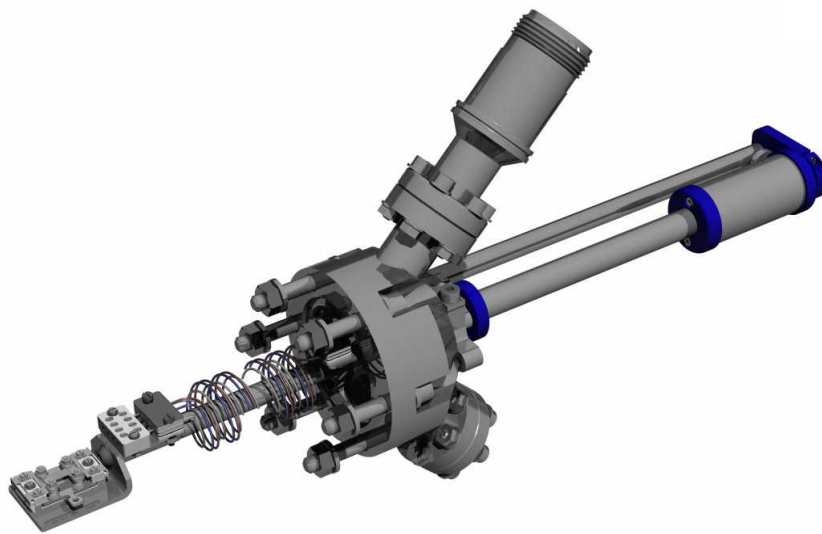


FERROVAC

ULTRA HIGH VACUUM TECHNOLOGY

HSASOM40(DCMD)-XXXX-YYYY

DC Heating Station for SHOMDC Sample Heating Plates



Operating Instructions

Version 1.2

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Warranty

Ferrovac AG warrants this product to be free of defects in material and workmanship for a period of 12 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 warranty of merchantability implied 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.

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Terms and Symbols

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.



A triangle with exclamation mark indicates a passage in the manual with information that is crucial for the operator. **READ THESE PARAGRAPHS CAREFULLY** or the product might be damaged by misuse.



The high voltage symbol, if found on a product or accessory of a product, indicates voltages that are potentially lethal.

WARNING! The **WARNING** heading in a manual explains dangers that may result in personal injury or death. Read the associated information always very carefully.

CAUTION! The **CAUTION** heading in a manual explains hazardous situations that could damage the product. Such damage may invalidate warranty.

Normal Use

The product described in this manual must always be used:

- With original cable sets supplied by Ferrovac which are explicitly specified for the use with the product described in this publication
- With all cabling connected and secured, if applicable
- With all electronic equipment switched on after all cables are connected properly
- In an indoor research laboratory environment
- By personnel qualified for operation of delicate scientific equipment
- In accordance with all related manuals.



Warning: lethal voltages!!

Any adjustment, fault finding procedure, installation and maintenance of the products described in this manual must be carried out by authorized personnel, fully qualified to handle potentially lethal voltages.



**CAREFULLY READ THE SAFETY INFORMATION AND ALL RELEVANT MANUALS
BEFORE USING THE PRODUCT AND ANY RELATED INSTRUMENTATION!**

Safety Precautions

The following safety precautions must be observed at all times before using the product described in this manual and any associated instrumentation.

The product described in this manual is intended for use by qualified personnel who recognize shock hazards and are familiar with the precautions necessary to avoid possible injury.

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 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 the manual and must be observed at all times.

Service Personnel are trained to work on live circuits and 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.

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

CAUTION: Always check for correct mains voltage before connecting any equipment!

WARNING: Lethal Voltages! Adjustments and fault finding measurements may only be carried out by authorised service personnel. Lethal Voltages may be present at parts of the instrument during operation.

WARNING:

- **Always** use the configured cables delivered with the product for electrical connections.
- **Always** disconnect the mains supplies of all electrically connected units before venting, pumpdown, opening the vacuum chamber, touching any part of the in-vacuum components.
- **Always** observe and strictly follow the safety notes and regulations given in this and related documentations.

1. Introduction

HS40EBDCBS(PS) is a heating stage for Block Style holders under UHV conditions. It can be used for a wide range of materials at the whole pressure range from atmosphere to UHV. The heating stage

operates with direct current through the Block Style holder or by irradiation through resistive heating.

2. Unpacking and Inspection

HS40 heating stages are shipped clean and ready to use in UHV. Prepare a sufficiently clean workspace and wear surgical gloves when unpacking and inspecting the evaporator. Check for any visible damage of the package, heating stage and accessories. Compare the contents of the package with the delivery note. Any damage or missing items must be reported to Ferrovac within 48 hours after delivery.

