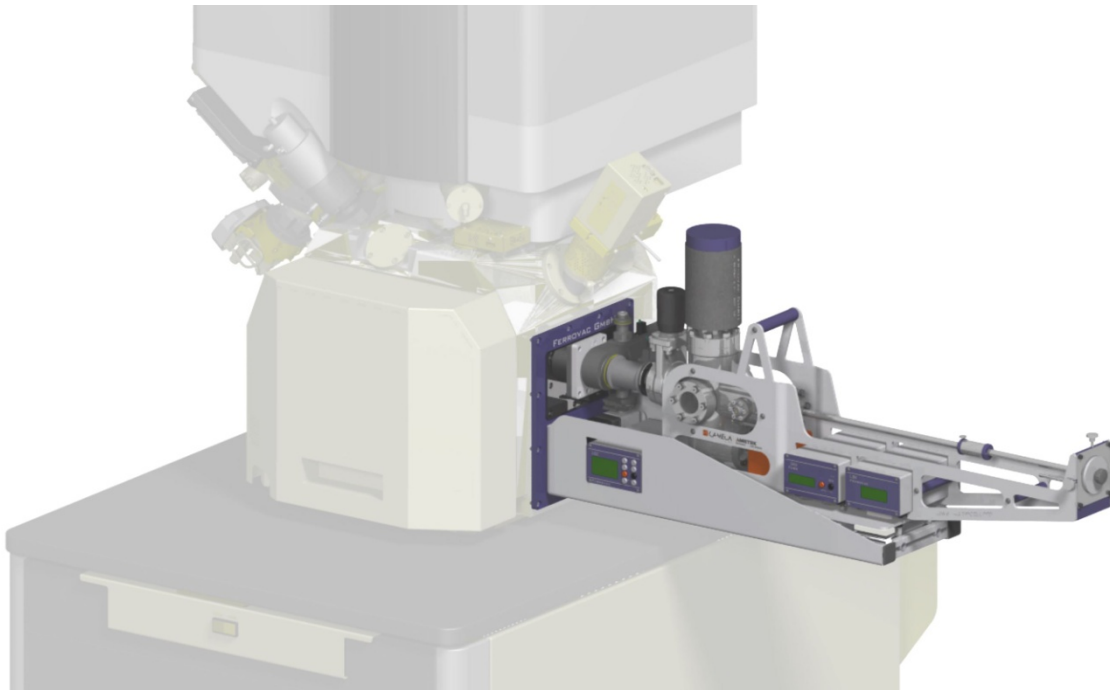


FERROVAC

ULTRA HIGH VACUUM TECHNOLOGY

IAKTHFIHELIOS Docking Solution



Installation Manual

Version: 25261_Rev_D [September, 2023]

Ferrovac AG
Thurgauerstrasse 72
CH-8050 Zürich

Phone +41 44 273 16 38
sales@ferrovac.com
www.ferrovac.com

**Important!**

It is the sole responsibility of the service engineers and service technicians to carefully read the installation guide and keep them safe. Read and follow all safety instructions carefully before using the product described in this document. Ferrovac AG declines any and all responsibility and liability for any damage/injuries resulting from incorrect use/adjusting/controlling or programming of the product.

Warranty

Ferrovac AG warrants this product to be free of defects in material and workmanship for a period of 24 months from the date of shipment. In case of proof of any defective parts in the product, we will at our option, either repair the product or replace it.

Warranty limitations

The warranty for this product does not apply to defects resulting from the following:

- Non-observance of operational- and safety instructions
- Natural wear of components
- Consumables
- Modifications to our products without our written consent
- Misuse of any product or part of the product

This warranty stands in place of all other warranties, implied or expressed, including any implied warranty of implied merchantability or fitness for a particular use. The remedies provided herein are buyer's sole and exclusive remedies.

Neither the company Ferrovac AG nor any of its employees shall be liable for any direct, indirect, incidental, consequential or special damages arising out of the use of its products, even if the company Ferrovac AG has been advised in advance of the possibility of such damages. Such excluded damages shall include but are not limited to: Costs of removal and installation, losses sustained as the result of injury to any person, or damage to property.

Copyright

Copyright 2019, Ferrovac AG. All rights reserved. All information in this document is the sole property of Ferrovac AG and is protected by Swiss copyright laws and international conventions. Ferrovac AG grants the right for reproduction for the purchasers own use. No part of this guide may be reproduced or transmitted by any third party in any form or by any means and for any purpose without the written permission of Ferrovac AG.

1	General Information.....	4
1.1	Designated Use.....	4
2	Terms and Symbols	5
3	General Safety Information.....	5
4	Installation.....	7
4.1	Preparations before arrival at installation site	7
4.2	Unpacking and Inspection after Delivery.....	10
4.3	Unpacking and Installation.....	10
4.3.1	SEM Preparation.....	11
4.3.2	Disassembly of the Docking Station.....	11
4.3.3	Assembly of the Docking Station on the Helios FIB/SEM	17
5	Maintenance	20
5.1	Venting and Pumpdown.....	20
5.2	Bakeout	20
6	Additional Information	21
6.1	Return of Defective Items.....	21
6.2	Downloads.....	21

1 General Information

This installation guide covers all important information about the installation of the IAKTHIFIHELIOS Docking Solution. The correct commissioning and operation of the Docking Solution is described in additional manuals, accordingly. It also provides important safety information, maintenance- and fault finding procedures.

The product described was manufactured in accordance with the applicable national standards and guidelines. The information in this document represents the state of the product at the date of print. Technical changes may be made without notice. Ferrovac AG makes no warranties or representations with respect to accuracy or completeness of the contents of this publication. Figures and photos are not binding. The product names used are for identification purposes and may be trademarks of their respective companies.

1.1 Designated Use

The product described in this document may only be used for its designated application. Designated use of the product is exclusively given if the following rules are obeyed:

- Product is used with original parts supplied by Ferrovac which are explicitly specified for the use with the product described in this publication
- In an indoor research laboratory environment or an industrial production or processing facility
- By personnel qualified for the installation of delicate scientific equipment
- In accordance with all related manuals.








Important!

Carefully read all safety instructions and all relevant manuals before installing the product and any related equipment!

