Technical specifications for sample holder system PTS, version 2.02

PTS

SAMPLE HOLDER SYSTEM

Adresss:	*OmniVac*
Internet:	*www.omnivac.de*
Phone:	*+49 (0)631 311 07 40*
Fax:	*+46 (0)631 28 056*

1. Introduction

This manual describes the sample holder system PTS, the receiving station PTS-REC, the high precision manipulator PTM 200 and the sample transfer for a linear or radial arrangement of UHV-chambers. This sample holder offers a wide variation of heating and cooling possibilities as well as sample holder for special applications.

1.1 Sample holder system PTS

The sample holder system PTS is a transferable sample holder for flexible surface analysis and preparation applications with included heater and cooling possibility. The general layout of the PTS H/K 1000 is shown in figure 1.

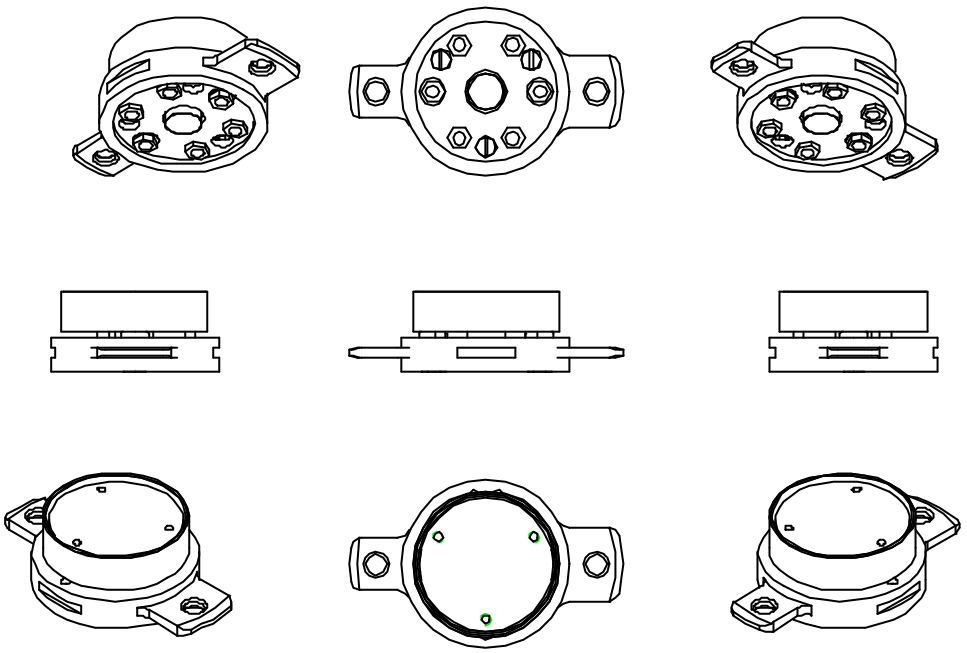

Figure 1: Sample holder PTS 1000 H/K

Figure 2. shows the detailed layout of the sample holder carrying thermal heat shield, cooling connection and six electrical contacts that can be used the following way:

- Two contacts for thermocouple
- Two contacts for heating
- Two contacts for sample bias

