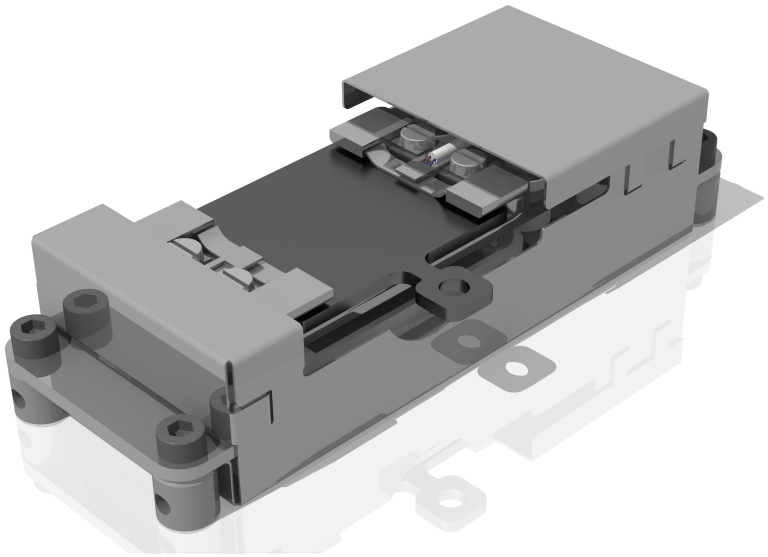
FERROVAC

ULTRA HIGH VACUUM TECHNOLOGY

HSOMPBN50

PBN Heater Assembly for Flag Style Plates



Revision D

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Important!

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

Warranty

Ferrovac warrants this product to be free of defects in material and workmanship for 24 months from the date of shipment. In the case of any defects, Ferrovac will either repair or replace the product at our discretion.

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 the buyer's sole and exclusive remedies.

Neither the company Ferrovac 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 Ferrovac has been advised 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

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1. General Information

This manual covers all important information about installation, commissioning and operation of your PBN heater assembly for flag style plates. It also provides essential 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 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 defined by the following rules:

The product is:

- Used with original cable sets supplied by Ferrovac which are explicitly specified for the use with the product described in this publication.
- Used in an indoor research laboratory environment or an industrial production or processing facility.
- Operated by personnel qualified for operation of delicate scientific equipment.
- Used in accordance with all related manuals.

Important!

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

1.2. Non Designated Use

Non-designated use is defined if any of the following are true:

- The product is used with other equipment not explicitly acknowledged by Ferrovac in writing.
- The product is used outdoors or at ambient conditions exceeding the values given in the product specification.
- The 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
	**Caution, hot surface!**	Potential burn hazard if safety precautions are not followed
	**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 while using the product described in this manual and any associated instrumentation.

Study this document to learn how to operate your product correctly. Keep this instruction manual in a safe place close to the described product and inform all other users of the manual's location. Always include this manual 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 use the product for its intended purpose. Users must be trained in electrical safety, and adequate use of the instrument. They must be protected from electric shock and other 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 described in this manual must be followed.

Service Personnel are trained to work on live circuits 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 check for correct mains voltage before connecting any equipment!
Mains supply voltage fluctuation must not exceed ±10% of the nominal voltage.

Warning!

- Always observe and strictly follow the safety notes and regulations given in this document
- Always use the originally delivered cables with the product for all electrical connections.
- Always switch the device off before disconnecting cables.
- Never operate the device outside its dedicated environment.
- DO NOT OPEN the device unless you fulfill the requirements of fully trained service personnel and you are familiar with live circuits and potentially lethal voltages.

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

3.1 Specific Safety Precautions for the PBN heater assembly for flag style sample plates

The PBN heater assembly for flag style sample plates is intended for use by qualified personnel who recognize shock hazards and are familiar with the precautions necessary to avoid possible injury.

Caution, hot surface!

- Certain components reach high temperatures during operation and represent a hazard - avoid direct contact.
- Covering the device and his components poses a fire hazard. Always keep objects, combustible objects, liquids, gases, etc. well away from the heat source.

