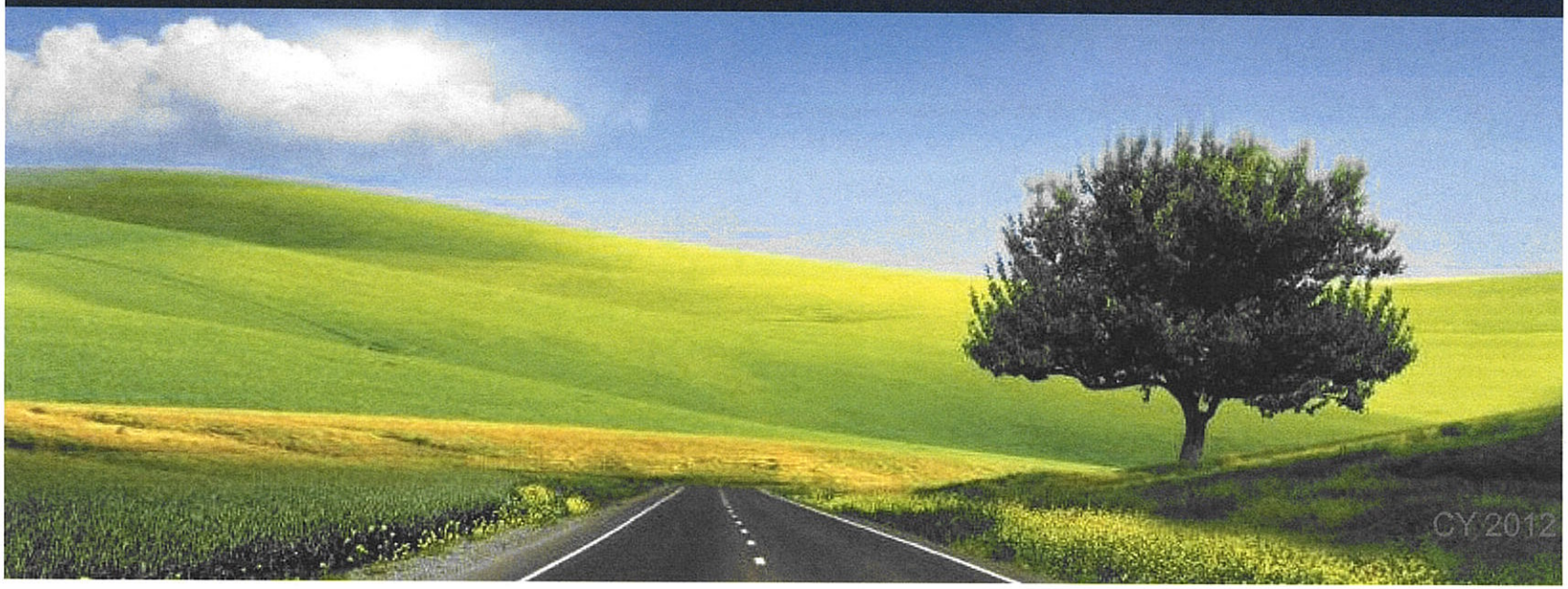
Alloy CW713R and CW507L



Supplier 08

Chemical composition and hardness

Material	Cu %	Mn %	Si %	Fe %	Al %	Pb %	Ni %	Sn %	P %	Zn %
CW713R	57.0-59.0	1.5-3.0	0.3-1.3	1.0 max	1.3-2.3	0.2-0.8	1 max	0.4 max	--	**Bal**
CW507L	63.5-65.5	--	--	0.05 max	0.02 max	0.05 max	0.3 max	0.1 max	--	**Bal**

