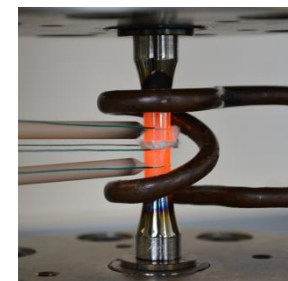
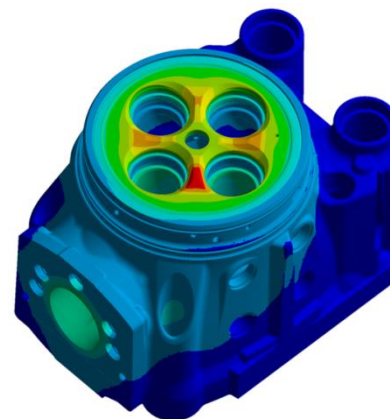


## Objectives of Work Package

WP Leader: Dr. Rayk Thumser  
Deputy: Santiago Uhlenbrock

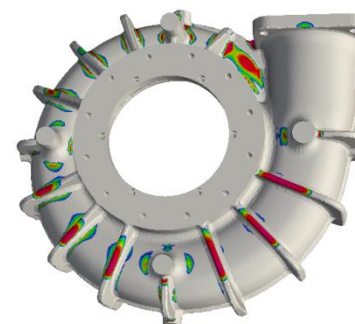
WP 4.1 New materials and design for cylinder heads

- Improvement of thermomechanical cycle resistance of factor 2 under increased temperature of 50 K
- decreased weight of cylinder head of 20%



WP 4.2 New materials for the turbocharger turbine casing

- Improvement of thermomechanical cycle resistance under increased temperature of 70 K under corrosion environment

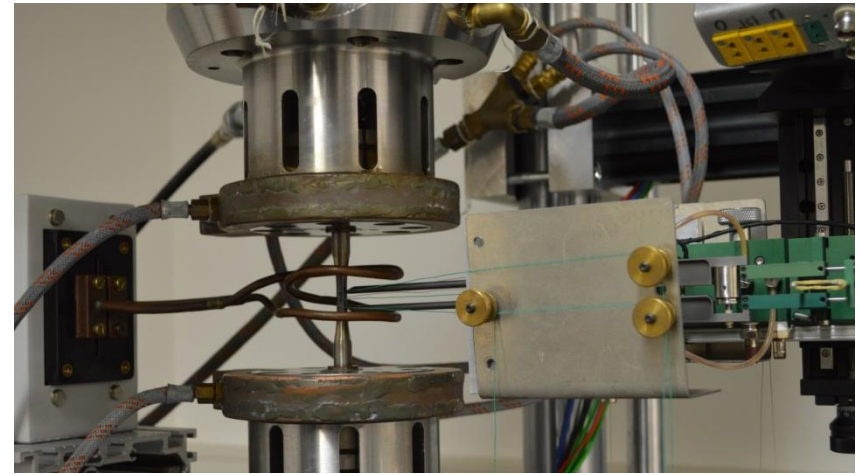


Partners:

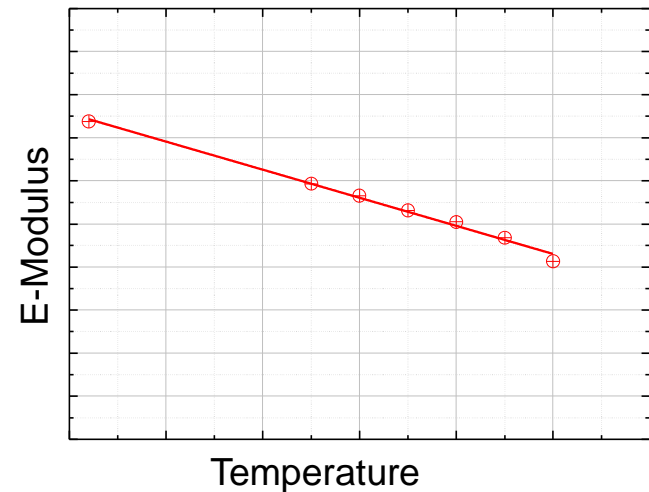


### Main results achieved during 1<sup>st</sup> year WP4.1

- 2 of 8 pre experimental material tests have been finished
- Fatigue tests and incremental step test for a preliminary study
- Typical influence of the temperature on the sequence of elasticity modulus