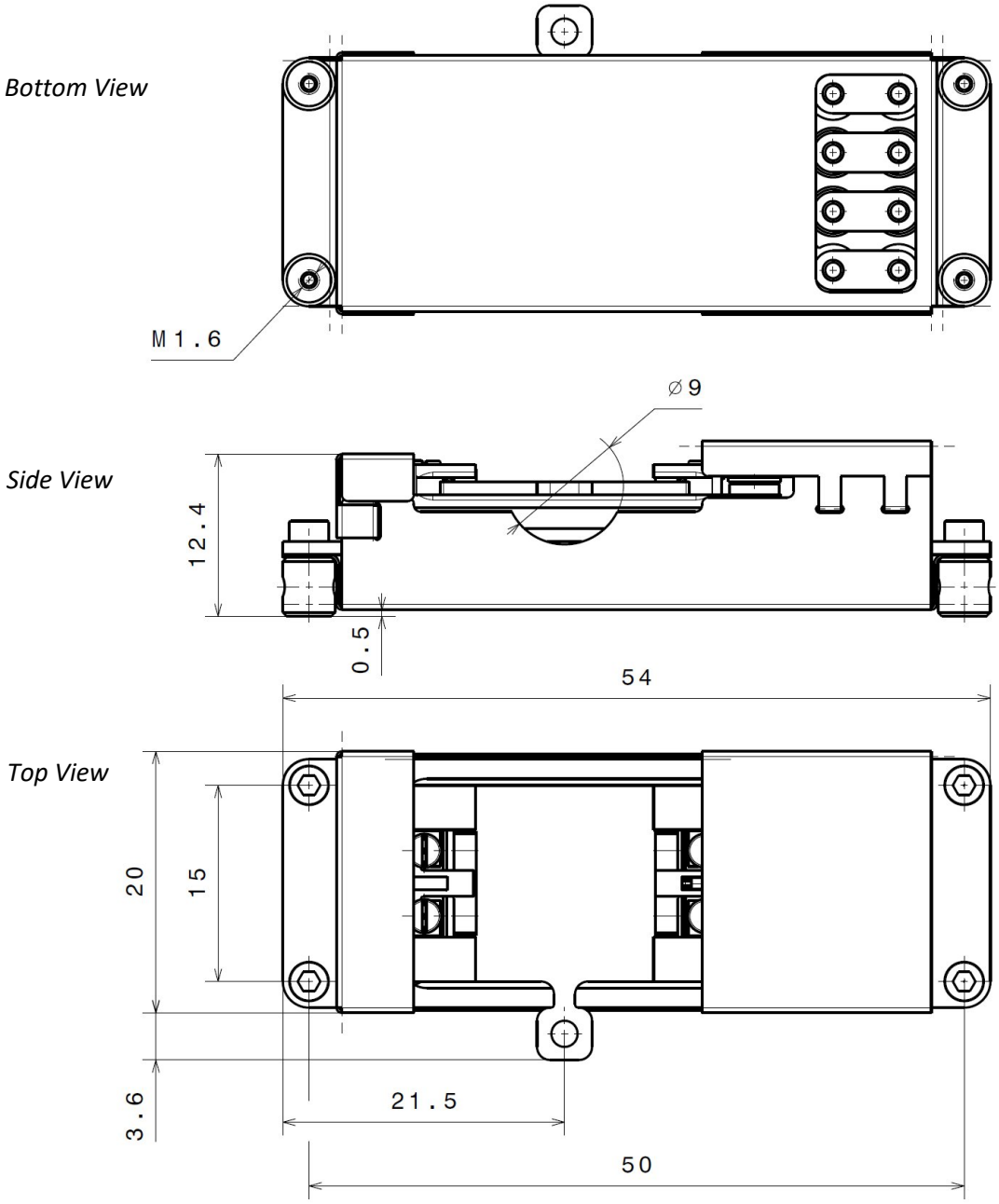
4. About

This assembly consists of a pyrolitic boron nitride heater in combination with a molybdenum receiver for flag style plates, and provides a reliable solution for sample annealing.
A K-type thermocouple is mounted on the sample receiver.

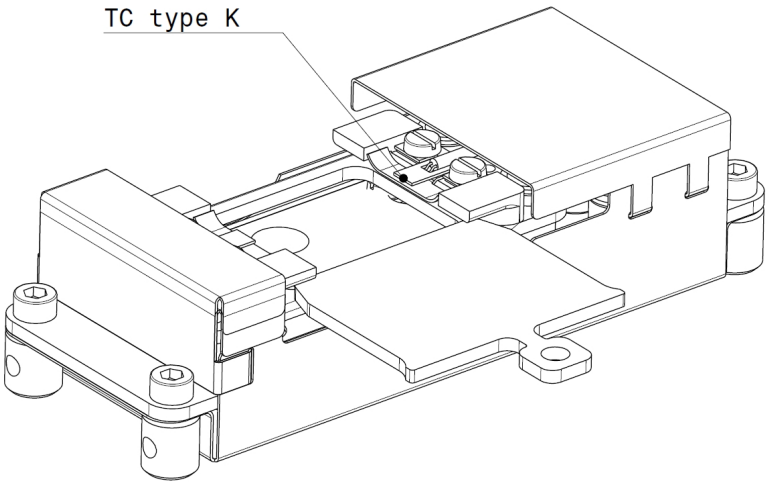
HSOMPBN50 heaters can be implemented in fully configured heating stages including flange assemblies with electrical feedthroughs. The HSOMPBN50 is also used in BOOMERAX manipulators and can be easily adapted to practically any commercially available XYZ manipulator.

