

Stelcar® JK® 112H

88% Tungsten Carbide/
12% Cobalt

Technical Note

Date: 9/22/03
Supercedes: New
No: C-055
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DESCRIPTION

Stelcar JK® 112H powder is manufactured by agglomeration and sintering fine particles of tungsten carbide and cobalt. This powder is design to be sprayed with the Jet Kote® thermal spray process using hydrogen as fuel. Highly polished surface finishes are possible because of the fine size and homogenous distribution of tungsten carbide particles. JK® 112H coatings are very resistant to abrasion and other forms of wear. JK® 112H powder is similar in composition to Praxair D-Gun® LW-1N30 coatings. JK® 112H is recommended when surface finish is a major requirement for the application.

APPROXIMATE COMPOSITION, Wt.%

| | |
|----------|---------|
| Carbon | 5.4 |
| Cobalt | 12.0 |
| Iron | <.1 |
| Tungsten | Balance |

SIZE

53/10 micron

APPLICATIONS

Hardfacing of compressor rods, pump casings, pump impellers, pump plungers, pump sleeves, mechanical seal faces, feed screws, gate valves, thread guides, paper cutting and slitter knives, fan blades, as well as various chemical and petrochemical parts.

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D-gun is a trademark of Praxair Inc.

COATING CHARACTERISTICS

| | <u>SET A</u> |
|---|---------------------|
| Bond Strength, PSI (per ASTM 633) | 10,000+ |
| Microhardness, DPH [300g] | 1140 - 1296 |
| Macrohardness, 15N | 92.7 - 94.6 |
| Estimated Porosity, As-Sprayed | <1.0% |
| Maximum Coating Thickness, Inches As-Sprayed, Flat or Irregular Shapes | .015 |
| Maximum Coating Thickness, Inches As-Sprayed on Cylindrical Shapes | .015 |
| Est. Maximum Service Temperature, °F | 1000 |
| Est. Deposit Efficiency, % | 50 |
| Estimated Coverage, Lb/Ft ² /. 010" | 1.8 |
| Est. Surface Finish, Microinch AA As-Sprayed | 185-300 |
| Est. Surface Finish, Microinch AA Ground and Diamond Lapped | <2 |
| Estimated Coating Density, g/cc | 14.6 |
| Abrasive Wear Resistance, MM ³ Loss Per ASTM G65-80, 2000 Revolutions | NA |

The above data in no way constitutes a specification. Parameters and other technical information in this document are for guidance only. Stellite Coatings may elect to make changes as additional information becomes available.

Note: Coatings produced with JK® 112H powder can be crack sensitive. These cracks are often extremely small and tight resulting in little to no reduction in coating performance. The cracks are not usually detectable by eye without the uses of a dye penetrate inspection process. Crack sensitivity can be reduced if the following practices are followed:

- 1) Apply coating as thin as possible as cracking sensitivity increases with increased coating thickness.
- 2) Apply the coating with a traverse speed and part to torch speed so that coating thickness per pass does not exceed .0002". Surface speed of the torch to part should be in excess of 300'/min.
- 3) Over heating of the coating should be avoided, maximum application temperature is about 300F.
- 4) Overcooling the coating by rapid direct cooling can cause quench cracks and should be avoided.

FINISHING

When finishing JK® 112H coatings diamond grinding or lapping must be used.

Light Duty Grinding:

Wheel Type: 100-240 Mesh Resinoid Bonded Diamond Wheels of L, P or R Hardness and
Concentration of 50

Cross-Feed Pass: .035" - .050"

Part Surface Speed: 40-50 Feet Per Minute

In-Feed Per Pass: .0005"

Note: Diamond wheels must be dressed periodically to achieve proper cutting and to avoid damage to the coating.

Heavy Duty Grinding:

Use all of the above but substitute a wheel with 100 mesh, nickel-clad diamonds in a resinoid bonded matrix, and hardness of R. Large surfaces may require a softer wheel.

NOTE:

1. Important! Diamonds must be periodically relieved, by dressing the wheel to insure proper grinding.
2. Irreversible damage to the coating can occur when the grinding wheel specifications and/or the grinding technique is incorrect.
3. Coolant must be flooded onto the part and grinding wheel during grinding. The coolant must not contain Amines, which can attack and pit the cobalt matrix!

