



CMS BARREL MUON DT CHAMBERS

Gas Distribution Layout: Baseline And Alternatives

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020611*



Ordering gas and cooling components for patch panel and chambers:

- With the exception of manifolds, pressure transducers and ancillary equipment, we were asked to place orders for all gas components directly on the chambers and on the patch panels. Same for cooling components.
- These orders, after collecting a new set of offers, were submitted to the administrations.
- The preparatory work - iteration of technical optimization and final offers - leads to a further saving of ~60 kCHF. Good News!
- In the cost estimates for gas components from 020404 there was a double count of one item (signal cables).
- Remember that the components on the gas patch panels are defined as belonging to the fixed gas piping. They are included in the present list because we are making their procurement together with the procurement of the components on the chambers.
- The water fittings on the RPC are being reconsidered by the RPC group; some may become of elbow type instead of straight type. Since these fittings are dedicated for the RPC, we propose that this item is ordered by the RPC group directly, once the quantities are settled.



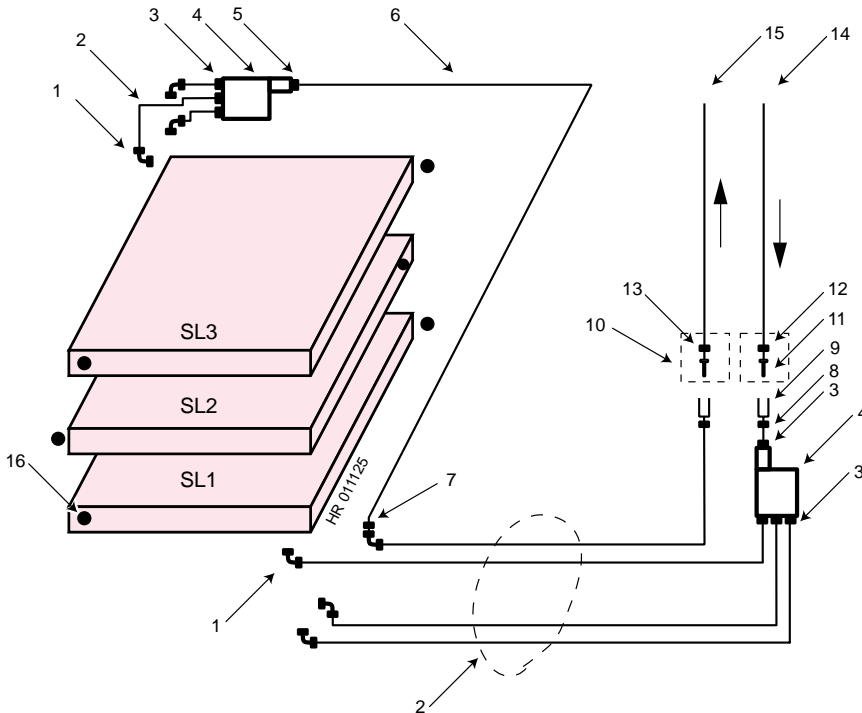
What & Why



Recent Discussion on Gas System

- BASELINE, as optimized and approved (TDR 1997, EDR 2001), includes safety margins as felt adequate for operation of basically not accessible chambers.
- ALTERNATIVES were brought into discussion again - **cost driven**.
- Differences discussed are related to 3 features:
 - 1- LOCAL DISTRIBUTION **parallel or serial**. Baseline has parallel distribution between the 3 SuperLayers (SLs) of one DT chamber. Main advantage is that a failure (leak or obstruction) affects only one SL and not the three.
 - 2- GAS INLET INTO SL **at bottom or don't care**. Baseline has inlet at bottom, since the gas has higher density than air. Ensures most effective removal of air, also at low overall flow rate and where air pockets may form. Note that the SL consists of many separated cells, internally.
 - 3- PRESSURE MEASUREMENT **at chamber in-&outlet or at chamber inlet only**. Baseline measures at in-&outlet with cheap transducers integrated into the manifolds, to be able to make diagnostics in any conceivable situation. A good and reliable knowledge of pressure is relevant for diagnostics of gas system operation and to understand drift velocity. With the gas system controls moved from the wheel balcony to the CV zone, the piping between control unit and individual chambers is very long, making redundant local pressure measurements at the chambers even more desirable.

