location and facility requirements](#) on page 24.

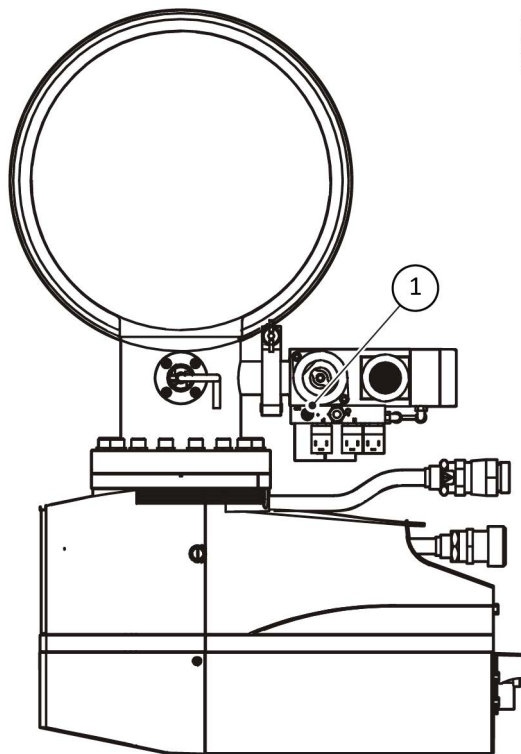
Figure 18 Nitrogen connection



1. Purge connection

Note:

Confirm the nitrogen pressure setting.

Figure 19 Nitrogen connection for the Multifunction valve

GE/2093/A

1. Purge connection

4.3 Connect to the pressure relief valve and exhaust system



WARNING: TOXIC, CORROSIVE, OR FLAMMABLE GAS

Risk of injury. To prevent personal injury, over pressurization, and equipment damage, connect an exhaust system vent line to the On-Board® IS Cryopump pressure relief valve before pumping toxic, corrosive, or flammable gases.



WARNING: IGNITION HAZARD

Risk of burn. To prevent flammable gas ignition, do not install a hot filament type vacuum gauge on the high vacuum side of the isolation valve.



WARNING: OZONE EXPLOSION HAZARD

Risk of explosion. To prevent explosions, be aware of ozone as a by-product of an oxygen process, and take the appropriate precautions.



WARNING: PRESSURE RELIEF VALVE OPERATION

Risk of explosion. To avoid over pressurization, equipment damage, and improper pressure relief valve operation, make sure that the 1.30 inch diameter x 1.38 inch long volume around the pressure relief valve remains unobstructed.





WARNING: EXHAUST GAS SYSTEM REQUIREMENTS

Risk of explosion. To avoid over pressurization and equipment damage, make sure that the exhaust gas system vent line has a minimum inside diameter of 1/2 inch. During regeneration, the exhaust system must be able to maintain a peak gas flow of 8 SCFM per cryopump.

Use the following precautions with toxic, corrosive, or flammable gases:

- Obey all local, state, and national codes.
- Always vent to a safe location using an inert purge gas.
- Perform inert gas purge regeneration at flow rates recommended for cryopumps.

See [Figure: Pressure relief valve exhaust connection](#) on page 35 for the exhaust gas adapter supplied by us for some pump configurations.

Do not use the cryopumps for oxygen applications where ozone is generated as a by-product of the process.

During certain processes, the generation of ozone through the ionization of oxygen can create an unsafe condition when using cryopumps. During the regeneration process ozone captured in the cryopump becomes very unstable when heated.

Note:

Changes in process can result in generation of ozone.

If you are running oxygen applications such as:

- Electron-beam deposition
- Sputtering
- Etch
- Glow discharge

Ozone may be present if the following occurs:

- You hear crackling and popping sounds, such as in electrical arcing, within the first few minutes of regeneration.
- You smell a gas similar to that in arc welding or during an electrical storm.

Use the following precautions in the area that can contain ozone:

- Reduce the oxygen flow rate to the lowest level allowed in the process.
- Shorten the time between regenerations. You may need to perform regeneration daily. Contact us for assistance.
- Obey all precautions for toxic, corrosive or flammable gas.

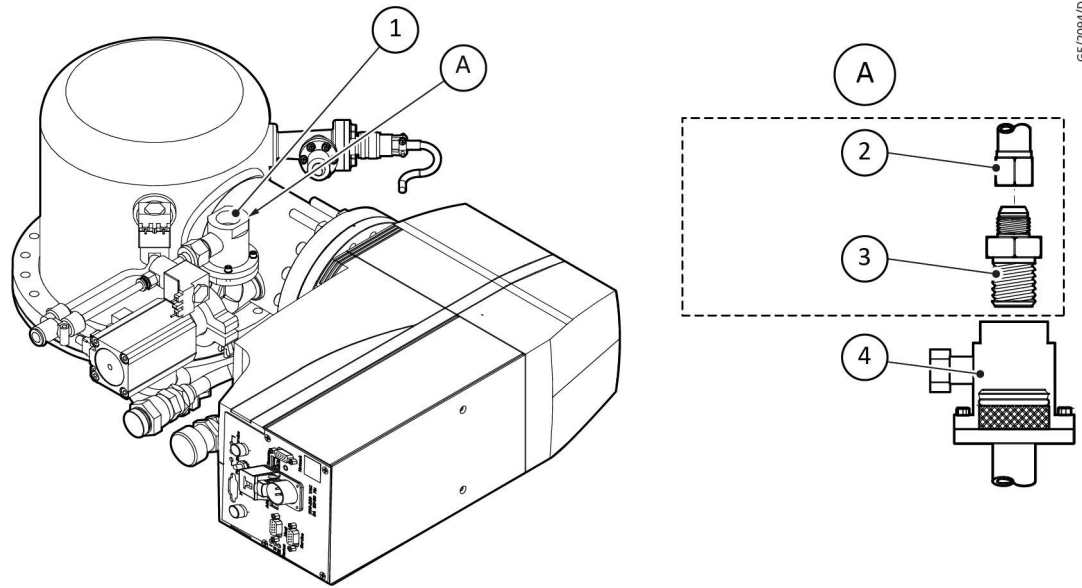
During regeneration, the exhaust system must be able to maintain a peak gas flow of 8 SCFM per cryopump.

