

Standard Outgassing Test ESA-certified according ECSS-Q-ST-70-02

To qualify materials for their suitability for space applications, assessment of outgassing properties is required. "Outgassing" is defined as the mass loss of a sample due to vacuum conditioning at elevated temperature.

At AAC a test rig is available to perform outgassing tests according to ESA-standard ECSS-Q-ST-70-02. During this test the outgassing behaviour is assessed by measuring the weight of the samples before and after thermal treatment. Furthermore, the mass gain of cooled collectors due to condensed matter is measured. By measuring the condensed mass it is possible to evaluate the possible contamination of sensible components (such as mirrors) by outgassed material. As for many applications the water-loss is not relevant, samples are also weighted after a post-conditioning (24 hours at 22°C and 55%rH) allowing recovery of lost moisture.

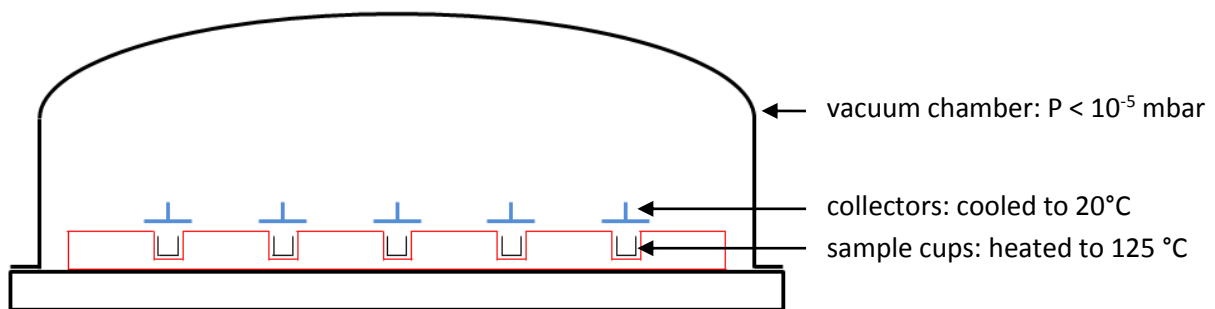


Figure 1: Schematic representation of outgassing test rig

An outgassing measurement is performed in the following steps:

- Pre-conditioning of samples: 24 hours at 22°C and 55%rH
- Weighing of samples, empty sample cups and collectors
- Thermal vacuum test: 24 hours at 125°C in vacuum ($P < 10^{-5}$ mbar)
- Weighing of samples and collectors
- Post-conditioning of samples: 24 hours at 22°C and 55%rH
- Weighing of samples

The following parameters are determined as result of an outgassing test:

- **TML** (Total Mass Loss): Total mass loss relative to the initial sample mass
- **RML** (Recovered Mass Loss): Mass loss after water absorption during post-conditioning (relative to initial sample mass)
- **CVCM** (Collected Volatile Condensable Material): mass gain of collectors relative to initial sample mass.

Outgassing facts

Test	Outgassing test according to ECSS-Q-ST-70-02		
Sample dimensions	3 samples per material required by ECSS for statistical evaluation Each sample weight 100 – 300 mg Max. size per sample 8x8x10 mm		
Materials per test run	For each test run 4 materials plus 1 empty sample cup (reference) is measured (i.e. 15 samples)		
Vacuum	$P < 10^{-5}$ mbar		
Temperatures	22°C	24 hours (pre-conditioning at 55%rH)	
	125 °C	24 hours (thermal vacuum test)	
	(up to 300°C	on request (non-ECSS))	
	22°C	24 hours (post-conditioning at 55%rH)	
Results & ECSS requirements	TML:	mean value < 1.0%	standard deviation < 0.1 * mean value
	RML:	mean value < 1.0%	standard deviation < 0.1 * mean value
	CVCM:	mean value < 0.1%	standard deviation < 0.2 * mean value

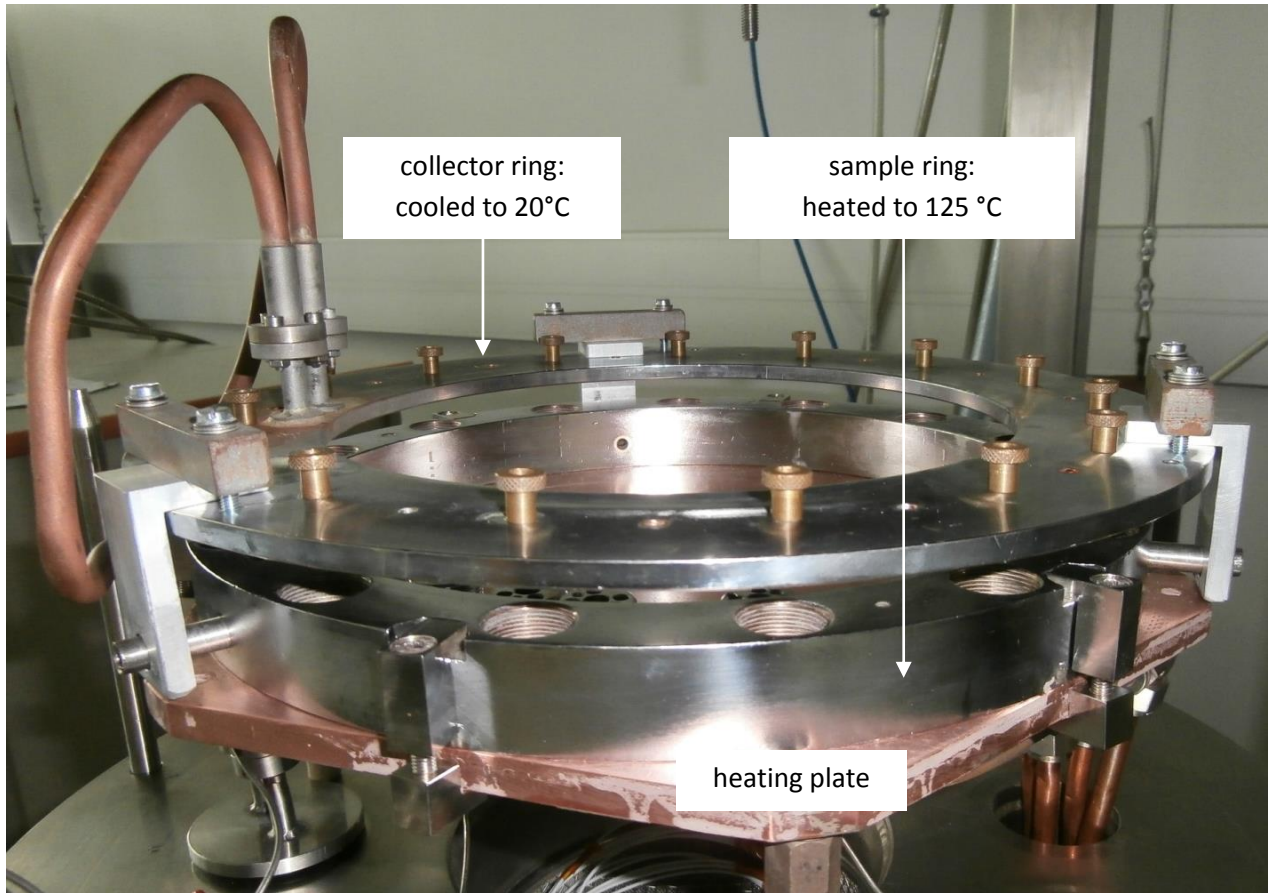


Figure 2: Photo of standard outgassing test rig at AAC