Recommended Lapping:

1. Lapping is best done following a 6-14 microinch AA diamond ground finish of the coating.
2. Diamond paste or slurry is recommended as lapping media. Do not lap coatings dry. Use a lubricant as recommended for the particular media used in each step. Remove debris, wash and dry the coating surface prior to proceeding to the next grain size. Avoid contamination of the lapping surfaces by cleaning prior to application of fresh media.
3. Recommended grain size progression after grinding:

| <u>Lapping Compound</u> | <u>Est. Finish, Microinch AA</u> |
|--------------------------------|---|
| 15-30 Micron | 3-5 |
| 9-15 Micron | 2-4 |
| 3-9 Micron | 1-2 |

4. Super finishing is possible only if the coating does not have porosity, cracks or pullout caused by improper coating or finishing techniques.

SET B OPERATING PARAMETERS ⁽¹⁾

| | |
|---------------------|----------------------------|
| Fuel Gas | Hydrogen (H ₂) |
| Powder Carrier Type | Argon (Ar) |
| Nozzle | 1/4 x 9 |
| Injector | #40 |

| <u>Console Type</u> | <u>JK®II</u> | <u>JK®II NOVA</u> | <u>JK®IIA/JK®III</u> |
|---------------------------------|--------------|-------------------|----------------------|
| <u>Manifold Pressures, PSI</u> | (2) (7) | (8) | (3) |
| Oxygen | 120 | 120 | 100 |
| Main Fuel Gas | 120 | 120 | 100 |
| Carrier Gas | 85 | 80 | 85 |
| Hydrogen (Pilot) | 25 | | 100 (JK®IIA) |
| <u>Console Pressures, PSI</u> | | | |
| Oxygen | | | 68-72 |
| Main Fuel | | | 79-85 |
| Carrier | | | 58-62 |
| <u>Console Flows (4)</u> | | | |
| Oxygen | 580-600 | 570 | 570 |
| Main Fuel | 1180-1200 | 1150 | 1150 |
| Carrier | 30-35 | 57 | 57 |
| <u>Console Settings (JKIIA)</u> | | | |
| Oxygen | | | 25.0 |
| Main Fuel | | | 63.9 |
| Carrier | | | 40.7 |
| <u>Cooling Water (5)</u> | | | |
| °F IN | 85-90 | 85-90 | 85-90 |
| °F OUT | 115-120 | 115 -120 | 115 -120 |
| Flow, GPM | 12.5 | 12.5 | 12.5 |
| <u>Powder feed Settings</u> | | | |
| RPM (Approximate) | 3.5-4.5 | 3.5-4.5 | 3.5-4.5 |
| Feed Rate (6), grams/Min. | 55-65 | 55-65 | 55-65 |
| <u>Spray Distance, Inches</u> | 7-8 | 7-8 | 7-8 |

NOTES:

- Pressures shown are running pressures with powder feeding.
- Manifold pressures for JK®II system are critical, manifold regulators must be located at factory supplied hose ends.
- Manifold pressure too low will not allow enough flow. If it is too high the controller will pulse upon start up.
- JK®II system does not correct flow due to change in gas temperature or pressures at the meters, JK®IIA system compensates and flow is displayed as true Standard Cubic Feet per Hour (SCFH):
 $T = 0^{\circ}\text{C}, P = 14.7 \text{ PSIA}$
- A heat exchanger to control the water inlet temperature to the torch is recommended. Adjust water flow to achieve outlet temperature. Water temperatures affect coating quality and torch performance.
- Powder feed rate must be checked with powder flowing through lit gun. Powder Feed Rate (PFR) = (Powder Weight (g) Initial-Powder Weight Final (g)/ Powder Feed Time (min.)). Powder feed time must be greater than 1 min. PFR is linear to RPM of the feeder. To achieve required PFR, change RPM as follows: $\text{NEW RPM} = (\text{PFR Required}) \times (\text{RPM Original}) / (\text{PFR Calculated})$
- JK®II or JK®II NOVA-A flowmeter requires change for specific gas use:
 H_2 - Part #973118 C_3H_6 - Part #973244
- Maximum Console Inlet gases pressure is 150 PSI.