For example: if 4 cryopumps are regenerated together, then the peak gas flow requirement is 32 SCFM. Refer [Figure: Pressure relief valve exhaust connection](#) on page 35.

1. Install a customer supplied 1/2 inch x 14 NPTF tube adapter in the exhaust gas adapter.

2. Connect a customer supplied 1/2 inch exhaust system vent line to the tube adapter fitting.

Figure 20 Pressure relief valve exhaust connection

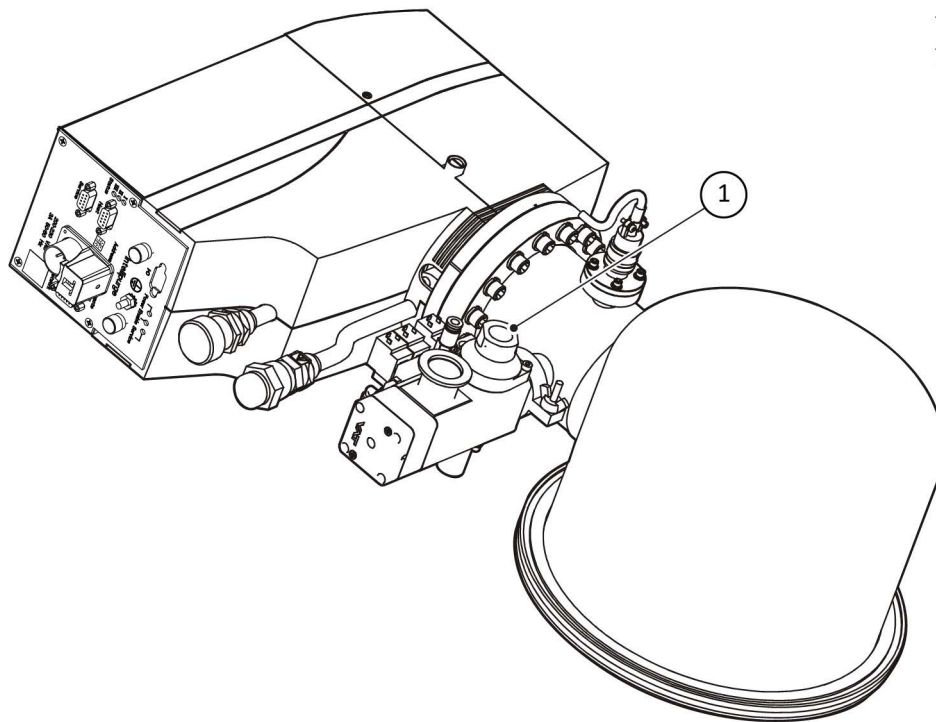


- | | |
|--------------------------------|------------------------|
| 1. 1/2 inch x 14 NPT connector | 2. 1/2 inch vent line |
| 3. 1/2 inch x 14 NPT connector | 4. Exhaust gas adapter |

Note:

"1/2 inch vent line" and "1/2 inch x 14 NPT connector" are customer supplied.

Figure 21 Pressure relief valve exhaust connection for the Multifunction valve



1. 1/2 inch female NPT connector

4.4 Connect the roughing system

Note:

The roughing system must provide 10 cfm (8, 8F) or 17 to 20 cfm (250, 320) to utilize FastRegen capability.

Connect your On-Board® IS Cryopump to a roughing pump system using a roughing line with the largest inside diameter possible to minimize the roughing time required during start-up procedures prior to normal operation. The roughing pump should have a blank-off pressure of less than 20 microns.

Refer [Figure: Roughing system connections](#) on page 36 for all roughing system connections. Connect the roughing system as follows:

1. Remove the clamp and blank-off from the On-Board® IS Cryopump roughing system connection.
2. Connect the roughing system line to the On-Board® IS Cryopump roughing valve using the clamp provided. Tighten the clamp.
3. Attach the high pressure air or nitrogen to the roughing valve pilot or multi-function valve pilot connection point.