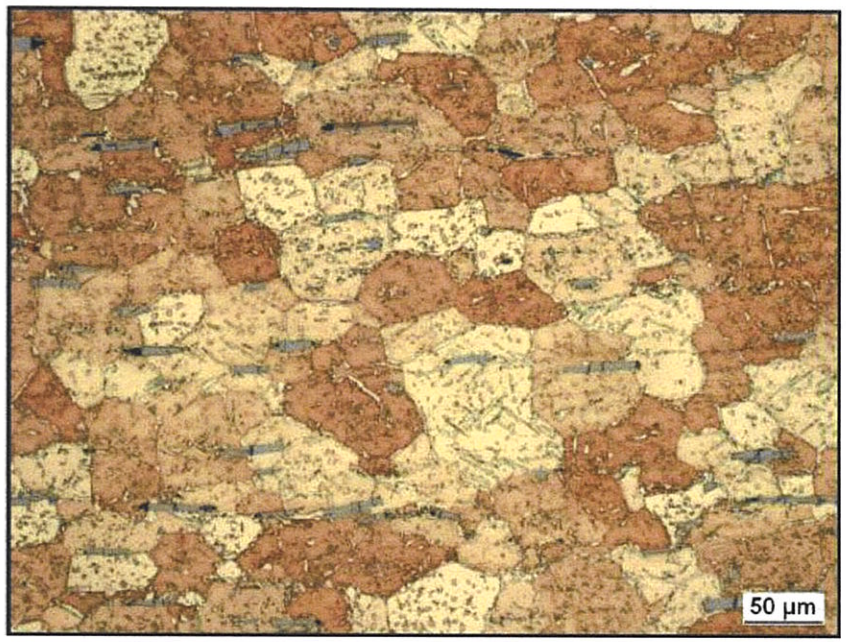
Material	Hardness [HBW2.5/62.5]
CW713R	~170
CW507L	~140

Supplier 08

Base characteristics and microstructure

CW713R (CuZn37Mn3Al2PbSi) :

- Predominantly β-phase matrix with small addition of α and Mn-Si compounds (grey needle-like particles).
- Mn-Si compounds have fine sliding characteristics and improve the wear resistance of the brass.
- Small addition of Pb improves anti-seizure and corrosion properties
- This alloys posses higher corrosion resistance than alloy CW507L, also against the environment with oil and bioethanol

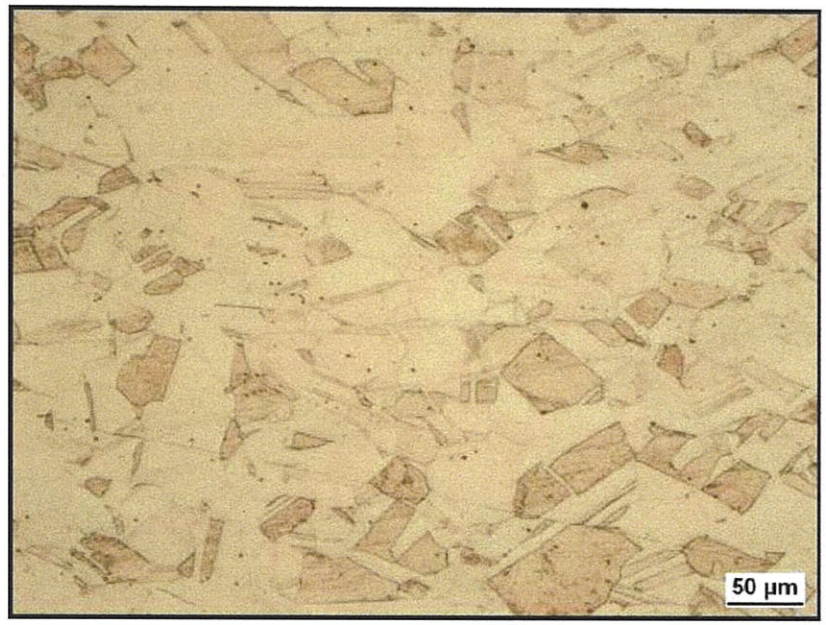


Supplier 08

Base characteristics and microstructure

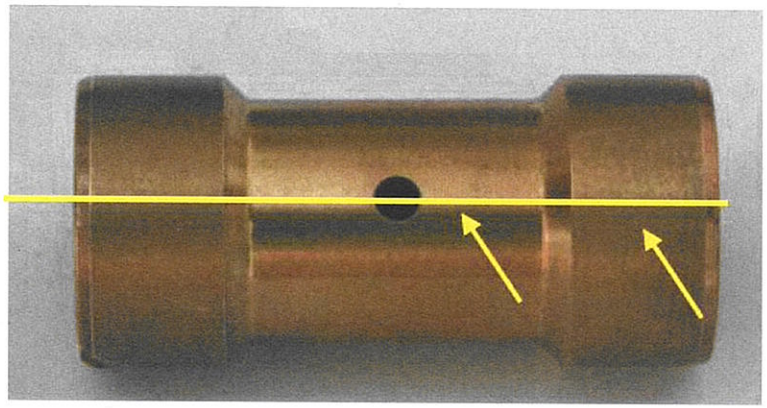
CW507L (CuZn36):

- Micorstructure consists of α-phase, alloy is suitable for cold-rolling
- No Mn-Si particles in the microstructure, which would increase the wear resistance of this alloy
- The microstructure and chemical composition is relatively simple.

