



SINTERED STEEL, COPPER, PHOSPHORUS ALLOY

WSS-M10A103-A1

1. SCOPE

The material defined by this specification is a sintered copper-phosphorus alloyed iron-base powder metal.

2. APPLICATION

This specification was released originally for engine cylinder block main bearing caps.

3. REQUIREMENTS

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.2 CHEMICAL COMPOSITION, % by Weight (ASTM E 415/ASTM E 350/ASTM E 1019)

Carbon	0.45 - 0.65
Copper	3.00 - 5.00
Manganese	0.25 - 0.45
Phosphorus	0.45 - 0.65
Sulfur	0.05 - 0.15
Others Each	0.20 Max.
Others Total	2.00 Max.
Iron	Balance

3.3 DENSITY, g/cc min (ISO 2738/ASTM B 328)

6.7

For in-process (IP) testing, the method and frequency of testing shall be specified in the Supplier Control Plan, and agreed upon between Ford and the supplier. The component location designated for sampling shall be described in the Engineering Specification (ES) or on the Engineering Drawing. This density requirement applies to critical areas. Critical areas are specified on Engineering Specification or on Engineering Drawing. Density will vary across part cross section and lower density is allowed in non-critical areas.

Date	Action	Revisions
2005 01 31	Revised	Updated format
2002 09 09	Activated	



Documents

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3.4 MECHANICAL PROPERTIES

In order to confirm Analytical Analysis calculations for new designs, the property specifications below shall be verified. Testing locations, frequencies and procedures will be outlined in the Engineering Specification or on the Engineering Drawing and will form part of the agreed Control Plan.

It is not recommended to machine test bars from a powdered metal component due to density variation and potential stresses induced during machining. Rather, test specimens will be separately pressed and sintered to the required dimensions from the same material lot (s) as the component they represent. Test blank density shall be not greater than the measured critical area(s) in the components they represent.

3.4.1	Tensile Properties (ISO 2740/ ISO 6892/ASTM E 8M)	
	Tensile Strength, MPa, min	450
	0.2% Offset Yield, MPa, min	350
	Elongation, % (extensometer), min	2.5
3.4.2	Compressive Yield Strength MPa, min (ASTM E 9M)	350
3.4.3	Shear Strength, MPa, min (ASTM B 565)	200
3.4.4	Fatigue Endurance Limit at 10^6 cycles, MPa, min (ASTM E 466, R = -1)	165

3.5 MICROSTRUCTURE (ASTM E 3)

The part will have a microstructure consisting of lamellar pearlite and ferrite with free copper and manganese sulfide particles. Microporosity shall be evenly distributed. Component microstructure shall be measured by taking sections as specified in the Engineering Specification or Engineering Drawing.

3.5.1	Ferrite (ASTM E 562)	60% max
3.5.2	Partial Decarburization (ASTM E 1077)	0.15 mm max

Samples for decarburization evaluation shall be taken from critical locations as defined in the Engineering Specification or on the Engineering Drawing. It is expected, however, that these decarburization limits be met in all areas of the component. Complete surface decarburization is not permitted.

3.5.3	Macro porosity (0.5 mm)	None permitted
3.5.4	Non-Metallic Inclusions (ASTM E 796)	0.20 mm max