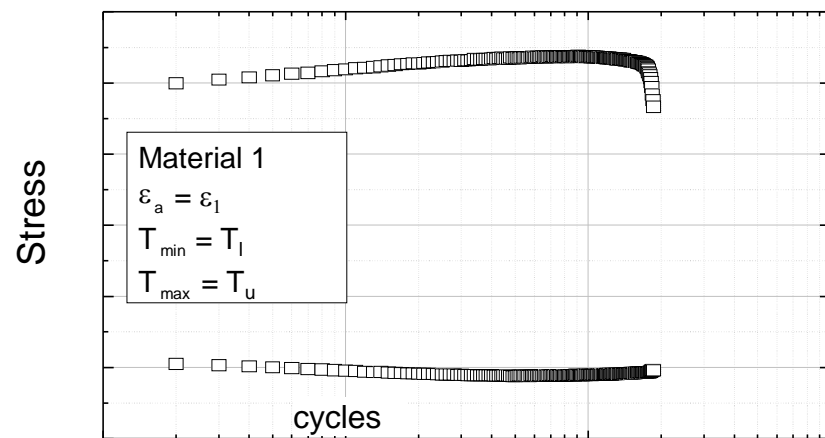
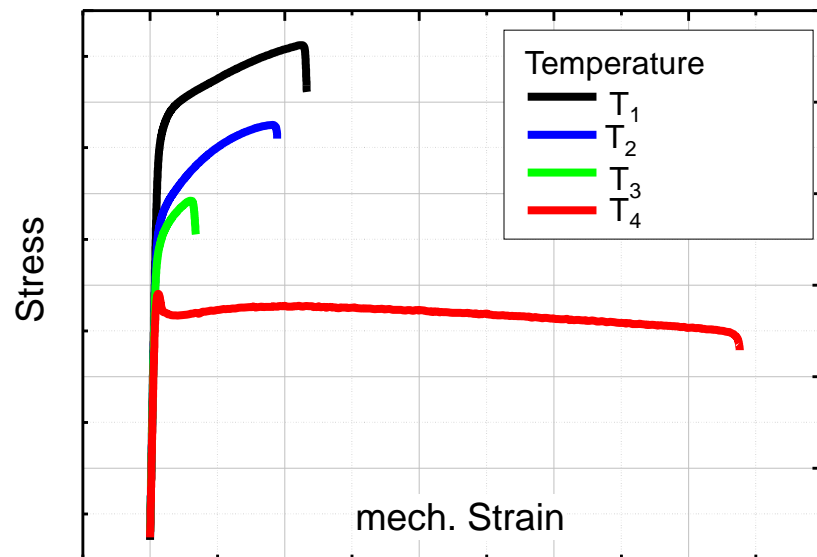
Elasticity modulus