Non-designated use is given if the following is true:

- Product is used with other equipment not explicitly acknowledged by Ferrovac in writing.
- Product is used outdoors or at ambient conditions exceeding the values given in the product specification
- Product is used by non-qualified persons
- Operation of the product in disregard of the safety instructions
- Operation of the product with disabled, modified, removed or damaged safety equipment and devices.

2 Terms and Symbols

Symbol	Term	Meaning
	Danger!	Risk of mortal danger when not observed
	Warning!	Risk of severe injury or danger to life when not observed
	Caution!	Slight risk of injury or damage to product when not observed
	High voltage!	Potentially lethal voltages are present
	Cryogenic Substances!	Potential cold burn hazard if safety precautions are not followed
	Important!	Important information for proper operation of the product
	Info, hint!	Useful hints, tips and clues

3 General Safety Information

Read the safety instructions very carefully. All safety precautions must be strictly observed at all times before using the product described in this guide and any associated instrumentation.

Study this document to learn how to operate your product properly. Keep this installation guide in a save place close to the described product and inform all other users of the product. Always include this guide when handing the product over to third party persons.

Responsible body is the individual or group of persons that are responsible for the proper use and maintenance of the product, ensuring that the product is operated within its specifications and operating limits. The responsible body must ensure that users of the product are adequately trained.

Operators are using the product for its intended purpose. Users must be trained in electrical safety, handling of cryogenic liquids and adequate use of the instrument. They must be protected from electric shock and contact with potentially dangerous situations.

Maintenance Personnel perform routine tasks on the product to keep it in proper operating conditions i.e. setting up the line voltage or replacing consumables. Maintenance procedures are described in this guide and must be followed at all times.

Service Personnel are trained to work on live circuits and to work cryogenic liquids as well as perform fault finding measurements and repair work to the product. Only fully trained service personnel qualified to handle potentially lethal voltages may perform servicing and repair.

Shock hazard: The American National Standards Institute states that a shock hazard exists when voltage levels are greater than 30 V RMS, 42.2 V peak or 60 VDC. A good safety practice is to assume that hazardous voltages are present in any unknown circuitry.

**Warning!**

- Always observe and strictly follow the safety notes and regulations given in this document
- Never operate the device outside its dedicated environment.
- DO NOT OPEN the device unless you fulfill the requirements of a fully trained service personnel and you are familiar with ultra-high vacuum products

**Important! Ambient conditions and environment:**

This product is only to be used indoors, in locations meeting the following requirements:

- Room temperature lies between 5°C/41°F and 40°C/104°F
- Humidity up to maximum of 80%
- Altitudes up to 2000m
- Pollution Degree 2 environments

4 Installation

4.1 Preparations before arrival at installation site



Important!

Please thoroughly review this section before your arrival at the installation site. **Ferrovac AG does not provide** all the components required for a complete installation and proper operation of the docking station. It is the exclusive responsibility of the service technician to establish communication with the end customer, gather all relevant information, and arrange for the acquisition of any missing parts necessary for on-site installation. Additionally, the installation must fully comply with all safety regulations stipulated by local laws.

In order to operate the docking station, the station needs to be connected to the following lines that must be accessible at site. The technicians must check with the laboratory if following lines are provided, where they are located, and that they can be safely accessed, connected and used:

1. Compressed Air Line (4.5-7 bar) and Tubing: The docking station has pneumatic valves. In order to operate these valves, the laboratory must provide a **compressed air line**. A **pressure regulator able to set the pressure to 4.5-7 bar** must be provided and must be fully accessible. The docking station itself is only equipped with an inlet connection (push-to-connect fitting for 4mm OD high pressure flex tube). **It is the sole responsibility of the service technician to fully provide the proper 4mm OD high pressure flex tube, with proper length, and with the proper adapters** to be able to connect it to the compressed air line on site. All necessary precautions must be taken that the compressed air line and tubing do not become a tripping hazard.
2. Nitrogen Gas Line (0.5-1 bar) and Tubing: The docking station has an automatic venting valve. Ferrovac AG suggests to always vent the chamber with nitrogen (or similarly with another clean dry gas), and thus a **nitrogen gas line with pressure regulator 0.5-1 bar** must be fully accessible. The docking station itself is only equipped with an inlet connection (push-to-connect fitting for a 6mm OD flex tube). **It is the sole responsibility of the service technician to fully provide the proper 6mm OD flex tube, with proper length, and with the proper adapters** to be able to connect it to the nitrogen gas line on site. All necessary precautions must be taken that the nitrogen line and tubing do not become a tripping hazard.
3. Power Plugs: The docking station is equipped with a scroll pump and the LSC controller. They must be powered and thus permanent electrical output need to be fully accessible. **It is the sole responsibility of the service technician to layout the electrical cabling according to the safety regulations of the laboratory**. In case external extension cords are used, the total length of the cord must be checked for damage before putting it into use and all necessary precautions must be taken that the cables do not become a tripping hazard.
4. Location of the Roughing Pump, additional Roughing Line Tube and Pump Interface Cable: Ferrovac AG optionally offers and delivers a scroll pump with the package (Edwards nXDS Scroll Pump, 103-190l/min, Ferrovac Product Code: PUS103 or PUS190). If the scroll pump is

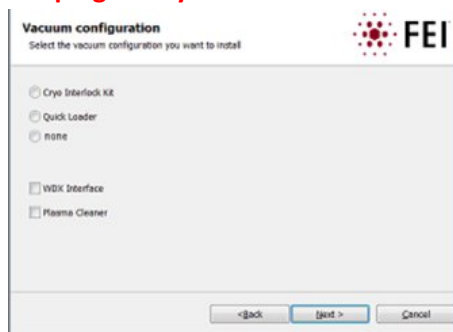
part of the package, be aware that Ferrovac AG also provides a **roughing line (KF16-to-KF16, 1 meter long)** and an interface cable (**D-Sub 15pin, female to male, shielded, 3 meter long**) with the package.

It is to the sole responsibility of the service technician to preliminarily layout where the pump will be located, and must provide the correct roughing line tube and interface cable.