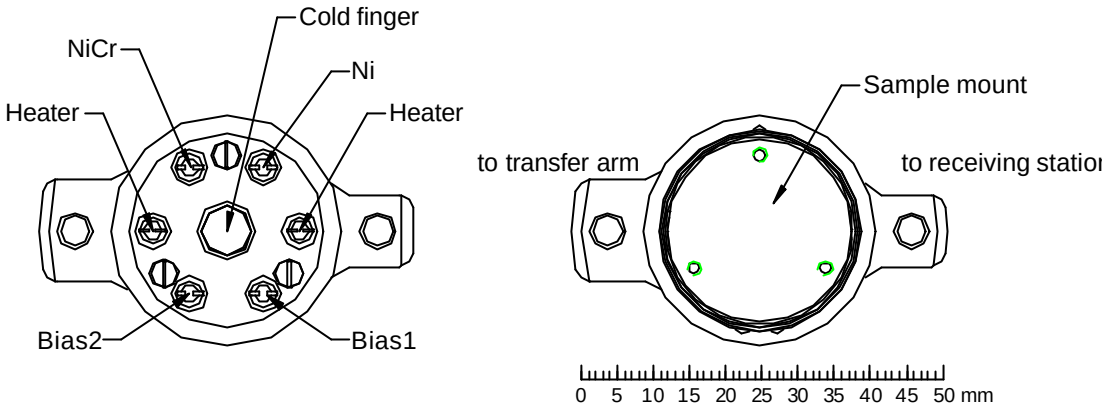

Figure 2: Detail view of sample holder PTS H/K 1000

The standard sample size is 25 mm but larger samples can be mounted and heated without modification of the sample receiving station. The two connecting sides of the sample holder have different size. The larger site is connected to the transfer rod and the other side to the sample receiving station.

The following special sample holders are available:

- PTS H/K 1000 – Sample holder made from molybdenum with indirect sample heating up to 1000 ?C and cooling to –160 ?C
- PTS EB 1200 – Sample holder with electron beam heating sample heating up to 1200 ?C and cooling to –160 ?C
- PTS H/K 600 – Sample holder made from copper with indirect sample heating up to 600 ?C and cooling to –180 ?C
- PTS EB 2000 – Sample holder with electron beam heating sample heating up to 2000 ?C to –150 ?C
- PTS DH 2000 - Sample holder with direct heating (through the sample) heating up to 2000 ?C and cooling to –160 ?C
- PTS KAT – Sample holder made from stainless steel with indirect heating by Philips Thermocoax up to 750 ?C in oxygen and cooling to –160 ?C
- PTS QUARTZ – Sample holder with integrated quartz balance
- PTS FARA – Sample holder with integrated faraday cup
- PTS OMC 1000 – Sample holder made from molybdenum with indirect sample heating up to 1000 ?C and cooling to –160 ?C with adapter to Omicron sample holder

- PTS-TRANS – Sample holder with heating and cooling to –170 °C for optical transmission spectroscopy (IR, UV)
- PTS-FLOOD – Sample holder with cooling to –170 °C with integrated electron flood source for charge compensation

1.2 Special sample holders

1.3 PTS-QUATZ

The PTS-QUARTZ sample holder is shown in figure 3. Together with the electronics from Inficon (Deposition controller) it is used to measure the corresponding pressure (by the impingement rate) of metal vapor targeting at the sample position.

Figure 3: Sample holder PTS-QUARTZ

The quartz oscillator is connected to one of the bias contacts and available as BNC contact at the sample manipulator.

1.4 Receiving station PTS-REC

The sample receiving station is shown in figure 3. This station is completely made from non-magnetic materials (titanium, non-magnetic stainless steel, copper, etc.) and provides the electrical contacts for heating and the setup for cooling.