4.1 Dimensions

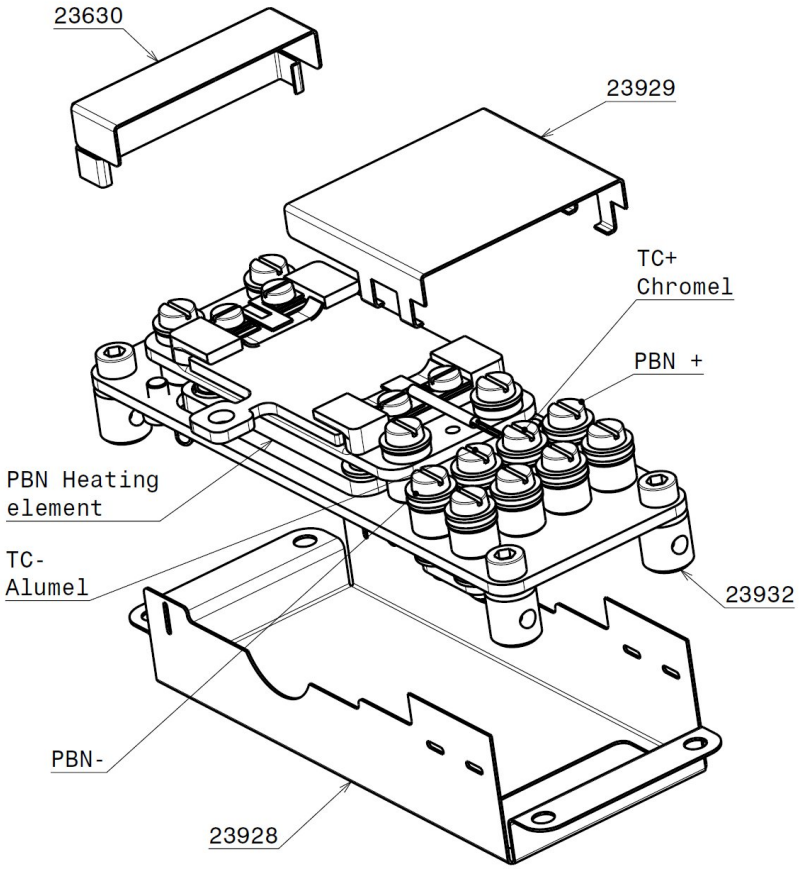
Pictured below is an excerpt of a technical drawing of the PBN heater assembly for flag style sample plates. All dimensions are given in millimeters (mm).



Technical drawing of the heating assembly and position of the internal thermocouple:



Explosion view of the PBN heating element and other sub assemblies of the product:



4.2 Specifications

PBN Heater Assembly for Flag Style Sample Plates: HSOMPBN50

- Maximum Temperature: 1000°C
- Maximum Power: 120W (40V, 3.0A at ~1000°C)
- Power Supply: Not included
  (Recommendation: Power 150W, Voltage Range: 0-50V, Current Range: 0-5A)
- Installed Thermocouple: K-type (chromel/alumel)
- Materials: All used materials are fully UHV compatible
  - Boralectric Heater: Pyrolytic boron nitride, pyrolytic graphite
  - Body/ Housing: Molybdenum
  - Sample Plate Receiver: Molybdenum
  - Isolators: Ceramics (Al203)
  - Mounting Sleeves: Stainless Steel (1.4301)
  - Screws/ Washers: Molybdenum, stainless steel (grade A4)
- Tolerances:
  - Machined Parts: ISO 2768-m-K

Caution!

Specifications may change if upgrades or accessories are mounted to the main product.

5. Unpacking and Installation

Before unpacking, optically inspect the parcel. If any damage is found, take pictures of the parcel and send them to Ferrovac immediately. Package contents depend on each specific heater configuration. Compare content with the delivery note. Any damage or missing items must be reported to Ferrovac **within one week of delivery**.

Caution!

- Ensure enough workspace on a clean table for unpacking and inspection
- Some Ferrovac products are shipped under UHV! Sudden uncontrolled venting can 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
- CF-Flange knife edges and edge-welded bellows are particularly vulnerable, any damage to these parts may result in a complete failure of the vacuum integrity

5.1 Product Specific Unpacking and Installation Instructions

Caution!

