

Stellite



Delcrome™ JK™513 Powder
316 Stainless steel

Technical Note

DATE: 1/10/95
SUPERSEDES: 10/23/87
NO: C-006
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DESCRIPTION

Delcrome JK513 is a type 316 stainless steel powder. Coatings produced with the JET KOTE^R thermal spray process are dense and exhibit moderate corrosion and wear resistance. JK513 coatings are generally used in component restoration, such in the restoration of bearing and seal areas on severely worn or mis-machined components. JK513 may be used as a build-up coating, with other coatings, such as JK112, applied onto the as-sprayed or machine finished JK513 coating. Coatings made from JK513 powder are used in many corrosion and wear resistant applications up to 1000°F.

APPROXIMATE COMPOSITION, Wt.%

MESH SIZE

Carbon	.1
Chromium	17.0
Iron	Balance
Nickel	13.0
Molybdenum	2.5
Silicon	1.0

-270

APPLICATIONS - Protective or Restoration Coatings

Boiler Tubes	Exhaust Fans and Blowers	Paper Mill Rolls
Build Up Coat	Miss-machined Parts	Pump Impellers
Pump Sleeves	Compressor Rods	Cylinder Bores
Piston Restoration	Plungers	Mixer Blades
Tank Lining	Hydraulic Rams	Drive Shafts

Parameters and other technical information in this document are provided as guidance for the application and use of JK513 coatings.

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JK™513

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COATING CHARACTERISTICS

	<u>SET A</u>	<u>SET B</u>
Est. Bond Strength, PSI (per ASTM 633)	7,300	7,700
Microhardness, DPH [300g]	243-323	311-470
Macrohardness, 15N (Rc conversion)	68.3-71.8 (19-24)	74.7-76.8 (28-32)
Estimated Porosity, Volume %	<1	<1
Estimated Coverage, Lb/Ft ² /.010"	.54	.52
Est. Deposit Efficiency, Wt %	69.3	69.0
Maximum Coating Thickness, Inches As-sprayed, Flat and Irregular Shapes	.060	.060<*
Maximum Coating Thickness, Inches As-sprayed, Outer Cylindrical Shapes	.080	.125<*
Est. Maximum Service Temperature, °F	1000	1000
Est. Surface Finish, Microinch AA As-sprayed	300-480	300-480
Est. Surface Finish, Microinch AA Ground and Diamond Lapped	<5	<2
Machinability, Lathe Turning	Fair	Excellent
Visual Oxide Content	Moderate	Low
Abrasive Wear Resistance MM ³ Loss ASTM G65-80, 30 lb. Load, 1000 Rev.	41.2	Unknown

The above data, in no way, constitutes a specification. Stellite Coatings may provide additional information as it becomes available.

***Note:** Coatings greater than .125" thick have been produced on outer diameter of shafts and coatings greater than .060" thick have been produced on flat and irregular surfaces, such as found in a power plant boiler tube applications. Thicker coating maybe possible.

FINISHING

Coatings of JK513 may be used as-sprayed, buffed with abrasive cloth or a wire wheel prior to use, or machine finished to dimensional tolerances as needed.

LATHE TURNING

Coatings produced with SET B may be conventionally lathe turned with Carbide tools. It is possible to mill, drill and turn treads into the SET B coating if the coating is removed with light cuts. Liberal amounts of lubrication can extend the life of the tooling. The use of dull tools may damage the coating, so tools must be sharp for best results.

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GRINDING

Coatings of JK513 produced with SET A conditions are best finished by grinding or lapping.

Wheel Type: 220 SiC, Vitrified Bond, H-L Hardness

Substitutions for wheel specifications may be required if coarse grinding and increased wheel life is desired.

Feeds and Speeds:

.035" - .075" Cross-Feed/Pass

40-65 Ft/Min. Part surface Speed

.0005" - .001" In-Feed/Pass

POLISHING AND LAPPING

Silicon Carbide (SiC) or Diamond media is recommended for best results. Aluminum Oxide media does not cut well and may leave a dull, porous finish due to tearing of the coating surface.

Wet polishing with liberal amounts of lubricant is recommended for best results. Care should be taken not to cause particle pull out by applying too much pressure, by using dull abrasive or by lack of lubrication. Lite machine oil is recommended for lapping with SiC media. Use appropriate lubrication for the specific form of Diamond media.

The progression of polishing steps follow:

- 1) Obtain the best finish possible by grinding or turning.
- 2) Use 320 mesh SiC media, followed by 400 and 600 making sure scratches from preceding media has been removed prior to continuing.
- 3) Super-finishing is best done with 3-9 micron diamond media in a slurry form. Honing a super-finish is also possible, consult manufacture of honing equipment or Stellite Coatings for additional information.

COATING TECHNIQUE

During spraying of thick coatings, it is important not to overcool or overheat the parts, creating excessive coating shrinkage that may cause coating failure. If possible, preheat the part to minimum of 100°F, minimize oxidization of the substrate, and apply the coating while keeping the coating and part below 450°F. Do not let the part cool more than 150°F during the application of the coating. Let the part slow cool, in air, when the application of the coating is complete.