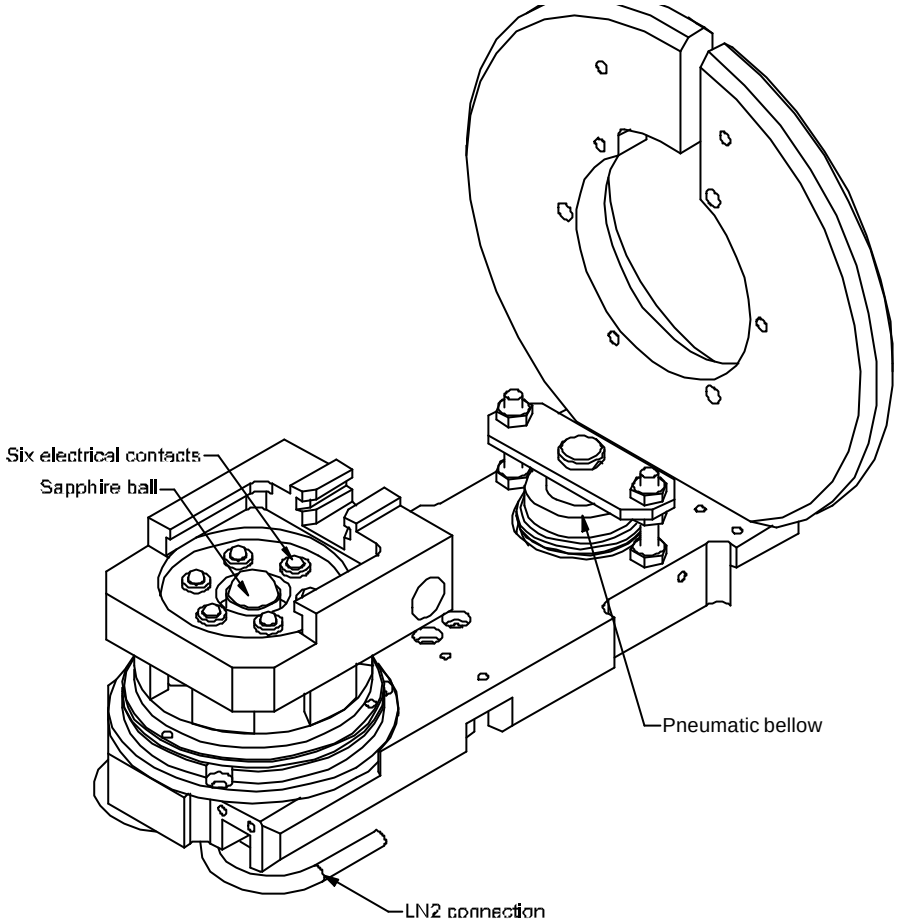

Figure 4: Sample receiving station PTS-REC

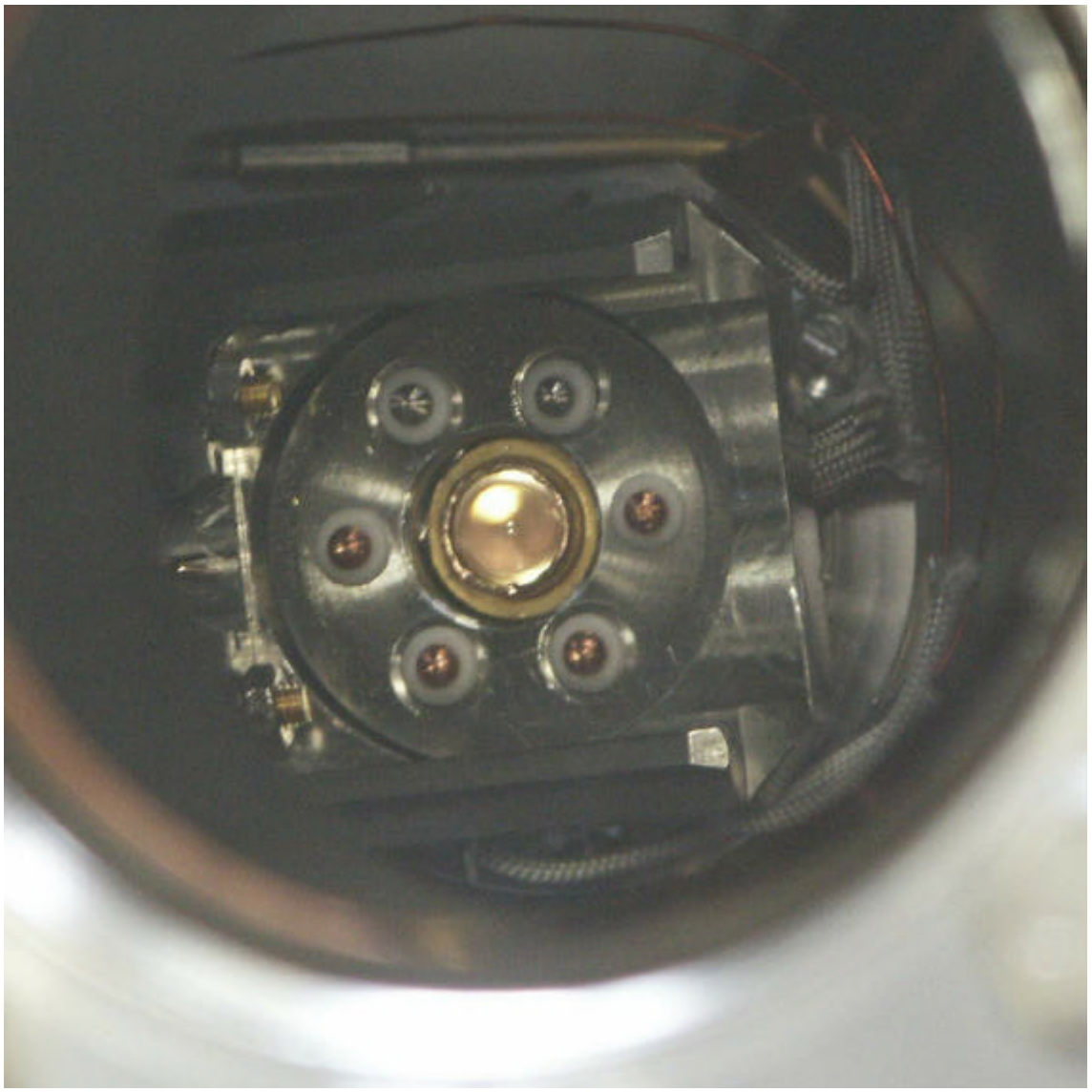

Figure 5: Top view of sample receiving station PTS-REC

The excellent cooling performance of this sample holder system is achieved by pressing a sapphire ball, which in tightly fitted into a copper reservoir filled with liquid nitrogen, into an identical shaped cold finger on the bottom side of the sample holder (see figure 6.). The cooling device is mounted in balance with a bellow. This bellow can be extended by applying a three different pressures:

- Sample transfer: 1 bar for release of electrical contacts
- Heating: ca. 2 bars for applying the electrical contacts only
- Heating and cooling: ca. 8 bar for pressing the sapphire ball into the sample holder.

Such a system provides the best possible heat transfer for a transferable sample holder.