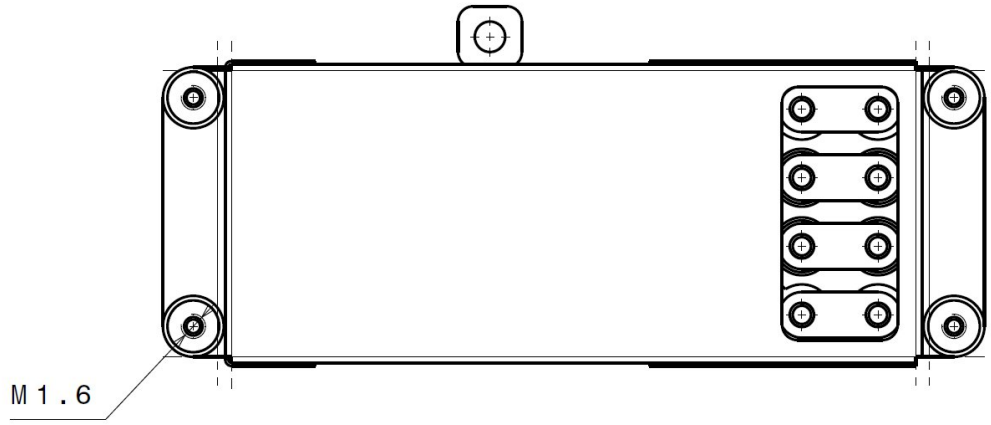
This product is designed for use in a UHV environment and therefore is cleaned to UHV standards.

- Never touch the product with bare hands or unclean gloves.
- Only place the product on adequately clean surfaces and only use clean tools to work on the product.
- Do not leave the product out of a vacuum environment unprotected for a prolonged period of time.

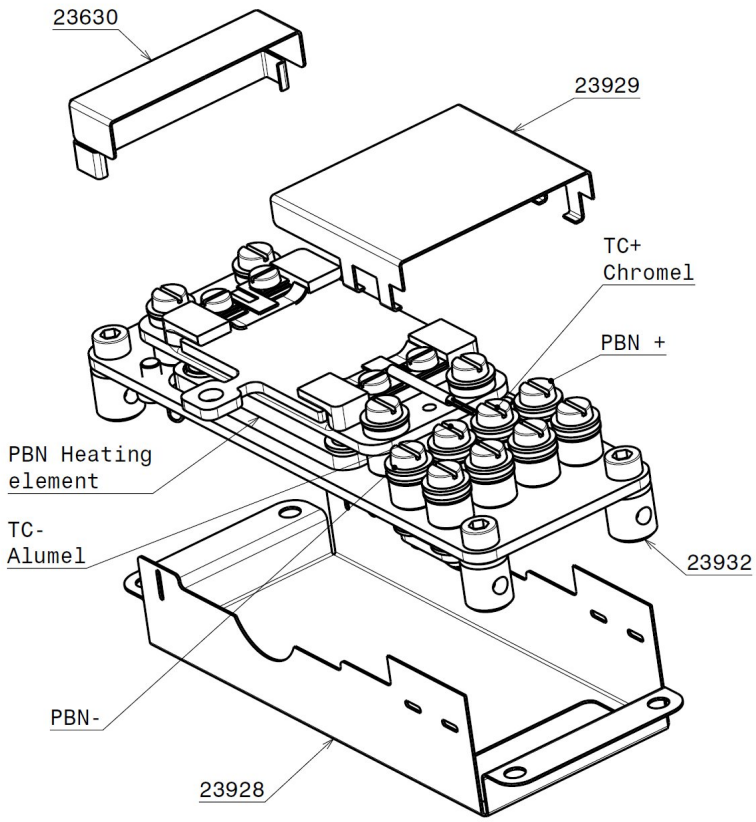
5.2 Installation

If not already mounted to another product, the PBN heater assembly is sealed in a clear reusable plastic membrane box.

Fixing the PBN heater assembly to the desired position usually occurs by fastening four M1.6 screws to the mounting threads in the four corners of the heater assembly. Refer to the technical drawing (bottom view) below for the location of these M1.6 threaded holes.



For connecting the wiring of the PBN heater assembly without an adapter, refer to the explosive isometric view below.



6. Operation

Caution!

The operator must inspect the product for technical defects before use and monitor the behavior of the product while in use, paying particular attention while the device is heating up to its maximum temperature.

Caution, hot surface!

- Certain components reach high temperatures during operation and represent a potential hazard. Avoid direct contact.
- Covering the device and its components poses a fire hazard. Always keep temperature-sensitive materials, liquids or gasses well away from the heat source.

6.1 Before First Usage

Make sure that all the wiring that connects to the PBN heating assembly is done completely and correctly according to the rules and regulations of your country, institute and workplace before commencing operation.

Caution!

