Status TRD-GAS

- Box-S/C Mechanical/Electrical
- Supply Vessel Filling
- COPV Protection
- ESTEC TVT Preparations
- Schedule

AMS TIM CERN 03-FEB-2009
Th. Siedenburg / MIT

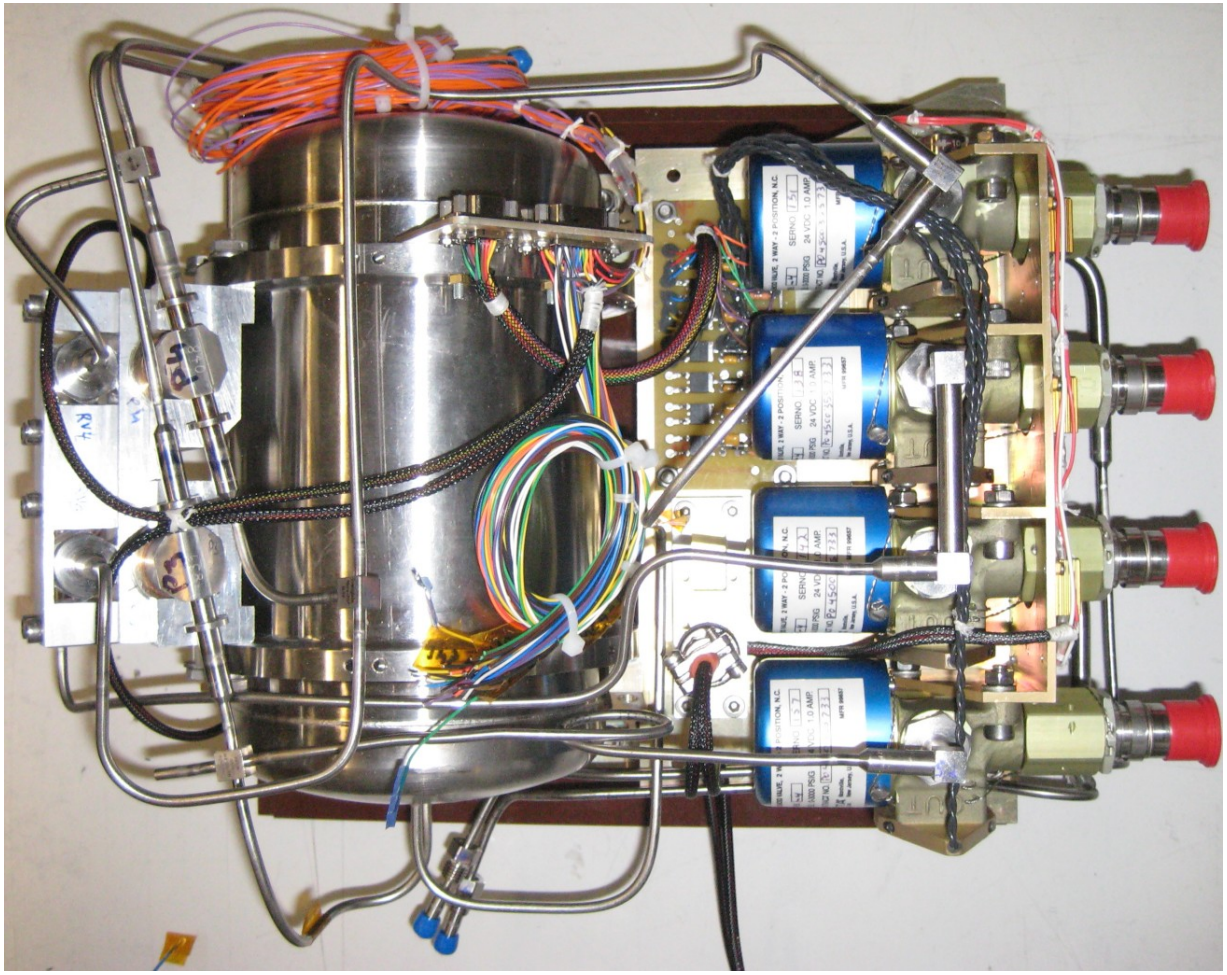
Box-S/C mechanical & electrical

Box-C:

Heaters & Thermostats and Connector Brackets machined, installed and cabled at RWTH

Local DTS remaining

GSE Bracket fits MLI ?