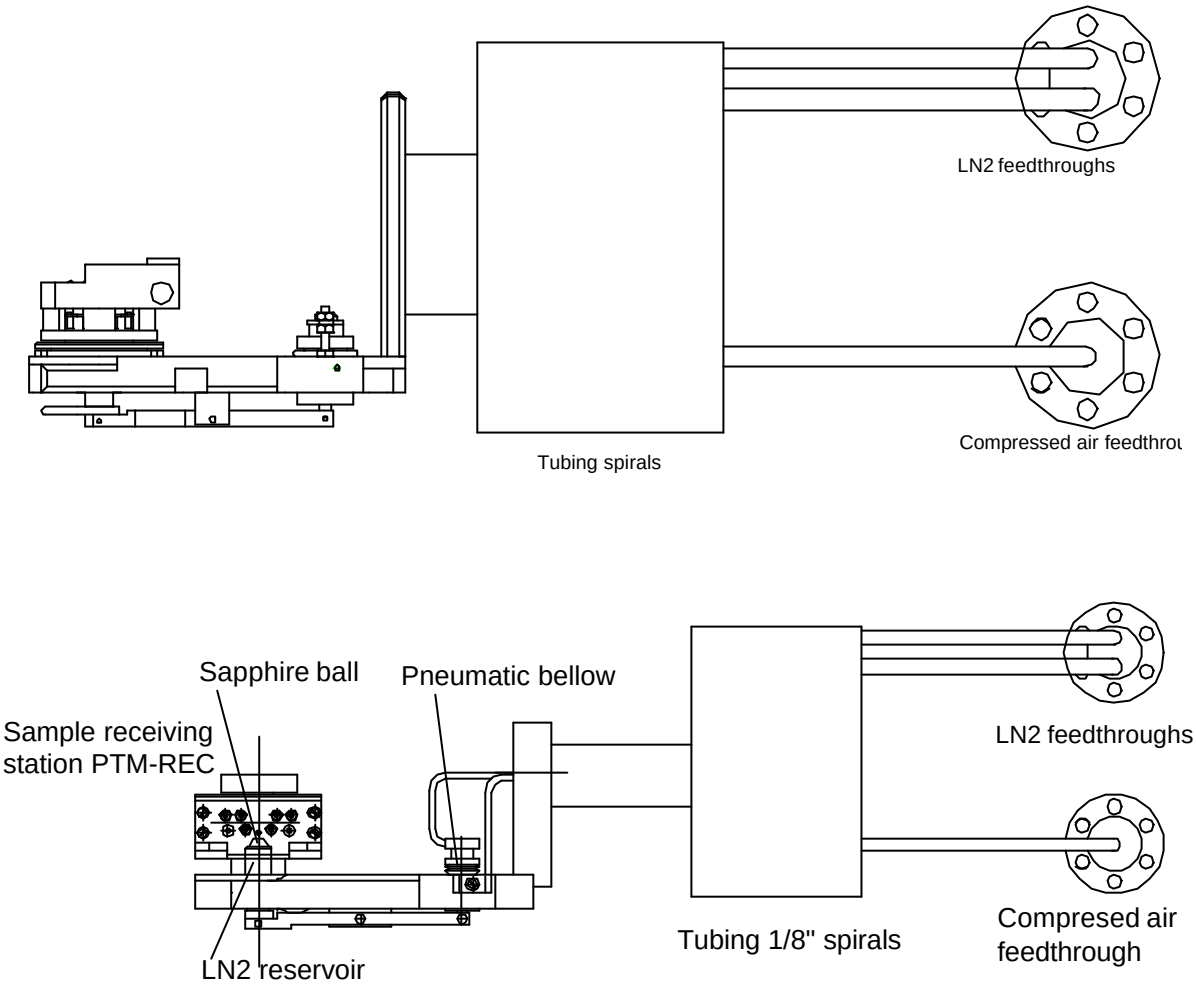

Figure 6: Cooling mechanism of PTS-REC

The one side of the LN2 input needs to be connected to a LN2 dewar the output to a small rotary vane pump. The large inner diameter of almost 2,5 mm of the tubes eliminates the problem of freezing almost completely.

1.5 Sample manipulator PTM 200

The manipulator shown in figure 6. is based on a precision cross table directly mounted to a DN 100 or DN 160 CF chamber flange. It provides up to five degree of freedom (X, Y, Z, THTEA and PHI), which are completely orthogonal to each other. The manipulator is available in a manual and stepping motor driven version.