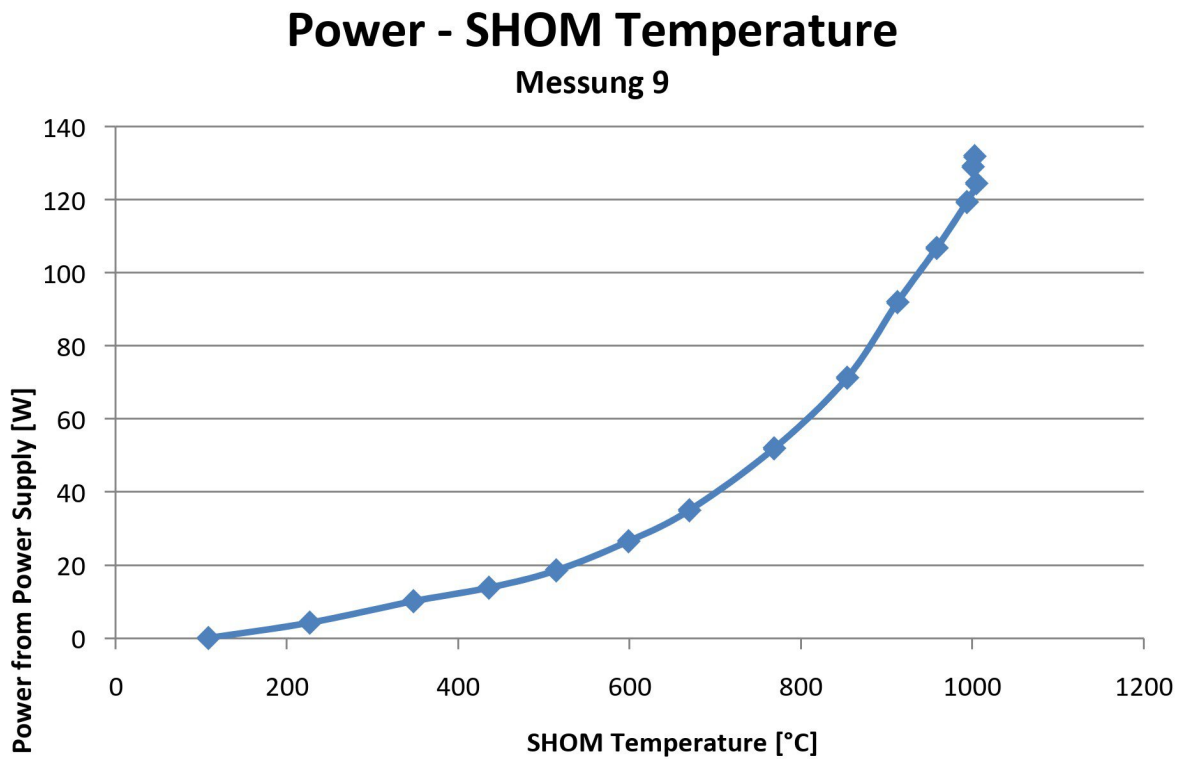
Do not heat up the PBN Heater Assembly over 150°C if it is not in an UHV environment. Once the PBN Heater Assembly has been heated up past that point in an UHV environment, do not heat it outside of an UHV environment again.

Recommendation!

Before using the PBN heater assembly for the first time, it is recommended to heat it up to ~150°C for approx. 30mins without any sample plate present. This degassing procedure will make sure the stage is clean and will enable a good vacuum during regular operations.