Figure 22 Roughing system connections

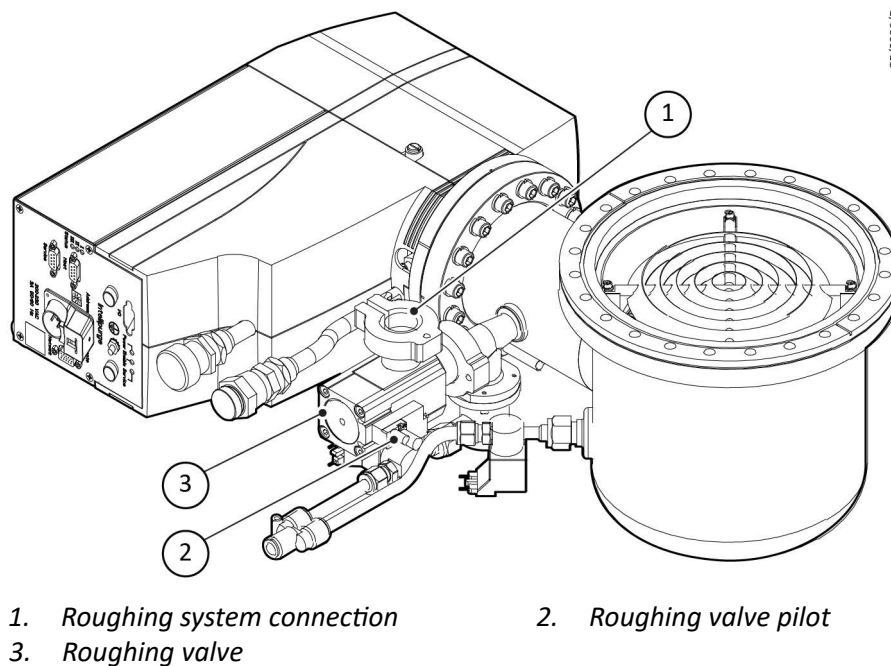
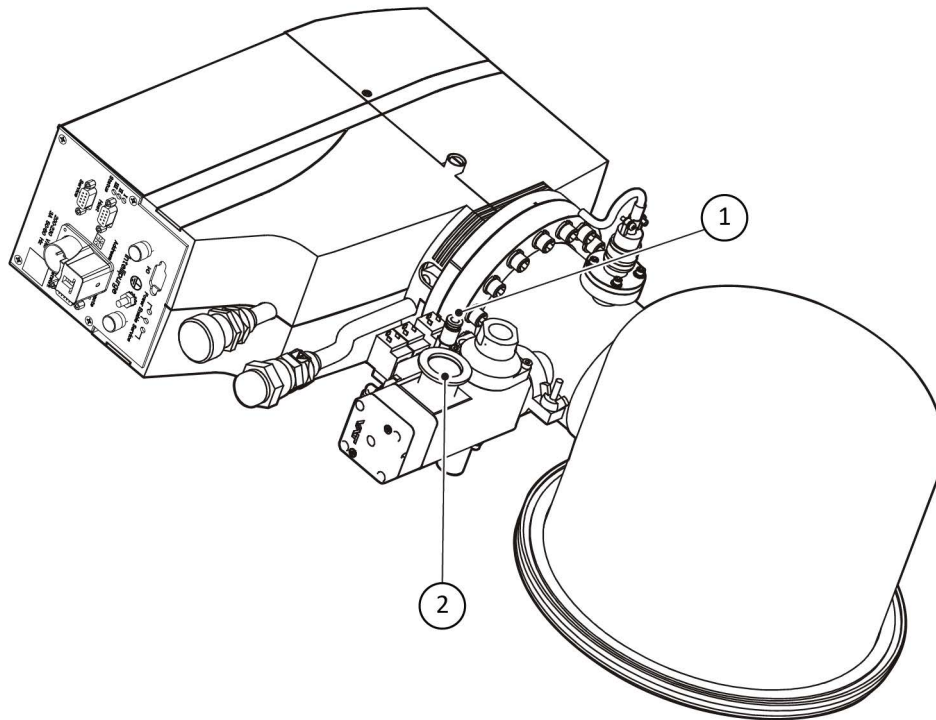


Figure 23 Roughing system connections through the Multifunction valve

1. Multifunction valve pilot

2. Roughing system connection

4.5 Connect and disconnect the helium flex line

CAUTION: EQUIPMENT DAMAGE



Risk of damage to the equipment. Make sure the helium flex lines are connected and disconnected from the cryopump appropriately, and as shown in [Figure: Connect and disconnect helium flex line self sealing couplings](#) on page 38. Failure to follow this procedure could damage connector O-ring seals or cause a helium circuit leak.

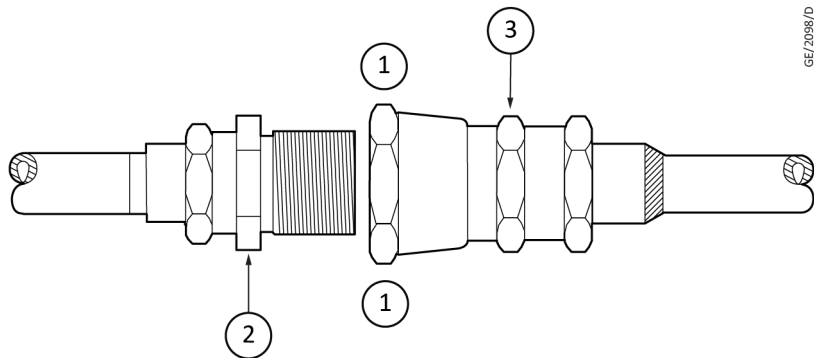
CAUTION: COMPRESSOR DAMAGE



Risk of damage to the equipment. To avoid damage to the compressor, do not connect multiple compressors to a single helium manifold that feeds a common supply and return header. If it becomes necessary to make this connection, contact us.

Note:

The number of On-Board® IS Cryopumps connected to a compressor varies based upon the On-Board® IS Cryopump models used. Contact us for more information on specific compressor/pump applications.

