CMS
BARREL MUON
DT CHAMBERS

Status of Gas Components, Especially Manifolds + Manometers

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021202

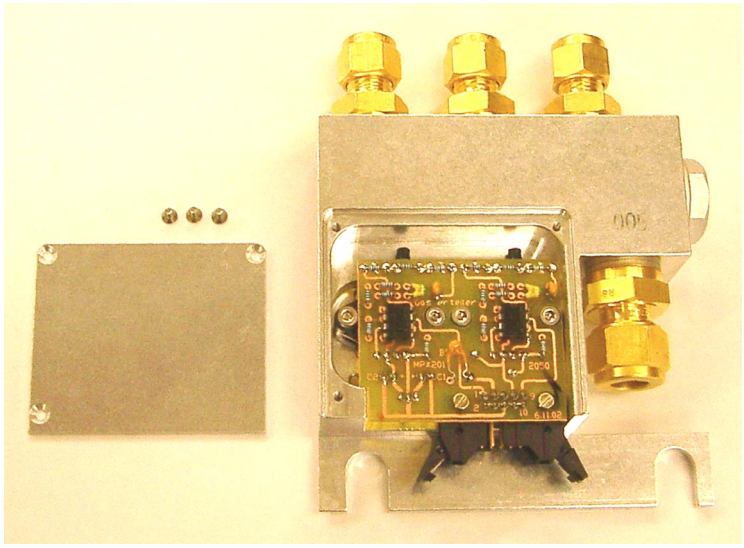
Overview

Status of gas components on DT:

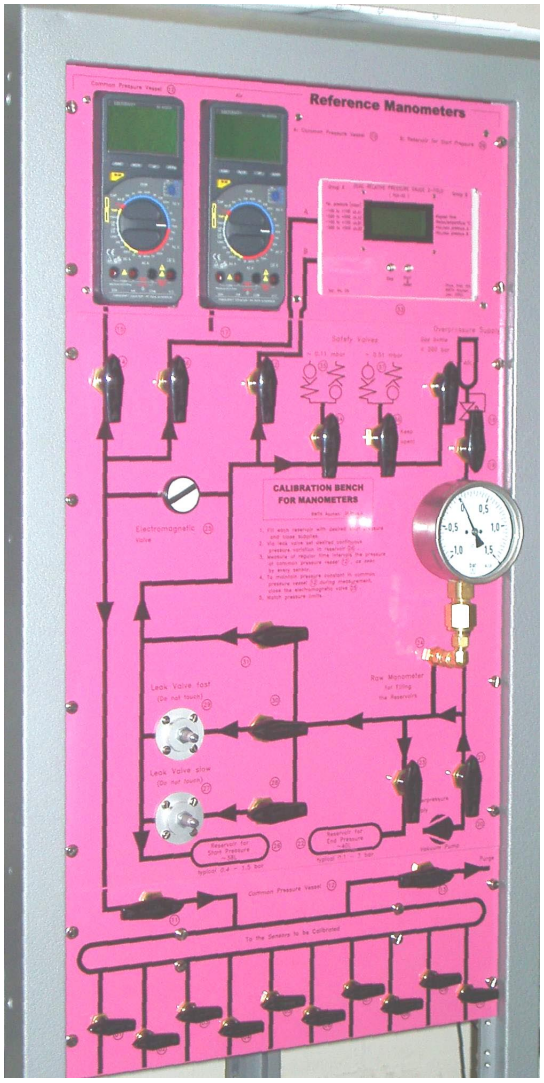
- **Fittings** for SL covers: all delivered
- **Quick connector**s for patch panel: all delivered
- **Flexible tube**: rejected by safety (no halogen but too flammable, although of type flame retardant)
- **Copper tube**: deliver (a) cut and pre-bent (1 bent segment + 1 straight segment + 1 fitting per DT), or(b) raw straight, or (c) raw endless?

  Propose (a), sending all pieces to CERN.
- **Manifold + manometer** (**ADC** board later): 50 units done; irradiated sensors; irradiating amplifiers; setting-up calibration; no need to add orifice plate for flow balance. Where to ship the first units?