3. Setup and Installation

3.1 Power Supplies

The supply for resistive heating should have a DC voltage range from 0-100V with a power of 200W.



WARNING: Any high voltage supply with a high power output can cause a **potentially lethal** electric shock if operated by unqualified personnel!

4. Layer Growth and Calibration

4.1 Typical Operation Parameters for Cobalt

Cobalt is a material often used in magnetism studies. It is considered as a difficult material to evaporate.

There are two possible ways of Cobalt evaporation

- a) Mount a block of Cobalt direct onto the central tungsten rod of the EV40.
- b) Use a tungsten crucible filed with bits of Cobalt wire.

Both methods do not allow Cobalt growth at high evaporation rates. Our tests show that cobalt alloys with the tungsten crucible at heating power >100W. This corresponds to an evaporation rate of $4 \cdot 10^{-3} \text{ nm/s}$ (Figure 4). If alloying occurs, the crucible is usually destroyed and the evaporator must be refurbished.

In case of method a), users report the melting of the Cobalt-block at higher rates resulting in short circuits in the evaporator.

4.2 Evaporation Rate vs. Power (Cobalt)

Figure 4 shows typical evaporation rates for cobalt evaporated from a Tungsten-crucible.

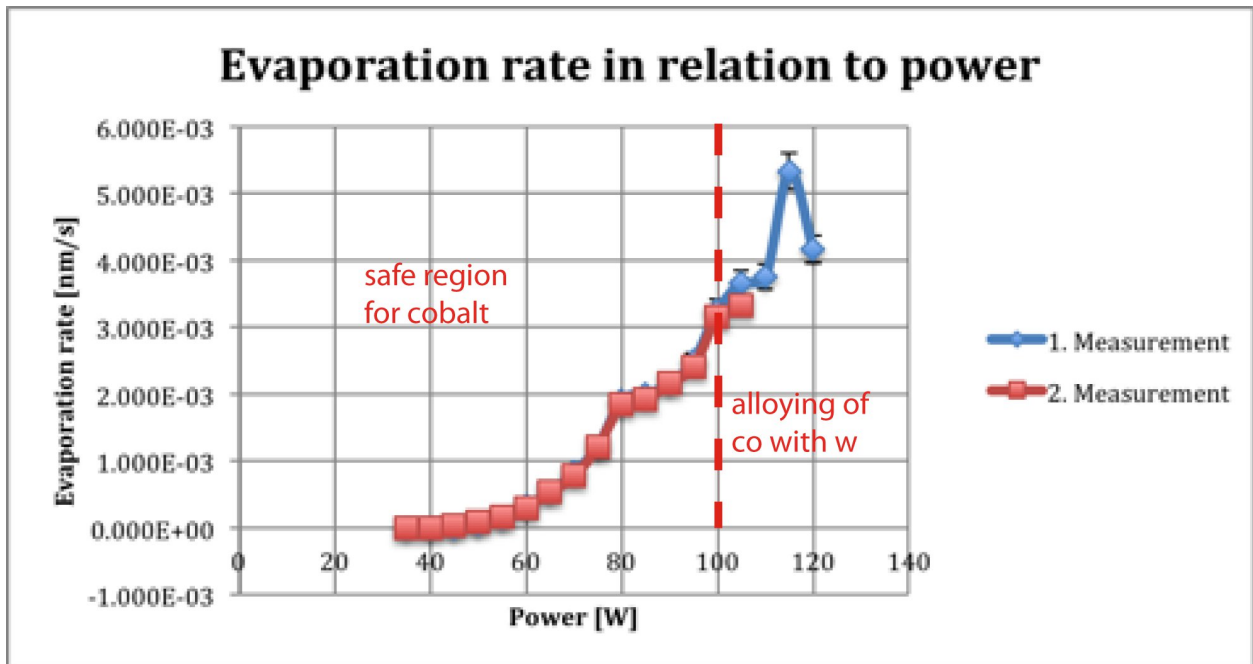


Fig4: Evaporation rate vs. power



CAUTION: Operating the evaporator loaded with cobalt with powers, above 100Watt will result in alloying with the crucible.

4.3 Emission Current vs. Filament Current (Cobalt)

Figure 5 shows the emission current as a function of the filament current. Two Tungsten filaments of 0.15 mm diameter are connected in series as indicated in Figure 2 and 3.

