# Procedure of setting up the Stern Gerlach Experiment (P2511101).

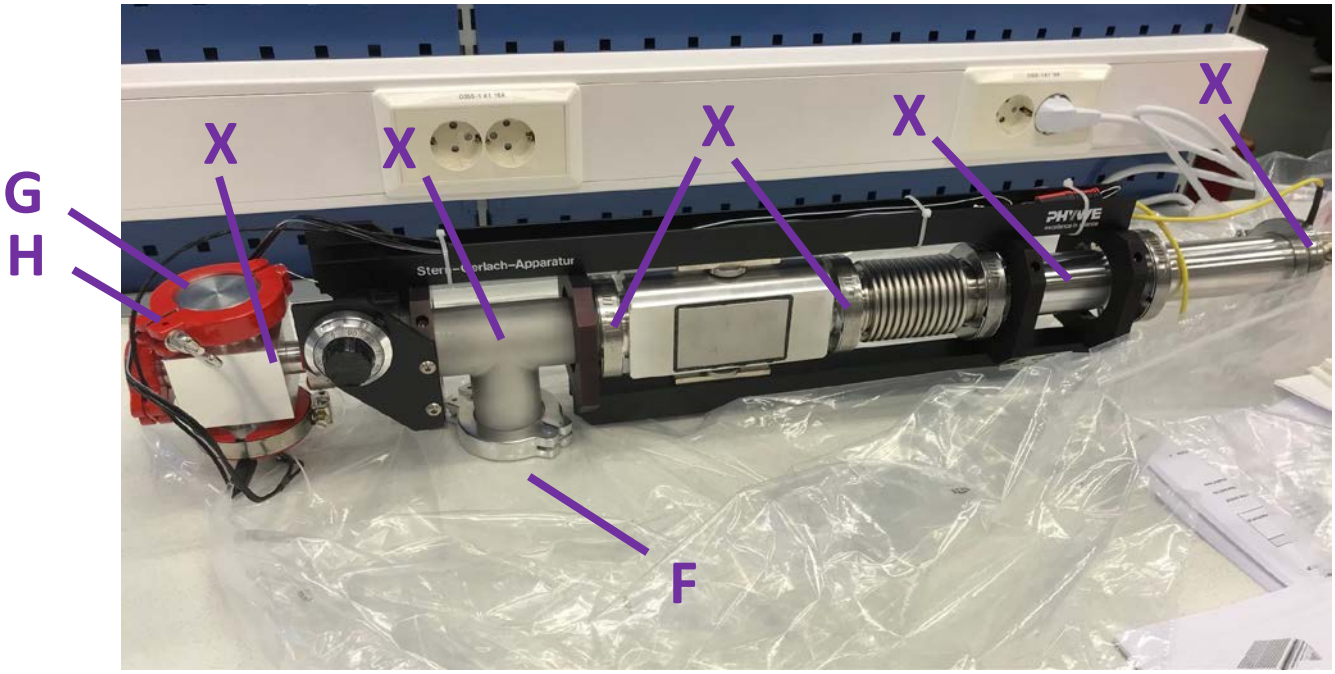
During the installation of the vacuum part, we recommend to wear gloves all the time.

1) Preparing the pump


a) Connect the reducing valve for nitrogen (33483-00) to the 10L nitrogen steel cylinder (41763-00) and connect it to the inlet (A) of the pump with the delivered vacuum tubing.
b) Turn on the pump (B) to evacuate the attached vacuum pipe (C) to about 0.1 mbar. The pump works fully automatic after turning it on with the main switch. Turn off the pump and slowly open the nitrogen in order to vent the vacuum pipe with nitrogen.
c) Open and remove the clamping ring (D) without removing the blank flange (E). When the internal nitrogen pressure exceeds the ambient pressure, the blank flange will slightly start to flap. Thereby you guarantee a slight nitrogen overpressure.

2) Preparing the Stern-Gerlach apparatus

The Stern-Gerlach apparatus is delivered sealed with an included inert protection gas and is fully pre-aligned by our specialist. Place the electromagnet on the table of the pump assembly, such that it fits the designated position (Y) of the Stern-Gerlach apparatus.




a) Open the clamping ring (F) and press the blank flange onto the Stern-Gerlach-Apparatus.
b) Lift the Stern-Gerlach-Apparatus close to the flapping blank flange (E).

