**High-Pressure Fluid Measurement Procedure**

This document explains the procedures to be followed when using the cylindrical cavity sensor before and during measurements of permittivity of gas under pressure. Safety glasses must be worn during all pressurized measurements. The procedure should be used in combination with the safe work analysis (SJA).

This procedure applies to both gas connection to the wall socket and to the gas bottle. Use a laboratory with a good ventilation system, which includes a fume exhaust and a pressure chamber.

**Hydrostatic Pressure Test**

The measuring system should be pressure tested using water to 150% of the maximum gas operating pressure, i.e. to 75 bar at a maximum operating pressure of 50 bar. This provides no assurance that the equipment will withstand high pressure over a long period of time.

1. Mount the measuring cell on the stand. Consider whether the stand should be screwed to the cabinet floor. Place the sensor setup in the cabinet.
2. Place the tube for gas input out of the chamber and attach to the pressure pump. The pipe for the gas outlet must be led out of the chamber where there is a valve and then into the chamber again. If necessary, a double valve must be fitted.
3. The pipe where the water comes out must be deposited in a suitable cup/bucket.
4. Mount the bottom lid (gas lid) securely, then fill the cavity with water. Mount the top lid securely.
5. Make sure that all connections and screws are tight.
6. Close the chamber and make sure you can see the measurement setup inside the chamber through the glass window.
7. Make sure the valve on the gas outlet is closed.
8. Increase the pressure to 5 bar. Note the pressure in the cylinder. Leave for 30 min while the pressure is monitored. Then increase the pressure in 10 bar increments. That is 15 bar – 35 bar – 45 bar – 55 bar – 65 bar – 75 bar. Leave for 30 min for each interval and make sure that the pressure does not drop. If the pressure drops at one of the intervals, stop the test and proceed to point 9.
9. When the pressure test is completed, open the valve to the gas outlet before opening the door.
10. Then open the door of the chamber and screw up the top lid. Wear safety glasses and keep your face away.
11. Drain the water and dismantle the equipment. Wipe over with a cloth. Run gas through the pipes to remove water.

**Førstegangsoppkobling**

If pressure measurements are to be carried out at high pressures, a chamber must be used (at the hydrogen lab or lab D2 on the 2nd floor). (Possibly at low pressure (<5bar?) the connection can be carried out at a chemistry lab).

1. Check whether the inside of the cylinder is empty and clean. Wash and dry if necessary.

2. Screw on the gas cap on the bottom/top of the cylinder and the EM cap on the bottom/cap depending on what is desired. Mount the measuring cell on the stand. Place in a suitable cabinet. Consider whether the stand should be screwed to the cabinet floor.

3. Fit the pipe to the gas inlet out of the cabinet via the pressure sensor and onto the gas source. Install pipes for gas outlet from the cabinet to a valve and then into the cabinet with extractor.

4. Calibrate the probe with the Rhode Shwartz X to the network analyzer. Software

5. Fit the EM connector to the network analyzer.

6. Make sure that all connections are firmly attached and that the screws are screwed in securely. Close the cabinet.

7. Check that the pressure sensor logs pressure, temperature and time on (the software)

**Gjennomføring av selve testen**

Ved ønske om målinger ved flere trykk, gjennomfør punkt 1-7

1. Åpne ventilen på gasstilførselen (gradvis/i steg).
2. La stå (til gassen har fylt målecellen)? Hvor lenge?
3. Steng utgangsventilen
4. Øk trykket til ønsket trykk
5. Steng inngangsventilen
6. Påse at trykket er konstant
7. Gjennomfør ønsket antall målinger ved trykket

**Nedkobling**

1. Når målingene er ferdige, åpne gassutgangs-ventilen og vent til trykket har sunket til atmosfærisk trykk.
2. Åpne skapet.
3. Hold hodet vekk mens målecellen frakobles og åpnes.
4. Koble fra gasstilkobling og -utgang.
5. Fjern eventuelt målecelle fra stativ.

**Nødstengingsprosedyre**

Gjennomføres ved materiell svikt, materiellskade, personellskade, gasslekkasje eller ved annen grunn til at nedstengingen bør finne sted.

Ved stor gasslekkasje:

1. Hold avstand
2. Steng hovedkran på gasstilførselen.
3. Steng hovedventil, og deretter alle andre ventiler
4. Tilkall beredskapsansvarlig

Ved alvorlig personellskade:

1. Ring 113, og NORCE beredskapsnummer