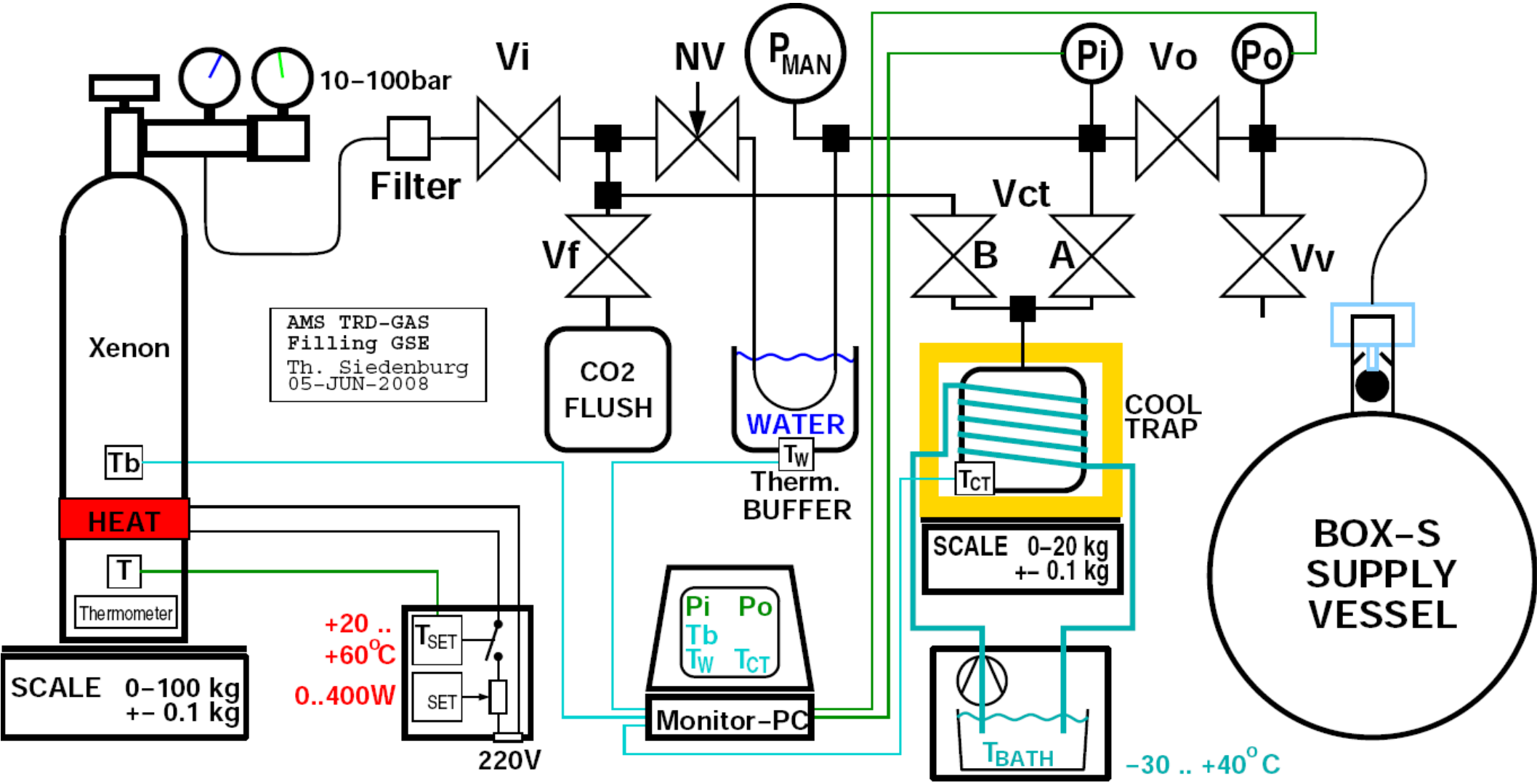


Box-S:

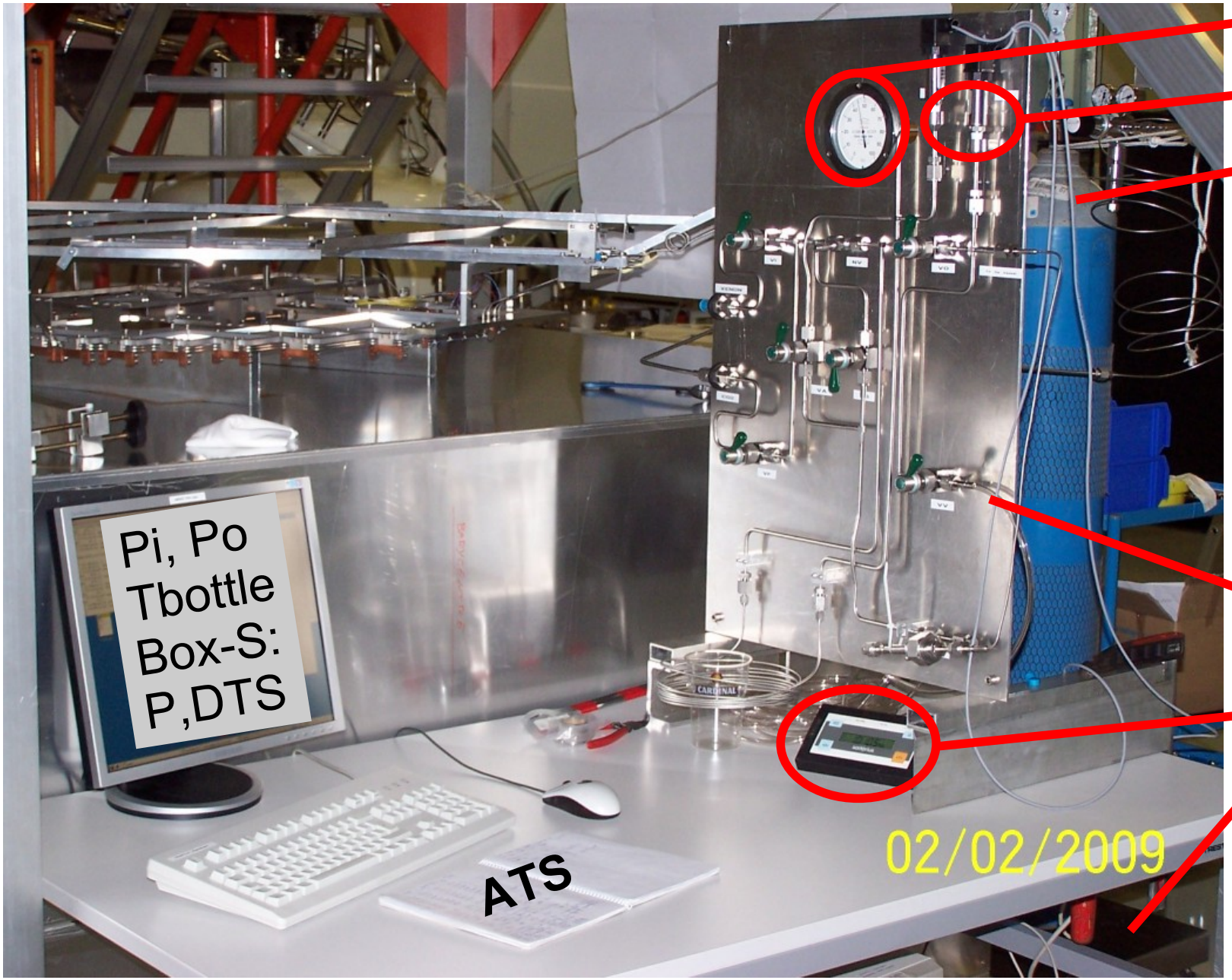
Bolt Replacement / Retorquing finished this week	(M.Vergain)
Potting of accessible Thermostats in progress	(F.Zhou)
Local DTS branch-off in preparation	(A.Kulemzin)
COPV inspection: Cut open vessel MLIs in May09	(NASA-MLI)
Opportunity to pot Thermostats on vessels	(F.Zhou)

TRD-Gas Filling GSE

Full System Schematics (with Cool-Trap for Xenon Filling)



5kg CO2 Flight Filling without Cool-Trap



Pman

Pi, Po

CO2 Bottle

Hidden:
Bottle Heating
with Display of
Control Temp.

Vent Outside

Display of
Bottle Scale

Operators:
F.Zhou
T.Siedenburg

CO2 Filling Procedure

Principle:

Boil off CO2 from source bottle (at 40 degC)
Condensate into CO2 Vessel (at 22 degC)

Control amount by weight-loss of source bottle
Cross check Box-S weight before and after

Detailed step-by-step ATS covering:

- System Setup of Bottle, Scale, Heater, Panel
- Bottle to Panel to Vessel Gastightness
- Flush Vessel (4x 50bar/1.2bar CO2)
- Fill Vessel with intermediate weighing steps
- Gastightness of Fill-Port Plug

Verification of Box-S Vessel Gastightness

Minimum Requirement: CO_2 Vessel gas-loss less than 10% of TRD CO_2 loss
Upper Limit: 50g/1000d (3×10^{-4} l.mbar/s)

Vessels were measured individually to better than 10^{-7} l.mbar/s,
but integrated Box-S with Fill-Ports was never checked to that level