5. Additional Cabling, not provided by Ferrovac: Due to country specific variations in electrical sockets, Ferrovac AG does not provide the electrical power supply cables that can be directly plugged to the mains power supply in the laboratory. It is the sole responsibility of the service technician to provide following cables:

- For LSC Controller: Electrical supply cable **IEC 320 C8 to IEC socket of your specific country**
- For Edwards nXDS Scroll Pump: Electrical supply cable **IEC 60320 C13 to IEC socket of your specific country**
- For the interface between LSC controller and Thermo Fisher Helios FIB SEM, a special cable is required that the customer either already has or needs to be ordered from Thermo Fisher as well. The customer must ask for the **product “cryo interlock Kit 1099932” from Thermo Fisher.**

IMPORTANT: Get in Contact with Thermo Fisher. In the software of the FIB Helios, the plugin “Cryo interlock kit” must be added with is a standard service action:



- i. Stop the XT server
 - ii. Put the system into Stand-by-mode
 - iii. Connect the cable
 - iv. Reinstall/Modify XT software. Add option Interlock kit
6. Additional Helping Hand: During the installation procedure, parts of the docking station will have to be held against the body of the FIB/SEM while bolts need to be fastened at the same time. Depending on the available space on site, this cannot be done alone. Ask for a helping hand to during this process.
7. Tools and Cleaning Procedures: The service technician must ensure enough work space on a very clean, dust free table for unpacking and inspection of the docking station. As for all UHV and HV type equipment, clean, lint-free gloves must be used and worn for handling the parts exposed to vacuum. The service technician must ensure that enough **sterile and lint-free gloves, as well as dust-free cleaning tissues and iso-propanol for cleaning purposes** are available on site during the installation process. A set of **clean metric Allen Keys and Screwdrivers** must be available on site to perform the installation.

4.2 Unpacking and Inspection after Delivery

Before unpacking, optically inspect the parcel. If damage is found, take pictures of the parcel and send them to Ferrovac AG immediately. Package content depends on each specific docking station configuration. Compare content with the delivery note. Any damage or missing item must be reported to Ferrovac **within 48 hours after delivery**.



Caution!

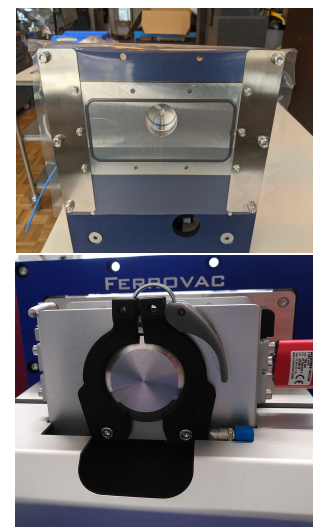
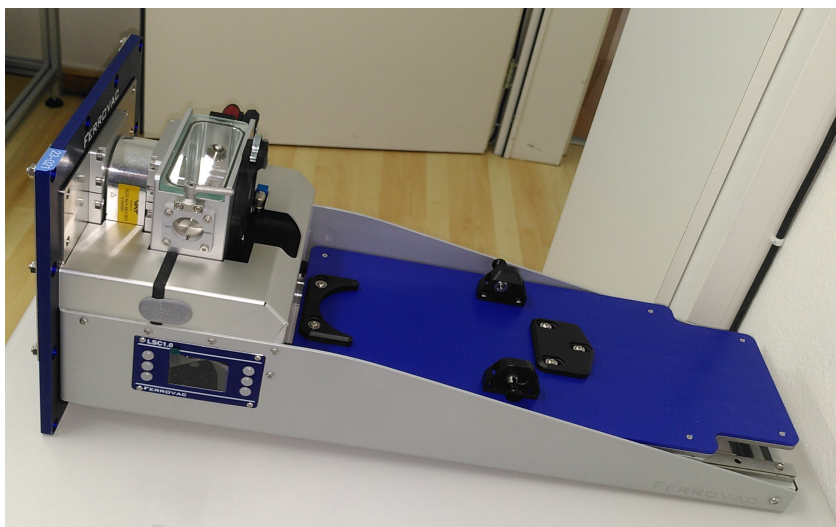
- Ensure enough work space on a clean table for unpacking and inspection
- Some products of Ferrovac might be shipped under UHV! Sudden uncontrolled venting cause damage to pumps and valves
- Read manuals carefully before using any device
- Never expose any component of the product/system to physical shock or aggressive chemicals
- Neither hit the CF flange knife edge nor any bellows

4.3 Unpacking and Installation

The product, its components and accessories are sealed in a cleaned plastic bag. Do not open and remove it until you are ready to mount the assemblies to the system. Prepare a very clean, dust-free bench. Carefully unpack the product and perform a visual check for any damage of the package, its contents and accessories.

As for all UHV and HV type equipment, clean, lint-free gloves must be used for handling the parts exposed to vacuum. All operations must be conducted on the prepared clean dust-free bench.

In the package, the fully assembled docking station can be found. Please check that the ports are still properly sealed:



4.3.1 SEM Preparation



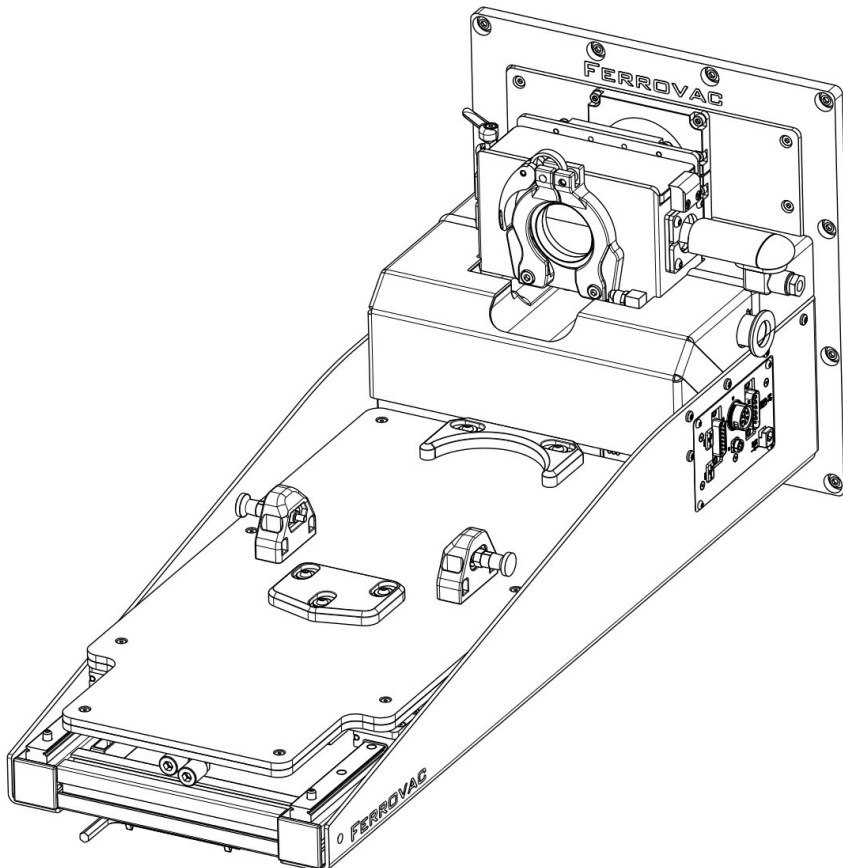
Caution!