The following step should be performed quickly in order to prevent the Stern-Gerlach-Apparatus to get dusty / dirty inside.

c) Remove the blank flange (E) of the pump and both the blank flange and the adapter ring of (F). Connect both vacuum pipes with one adapter ring in between. Put the clamping ring (F) back on it but don't tighten it firmly in order to keep the nitrogen pressure on a moderate level.

d) Open and remove the clamping ring (H) and tighten firmly the clamping ring (F).

The Stern-Gerlach apparatus is now fixed onto the high vacuum pump assembly. The blank flange (G) should start flapping now and signalizes a slight overpressure inside the Stern-Gerlach apparatus, which prevents dirt/dust from entering.

The apparatus is now prepared and the sample can be inserted.

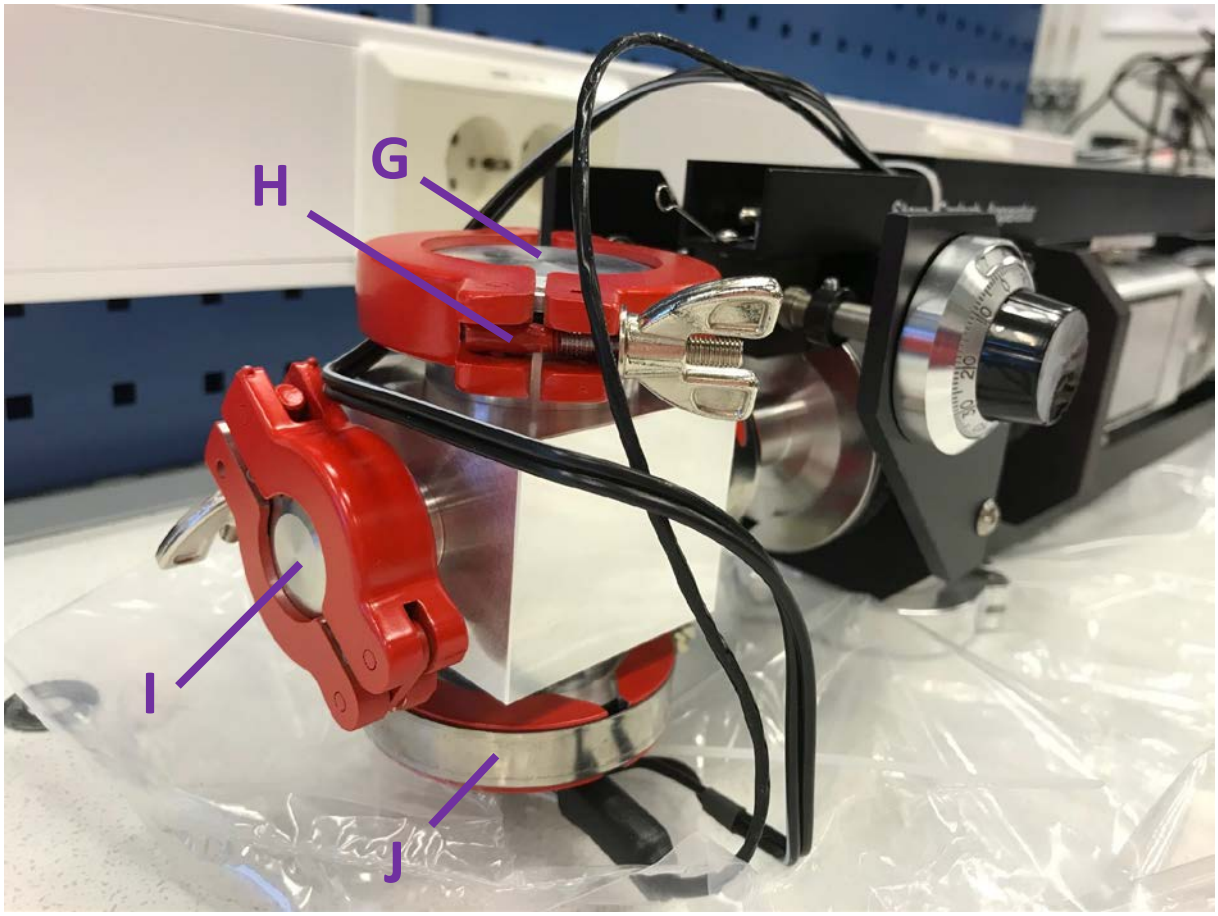
Note: The Stern-Gerlach apparatus contains a total of 6 apertures (X) which are pre-adjusted before delivery and don't require any further adjustment from the user.