6.2 General Operation

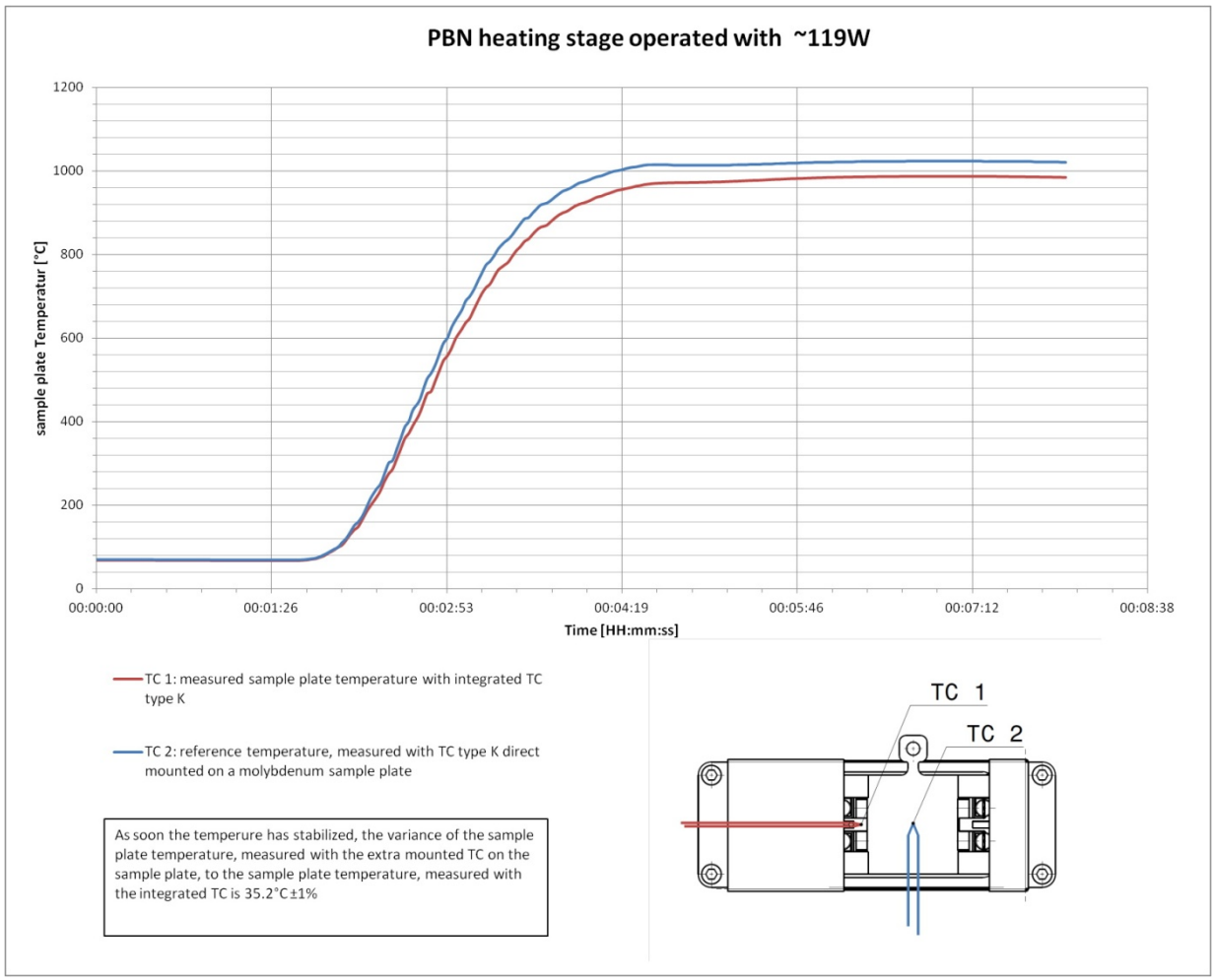
Only use materials that can withstand the temperatures of operation.
When using the product at its maximum specified temperature it is strongly recommended to not use sample plates of the same material as the receiver. There is a high chance of welding the sample plate to the receiver through friction and heat.
Never exceed the power or temperature limit specified in Section **4.2 Specifications**.



This graph shows the measured temperature on the molybdenum sample plate [in °C] in regards to the applied power [in Watts].

The temperature measured by the built-in thermocouple will be different from temperatures measured directly on the sample plate (see next page).

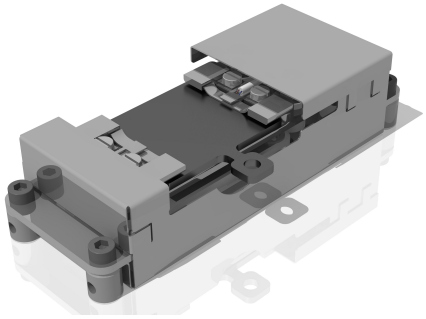
The measured temperature variance of the internal thermocouple (TC1) compared to a reference temperature at the center of a sample plate (TC2) is as shown on the chart below.



6.3 Sample Plate Handling

The following images and descriptions show the process of introducing or extracting a standard flag style sample plate to/from the PBN heating stage.

1

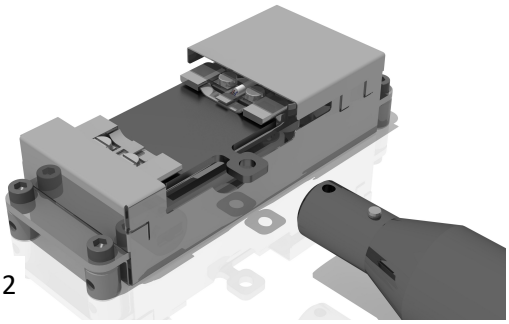


The SHOM sample plate can be introduced to the HSOMPBN50 heating stage from both sides.

All original Ferrovac standard grabbers and pincers can be used to introduce or extract flag style sample plates to/from the PBN heating stage.