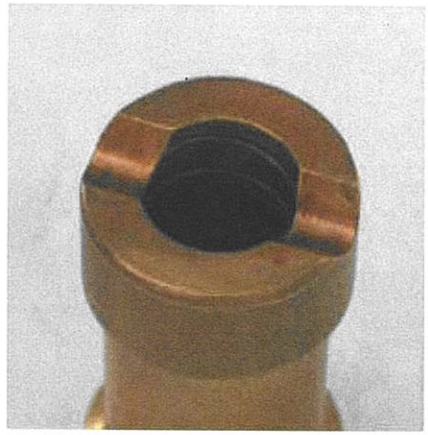


Supplier 08

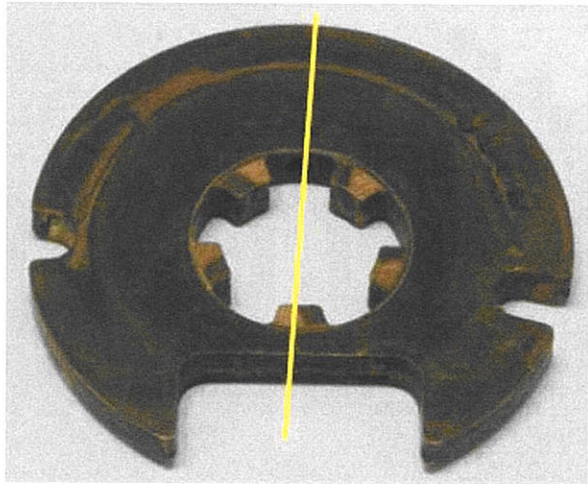
On-engine test - 8 % of E100 in oil, 246 h Flex Fuel Test