## Main results achieved during 1<sup>st</sup> year WP4.1

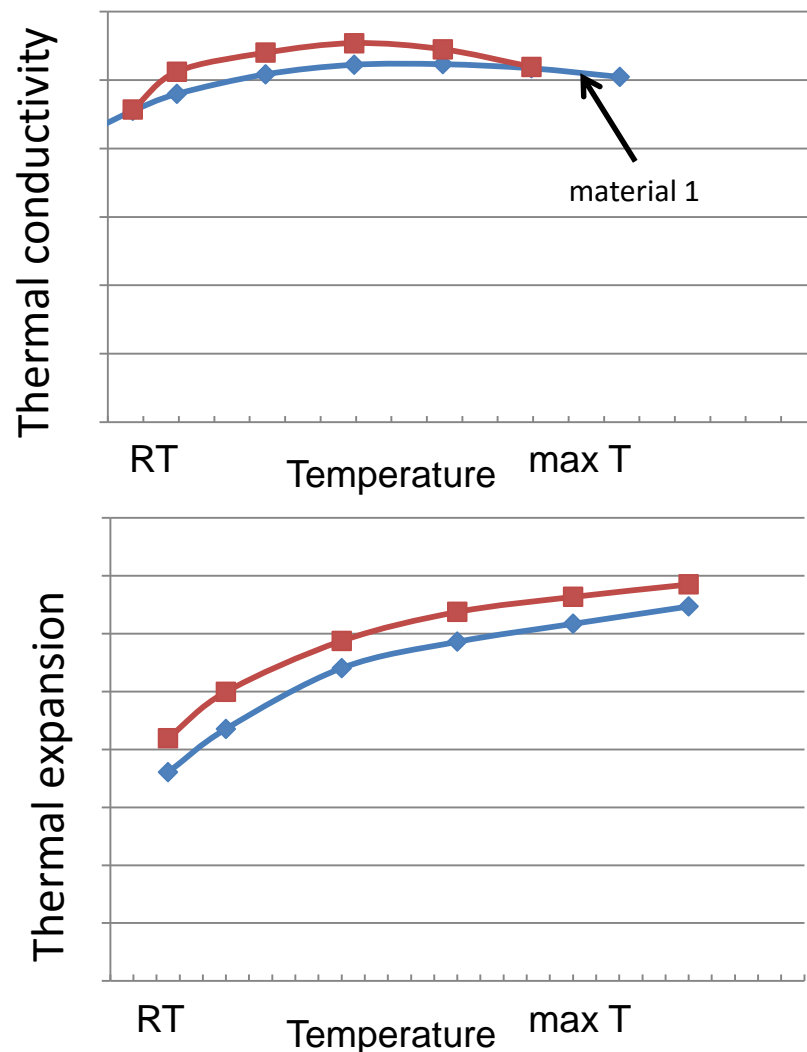
- Hot tensile test for first rating of materials
- Out-of-Phase TMF operations for preliminary estimation of thermomechanical fatigue

Hot tensile test and OP-TMF Test of material 1

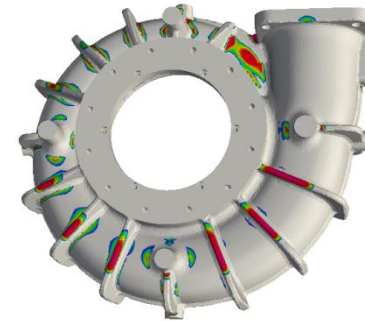


### Main results achieved during 1<sup>st</sup> year WP4.2

- Thermophysics data for 1 new material available
- Minimum deviation to existing material
- Thermal expansion slightly different by an offset

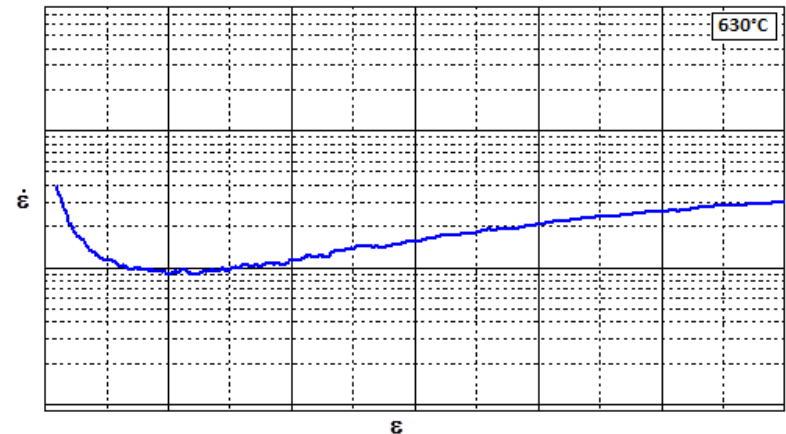


### Main results achieved during 1<sup>st</sup> year WP4.2



- three different casting batches produced
- manufacturing problems solved (bent shape)
- Creep test started @BAM

Creep Tests



## Future Work

### WP4.1

- Finalisation of pre study
- Development of performance indicator for selection of final material investigation
- Material investigation for TMF
- First test at fatigue test rig for superimposed thermal and mechanical loading

### WP 4.2

- Continuation of low cycle fatigue, thermomechanical fatigue and creep tests
- Derive of a constitutive equation for the creep behavior and the load limits of the material
- Validation of the material model