When introducing a flag style sample plate to the heating stage, the clearance induced angle of the plate must be taken into account (7).

2



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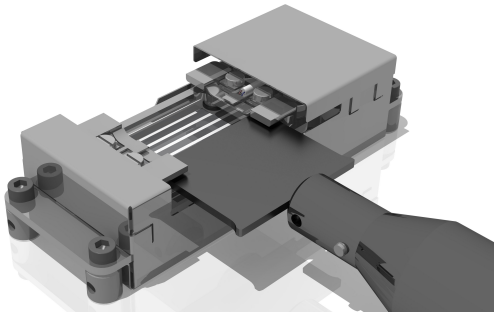

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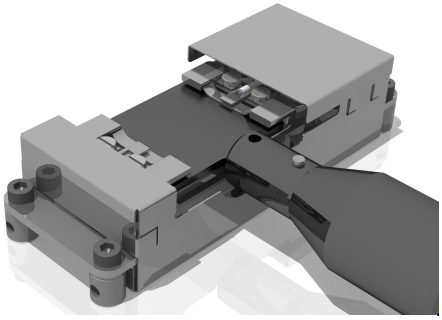

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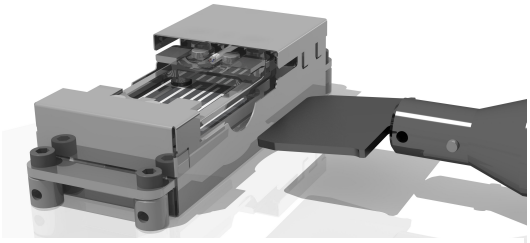

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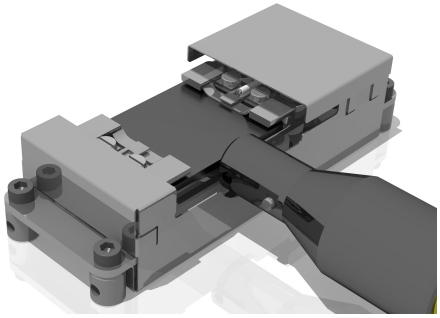
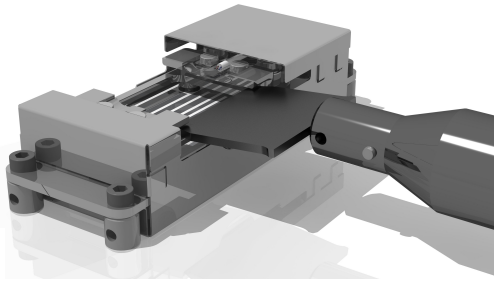


(7)



Caution!

Never use excessive force to introduce or extract sample plates from the PBN heating stage. Using excessive force might result in bending or breaking of the heating stage, sample plate or applied manipulator.

Axis of Engagement Information!

The PBN Heating Stage is designed for orthogonal access to the sample heating stage.
The engaging manipulator axis must be orthogonal to the Z-axis of the PBN heating stage when introducing or extracting a flag style sample plate.
The clearance of the sample plate in the grabber or pincer tool must be taken into account for the correct introducing and extracting of sample plates to/from the PBN heating stage.

Compatibility Information!

The PBN Heating Stage has only been tested with original Ferrovac manipulators, pincers and grabber tools.
Third party tools and manipulators may collide with the temperature shields of the heating stage!

Links to commonly used Ferrovac standard products with this PBN heating assembly:
WM40 - WMG40 - PGWMS(OM) - PGWMS(OMH) - GRABSHOM7 - SHOM

Warranty Information!

The Ferrovac warranty service can only be provided, when original Ferrovac manipulators, pincers and grabber tools are used during the operation of the PBN heating assembly.

Links to commonly used Ferrovac standard products with this PBN heating assembly::
WM40 - WMG40 - PGWMS(OM) - PGWMS(OMH) - GRABSHOM7 - SHOM

7. Maintenance

Do not remove, add or otherwise tamper with any part of the PBN heater assembly if it is hooked up to a power source. Always wait until the PBN heater assembly has cooled down to room temperature before venting the system it is part of.

The sheet metal shields / housing of the PBN heater assembly can easily be removed by hand.
The wiring of the PBN heater assembly can be replaced by loosening the screws fixing the wires in place on the underside of the PBN heater assembly. Make sure that all wires are securely fixed in place before using the PBN heater assembly again.