In order to be able to install the docking setup, the Thermo Fisher FIB Helios system must be vented and the L-port plate on the system must be removed. To ensure safety, read the manual of the according system carefully and follow the instructions. This guide does not cover these steps and it is to the sole responsibility of the technician to perform these steps correctly.

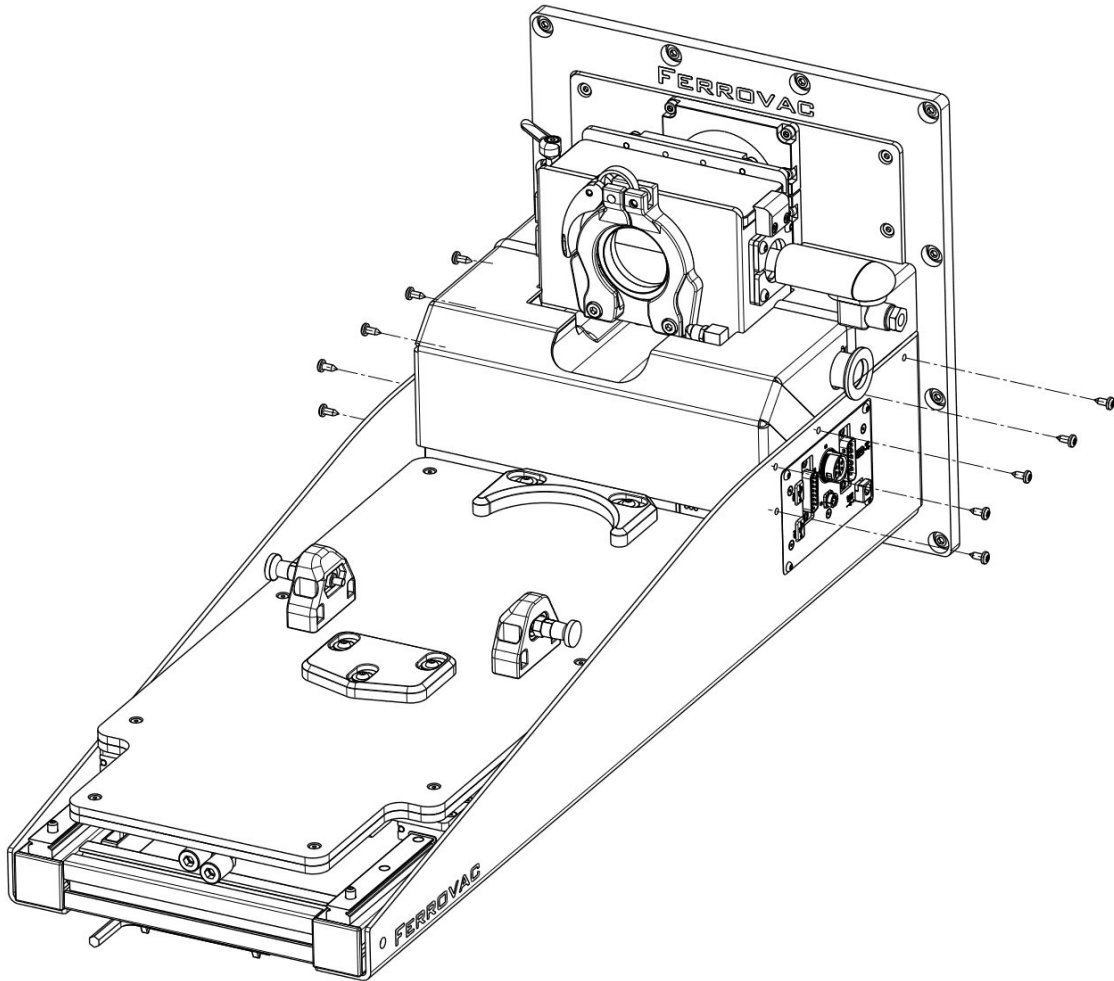
4.3.2 Disassembly of the Docking Station

In the package, the fully assembled docking station can be found. In order to mount it to the Thermo Fisher FIB Helios, the docking station must be partially disassembled and assembled on the system again. Read all the following steps carefully first before you start the disassembly of the docking station. Make sure that you understand each step, otherwise contact Ferrovac.

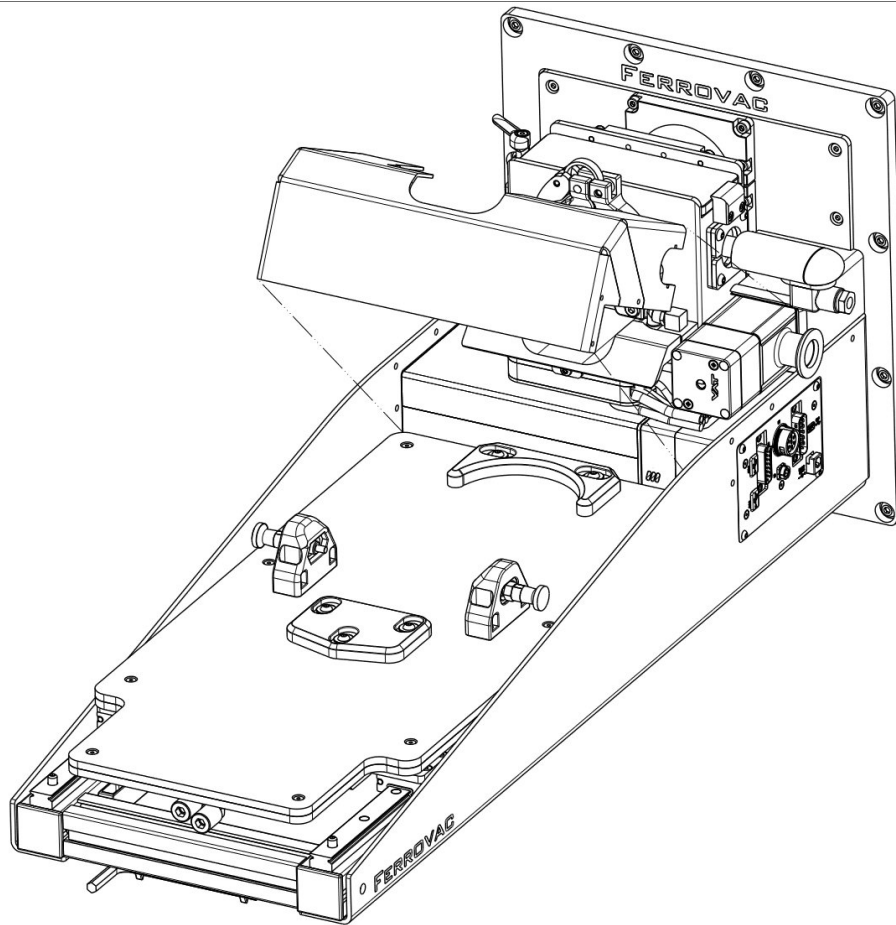
1. Set up the FerroLoader on a dust-free, open workspace where you can easily reach all sides of the assembly.