Figure 24 Connect and disconnect helium flex line self sealing couplings

1. Turn with 1 3/16 inch wrench
2. Hold with 1 1/8 inch wrench
3. Hold with 1 inch wrench

4.5.1 Connect the helium flex line

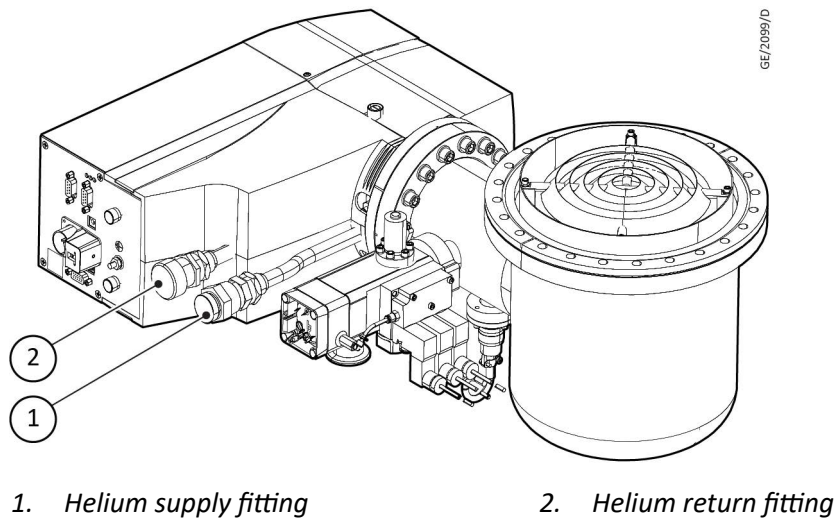


WARNING: HIGH GAS PRESSURE

Risk of injury. Flex lines are high pressure gas lines.

Refer to [Figure: Connect and disconnect helium flex line self sealing couplings](#) on page 38 and [Figure: Helium supply and return fitting connections](#) on page 39 and do the procedure as follows:

1. Remove all dust plugs and caps from the gas supply and return lines, and the compressor and cryopump supply and return connectors. Check for the presence of a flat gasket in the male connector, and no gasket in the female connector.
2. Connect the gas return line to the gas return connector on the rear of the compressor and then to the gas return connector on the On-Board® IS Cryopump or helium manifold. Using two wrenches as shown in [Figure: Connect and disconnect helium flex line self sealing couplings](#) on page 38, tighten the connector.
3. Connect the gas supply line to the gas supply connector on the rear of the compressor and then to the gas supply connector on the On-Board® IS Cryopump or helium manifold. Using two wrenches as shown in [Figure: Connect and disconnect helium flex line self sealing couplings](#) on page 38, tighten the connector.
4. Attach the supply and return line identification labels to each end of the appropriate lines.
5. Refer to appropriate compressor manual to verify proper system ("OFF" condition) helium charge pressure.

Figure 25 Helium supply and return fitting connections

4.5.2 Disconnect the helium flex line

Refer to [Figure: Connect and disconnect helium flex line self sealing couplings](#) on page 38 and [Figure: Helium supply and return fitting connections](#) on page 39 and do the procedure as follows:

1. Using two wrenches as shown in [Figure: Connect and disconnect helium flex line self sealing couplings](#) on page 38, disconnect the two self sealing coupling connectors quickly to minimize helium leakage.
2. Disconnect the helium supply line from the cryopump supply connector first, then disconnect the line from the compressor supply connector.
3. Disconnect the helium return line from the cryopump return connector, then disconnect the line from the compressor return connector.

4.6 Connect input power to the On-Board® IS module equipped with connector



WARNING: DANGEROUS VOLTAGE

Risk of electric shock. High voltage electric shock could cause severe injury or loss of life. To avoid high voltage electric shock, make sure that the On-Board® IS Cryopump power cable is connected to a 208 VAC, single-phase 5 Amp source, and that you follow all appropriate electrical code requirements.

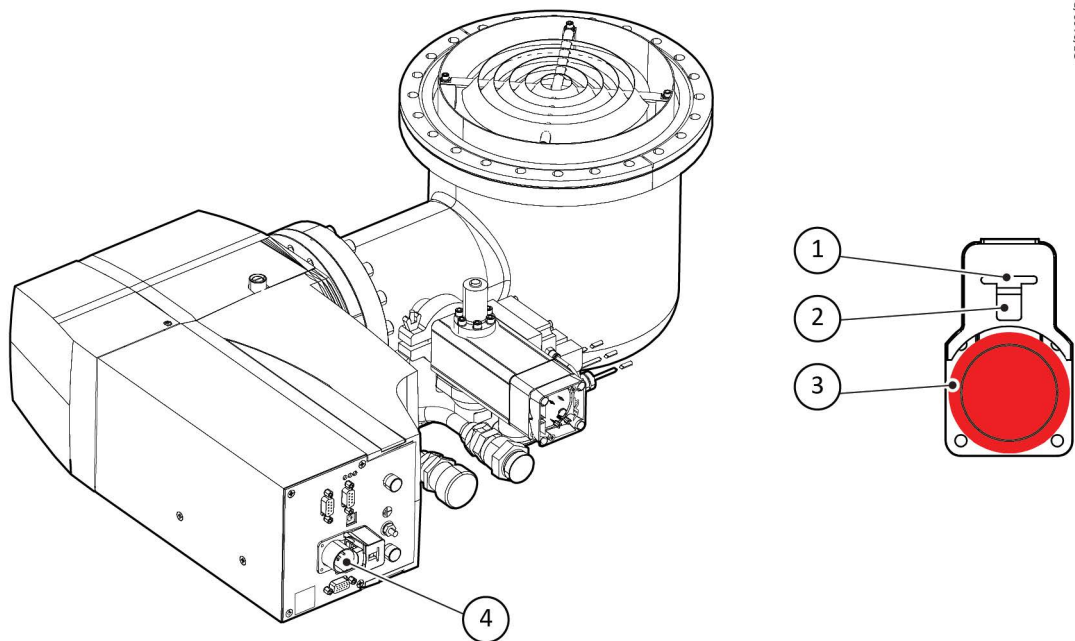


WARNING: CRUSH HAZARD AND EQUIPMENT DAMAGE

Risk of injury. To avoid dropping the On-Board® IS module, do not move the power cable clamp until you are ready to connect the power cord to the On-Board® IS Cryopump. The power cable clamp assists in securing the On-Board® IS module to the pump.