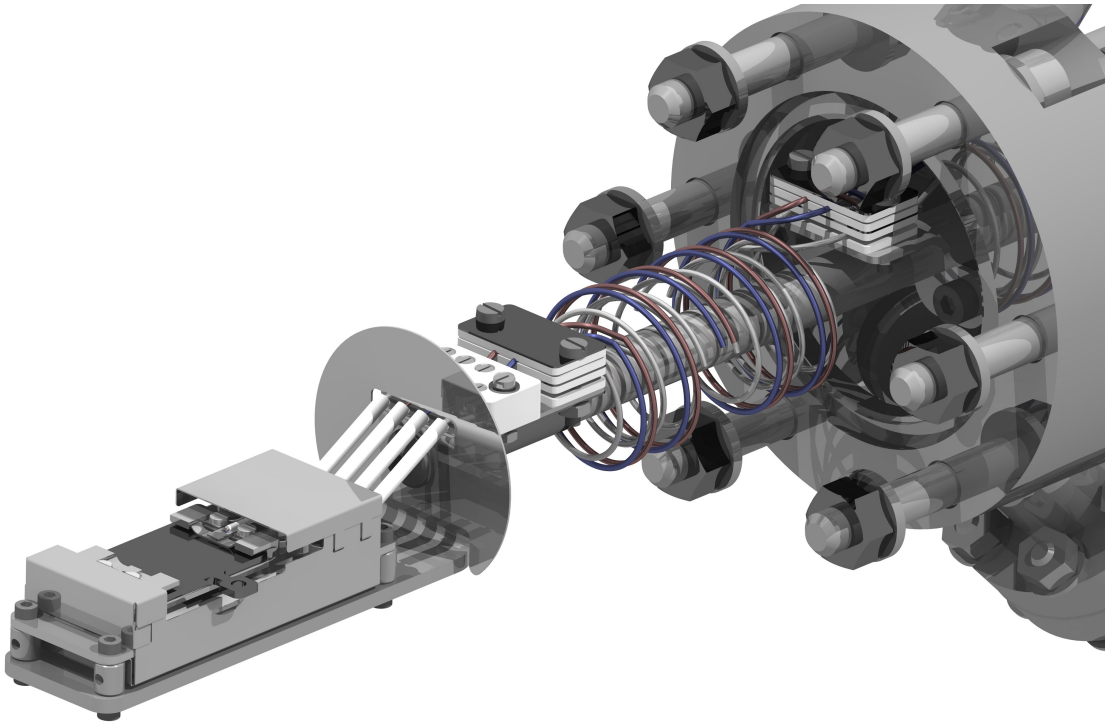
Once the product has come in contact with any tools, parts or instruments, or if it has been touched by bare hands, it needs to be cleaned to UHV standards before reintroducing it to a UHV environment.

Don’t hesitate to contact us directly if any non-standard part of the product is broken, or if significant changes need to be made to a part. Our contact details can be found at the end of this document.

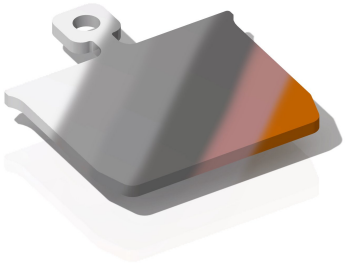
Ferrovac does not guarantee a failure free operation if any part of the product is no longer in its original state, has been replaced by a part or product of a third party, or if the product has been used outside of its intended purpose or specifications.

8. Options and Upgrades

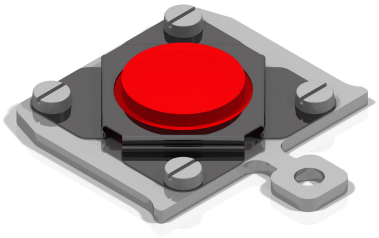
The PBN heating assembly can be mounted to a variety of fitting adapters and ready-to-use stages that are specifically designed for this product.



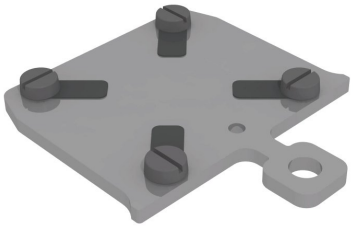
The PBN heating assembly is designed for, and works best with Ferrovac flag style sample plates. Listed below are a few commonly used sample plates.



SHOM



SHOMTCH



SHOM4T

Many more standard models and customized solutions in a wide range of materials are available.

Caution!

Choosing the wrong material for your sample plate can break the heating stage.

The user is fully responsible for choosing a material that can withstand the application and environment of the PBN heating stage.
Ferrovac will gladly provide support in choosing the correct material to fit the required specifications..

For more information, check the product catalogue on our website or contact us directly per e-mail at sales@ferrovac.com.

9. Additional Information

8.1 Return of Defective Items

Before any items are returned to the factory, Ferrovac requires a completed declaration of contamination form and will issue a corresponding Return Material Authorization (RMA) number, along with information on how to proceed with the return of defective items.

8.2 Downloads

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

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