CW713R



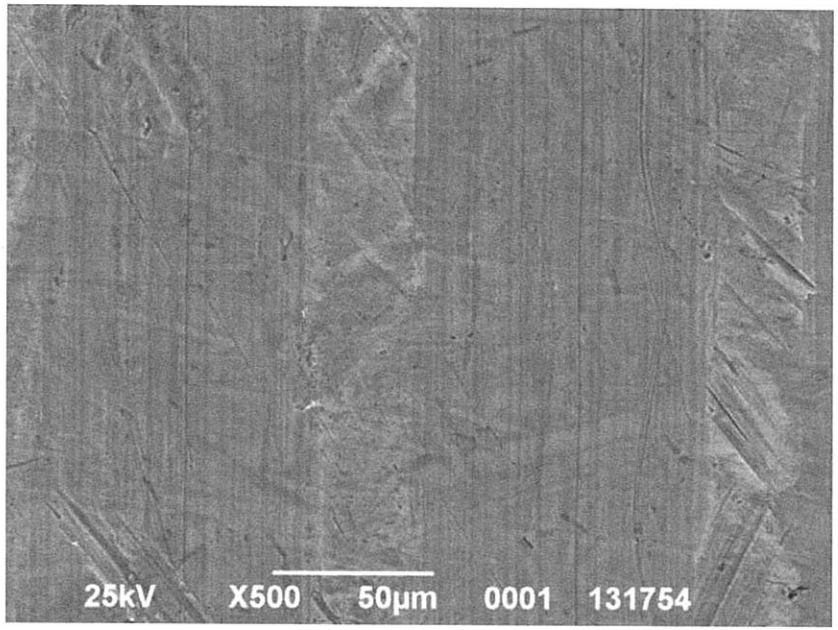
CW507L

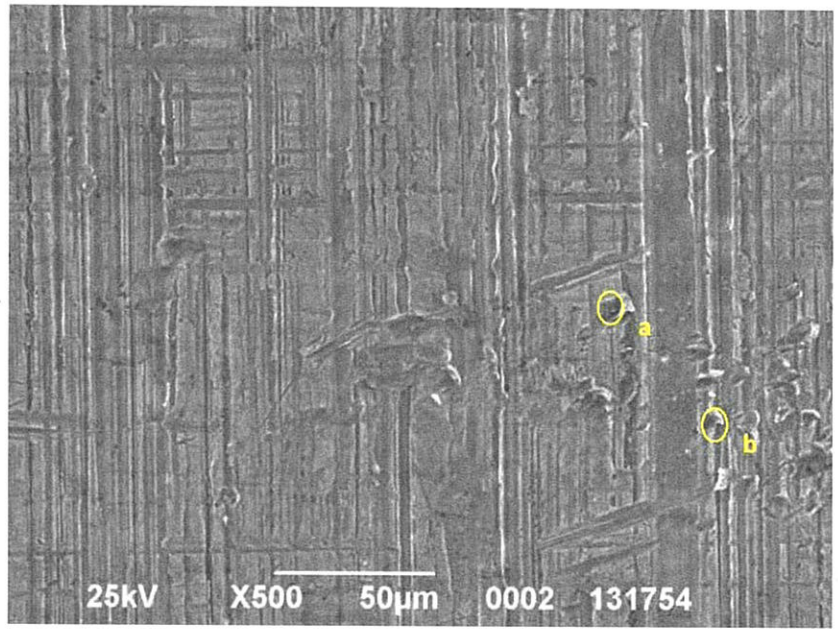


Slight measurable sliding wear on the journal bearing with the dimension in tolerance with the drawing requirements. Increased running traces and discolouration were revealed on the thrust bearing.

Supplier 08

Journal Bearing made of CW 713R after the test - 8 % of E100 in oil, 246 h

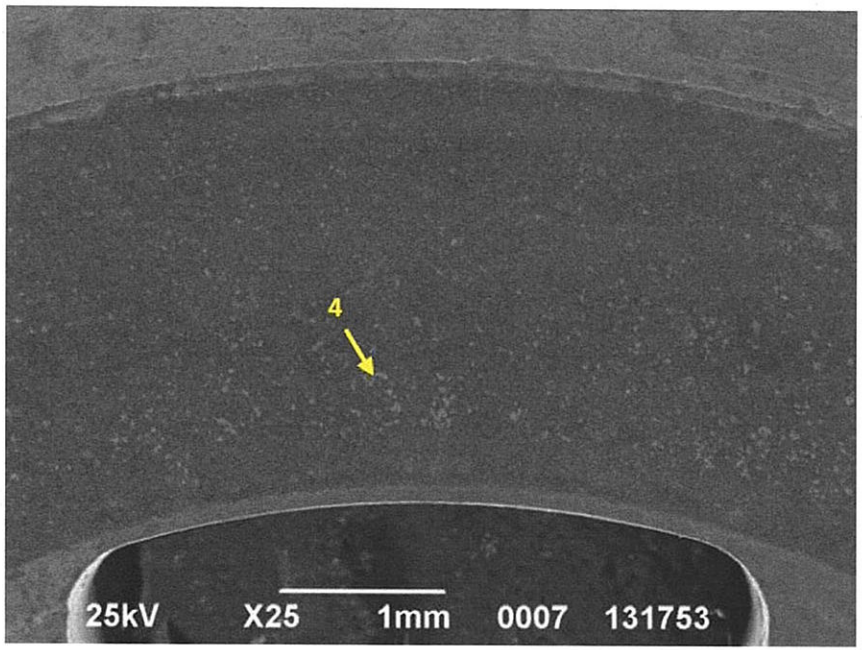


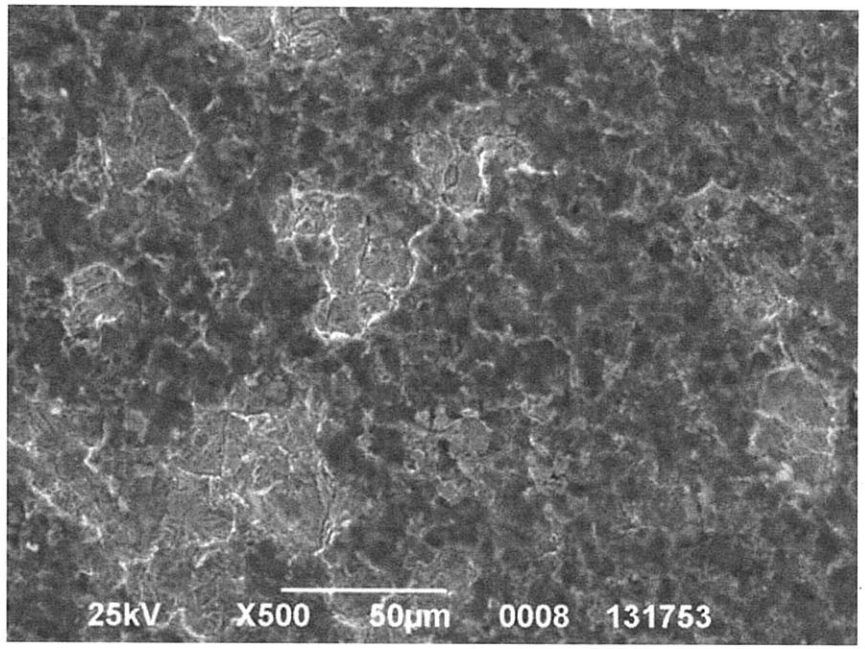


No evidence of corrosion damage on the surface of the journal bearing. Higher magnification SEM view showed only mechanical damage to the surface of the bearing caused by particles in the oil