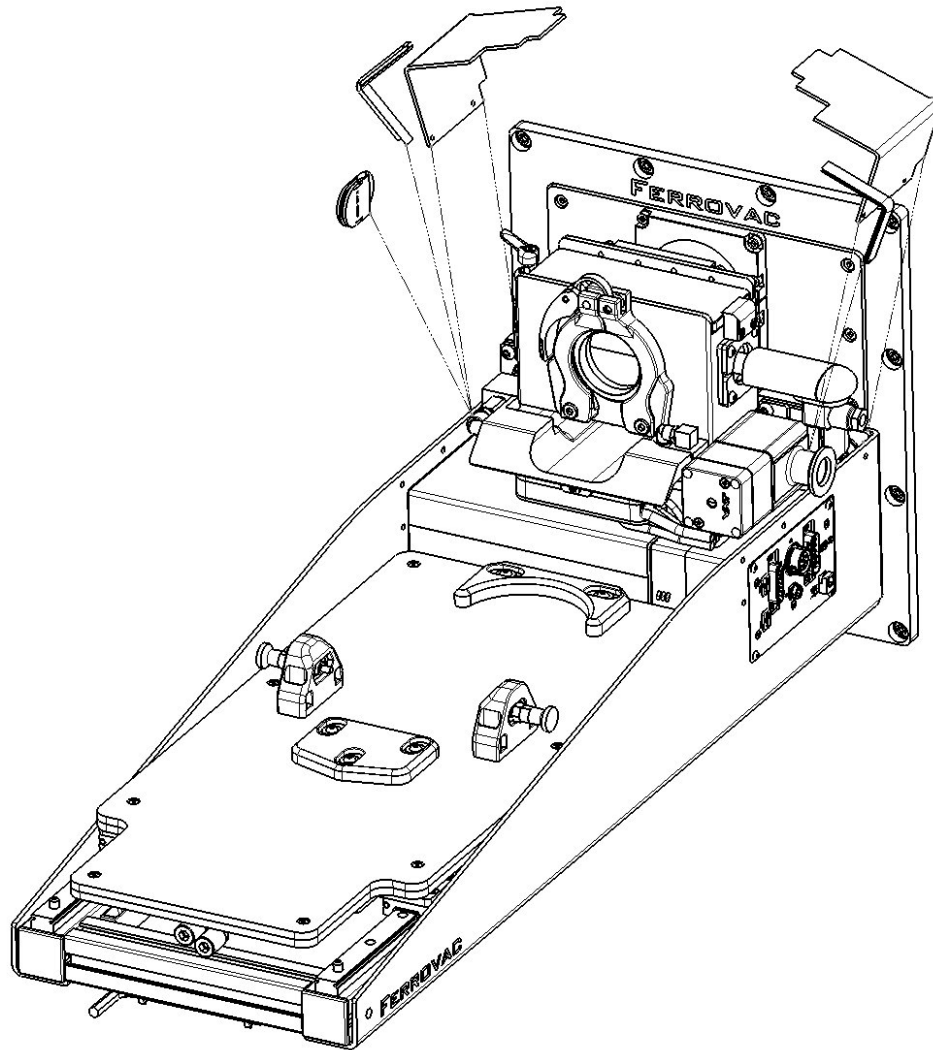
2. Remove the 10 Phillips screws on the side covering. This will loosen the protective covering.