Manifold Production



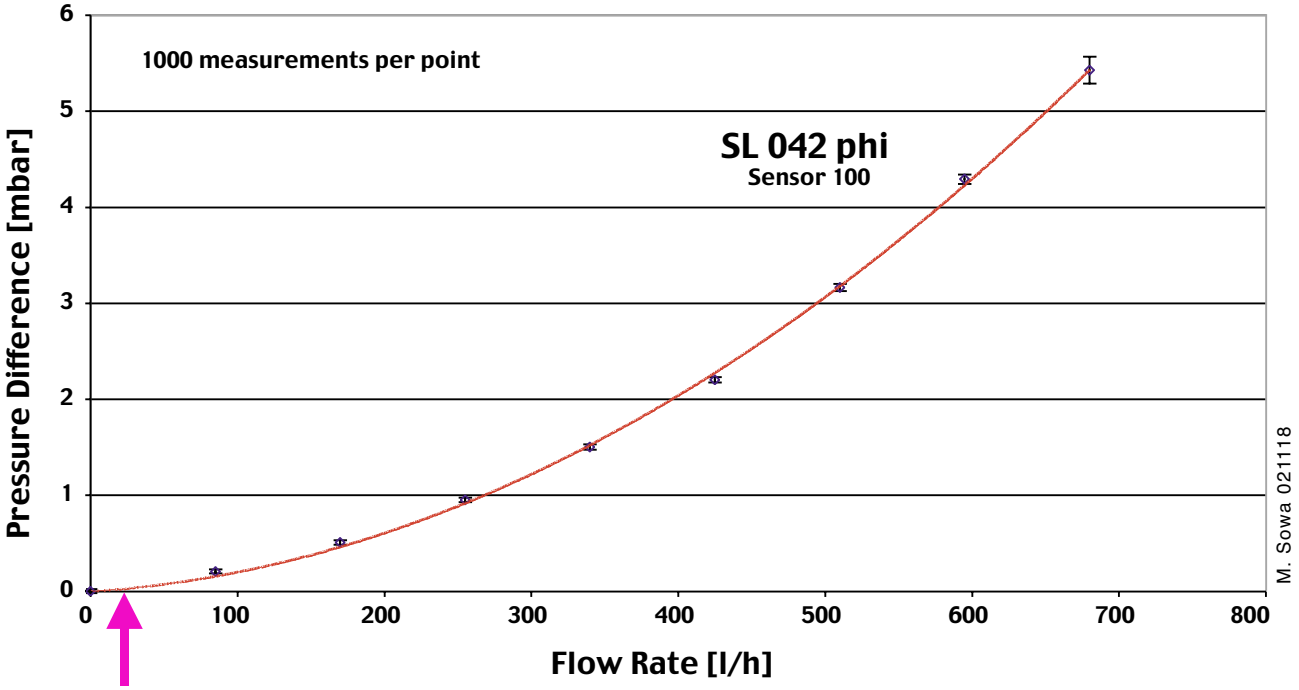
An assembled manifold. The inlet and the three outlets are clearly visible; the cover has been removed to show the preamplifier; the sensors are under the PCB and thus not visible. Calibration tests suggest that the resolution is limited by the ADC and external noise.



View of the calibration rack. Up to 10 manifolds can be connected and calibrated simultaneously. Increases production speed and precision.

Impedance of SL (1)

Measure pressure drop as a function of the gas flow in single SL.