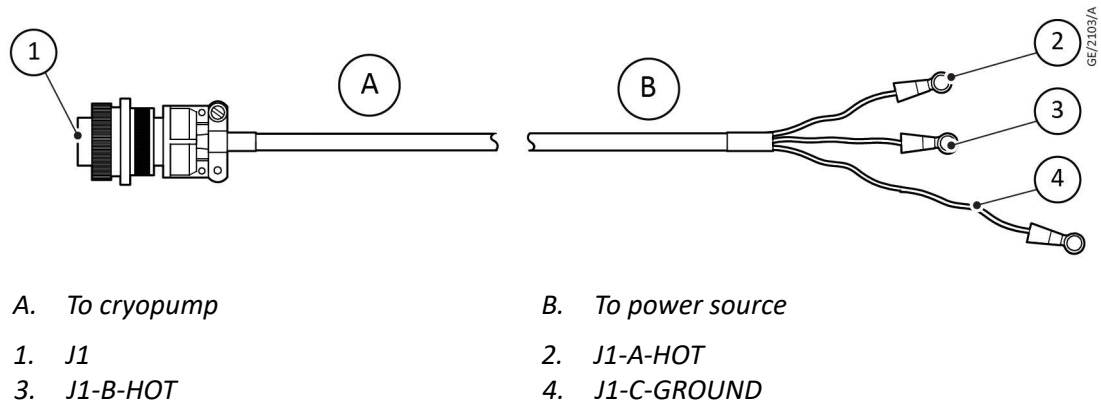
1. Insert a flat blade screwdriver into the power cable clamp slot on the On-Board® IS Cryopump module as shown in [Figure: Input power cable with connector](#) on page 41.
2. Move the screwdriver away from the power cable connector cap in [Figure: Input power cable connection points for the On-Board® IS module](#) on page 44. The screwdriver is held in place in the power cable clamp slot. The power cable clamp releases the power cable connector cap and the locking tab appears.
3. Remove the power connector cap.
4. Connect the input power cable to the input power cable connector on the module, and then rotate the connector collar until tight.
5. Remove the screwdriver to lower the power cable clamp. This secures the input power cable with the power cable clamp.
6. Connect the opposite end of the input power cable to a local 208 VAC, single-phase 5 Amp source as shown in [Figure: Input power cable with connector](#) on page 41.

Figure 26 Input power cable connection points for the On-Board® IS module with connector



- | | |
|--|--------------------------------|
| 1. Locking tab moves into module housing | 2. Power cable clamp slot |
| 3. Power cable connector cap | 4. Input power cable connector |

GE/2102/D

Figure 27 Input power cable with connector

4.7 Connect the intercomponent network

Note:

Refer to the *On-Board® IS Controller Quick Installation Guide (8040657)*, or the *On-Board® IS Controller with EtherCAT communication Quick Installation Guide (504035)* for information on connecting On-Board® IS Cryopumps to the intercomponent network.