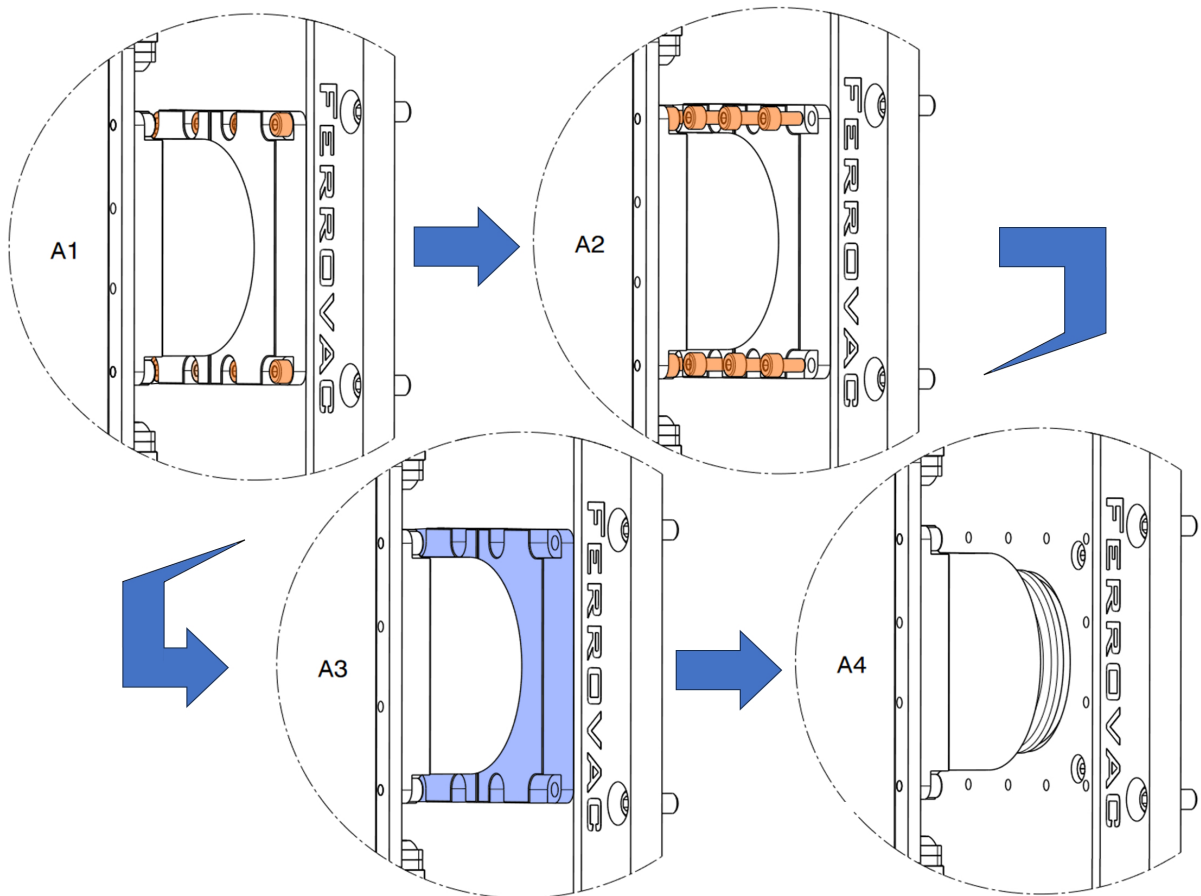
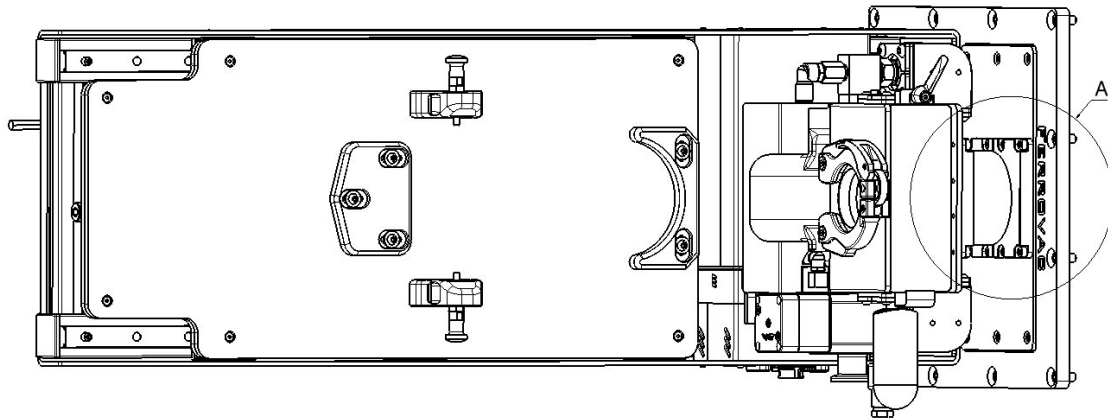
3. Remove the front part of the protective covering by carefully tilting it and moving it up- and outwards.



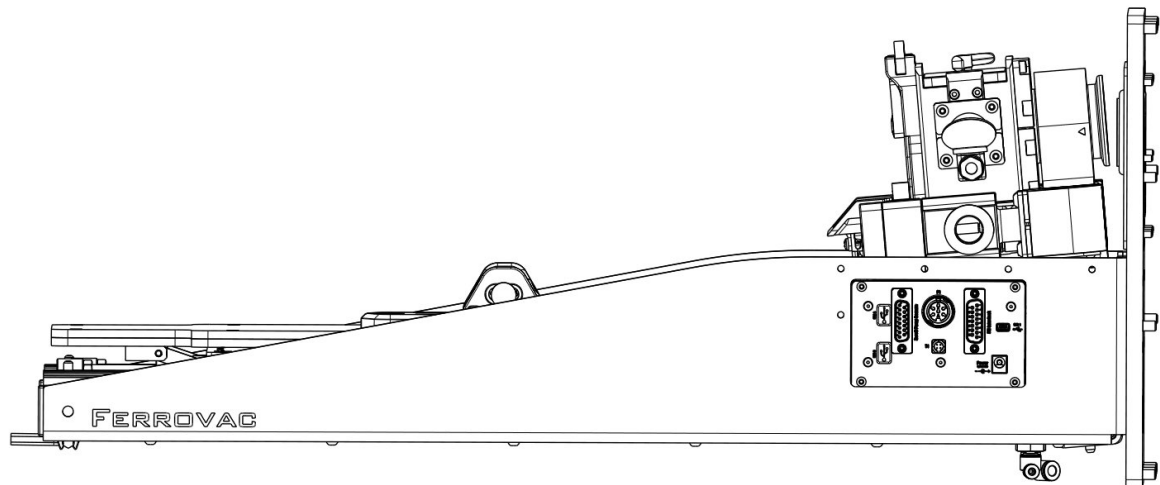
4. Carefully remove the rest of the protective cover, along with the edge protectors. In total there are three parts of the protective covering, connected by edge protectors. There is also one oval plastic covering on the opposite side of the side KF valve.



5. On the L-port frame of the dock, remove the 8 head socket screws and the two plates that hold the gate valve and the adapter plate together. Follow steps A1 to A4 to do so.

