

Journal Bearing testing

The JBT allows to test materials and coatings for use in plain bearings on spacecrafts or for exploration (torque and life time). Besides the JBT a setup for high loads (kN) is available which is run as "insertion" to the HADES test device used also for bearing and gear testing (see below).

Plain bearings are used for articulations or linear guidance systems dedicated to single shot or low life time requirement. These include for example solar array panel articulations, radiator panel articulations, HDRM fold back articulations, exploration rovers' articulations and linear guidances, landing pointing system articulations.

The JBT plain bearing tribometer allows the measurements of friction and wear of a complete journal bearing for alternate rotations $< 180^\circ\text{C}$ and small loads $< 150\text{N}$. The working environment will be the same as for the other vacuum tribometers: humid air, high vacuum and controlled gases (eg CO_2 at 6mbar to simulate Martian atmosphere). It works basically -100 to $+300^\circ\text{C}$.

Post-Analysis may cover measurement of wear by profilometry, SEM, investigation of surface structure or material transfer by SEM/EDX.



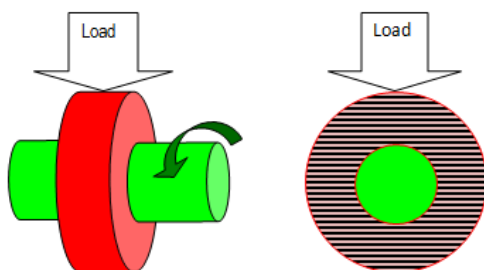
All devices are fully PC-controlled. To the control parameters, e.g. sliding distance, motion profiles (uni, oscillating, ...), can be selected. On-line-data acquisition offers to post-process data, e.g. for automatic calculation of torque in running-in- or steady state, as well as endurance of solid lubricant coatings.

Measurement of

- Torque/Friction force/coefficient
- Environmental Data
- Pre-load (if for high loads)
- Optional (e.g. residual gas, user defined)

*JBT with high vacuum chamber
(small bushes, loads $< 200\text{N}$)*

JBT TEST PRINCIPLE. BUSH IS LAIUIARY LOADED AGAINST SHAFT



A second setup “high-load-JBT” allows to test larger bushes (sliced and half, OD up to 50mm) combined with higher loads (range several kN). The limitation is currently by the available maximum torque of 50Nm. (Can be extended to 100Nm.)

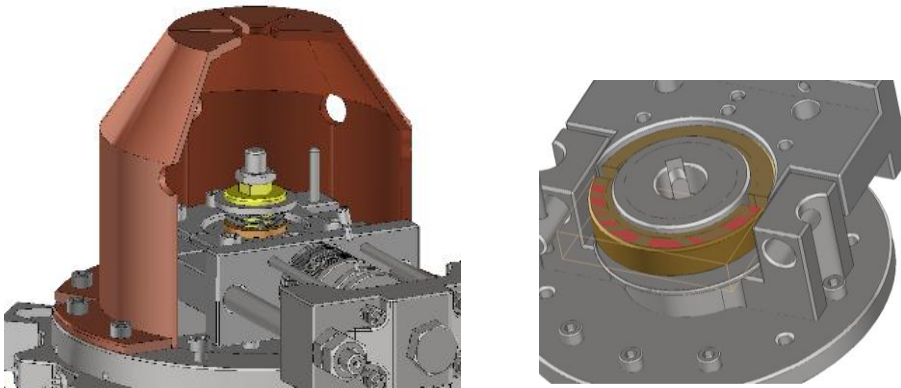
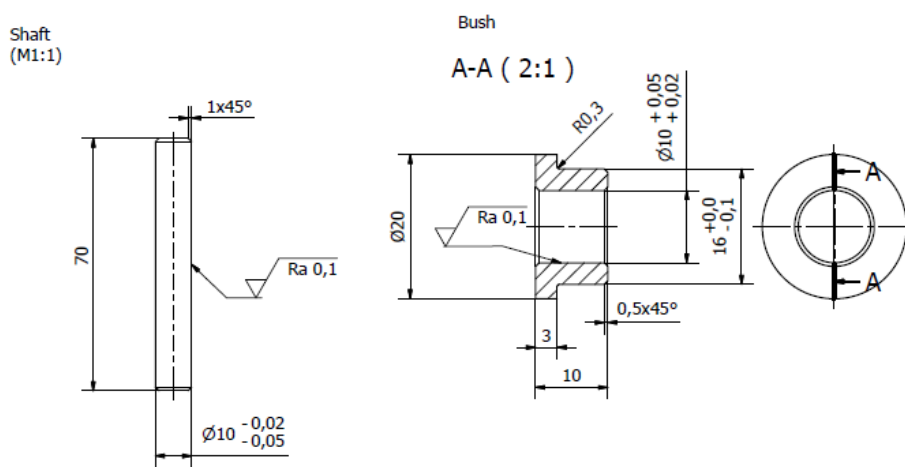


Image of the high load JBT (diameters 30-50mm, loads up to kN) in High Vacuum Test chamber (HADES)

Specifications	
Samples	Journal bearings / sliced / half bushes against shaft <ul style="list-style-type: none"> • Already available housings for full bushes OD16mm, ID10mm • Sliced or half bushes (OD 30-50mm) Further housings on demand.
Test (Output)	online measurement of <ul style="list-style-type: none"> • Torque, angle • Environmental Data • Pre-Load for high load setup (before and after test, in-situ) residual gas analysis (mass spectrometer of outgassing particles)
Loads (radially)	JBT (small): 1 <> 200 N (loading under vacuum, dead weight) JBT HADES: up to range of kN using spring (measured before/after test) limit is Torque 50Nm
Speed / Motion	Motion selectable from unidirectional to reciprocating (several angles selectable 5 - 360°) Speeds 0,1 to 500 rpm
Vacuum / Environments	Vacuum selectable down to 10 ⁻⁶ mbar Air with controlled humidity Gases with controllable pressure (e.g CO2 at 15mbar = Mars)
Temperatures	from -100 up to + 150 °C, thermal cycles available
Accuracy	Torque ± 0.01 N Angle: 10 arcsec Temperature (several locations simultaneously): ±2°C

Annex specimens (examples):

Full bush and shaft for JBT (small):



Bushes and shafts for the high-load-JBT (large journal bearings) – on demand.