4.8 Connect the IntelliPurge

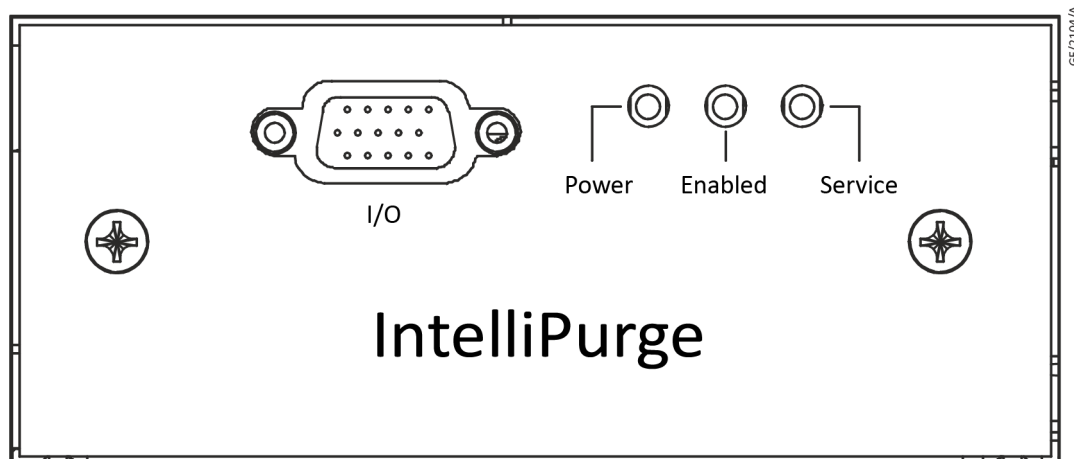


CAUTION: EQUIPMENT DAMAGE

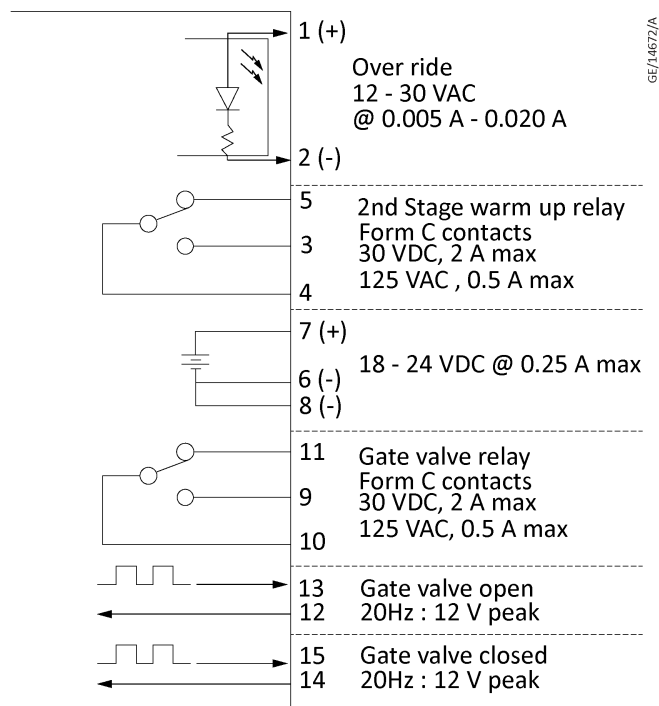
Risk of damage to the equipment. To avoid equipment damage, connect IntelliPurge only if the implant tool is configured to use IntelliPurge. Contact the implant tool manufacturer to check the applicable settings.

To connect the IntelliPurge refer to [Figure: IntelliPurge panel](#) on page 42 and do the steps as follows:

1. Connect the IntelliPurge I/O cable (not shown) to the IntelliPurge panel high density female DB15 connector.
2. Connect the position sensors and control solenoid for the high-vacuum isolation valve to the IntelliPurge I/O cable. See [Table: IntelliPurge pin descriptions](#) on page 42.

Figure 28 IntelliPurge panel**Table 4** IntelliPurge pin descriptions

Pin	Description
1	Override input, 12 VDC - 30 VDC (positive) @ 0.005 A - 0.02 A
2	Override voltage return, 12 VDC - 30 VDC (negative)
3	2 nd stage warm up alarm relay normally open contact
4	2 nd stage warm up alarm relay common contact
5	2 nd stage warm up alarm relay normally closed contact
6	24 VDC return, 24 VDC (negative)
7	24 VDC output, 24 VDC (positive) @ 0.250 A, maximum
8	24 VDC Return, 24 VDC (negative)
9	Gate valve control relay normally open contact
10	Gate valve control relay common contact
11	Gate valve control relay normally closed contact
12	Gate valve open sense return
13	Gate valve open sense output, 20 Hz square wave 12 V peak
14	Gate valve closed sense return
15	Gate valve closed sense output, 20 Hz square wave 12 V peak

Figure 29 Electrical connections for the pins

4.9 On-Board® IS remote connections

If desired, an On-Board® IS remote can be connected to the On-Board® IS Cryopump for direct communication with the cryopump. Refer to the On-Board® IS remote Quick Installation Guide part number 8040664 for information on how to install On-Board® IS remote.

4.10 Connect the input power to the On-Board® IS module

WARNING: HIGH VOLTAGE



Risk of electric shock. High voltage electric shock could cause severe injury or loss of life. After making all the appropriate connections on the module, make sure that the On-Board® IS Cryopump power cable is connected to a 208 VAC, single-phase 5 Amp source. Obey all appropriate electrical code requirements to avoid high voltage electric shock.

Refer to [Figure: Input power cable connection points for the On-Board® IS module](#) on page 44 and [Figure: Input power cable](#) on page 44 as necessary throughout the following instructions.

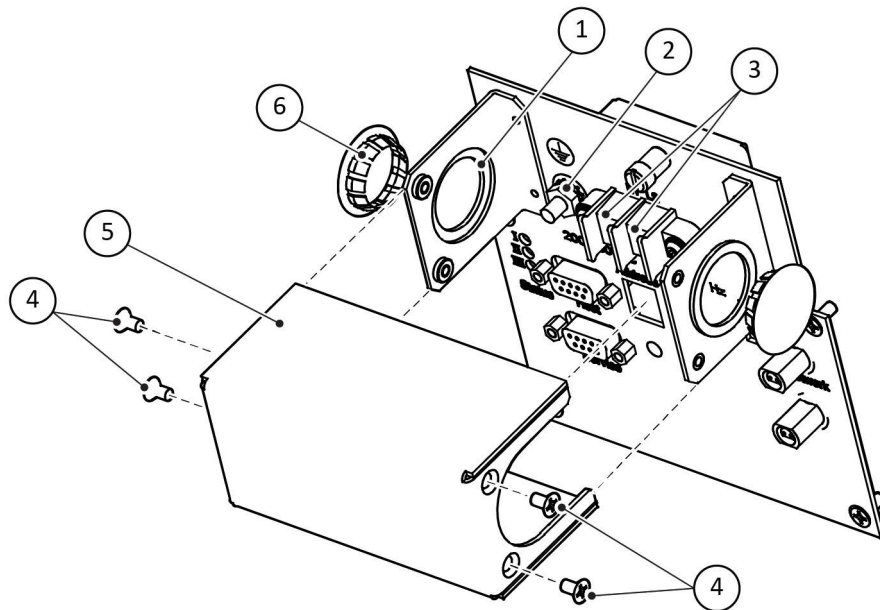
1. Remove the four cover screws.
2. Slide the cover off the module power connector.
3. Remove either one of the two punch-outs.
4. Feed the three wire ends of the input power cable through the punch-out hole so that the wire ends are near the connection points.