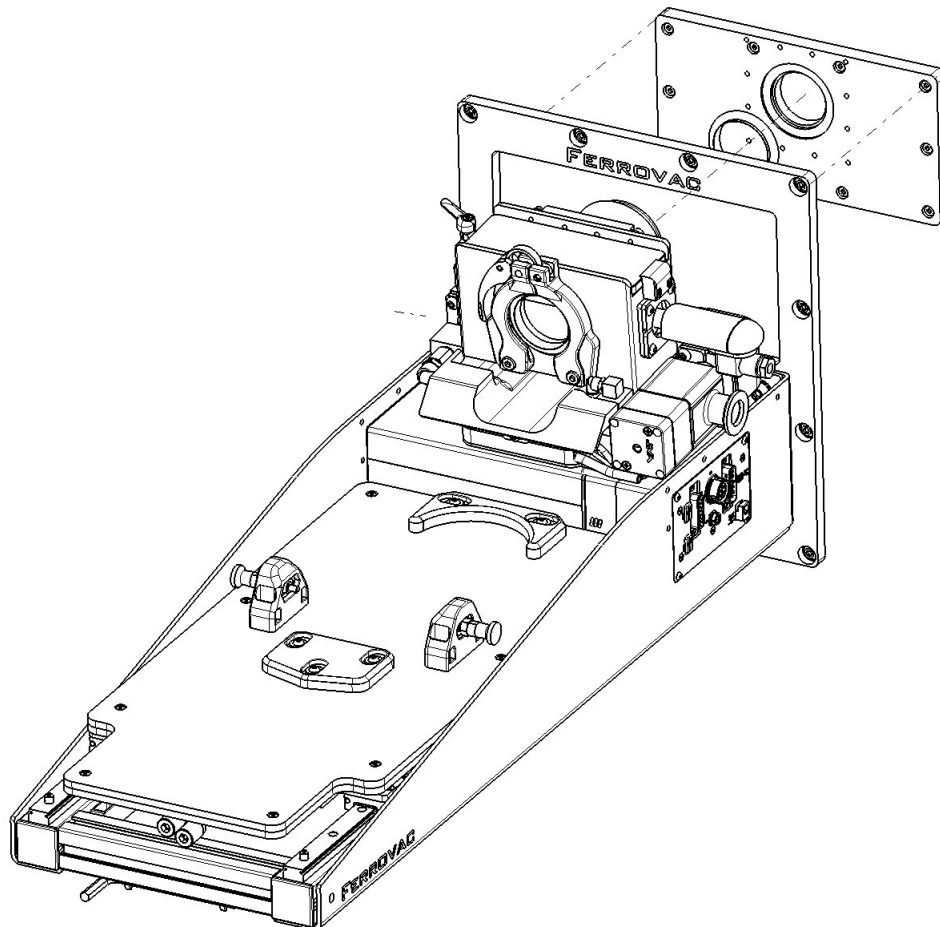
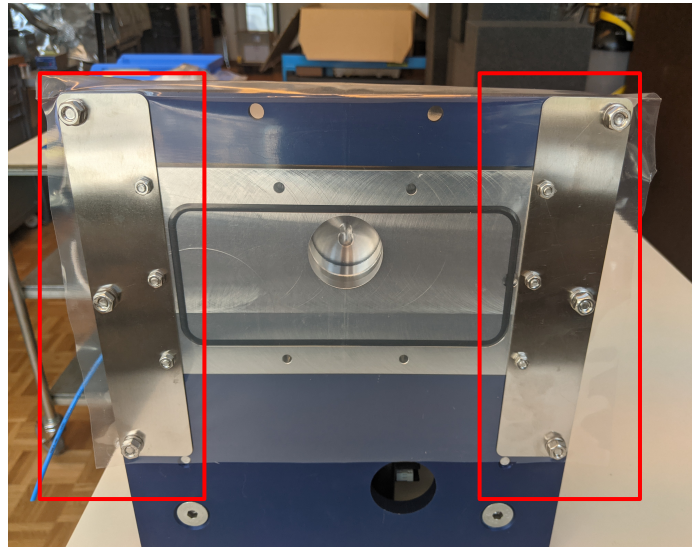


6. Once the gate valve is detached from the adapter plate (step 5), the pumping unit can be twisted slightly. This can help to remove the KF viton gasket between gate valve and adapter plate. It will also allow for better removal of the two plates mentioned in step 5.



7. Finally, remove the two metal plates (labeled with “packaging material”) in order to remove the adapter plate from the dock.

REMOVE Packaging Material Plates



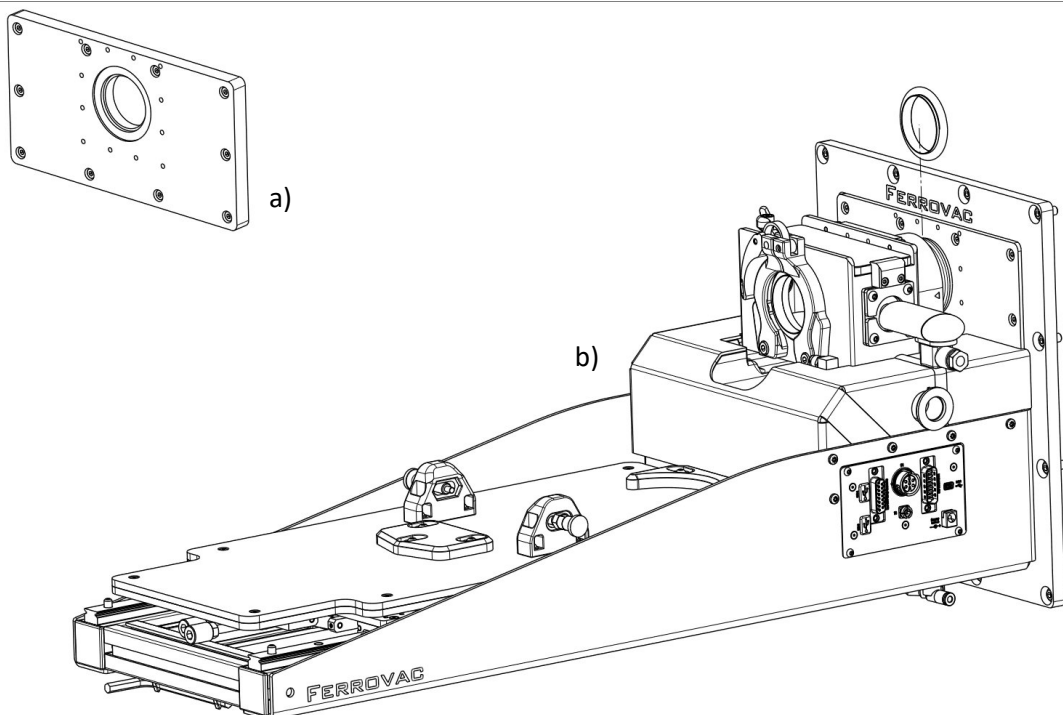
4.3.3 Assembly of the Docking Station on the Helios FIB/SEM



Caution!