Gas Connection of a DT Chamber List of Components



- 1- 90 degree fitting (G1/4" on FE, G1/8" on HV cover; 6mm/8mm flexible pipe)
- 2- 6mm/8mm flexible; type = ?
- 3- fitting (on manifold, for 6mm/8mm flexible pipe)
- 4- 1:3 manifold, with integrated pressure sensor(s)
- 5- fitting (on manifold, for 8mm/10mm Cu pipe)
- 6- 8mm/10mm Cu pipe
- 7- fitting 90 degree (8mm/10mm Cu pipe to 6mm/8mm flexible pipe)
- 8- adapter 8mm to 10mm
- 9- quick conn., female, 6mm, lubricant-free, both ends locking, with key
- 10- patch panel on yoke
- 11- quick conn., male, 6mm, lubricant-free, both ends locking, with key
- 12- adapter 10mm to 12mm
- 13- adapter 10mm to 14mm
- 14- supply pipe Cu 10mm/12mm
- 15- exhaust pipe Cu 12mm/14mm
- 16- stopper on cover, at unused end (G1/4" on FE, G1/8" on HV cover)
- 17- not shown here: ADC box, located in rear C-profile, and cable(s)

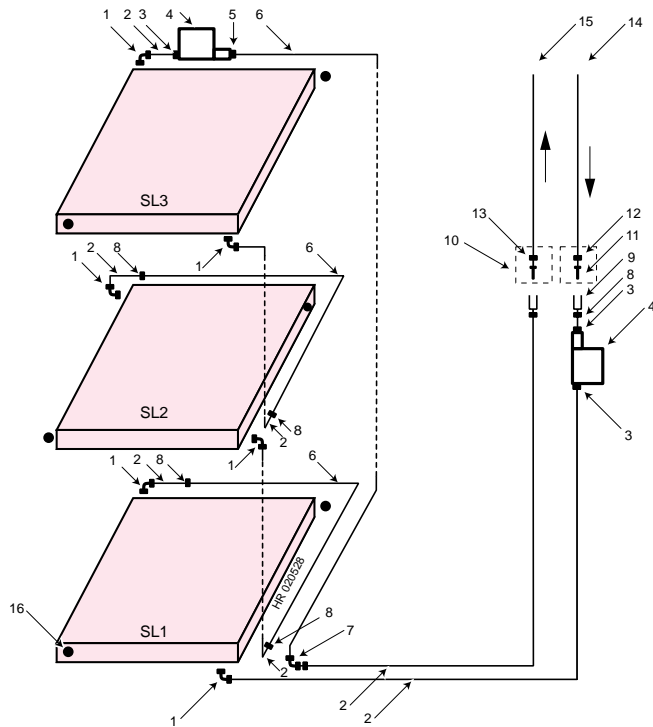
File: DT_fitings_masterreps HR 011125020404

- Local distribution: parallel
- Gas inlet: bottom
- Pressure measurement: at inlet & outlet
- Cost: 265 kCHF (incl. patch panel)

0204
B.P., H.R.
Version B

Gas Connection of a DT Chamber

List of Components for a Special Version:
SERIAL (Inlets at Bottom; Pressure Measurement at Inlet and Outlet)



File: DT_fitting_serial0205b.eps HR 020528

- 1- 90 degree fitting (G1/4" on FE, G1/8" on HV cover; to 6mm/8mm flexible pipe)
- 2- 6mm/8mm flexible; type = ?
- 3- fitting (on pressure gauge housing, for 6mm/8mm flexible pipe)
- 4- housing of pressure sensor(s)
- 5- fitting (on pressure gauge housing, for 8mm/10mm Cu pipe)
- 6- 8mm/10mm Cu pipe
- 7- fitting 90 degree (8mm/10mm Cu pipe to 6mm/8mm flexible pipe)
- 8- adapter 8mm to 10mm
- 9- quick conn., female, 6mm, lubricant-free, both ends locking, with key
- 10- patch panel on yoke
- 11- quick conn., male, 6mm, lubricant-free, both ends locking, with key
- 12- adapter 10mm to 12mm
- 13- adapter 10mm to 14mm
- 14- supply pipe Cu 10mm/12mm
- 15- exhaust pipe Cu 12mm/14mm
- 16- stopper on cover, at unused end (G1/4" on FE, G1/8" on HV cover)
- 17- not shown here: ADC box, located in rear C-profile, and cable(s)