5. Attach the two wires (J1-A-Hot and J1-B-Hot) and one ground wire (J1-C-Ground) to the appropriate connection points.
6. Slide the cover on.
7. Replace the cover screws and tighten them.
8. Plug the other end of the cable into the power source.

 Note:

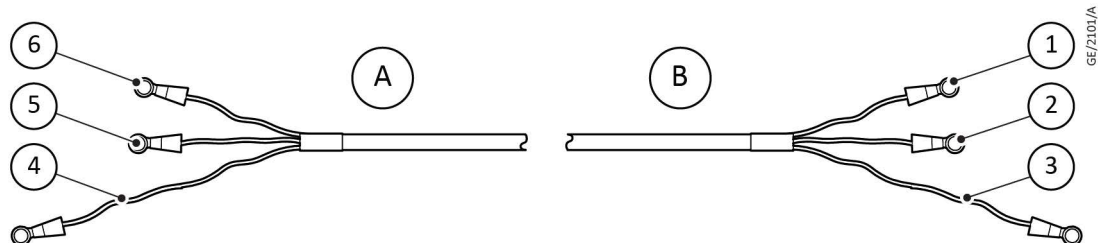
The power source end of the cable may be different from the example in [Figure: Input power cable](#) on page 44.

Figure 30 Input power cable connection points for the On-Board® IS module



- | | |
|--|---|
| 1. Punch-out hole (feed wires through the hole to connection points) | 2. Ground wire connection point (J1-C-GROUND) |
| 3. Hot wire connection points (J1-A-HOT, J1-B-HOT) | 4. Cover screws |
| 5. Cover | 6. Punch-out |

Figure 31 Input power cable



- | | |
|----------------|--------------------|
| A. To cryopump | B. To power source |
| 1. J1-D-HOT | 2. J1-E-HOT |
| 3. J1-F-GROUND | 4. J1-C-GROUND |
| 5. J1-B-HOT | 6. J1-A-HOT |

5. Fault finding

5.1 Keep a normal operation log

Maintaining a log of certain parameters during normal operation can be a valuable tool in troubleshooting vacuum problems. The log may contain many parameters. However, the following minimum parameters should be included:

- Chamber base pressure
- Chamber pump down time
- Chamber rate of rise

In addition, a baseline chamber RGA scan is useful for system troubleshooting.

5.2 Assessing basic fault

The primary indication of fault in a vacuum pumping system is a rise in base pressure of the vacuum chamber. A rise in the base pressure may be caused by the following:

- A leak in the vacuum system
- The cryopump reaching capacity
- The cryopump running too warm

Typically a high base pressure is caused by an air-to-vacuum leak in the system.

If a leak in the vacuum system is suspected, do the following:

1. Isolate the On-Board® *IS* Cryopump by closing the Hi-Vac valve and leak check the vacuum chamber.
2. Leak check all potential sources of leaks such as:
 - Through process gas valves
 - Chamber rough valves
 - Chamber cooling lines
3. If no leaks are found, a leak may be present on the cryopump side of the Hi-Vac valve.
4. Leak check the cryopump side of the Hi-Vac valve should be performed with the On-Board® *IS* Cryopump shut off and at room temperature.
5. Leak check the On-Board® *IS* while the cryopump is cold may mask leaks that are present (due to the ability of the cryopump to pump helium). If no leak is found, refer to the cryopump troubleshooting procedures given in [Understand specific causes and corrective actions](#) on page 45.

5.3 Understand specific causes and corrective actions

The problems are followed by possible causes and corrective actions. The causes and corresponding actions are listed in their order of probability of occurrence.

Fault	Vacuum system base pressure high and cryopump temperature above 20 K
Cause	Helium pressure is low
Remedy	Check compressor helium pressure. If the helium return pressure gauge reads below the normal operating pressure, add gas as described in the On-Board® <i>IS</i> compressor manual.
Cause	High partial pressure of non condensables (helium, hydrogen, or neon) within the cryopump because the second stage array has reached full capacity
Remedy	Regenerate the cryopump as described in the appropriate On-Board® <i>IS</i> Cryopump system operation guide part number 8040647.
Cause	Excessive thermal load on frontal array
Remedy	Look for new sources of thermal loads on the cryopump.
Cause	Helium gas line contamination
Remedy	See part number (document) 8040720 for more information about helium circuit decontamination.
Fault	Vacuum system base pressure high and cryopump temperature below 20 K
Cause	Air-to-vacuum leak in vacuum system or in cryopump
Remedy	Check vacuum chamber and Hi-Vac valve for leaks. Check cryopump side of Hi-Vac valve for leaks.
Cause	High partial pressure of non-condensable (helium, hydrogen or neon) in the cryopump as the second stage array has reached full capacity
Remedy	Regenerate the cryopump as described in the On-Board® <i>IS</i> Cryopump system operation guide part number 8040647.
Fault	Cryopump fails to cool down to the required operating temperature or takes too long to reach that temperature (20 K)
Cause	Helium pressure is low
Remedy	Check compressor helium pressure. If the helium return pressure gauge reads below the normal operating pressure, add gas as described in the On-Board® <i>IS</i> compressor manual.
Cause	Loose or disconnected helium self sealing couplings
Remedy	Fully connect all helium self sealing couplings.
Cause	Compressor problems
Remedy	Refer to the On-Board® <i>IS</i> compressor installation, operation and maintenance instructions.
Cause	Leak in vacuum system or cryopump
Remedy	Check vacuum chamber and Hi-Vac valve for leaks. Check cryopump side of Hi-Vac valve for leaks.