All surfaces that will be exposed to the vacuum must be exceptionally clean! The service technician must wear lint free gloves, inspect all surfaces and clean them **with dust-free cleaning tissues and iso-propanol if necessary.**

- a) Mount the adapter plate to the FIB Helios system using 10 head socket screws. **Important:** Clean the gasket and surface that will be face towards the FIB Helios System.
- b) Mount the docking frame to the FIB Helios System. Please ask for additional help while holding the docking frame in place and mount the 12 socket head screws.



- c) Once both the adapter plate and frame are mounted to the FIB Helios System, the assembly can be performed in **reverse order** as described in section "[Disassembly of the Docking Station](#)".

Important Notes:

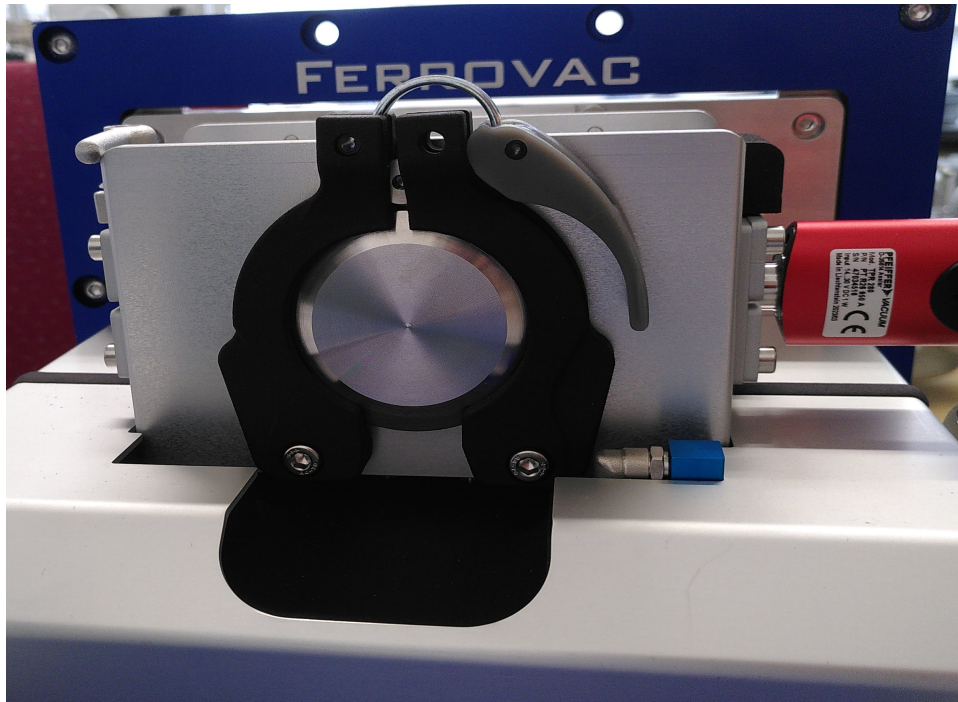
- For the proper functionality of the docking stage, the KF viton gasket between the gate valve and adapter plate must be correctly placed and secured. Make sure that all screws are tightened evenly and tight.

- d) On the back side of the electronics box, the inputs for **nitrogen N2 or any other dry gas (0.5 bar min to 1bar max)**, as well as for the **Compressed Air Line (4.5 bar min to 7 bar max)** can be found. Connect the lines in accordance to section [“Preparations before arrival at installation site”](#).



- e) **If an Edwards nXDS Scroll Pump (103-190l/min, Ferrovac Product Code: PUS103 or PUS190) was part of the package:** Connect the roughing pump to the KF16 port using the appropriate roughing line and connect the D-Sub 17 connector between the electronics box and the Scroll pump with the D-Sub cable that is delivered with the package.
If no Edwards nXDS Scroll Pump was delivered with the package: Connect the roughing pump to the KF16 port but **do not** connect it to the D-Sub17 connector of the dock. The interface of the pump might be different from the nXDS Scroll Pump. If the interface of the customers pump is different from the Edwards Scroll pump, the pump cannot automatically controlled but needs to be manually turned on and off during operation.
- f) Connect the appropriate D-Sub17 Cable between the FIB Helios and the electronics box of the docking station (**“cryo interlock Kit 1099932” from Thermo Fisher**). This cable is not provided by Ferrovac but must be provided by Thermo Fisher.

- g) The pumping volume must be properly sealed. If applicable, **remove the protective plastic** from the KF-40 opening and connect a transfer arm, UHV Suitcase or a blank flange to fully enclose the pumping volume. If there is no plastic covering and a blank flange is already in place, you may skip this step.
- h) Make sure that the glass lid on top of the pumping volume is placed properly in place.



5 Maintenance

5.1 Venting and Pumpdown



Caution!

- If vented with pressurized dry gas, make sure that the pressure does not exceed 1000 mbar. Overpressure may damage sensitive parts such as bellows, viewports or other components. If the vented volume is still under pressure after every vent, slightly increase the pressure on the pressure regulator of the pressurized dry gas bottle
- Make sure that all parts of the affected system are strictly at room temperature before venting!
- CF knife-edges and copper gaskets are very sensitive! Avoid using any sharp instrument in the vicinity of the knife-edge and gaskets. CF flanges, KF flanges and gaskets must be handled by qualified personnel only!

5.2 Bakeout



Caution!

Never perform a bakeout of UHV equipment on the docking station of the FIB Helios! The FIB Helios, as well as the Ferrovac docking station, are both strictly designed to operate at room temperature. Bakeouts of any UHV related components (such as a Ferrovac VSN40S suitcase) are strictly prohibited on the docking station and will lead to unforeseeable and unpredictable damages on both the Thermo Fisher Helios and the Ferrovac Docking Station

6 Additional Information

6.1 Return of Defective Items

Ferrovac AG requires a completed declaration of contamination form and will issue an RMA (Return of Materials Authorization) form, before any items are factory returned. Please contact us beforehand. You will be given an RMA number and information on how to proceed with the return of defective items.

6.2 Downloads

The latest version of this guide can be downloaded from our website Ferrovac.com. For any suggestions or questions concerning this guide, please don't hesitate to contact us.

Ferrovac AG
Thurgauerstrasse 72
8050 Zürich
Phone: +41 (0) 44 273 16 38
E-Mail: sales@ferrovac.com
Website: www.ferrovac.com