Supplier 08

Thrust Bearing - made of CW507L after the test - 8 % of E100 in oil, 246 h



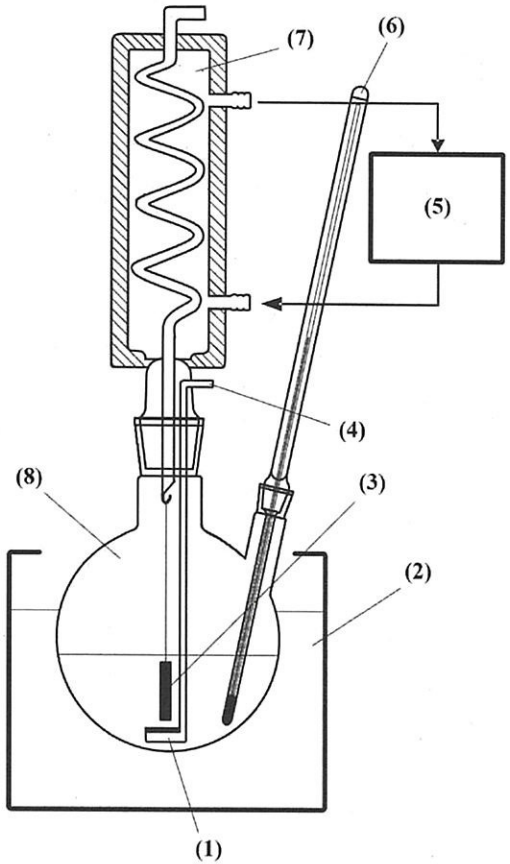


Thrust bearing showing pitting and intergranular corrosion to the surface

Supplier 08

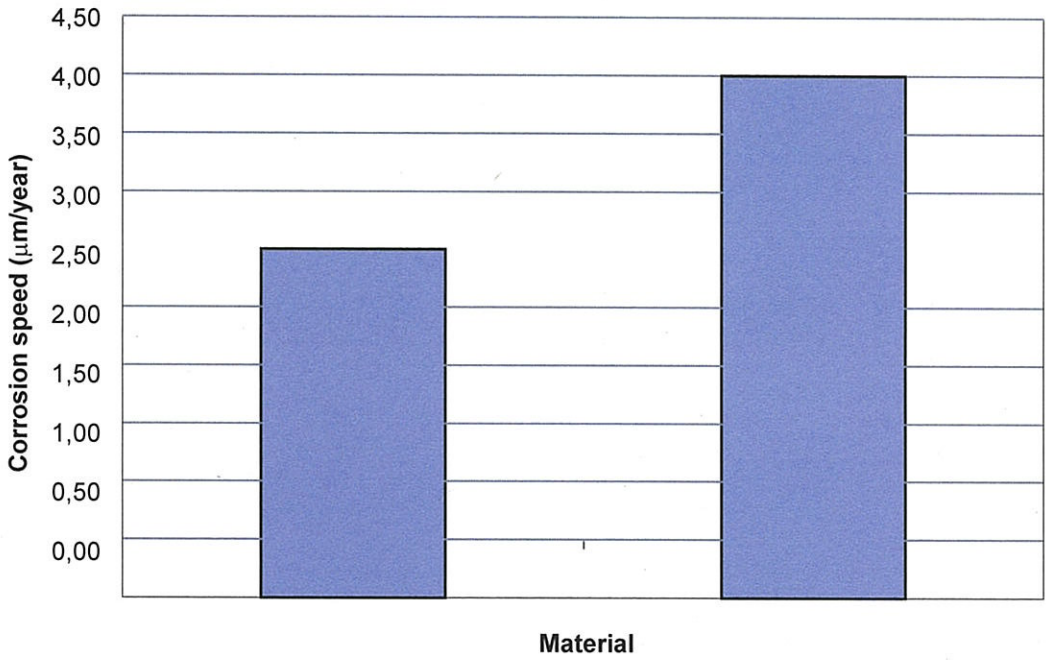
Static corrosion test of brass materials