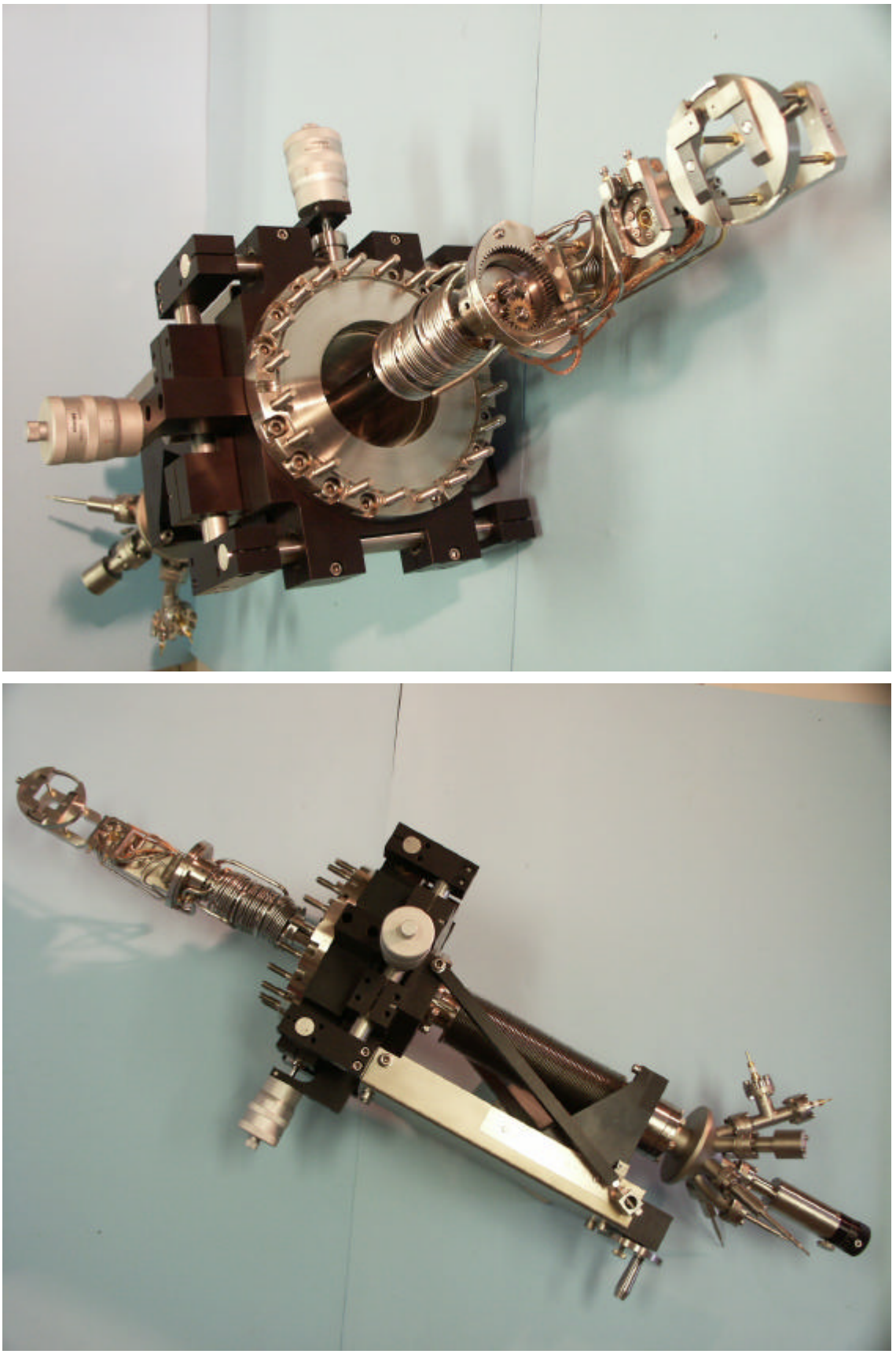

Figure 7: Precision XYZ-manipulator

Specifications PTM 200 (manual operation)

Movement	Stroke	Step width	Reproducibility
X	? 12.5 mm	20 ?m	10 ?m
Y	? 12.5 mm	20 ?m	10 ?m
Z	70 , 200, 400 mm	20 ?m	10 ?m
TILT	? 90?	0.5?	
AZIMUTH	? 180?	0.5?	

Bakeable stepping motors with end switches do the automatic operation. The motors do not have to be removed during bakeout therefore a recalibration is not necessary.

Specifications PTM 200 (stepping motor operation)

Movement	Stroke	Step width	Reproducibility
X	? 12.5 mm	5 ?m	1 ?m
Y	? 12.5 mm	5 ?m	1 ?m
Z	70 , 200, 400 mm	5 ?m	2 ?m
TILT	? 90?	0.1?	
AZIMUTH	? 180?	0.1?	

The sample manipulator can be positioned by a manipulator console showing the actual positions or by a PC through an RS 232 interface.

1.6 Sample transfer

The sample transfer between the different chambers a mechanical coupled rack and pinion translator (advantage no magnetic fields, constant torque, simple use by one person only) with a second rotation possibility is used.