3) Preparing the Sample

CAUTION when handling potassium: Contact with the skin causes burns! Wear protective goggles and gloves! If any item is contaminated by potassium put them into a vessel containing propanol-2. Only remove the items when the reaction is complete. NEVER wash with water.

All safety measures with respect to handling of potassium apply!

We suggest to prepare the potassium inside a plastic box to prevent spilling

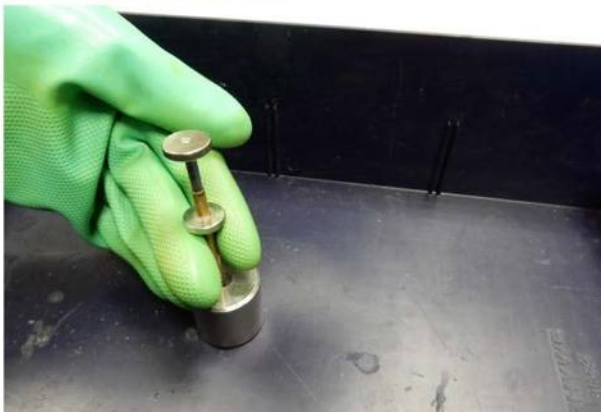



The blank flange (I) stays closed under normal installation and operation conditions. It is only used by our technicans for adjustments of the Stern-Gerlach apparatus with respect to the 6 apertures.

The blank flange (J) stays closed under normal installation and operation conditions. It is only used by our technicans in order to remove the atombeam furnace for example for cleaning purposes.

a) Make sure the clamping ring (H) is removed and the blank flange (G) is flapping slightly. The blank flange (G) can be removed, once you make sure that the Stern-Gerlach apparatus is continuesly flushed with nitrogen and nothing can fall into the oven.
b) Remove the cover of the atombeam furnace.

The potassium is highly air sensitive. The following steps should be performed in the shortest time possible (~10 sec.) in order to minimize the time of air contact of the potassium. In order to minimize the time, place the potassium ampoule, the ampoule opener and the potassium injector close by the Stern-Gerlach apparatus / the atombeam furnace.



c) Place a potassium ampoule with its tip upwards into the steel cylinder of the ampoule opener and cover it with its associated steel disc. Strike the steel disc with a hammer, thus cutting off the top of the ampoule.
d) Press the potassium injector as far as possible into the ampoule in order to load as much potassium as possible.
e) Withdraw the injector and strip off glass spinters with a spatula if necessary.
f) Transfer the tip of the potassium injector into the nitrogen / atombeam furnace.

Once the potassium is located in the nitrogen it will stop oxidizing.

g) Empty the potassium injector inside the atombeam furnace by pressing the potassium to the bottom of the furnace. Make you you press the potassium towards the backside / away from the aperture of the furnace.

If the potassium gets to close to the aperture it might clog it which would entail the necessity to clean the whole furnace.

h) Remove the injector and cover the furnace.
i) Put the blank flange (G) back in place and put the clamping ring (H) back on it but don't tighten it firmly in order to keep the nitrogen pressure on a moderate level.
j) Turn off the nitrogen flow and tighten firmly the clamping ring (H).
k) Evacuate the whole setup by turning on the pump (B).

For measurements the pressure inside the apparatus schould reach down to about $10^{-7}$ mbar.

The atombeam is expected to work fine for temperatures of about > 180 °C (i.e. around 200 °C)

For further instructions regarding the measurement please refer to the experimental instructions, setup and procedure points 5. To 7.