- Static corrosion test under a reflux condenser in the presence of oxygen at the increased temperatures
- Simulation of influence of aggressive environment – usage of bioethanol
- Test medium – mixture of laboratory aged oil, bioethanol E100 and addition of salts and acids (aggressive ethanol)
- The tested material were immersed into this mixture



(1 – frit with a tube for oxygen supply, 2 – thermostat,
3 – sample with a hinge, 4 – oxygen supply, 5 – cooling, 6 – thermometer,
7 – ground joint reflux condenser with a hook, 8 – ground joint flask with oil sample)

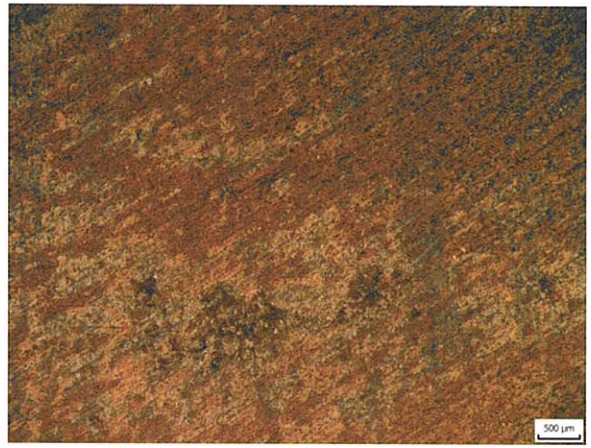
Corrosion speed CW713R vs. CW507L



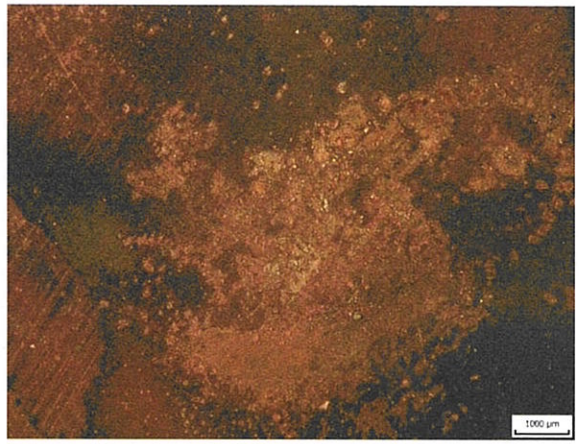
The corrosion rate was calculated from the weight difference before and after the experiment. The corrosion rate is given in µm/year.

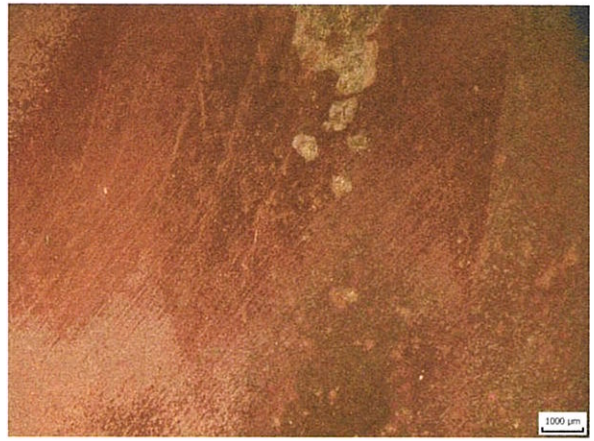
Supplier 08

After corrosion test



CW 507L – sample after the corrosion test – general and pitting corrosion





CW 713R – sample after the corrosion test – pitting and slight general corrosion

Summary

- Both materials CW713R and CW507L are well known and widely available on the market
- Material CW 713R, in comparison to material CW 507L, has better mechanical properties, wear resistance and corrosion resistance
- CW713R consists of MnSi particles in β matrix. MnSi particles improve the sliding characteristics and wear resistance of the alloy
- CW 713R with lead (0.2 – 0.8%) has a much better corrosion resistance (intergranular corrosion) as without lead, – see material 507L.
- The lead free material 507L (thrust bearing) shows intergranular corrosion after the comparison test.

Thank You

Our Vision

- A Clean, Energy-Efficient World

Our Mission

- Deliver Innovative Powertrain Solutions that Improve Fuel Economy, Emissions & Performance

Fuel Efficiency

Reduced Emissions

Performance