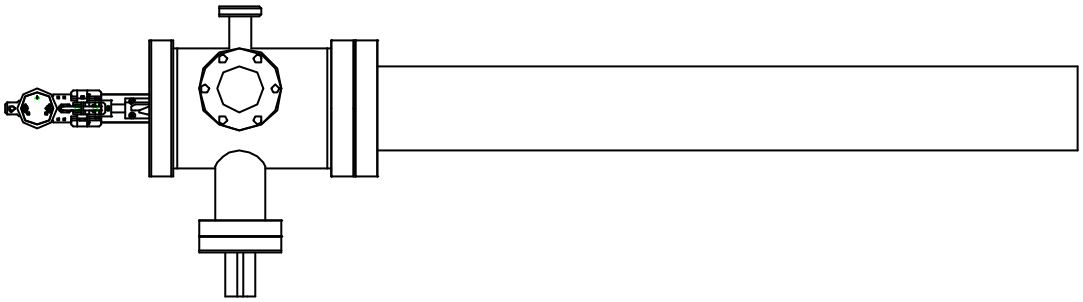

Figure 8: Rack and pinion linear and rotational translator

The sample locking mechanism is automated and based on a simple ball-pen locking mechanism. It is activated if the sample holders move against a mechanical stop (e. g. sample receiving station). At the first encounter the sample holder is released from the transfer rod and remains in the sample receiving station. At the second encounter the sample holder is locked on the transfer rod and can be removed from the chamber.
For details see figure 9.

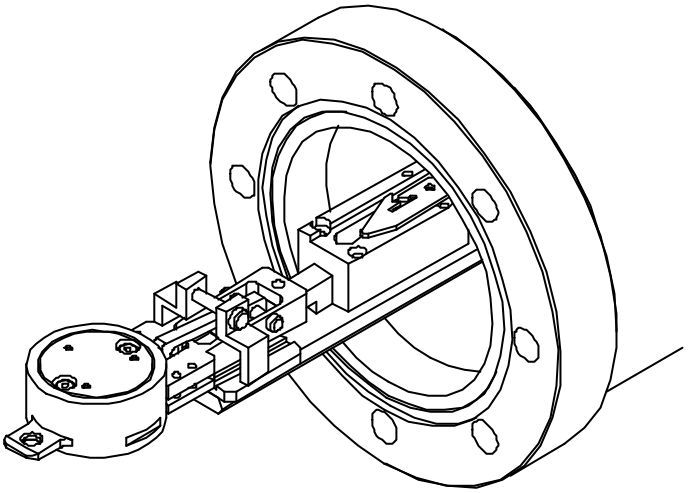

Figure 9: Linear transfer rod with sample holder PTS H/K 1000

This simple and proven transfer system makes it possible to perform the transfer and the pick-up or drop-off by only one rotary motion feedthrough. This allows a very fast transfer even of hot or cold samples. Transfer between two chambers is possible below 60 seconds, i. e. an as small as possible change in sample temperature and minimized contamination by background pressure.
The four steps are shown in figure 11. (based on sample holder system PTM).

