



ENGINEERING MATERIAL SPECIFICATION

Material Name

Specification Number

MOLYBDENUM AND NICKEL, CHROMIUM ALLOY FACING,
CO-DEPOSITED

WSE-M1P92-A1/A2

1. SCOPE

The material defined by this specification is a mixture of molybdenum and nickel-chromium hardening alloy powders, applied with a plasma spray gun.

2. APPLICATION

This specification was released originally for a facing applied to the surface of parts to obtain increased wear and scuff resistant properties. The original release of this specification is for deposition on the O.D. surface of cast iron piston compression rings in an internal combustion engine.

3. REQUIREMENTS

3.1 QUALITY SYSTEM REQUIREMENTS

Material suppliers and part producers must conform to Quality System Requirements, QS-9000. Material specification requirements are to be used for initial qualification of materials. A Control Plan for ongoing production verification is required. This plan must be reviewed and approved by the relevant Ford Materials activity and/or Ford Supplier Technical Assistance (STA) prior to production parts submission. Appropriate statistical tools must be used to analyze process/product data and assure consistent processing of the materials.

Part producers using this material in their products, must use Ford approved materials and must conform to a process control plan which has been approved by STA and/or the relevant Materials Activity.

3.2 POWDER MIXTURE

	A1	A2
Molybdenum (99 % min purity)	67 - 80 %	55 - 75 %
Nickel - Chromium Alloy (see para 3.2)	20 - 33 %	21 - 33 %
Chrome Carbide (98 % pure)		4 - 12 %

Date	Action	Changes
1996 02 29	Activated	P. Lee

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3.3 NICKEL-CHROMIUM ALLOY CHEMISTRY

Nickel	64.0 - 75.0
Chromium	13.0 - 20.0
Boron	2.75 - 4.75
Silicon	3.0 - 5.0
Iron	3.0 - 5.0
Cobalt	1.0 max
Carbon	0.6 - 1.3

3.4 THICKNESS

As specified on
engineering drawing

Material in sprayed and deposited condition is rough and uneven. Material is generally sprayed to a thickness greater than required, and ground or lapped approximately 0.05 mm deep to specified thickness and surface finish. Thickness to be determined on a metallurgical cross section sample mounted and polished.

3.5 SURFACE HARDNESS (ISO 6507/2)

320 min

HV 0.5

3.6 MICROSTRUCTURE

The microstructure of the facing, on a metallurgical mounted and polished cross section, shall be a layered structure of uniformly distributed molybdenum and nickel-chromium phases caused by the impact of molten particles upon the surface. Volume content and composition of the facing as determined by quantitative metallurgical system shall be as follows:

	A1	A2
Molybdenum, min	50 %	40 %
Nickel-Chromium, Chrome Carbide, min	20 %	30 %
Porosity, max	15 %	15 %

Occasional isolated unmelted particles are acceptable, however, clusters of unmelted particles are not acceptable. Interphase fusion must be essentially complete, evidence of incomplete fusion or bonding between phases or phases to base material is not acceptable.

3.7 COATING ADHESION

3.7.1 Cast Iron

After shock loading the edge of the parts to cause the coating to rupture (such as a hammer blow upon the ring O.D. while resting flat on side on an anvil), the resulting fracture shall show failure only at the localized point of impact in the facing layer and no failure at the bond interface of the facing with the base metal outside the deformed impact area.