

TRT Component Validation

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Status of QC Procedures

A. List with Standard Components.

Existing

- Group of tables comprising all components which are in contact with the gas. They specify inside materials, cleaning protocol, and the approved usage of this component type.

B. Implement Quality Route cards:

Starts next week.

1. "Component Batch Route Card" (one for each component batch).

This card follows a component batch from the arrival at CERN up to the installation in a rack.

Purpose: check completeness, track cleaning and analysis actions of this component batch. (First test run next week.)

2. "Rack Route Card" (for each Rack or Module)

To be prepared

This card follows a Rack batch from the construction at CERN up to the installation in the pit.

Purpose: Track all test results, modifications, etc.

3. "Installation Route Card"

Not yet set-up

TRT allowed Materials

System	Gas	Elastomeres		Metals		Plastics		Glues		Thread Tightening Products		Bubbler Oils		Lubricants	
		preferred	forbidden	preferred	forbidden	preferred	forbidden	preferred	forbidden	preferred	forbidden	preferred	forbidden	preferred	forbidden
MDT	Ar / CO ₂ / H ₂ O	Neoprene, Buna N, Nordel, EPM, EPDM	RTV	Stainless Steel Aluminium Copper Brass	-	Noryl, Pocan, Br4		Araldit AW103		Teflon tape (for exceptional use only)	Si-joint Loctite	if needed Briox oil (snake oil)		to be avoided, if ever use Apiezon or Krytox	any other
CSC	Ar (Xe) / CO ₂ / CF ₄	Neoprene, Buna N, NBR, Nordel, EPM, EPDM	Viton A ?	Stainless Steel Aluminium Copper Brass	-	Br4		Araldit AW103		Teflon tape		not specified		not specified	
TGC	CO ₂ / n-pentane	Nitrile, NBR, Buna N, Viton	Neoprene, NR, Nordel EPM, EPDM	Stainless Steel Aluminium Copper Brass	-	BR4 Rilsan Polyurethane Teflon		Araldit AW103		Teflon tape	Si-joint Loctite	Briox oil (snake oil)	Si Oils	Apiezon Krytox	any Si based
RPC	C ₂ H ₂ F ₄ / IC ₄ H ₁₀ / SF ₆ (optional)	Neoprene, Nitrile, NBR, Buna N, spec. Viton	Viton A Natural Rubber, Nordel	Stainless Steel Aluminium Copper Brass	Bronze Beryllium	Br4	PTFE (swelling) Polyurethane bad effects under radiation	Araldit AW103		Teflon tape		not specified		not specified	
TRT (Active gas)	Ar (Xe) / CO ₂ / CF ₄ / O ₂ and O ₃	Viton, EPDM, Kel-F Kalrez Teflon based	RTV, NBR, Buna N	Stainless Steel Brass Copper	Aluminium for distribution	Teflon, PTFE, Peek, ULTEM	Polyurethane	Araldit AW103, Tra-Bond 2115	Araldit AW106	Teflon tape (for exceptional use only)	Si-joint Loctite	H ₂ O	any oil	to be avoided, if ever use Apiezon or Krytox	any other

Standard QC Procedures

Project Phase	Standard QC Process
Control before ordering components	Component must be approved on standard component list Component must comply with Material List for that sub-detector.
Control after Delivery	1) Check packaging and damage of components 2) If possible, decompose one piece check, e.g. that there is no grease. 3) In some cases: random samples to Chem. Analysis Batch route card tracks all actions on each component batch.
Control after Assembly	Rack route card tracks all actions (tests, modifications, etc.) on each rack or module.

Validation Procedures

What is done when ?

Project Phase	Standard Systems	MDT	TRT
Control before ordering components	Standard QC procedures	Standard QC procedures + Chemical analysis or Ageing test	Standard QC procedures + Ageing test
Control after Delivery	Standard QC procedures	Standard QC procedures	Standard QC procedures + Ageing test with one component from each batch.
Control after Assembly	Standard QC procedures	Standard QC procedures	Standard QC procedures + Ageing test with each rack.

Type

Batch

Rack

Note: there are exceptions depending on risk of contamination

Outcome from Current Validation Tests

(All tests performed August 2003 to February 2004)

	<i>Total No. of Tests (since August 2003)</i>	<i>Accepted Components</i>	<i>Not acceptable</i>	<i>Test not conclusive or test not done</i>	<i>Test not finished.</i>
<i>Ageing Test TRT</i>	20	7	6	1	7
<i>Chemical Analysis (Cedric Petitjean)</i>	35	22	8	3	2

All results are accessible on the Web 6

Number of Validations (1)

- Phase 1: (BEFORE COMPONENT ORDER)
 - 60 - 100 type of components that need validation before. (7 ARE DONE)
- Phase 2: (AFTER BATCH'S ARRIVE AT CERN.)
 - Count on 15 to 30 component batches per module. Without recovery needs 7 different modules. This leads to 100 to 200 batches to be validated.
- Phase 3: (AFTER RACK CONSTRUCTION)
 - Testing each rack individually leads to 10-12 validation tests in this phase.

Number of Validations (2)

- ALL in all the present validation scheme leads to 250 to 500 validation runs (will depend strongly on efficiency).
 - Grouping of Modules could be a way to reduce by 10-30%. But this increase the complexity for the construction.
 - Grouping will have the consequence that components for one module would only be ordered if all others are ready for ordering as well (very difficult to achieve in practice).

How to proceed ?

- We could start making bulk orders when 80% of the phase 1 validation is completed.
- One module can start construction if 100% of the phase 2 validation is finished.
- No rack would be installed in the pit, before the phase 3 validation.

Conclusions:

- Validation tests are indispensable for the TRT:
 - Ageing test failures ~50%
- All in all 250 to 500 validation tests need to be done.
 - So far 7 components are validated (from Aug. 2003 until February 2004).
- The TRT group has to take the entire responsibility to finish the validation tests in time.