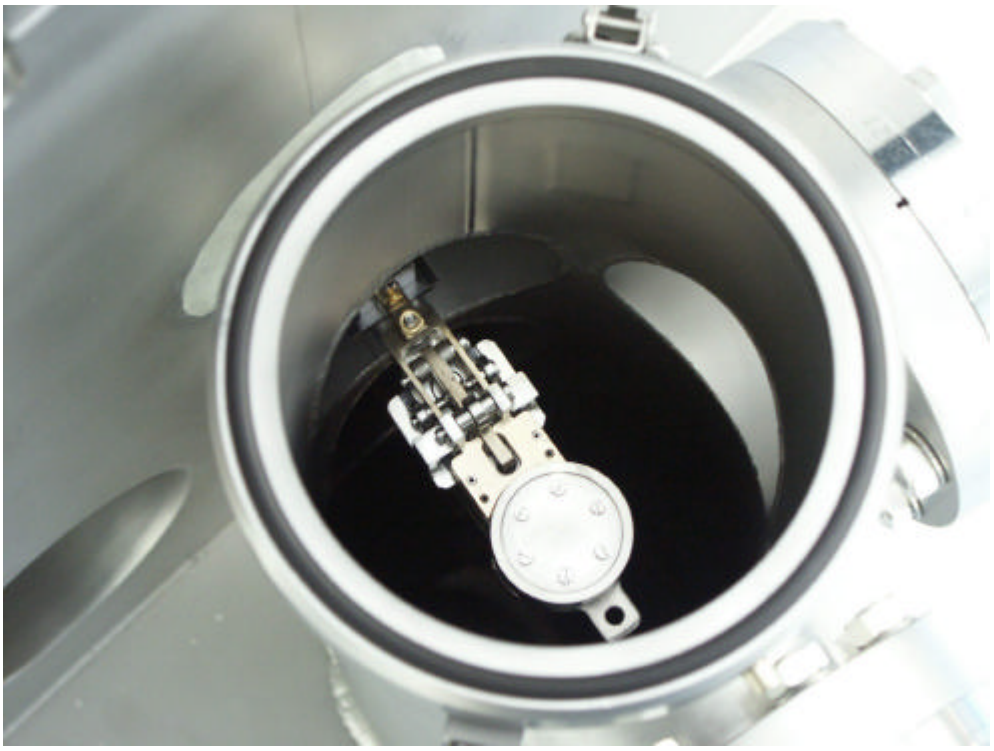

Figure 10: Locking mechanism with sample holder

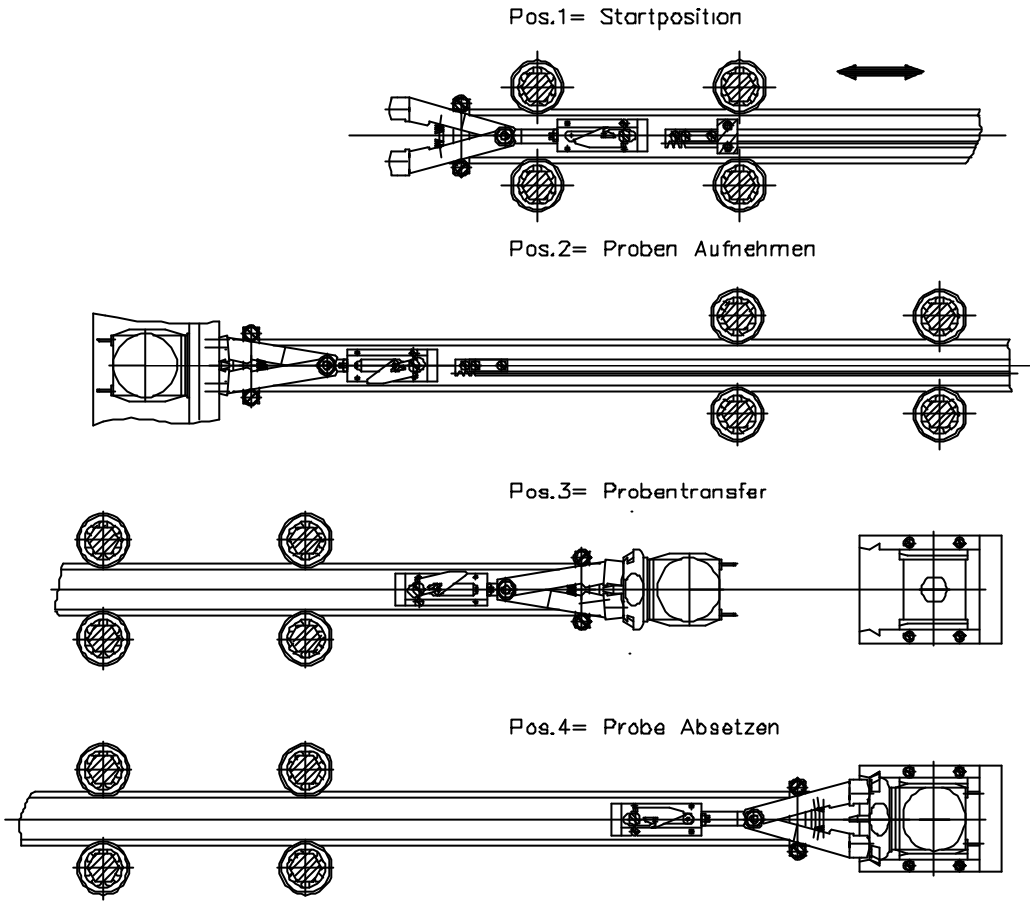

Figure 11: Locking mechanism