Weight Loss: Upper limit equiv. to 50mg/d for a 100kg object

Pressure Loss: At 20 ^{o}C same vapor pressure from 2.5kg - 10.0kg CO_2

At 60 ^{o}C Pressure loss of 10 mbar/day at 100bar
but also 300 mbar change per 1 ^{o}C

Option: Measure pressure increase from CO_2 loss into a vacuum chamber
Check RWTH TVT gas-tightness - currently around 3×10^{-5} l.mbar/s

Test Box-S at Aachen with CO_2 vessel filled for flight
and Xenon vessel a) empty b) filled with 50bar CO_2

COPV Protection Plan

NASA updated certification process of **C**omposite **O**verwrapped **P**ressure **V**essels

TRD-GAS: Xenon and CO2 storage vessels need to be reassessed

Filling CO2 vessel now no issue because of low pressure (57bar wrt. 200bar MDP)

Final inspection of COPV surface - can be done after filling

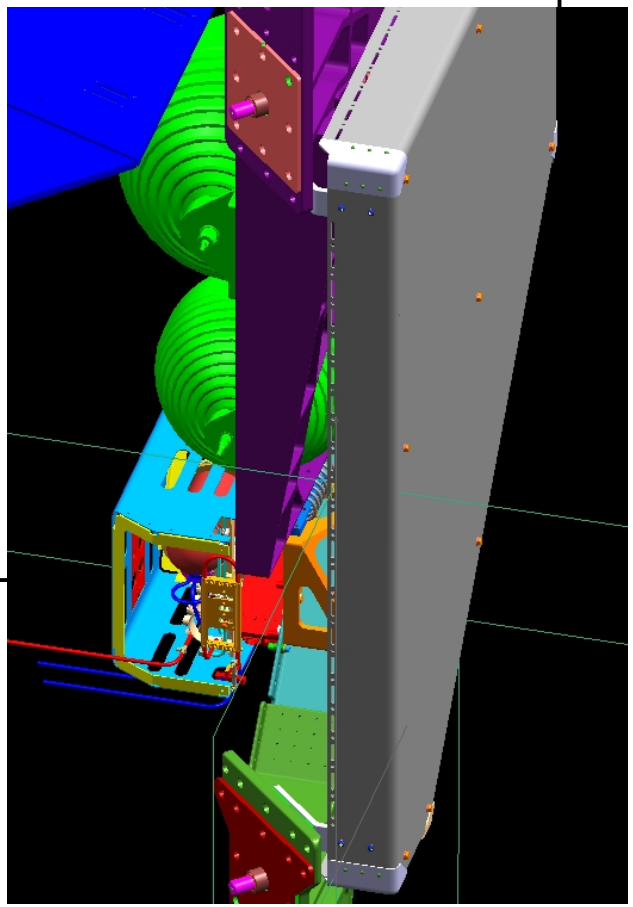
Protective covers on storage vessels always in place

Continuous log of vessel pressurization

Restricted Clean-Room operations around TRD-GAS

Extra debris shield to cover exterior side of TRD-GAS

Flight cover for Box-S storage vessels on interior side



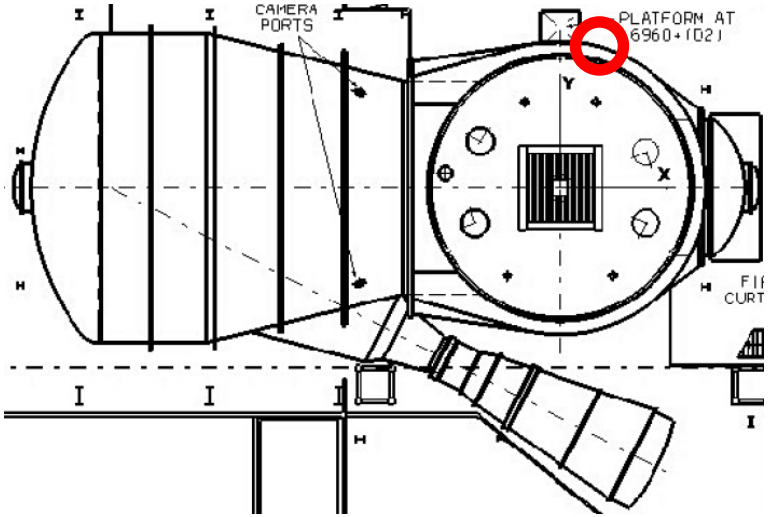
ESTEC TRD-GAS GSE

GSE for TRD Pressure Control in Emergency (TRD-GAS Failure)