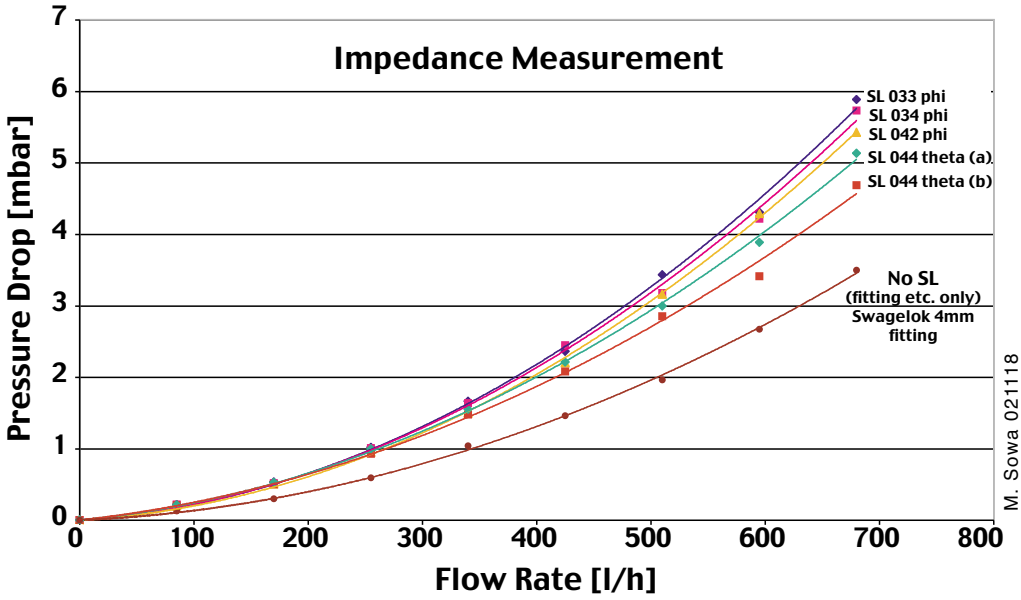


Foreseen operation at CMS

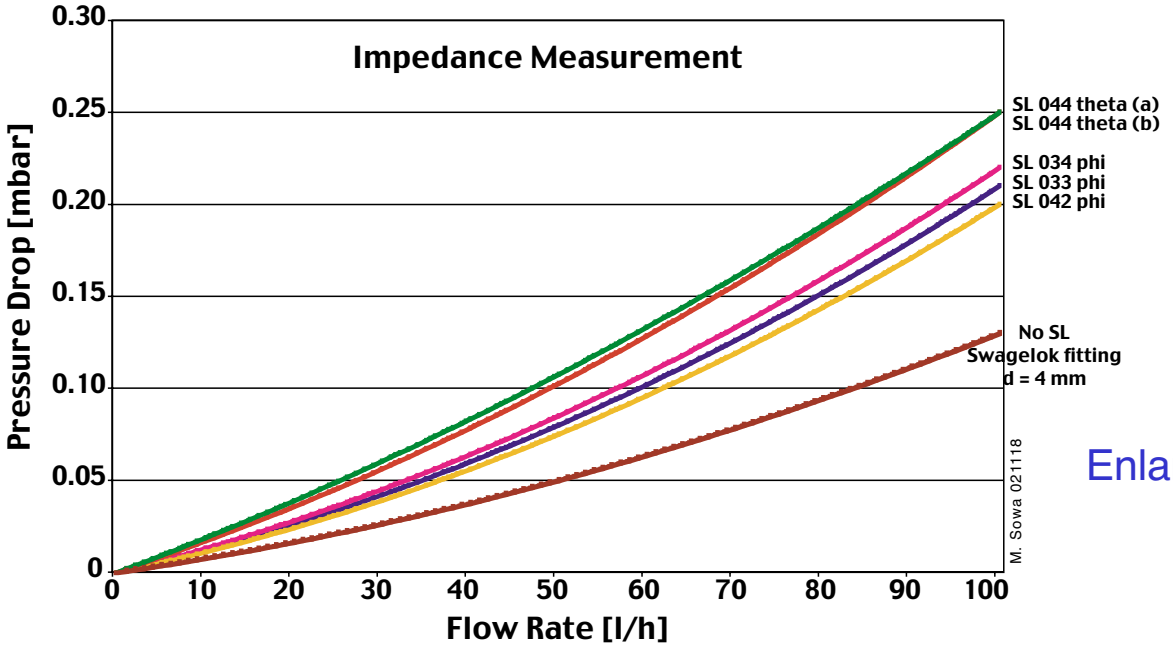
Find:

- Pressure drop is very low (had to measure up to large flow)
- Measurement reproducible to <0.2 mbar
- Inside SL have laminar flow throughout in this range (calculated)
- Raise is not linear; have nevertheless transition to turbulence?

Impedance of SL (2)



Measuring different SLs. Bottom curve is with same fittings etc. but NO SL. The two fittings have 4 mm inner diameter. (a), (b) was reversing the flow direction.



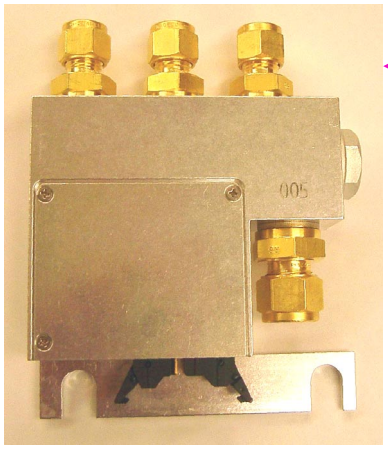
Enlarged view.

Find

- The SuperLayers (SL) have low and comparable impedance
- 4 mm straight fittings etc. are the largest contribution to the impedance
- In these fittings, expect laminar flow below ~350 l/h and turbulent flow above ~600 l/h. Are thus in transition region in this wide range, here.
- The final fittings have elbow shape and 3 mm diameter. Their pressure drop at max. flow is more than twice the drop in the SL proper. The flow is thus determined by the fittings mainly. No need for further regulation.

Orifice Plate?

Link to the three SLs. We have been conjecturing that, due to differences in the impedance of the three SLs of a DT, the gas distribution in parallel may lead to one SL getting no gas. Using three small orifice plates one could overcome the problem.



A small orifice plate would be mounted inside these fittings, in every manifold.

The orifice plates:

- Are pressed inside the fitting at production time (adding later means substituting the fitting as well, here ~8kCHF).
- Additional cost for orifice plates ~20 kCHF.
- Tolerance of orifice of 1 mm is +/-0.127 mm, which means impedance fluctuations by factor~1.7 (for d**2) to ~2.8 (for d**4).
- The measured impedance fluctuations of SLs with normal fittings are smaller than this and already small enough to ensure a similar gas flow in each of the three SLs of a chamber.

CONCLUDE:

- There is no need to add orifice plates.
- Propose not to add them.