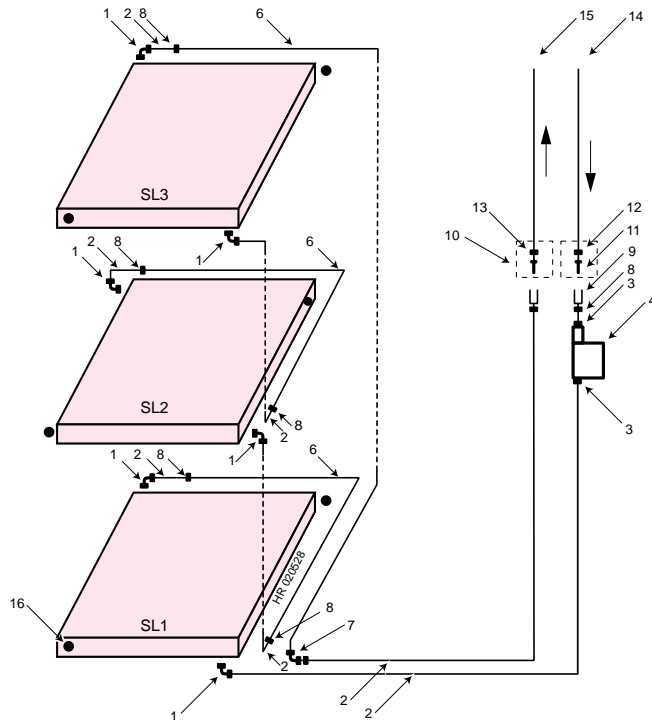
- Local distribution: **serial**
- Gas inlet: **bottom**
- Pressure measurement: **at inlet & outlet**
- Cost: **289 kCHF (incl. patch panel)**

0205
B.P., H.R.
Version C

Gas Connection of a DT Chamber

List of Components for a Special Version:

SERIAL, PRESSURE MEASUREMENT AT INLET ONLY (Inlets at Bottom)



File: DT_fitings_serial0205c.eps HR 020528

- 1- 90 degree fitting (G1/4" on FE, G1/8" on HV cover; to 6mm/8mm flexible pipe)
- 2- 6mm/8mm flexible; type = ?
- 3- fitting (on pressure gauge housing, for 6mm/8mm flexible pipe)
- 4- housing of pressure sensor(s)
- 5- fitting (on pressure gauge housing, for 8mm/10mm Cu pipe)
- 6- 8mm/10mm Cu pipe
- 7- fitting 90 degree (8mm/10mm Cu pipe to 6mm/8mm flexible pipe)
- 8- adapter 8mm to 10mm
- 9- quick conn., female, 6mm, lubricant-free, both ends locking, with key
- 10- patch panel on yoke
- 11- quick conn., male, 6mm, lubricant-free, both ends locking, with key
- 12- adapter 10mm to 12mm
- 13- adapter 10mm to 14mm
- 14- supply pipe Cu 10mm/12mm
- 15- exhaust pipe Cu 12mm/14mm
- 16- stopper on cover, at unused end (G1/4" on FE, G1/8" on HV cover)
- 17- not shown here: ADC box, located in rear C-profile, and cable(s)

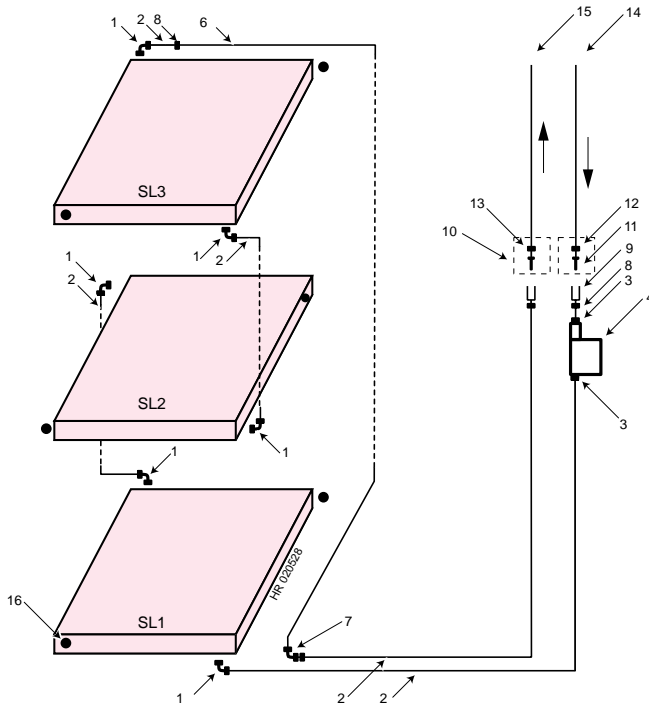
- Local distribution: serial
- Gas inlet: bottom and top mixed ("don't care")
- Pressure measurement: at inlet & outlet
- Cost: 249 kCHF (incl. patch panel)

0205
B.P., H.R.
Version D

Gas Connection of a DT Chamber

List of Components for a Special Version:

SERIAL, INLETS MIXED TOP/BOTTOM, PRESSURE MEASURED AT INPUT ONLY



File: DT_fitings_serial0205d.eps HR 020528

- 1- 90 degree fitting (G1/4" on FE, G1/8" on HV cover; to 6mm/8mm flexible pipe)
- 2- 6mm/8mm flexible; type = ?
- 3- fitting (on pressure gauge housing, for 6mm/8mm flexible pipe)
- 4- housing of pressure sensor(s)
- 6- 8mm/10mm Cu pipe
- 7- fitting 90 degree (8mm/10mm Cu pipe to 6mm/8mm flexible pipe)
- 8- adapter 8mm to 10mm
- 9- quick conn., female, 6mm, lubricant-free, both ends locking, with key
- 10- patch panel on yoke
- 11- quick conn., male, 6mm, lubricant-free, both ends locking, with key
- 12- adapter 10mm to 12mm
- 13- adapter 10mm to 14mm
- 14- supply pipe Cu 10mm/12mm
- 15- exhaust pipe Cu 12mm/14mm
- 16- stopper on cover, at unused end (G1/4" on FE, G1/8" on HV cover)
- 17- not shown here: ADC box, located in rear C-profile, and cable(s)

- Local distribution: **serial**
- Gas inlet: **bottom and top mixed** (“don’t care”)
- Pressure measurement: **at inlet only**
- Cost: **217 kCHF** (incl. patch panel)



Cost Tables



Gas components on patch panel and downstream

BASELINE (par.,bottom,2p)	Nominal qty	Add. Spares [%]	Final qty	Unit cost [excl.; EUR]	Unit cost [excl.; CHF]	Total cost [excl.; kEUR]	Total cost [excl.; kCHF]
On patch panel:							
Quick connectors, adapters,...	250	5	263	189.60	284.40	50	75
Downstream patch panel:							
Manifold (w. fittings, transducers)	500	5	525	112.70	169.05	59	89
ADC & RO box	250	8	270	116.60	174.90	31	47
Tubes, fittings on SL covers	250	5	263	127.93	191.90	34	50
DCS cable (also for alignment)	250	0	250	10.70	16.05	3	4
					Sum "downstr."	127	190
					Sum "all":	177	265

ALTERNATIVE B (ser.,bottom,2p)	Nominal qty	Add. Spares [%]	Final qty	Unit cost [excl.; EUR]	Unit cost [excl.; CHF]	Total cost [excl.; kEUR]	Total cost [excl.; kCHF]
On patch panel:							
Quick connectors, adapters,...	250	5	263	189.60	284.40	50	75
Downstream patch panel:							
Sensor holder (w. fittings, transducers)	500	5	525	101.40	152.10	53	80
ADC & RO box	250	8	270	116.60	174.90	31	47
Tubes, fittings on SL covers	250	5	263	210.96	316.44	55	83
DCS cable (also for alignment)	250	0	250	10.70	16.05	3	4
					Sum "downstr."	143	214
					Sum "all":	193	289

ALTERNATIVE C (ser.,bottom,1p)	Nominal qty	Add. Spares [%]	Final qty	Unit cost [excl.; EUR]	Unit cost [excl.; CHF]	Total cost [excl.; kEUR]	Total cost [excl.; kCHF]
On patch panel:							
Quick connectors, adapters,...	250	5	263	189.60	284.40	50	75
Downstream patch panel:							
Sensor holder (w. fittings, transducers)	250	5	263	101.40	152.10	27	40
ADC & RO box	250	8	270	116.60	174.90	31	47
Tubes, fittings on SL covers	250	5	263	210.96	316.44	55	83
DCS cable (also for alignment)	250	0	250	10.70	16.05	3	4
					Sum "downstr."	116	174
					Sum "all":	166	249

ALTERNATIVE D (ser.,any,1p)	Nominal qty	Add. Spares [%]	Final qty	Unit cost [excl.; EUR]	Unit cost [excl.; CHF]	Total cost [excl.; kEUR]	Total cost [excl.; kCHF]
On patch panel:							
Quick connectors, adapters,...	250	5	263	189.60	284.40	50	75
Downstream patch panel:							
Sensor holder (w. fittings, transducers)	250	5	263	101.40	152.10	27	40
ADC & RO box	250	8	270	116.60	174.90	31	47
Tubes, fittings on SL covers	250	5	263	130.96	196.44	34	52
DCS cable (also for alignment)	250	0	250	10.70	16.05	3	4
					Sum "downstr."	95	143
					Sum "all":	145	217

Notes 020608:
 Unit costs from offers 0203 (by B.P.)
 Had double counting of signal cables (H.R.)
 No need for long 12 V cables (M.S.)



Conclusions



- Orders of gas and cooling components are being processed by the administrations
- Iteration on technical optimization and offers led to a further saving.

Concerning the discussion (*) on gas distribution scheme on the DT chambers:

- The BASELINE still looks safest and most performant
- The cost impact of ALTERNATIVES is modest
- The safety/redundancy planned is a good investment
- Consequent effort in execution of the BASELINE, which has recently led to same level of savings discussed here - without sacrifice of performance and safety -, is best investment of scarce manpower and time
- Therefore proposing to STICK TO BASELINE.

(*) Discussion means that there was some other opinion, obviously. Final discussion and decision to take place in DTIC this week.