To assure P_{TRD} stays above P_{ATM} when LSS is repressurized

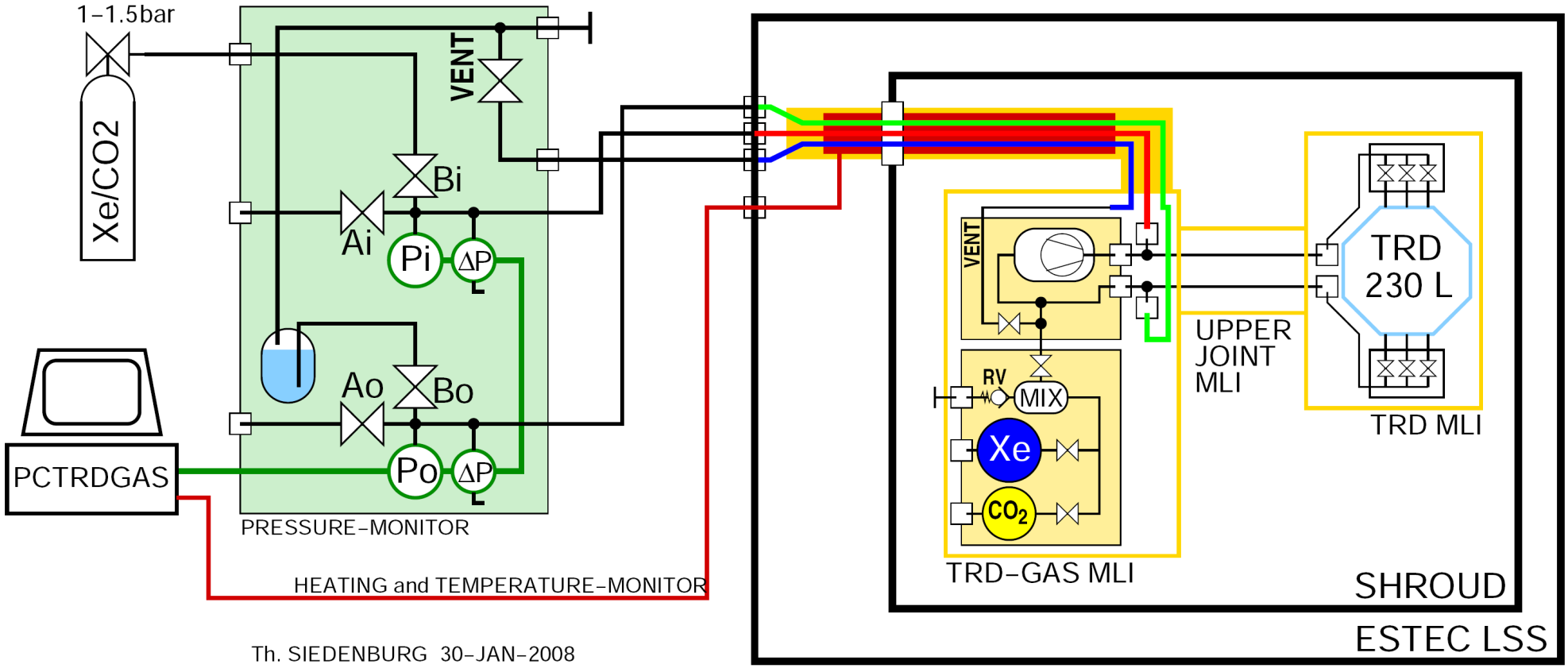
3 x 1/8" Lines for Gas In / Out / Vent
Fix routing from TRD to C2-Flange

Lines insulated in copper tube&MLI
Test of bending and heating



C2 Flange for TRD
3x1/8"VCR
6 pins DTS
4 pins Heat

Flange specs sent to ESTEC



Th. SIEDENBURG 30–JAN–2008

TRD-GAS Schedule

FM UG Electronics delivered to CERN		Dec.08
Problem with FM UGPD on Jigg - removed again		Feb.09
Box-S mechanics finished		Jan.09
Finalize Box-S/C cabling	90%	Feb.09
CO2 filling at CERN		Feb.09
Box-S Vessel Gastightness Check		Mar.09
COPV Inspection		May.09
Potting of Box-S Vessel Thermostats		May.09
Xenon Filling at CERN		May.09
Design/produce Xe/CO2 COPV protection covers		May.08
Design/produce heated gas line + flange for ESTEC		Jun.09
TRD-GAS ADP		Jun.09
TRD-GAS Command Sequences in JMDC		Jun.09
TRD-GAS Operation with Offline TRD		Jul.09