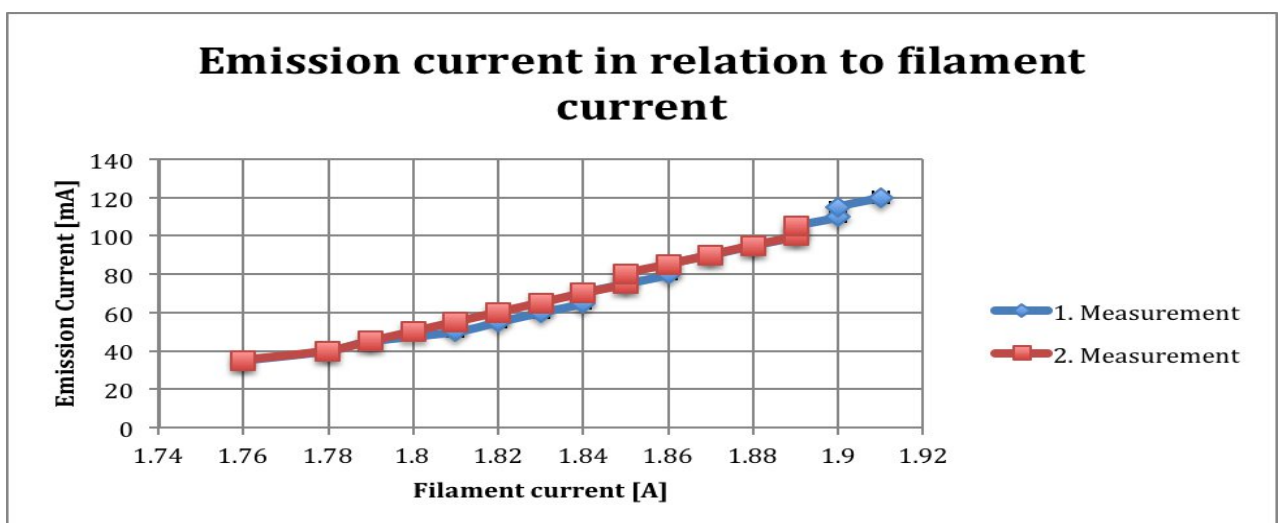


Fig5: Emission current in relation to filament current

4.4 Filament Resistance

Figure 6 shows the typical operation range of two tungsten filaments connected in series.

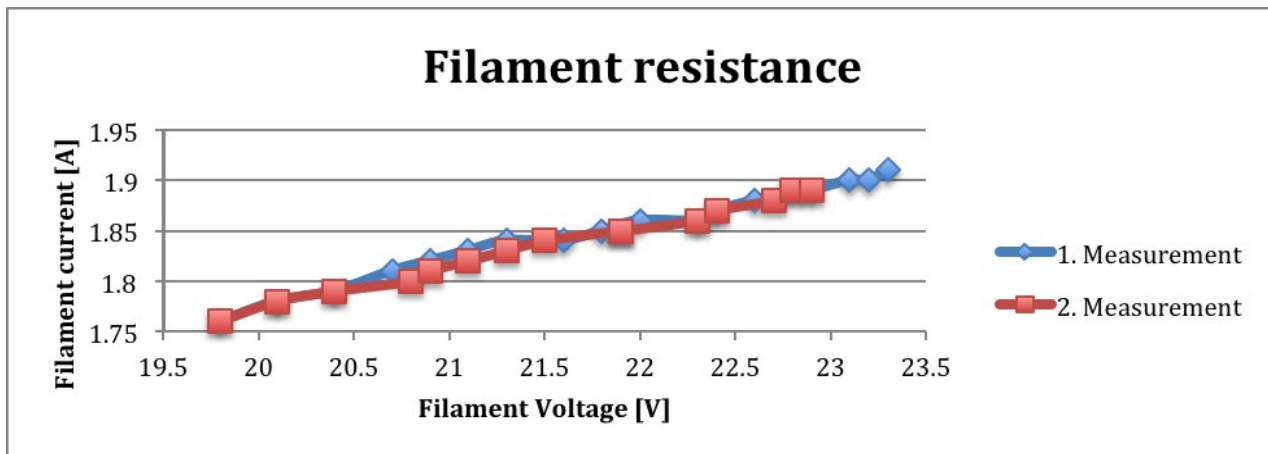


Fig6: Filament resistance

5. Specifications

- Mounting flange DN40CF, min. tube I.D. 36mm required
- Distance flange face to front end = 175mm
- Water cooled housing, water connections G1/8 with metric 6mm Serto tube fittings
- Tungsten-crucible, filling volume is up to 500mm³
- Average resistance of the filaments $\approx 11\text{-}12\Omega$
- Max. bake-out temperature 200°C
- Max. high voltage = 1kV