Cause	Helium gas line contamination
Remedy	See part number (document) 8040720 for more information about helium circuit decontamination.
Fault	Status LED III is not illuminated
Cause	Network cable is disconnected from the On-Board® IS module
Remedy	Reconnect network cable to the On-Board® IS module.
Fault	Status LED III is amber
Cause	On-Board® IS Cryopump heater failure
Remedy	Contact us for information and assistance.
Fault	Rough valve clicks but does not open and close
Cause	Too little or no air pressure to drive valve
Remedy	Increase air pressure to 60 to 80 psi(g).
Fault	Purge valve clicks but does not open
Cause	Too little or no air or nitrogen pressure to drive valve.
Remedy	Make sure that the air and nitrogen pressures are set correctly. Refer to Component location and facility requirements on page 24 for correct pressures.
Fault	Gate valve does not operate
Cause	Cryopump is not below 22 K or is in regeneration.
Remedy	Safety interlock.
Cause	Gate valve cabling is not connected.
Remedy	Connect cabling and clear gate valve error (gate valve will close and needs to be sensed closed).
Cause	Gate valve sensing is in error.
Remedy	Clear gate valve error. If the error does not clear, check voltages at the gate valve position indicators and at the cryopump. The gate valve error will need to be cleared anytime the gate valve cable is disconnected.

6. Service

6.1 Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must complete a Declaration of Contamination Form. The form tells us if any substances found in the equipment are hazardous, which is important for the safety of our employees and all other people involved in the service of your equipment. The hazard information also lets us select the correct procedures to service your equipment.

If you are returning equipment note the following:

- If the equipment is configured to suit the application, make a record of the configuration before returning it. All replacement equipment will be supplied with default factory settings.
- Do not return equipment with accessories fitted. Remove all accessories and retain them for future use.
- The instruction in the returns procedure to drain all fluids does not apply to the lubricant in pump oil reservoirs.

Download the latest documents from edwardsvacuum.com/HSForms/, follow the procedure in HS1, fill in the electronic HS2 form, print it, sign it, and return the signed copy to us.

**NOTICE:**

If we do not receive a completed form, your equipment cannot be serviced.

7. Disposal

The components of the On-Board® /S Cryopump must be disassembled correctly and disposed of according to the regionally applicable regulations.

Obey all federal, state, local and facility procedures for the disposal of hazardous materials.



EU Declaration of Conformity



Edwards Vacuum LLC,
6416 Inducon Drive W,
Sanborn,
NY,
USA 14132

Documentation Officer:
Jelena Havelkova, Spielberk Office Centre, Holandska
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Tel: +42(0) 734 418 896,
Email: documentation@edwardsvacuum.com

This declaration of conformity is issued under the sole responsibility of the manufacturer.

- *On-Board® IS Cryopump*
- *Models: 8, 8F, 8F XP, 250F, 250FX, 250FE, 320FX, 320FE, 320F, 500, 500 FX*

Is in conformity with the relevant requirements of European CE legislation:

2014/35/EU Low voltage directive (LVD)

2014/30/EU Electromagnetic compatibility (EMC) directive
Class A Emissions, Controlled EMC/EMI Environment

2011/65/EU Restriction of certain hazardous substances (RoHS) directive as amended by Delegated Directive (EU) 2015/ 863

Based on the relevant requirements of harmonised standards:

EN 61010-1:2010 +A1:2019 Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements

EN 61326-1:2013 Electrical measuring, control and laboratory equipment. Electromagnetic compatibility requirements. Part 1: General requirements

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2023-05-04. This declaration becomes invalid if modifications are made to the product.

This is a sample EU legal declaration.

Find the signed legal declaration in the product packaging.

You must retain the official signed legal declaration for future reference.

*Design Signatory – Tanya Palmer, VP of Engineering,
Haverhill, MA, USA*

*Manufacturing Signatory – Jerry Fargo, General
Manager, Haverhill, MA, USA*

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

EU Pressure Equipment Directive 2014/68/EU:

This product has been assessed against the requirements of the above PED Directive and classified Category I.

In accordance with Article 1.2, (f) this Directive does not apply to Category I equipment in scope with the LVD and is therefore is not quoted on the Declaration of Conformity. The full classification of this product if in scope of the Directive would be: Group 2, Category I, Conformity Assessment Module: A

EU EMC Directive: Industrial equipment

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

EU RoHS Directive:

This product is supplied as a component on "large-scale stationary industrial tool" under Article 3 (3). In accordance with Article 2 Paragraph 4(d) this product is not in the scope of the 2011/65/EU RoHS (recast) Directive."

EU REACH Regulation Compliance

This product is a complex article which is not designed for intentional substance release. To the best of our knowledge the materials used comply with the requirements of REACH. The product manual provides information and instruction to ensure the safe storage, use, maintenance and disposal of the product including any substance based requirements.

Article 33.1 Declaration

This product contains Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

- Lead (Pb)
This substance is present in certain brass / electrical or electronic components.

Additional Applicable Requirements

WASTE FRAMEWORK DIRECTIVE (EU)

SCIP Number: ced1254e-46a8-4b40-8dbc-b601e3aa9abb

材料成分声明
China Material Content Declaration

部件名称 Part name 	有害物质 Hazardous Substances					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
电子元件和控件 Electronics and Controls	X	O	O	O	O	O
铜接头 Brass connectors	X	O	O	O	O	O
钢合金制品 Steel alloys	X	O	O	O	O	O
电缆/电线/连接器 Cable/wire/connector	X	O	O	O	O	O
O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。 O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572. X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。 X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.						