ProboStat™ High Pressure modification

A stainless steel (SS) ProboStat™ cell can be equipped with an extra outer tube made of high pressure/high temperature tolerant SS material. The tube is welded onto a standard ProboStat™ SS flange. With the SS outer tube mounted on the outside of an alumina outer tube, the ProboStat™ can tolerate up to 15 bar overpressure. In order to prevent the alumina tube from rotating while tightening the flange on the SS tube, the ProboStat™ cell is modified in the way described below:

Items included:

- 2 plastic stoppers (PEEK) of length 11 mm (picture 1),

Picture 1. PEEK stoppers.

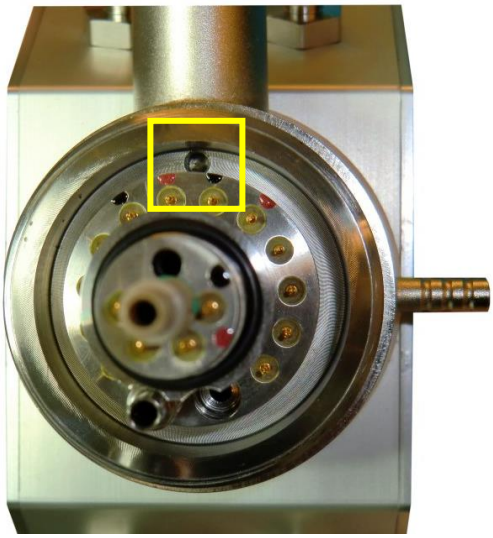
- 1 closed end outer tube (stainless steel 253MA) welded onto a stainless steel ProboStat™ flange (picture 2),
- 1 closed end outer tube (alumina) with a small cut-out in lower end (picture 3).

Picture 2. Stainless steel outer tube.

Picture 3. Alumina outer tube with a cut-out.

Setup for high pressure measurements

In the base unit groove there is a small hole (picture 4). Insert one plastic stopper in the hole (picture 5).



Picture 4. Hole for the PEEK stopper.

Picture 5. The stopper inserted in the hole.

Thread a 40x3 mm O-ring (standard ProboStat™ item) onto the lower end of the outer alumina tube and place the tube so that the tube cut-out fits with the plastic stopper (picture 6). The alumina tube is now fixed in position, unable to rotate. Mount the outer stainless steel tube outside the alumina tube. The system is now ready for use (picture 7, 8).

Picture 6. Outer alumina tube inserted.

Picture 7. Stainless steel tube mounted.

Picture 8. ProboStat™ assembled for high pressure measurements.

Use of high pressure outer tube without alumina tube

The SS outer tube can be used without the alumina tube mounted on the inside. In order to avoid gas leakage through the flange, replace the alumina tube by a 40 mm outer diameter tube piece of alumina or quartz. Suitable height is 5 cm. Thread the 40x3 mm O-ring onto the tube piece and places it in the ProboStat™ groove. Do not use the plastic stopper. Mount the SS outer tube.

Important

Operation of ProboStat above atmospheric pressure – even with a steel outer tube – is done entirely at the user's risk and responsibility, and requires that the user understands the principles of operation and the possible sources of failure and danger, and installs safety precautions as required.

The steel tube conducts heat from the furnace to the base unit more efficiently than with only ceramic tubes. Thus, ensure that water cooling of the base unit is in operation.

Oxygen is a potentially dangerous gas in pure form at atmospheric and higher pressures: It may ignite organic materials and metals, especially if they are hot. This is a potential danger for the materials of the base unit. Thus, limit pressures of oxygen, and ensure that water cooling is in operation.

The steel tube is in danger of touching or short-circuiting the heating element for some type of furnaces. Ground the base unit if electrical hazards cannot be excluded.

Do not attempt to force the steel tube into a furnace with too narrow working tube if it does not run freely.

The closed 253 MA tube works as a safety container around a ceramic enclosing tube when this is subjected to above-atmospheric pressures or explosive/toxic/corrosive gases that must not escape in case of breakage of the ceramic tube.

Never use closed outer quartz tube for high pressure measurements, only the high-quality alumina tube.

Material specifications for SS outer tube

Top plate

Material: 253 MA (cold rolled stainless, EN 2E, ASTM 2D)
Thickness: 4 mm
Heat treatment: 1170°C

Tube

Material: 253 MA (seamless stainless hot finished tube for high temperatures)
OD: 48.26 mm
ID: 42.72 mm
Wall thickness: 2.77 mm

Welding

Material: 253 MA

General

The 253 MA resists oxidation in air up to 1150°C. The tubes are welded to SS outer flanges, and are fastened to the outer thread of the base unit, against the Viton O-ring.