SET A OPERATING PARAMETERS⁽¹⁾

Fuel Gas	Propylene (C ₃ H ₆) or Propane (C ₃ H ₈)	
Powder Carrier Type	Nitrogen (N ₂)	
Nozzle	5/16 X 6	
Injector	#50	
Carbide Insert	.052" or .080"	
<u>Console Type</u>	<u>JKII</u>	<u>JKIIA</u>
<u>Manifold Pressures, PSI</u>	(2) (7)	(3)
Oxygen	120	90-100
Main Fuel Gas	80	75-80
Carrier Gas	100	85
Hydrogen (Pilot)	25	90-100
<u>Console Pressures, PSI</u>		
Oxygen	80-85	70-75
Main Fuel	58-69	58-68
Carrier	58-70 (.052")	58-70 (.052")
	45-57 (.080")	45-57 (.080")
<u>Console Flows⁽⁴⁾</u>		
Oxygen	1000-1020	980-1020
Main Fuel	56-60%	123-137
Carrier	30-40	77-90
<u>Console Settings</u>		
Oxygen		54.4-56.7
Main Fuel		41.0-45.7 (C ₃ H ₆)
		45.6-50.7 (C ₃ H ₈)
Carrier		77.0-90.0
<u>Cooling Water⁽⁵⁾</u>		
°F IN	80-90	80-90
°F OUT	115-120	115-120
Approx. Flow, GPM	8	8
<u>Powder Feeder Settings</u>		
Dial Set (Approximate)	210-319	210-319
RPM (Approximate)	2.9-5.0	2.9-5.0
Feed Rate ⁽⁶⁾ , grams/Min.	50-85	50-85
<u>Spray Distance, Inches</u>	9-11	9-11

NOTES:

- Pressures shown are running pressures with powder feeding.
- Manifold pressures for JKII system are critical, manifold regulators must be located at factory supplied hose ends.
- Manifold pressure too low will not allow enough flow. If the pressure is too high the controller will pulse upon start up.
- JKII system does not correct flow due to change in gas temperature or pressures at the meters. The JKIIA system gas flow is displayed as true Standard Cubic Feet per Hour (SCFH): T = 0°C, P = 14.7 PSIA
- A heat exchanger to control the water inlet temperature to the gun is required for best results. Adjust water flow to achieve outlet temperature. Water temperatures may affect coating quality and gun 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 one minute. PFR is linear to RPM of the feeder. To achieve required PFR, change RPM as follows:

$$\text{RPM (NEW)} = \frac{\text{PFR (Required) RPM (Original)}}{\text{PFR (Calculated)}}$$

- JKII flowmeter requires change for specific gas use:

H₂ - Part #972763 C₃H₆ or C₃H₈ - Part #972763

SET B OPERATING PARAMETERS⁽¹⁾

Fuel Gas	Hydrogen (H ₂)	
Powder Carrier Type	Nitrogen (N ₂)	
Nozzle	1/4 x 9	
Injector	#40	
Carbide Insert	.052" or .080"	
<u>Console Type</u>	<u>JKII</u>	<u>JKIIA</u>
<u>Manifold Pressures, PSI</u>	(2) (7)	(3)
Oxygen	120	90-100
Main Fuel Gas	120	100
Carrier Gas	100	85
Hydrogen (Pilot)	25	
<u>Console Pressures, PSI</u>		
Oxygen	52-60	44-52
Main Fuel	72-83	66-77
Carrier	52-60 (.052")	52-60 (.052")
	40-47 (.080")	40-47 (.080")
<u>Console Flows⁽⁴⁾</u>		
Oxygen	450	450
Main Fuel	1200-1350	1120-1270
Carrier	30-35	67-77
<u>Console Settings</u>		
Oxygen		25.0
Main Fuel		65.0-70.6
Carrier		67.0-77.0
<u>Cooling Water⁽⁵⁾</u>		
°F IN	80-90	80-90
°F OUT	110-120	110-120
Approx. Flow, GPM	11.2	11.2
<u>Powder Feeder Settings</u>		
Dial Set (Approximate)	152-277	152-277
RPM (Approximate)	1.8-4.2	1.8-4.2
Feed Rate ⁽⁶⁾ , grams/Min.	30-70	30-70
<u>Spray Distance, Inches</u>	9-11	9-11

NOTES:

1. Pressures shown are running pressures with powder feeding.
2. Manifold pressures for JKII system are critical, manifold regulators must be located at factory supplied hose ends.
3. Manifold pressure too low will not allow enough flow. If the pressure is too high the controller will pulse upon start up.
4. JKII system does not correct flow due to change in gas temperature or pressures at the meters. The JKIIA system gas flow is displayed as true Standard Cubic Feet per Hour (SCFH): T = 0°C, P = 14.7 PSIA
5. A heat exchanger to control the water inlet temperature to the gun is required for best results. Adjust water flow to achieve outlet temperature. Water temperatures may affect coating quality and gun performance.
6. 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 one minute. PFR is linear to RPM of the feeder. To achieve required PFR, change RPM as follows:

$$\text{RPM (NEW)} = \frac{\text{PFR (Required) RPM (Original)}}{\text{PFR (Calculated)}}$$

7. JKII flowmeter requires change for specific gas use:

H₂ - Part #972915 C₃H₆ or C₃H₈ - Part #972763