

Stellite



JKTM591 NistelleTMC POWDER
JK591P FOR PROPYLENE FUEL OR
JK591H FOR HYDROGEN FUEL

TECHNICAL NOTE

DATE: 3/4/93
SUPERSEDES: 9/6/88
NO: C-007
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DESCRIPTION

JK591, Nistelle C powder, offers coatings which are characterized by their corrosion resistance to oxidizing acids such as nitric and sulfuric. Coatings of JK591 exhibit good metal-to metal wear and abrasion resistance and are well suited for applications in the chemical industry for pumps and valve parts.

JK591H is sized the same as previously described JK591 powder and may best be used with hydrogen fuel parameters where the fine powder size is not likely to inhibit long spray periods.

JK591P is recommended for use with propylene fuel, especially for long spray durations. This powder is slightly coarser than JK591H. The powder appears to be more user friendly than previous JK591 without affecting the coating properties. The attached starting parameters have also been established to assist in extending spray periods. In addition the introduction of .082" carbide insert has been observed to reduce buildup of material on gun parts, which reduces spitting undesired large particles onto the part, or loading of nozzles. The powder feed rate does not appear to be as critical as in the past. Increased powder feed rate may be possible to significantly increase the deposition rate above the parameter SET A since the larger insert will allow more material through with less carrier gas pressure.

APPROXIMATE COMPOSITION, WT %

Chromium	16.5
Iron	5.5
Molybdenum	17.0
Nickel	Balance
Tungsten	4.5

MESH SIZE

JK591H	325/D
JK591P	270/D

APPLICATIONS

Restoration of, or increasing the wear or corrosion resistance of: Yankee Dryer rolls used in paper manufacturing, Boiler Tubes in coal fired power generation boilers, paper mill digester boiler tubes, Pump Components, Fan Blades, etcetera...

JK, JET KOTE AND NISTELLE ARE TRADEMARKS OF
STOODY DELORO STELLITE, INC.

COATING CHARACTERISTICS:

	<u>SET A</u>	<u>SET B*</u>
Bond Strength, PSI (Per ASTM C-633)	Unknown	Unknown
Microhardness, DPH [300g]	377	434
Macrohardness, 15N (Rc Conversion)	80 (39)	83 (45)
Estimated porosity, %	<3	<1
Maximum Coating Thickness, Inches	.040	Unknown
As-Sprayed, Flat or Irregular Surfaces		
Maximum Coating Thickness, Inches	.090	.187+?
As-Sprayed, on Cylindrical Shapes		
Est. Maximum Service Temperature, °F	1400	1400
Est. Deposit Efficiency, %	63%	Unknown
Estimated Coverage, Lb/Ft ² /.010"	.67	Unknown
Est. Surface Finish, Microinch AA	200-300	120-150
As-Sprayed		
Est. Surface Finish, Microinch AA	3-5	<2
Ground and Lapped		
Abrasive Wear Resistance, MM ³ Loss	34.3	Unknown
Per ASTM G65-80, Approximate		
Machinability	Fair	Excellent
Oxide Level	High	Moderate
Est. Thermal Expansion Coefficient	Unknown	Unknown
Microinches/inch/°F , 75-1000 °F		

*Note: If possible preheat the part, making sure not to oxidize the substrate, and apply the coating up to 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 coating buildup is complete.

The above data, in no way, constitutes a specification.
 Stellite Coatings reserves the right to make changes.

CORROSION DATA

The corrosion resistance of JK591 is rated as shown, for the following environments. These results are based on laboratory tests of the coating. Because of porosity in the coating, even though less than 3% is possible, and due to other variables in the operating environment, the best evaluation of the coating should be done by field testing the coating.

<u>MEDIA</u>	<u>CONCENTRATION, VOL.%</u>	<u>°F</u>	<u>RESULTS</u>
Formic Acid	30	150	Excellent
Acetic Acid	30	Boiling	Excellent
Sulfuric Acid	5	150	Excellent
Nitric Acid	65	150	Satisfactory

FINISHING

GRINDING

This is the preferred method of finishing JK591 coatings, especially when applied by SET A parameters.

Wheel Type: 60-220 SiC Vitrified wheel of H to L hardness
Cross Feed Per Pass: .035-.075
Part Surface Speed: 40-65 Feet Per Minute
In Feed Per Pass: .0005" - .001"

MACHINING : TURNING, MILLING OR DRILLING OF JK591H, SET B COATINGS

The use of tungsten carbide tools is recommended since JK591H coatings work-harden and can rapidly dull the tool. Dull tools increase the work-hardening effect and may damage the coating. Lubricating the coating and tool during machining is recommended. If the coating begins to machine hard, sharpen the tool, lower the surface speed of the part or tool and decrease the size of cut being made. Unlike most thermal spray coating when machined, JK591H usually produces shavings similar to wrought alloys.

POLISHING AND LAPPING

SiC or diamond media is recommended. 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 grit size. Avoid contamination of the lapping surfaces by cleaning them prior to application of fresh media.

Recommended grit size progression after grinding or machining:

320, 400, and then 600 - U.S. Screen Sizes

Super-finishing to a mirror finish can be accomplished with SiC or diamond paste or slurry. Diamond media may produce the best results by using the following grain size progression:

15 or 9 micron and then 6 or 3 micron

SAFETY

In addition to compliance to the bottle label warning of the hazards dust and fumes may cause, the use of shaded glasses during the spraying of this powder reduce the brightness and glare produced, is recommended.

SET A OPERATING PARAMETERS⁽¹⁾

Fuel Gas		Propylene (C ₃ H ₆)
Powder Carrier Type		Nitrogen (N ₂)
Nozzle		5/16 x 6
Injector		#50
Carbide Insert		.082"
<u>Console Type</u>	<u>JKII</u>	<u>JKIIA</u>
<u>Manifold Pressures, PSI</u>	(2) (7)	(3)
Oxygen	120	90-95
Main Fuel Gas	80	80
Carrier Gas	100	85
Hydrogen (Pilot)	25	90
<u>Console Pressures, PSI</u>		Estimated:
Oxygen	79-85	65-75
Main Fuel	62-65	54-65
Carrier	46-52	46-52
<u>Console Flows⁽⁴⁾</u>		
Oxygen	1070-1080	1080-1100
Main Fuel	50-52%	110-115
Carrier	35-40	88-90
<u>Console Settings</u>		
Oxygen		60.0-61.1
Main Fuel		36.6-38.3
Carrier		88.1-90.1
<u>Cooling Water⁽⁵⁾</u>		
°F IN	80-90	80-90
°F OUT	110-120	110-120
<u>Powder feed Settings</u>		
Dial Set (Approx.)	231-282	231-282
RPM (Approximate)	3.5-4.1	3.5-4.1
Feed Rate ⁽⁶⁾ , grams/Min.	60-69	60-69
<u>Spray Distance, Inches</u>	9-10	9-10

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 it 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, JKIIA system compensates and flow is displayed as true Standard Cubic Feet per Hour (SCFH):
 $T = 0^{\circ}\text{C}, P = 14.7 \text{ PSIA}$
5. A heat exchanger to control the water inlet temperature to the gun is recommended. 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 1 min. PFR is linear to RPM of the feeder. To achieve required PFR, change RPM as follows:

$$\text{RPM (NEW)} = \frac{\text{PFR (Required)} \text{ RPM (Original)}}{\text{PFR (Calculated)}}$$
7. JKII flowmeter requires change for specific gas use:
 H₂ - Part #972915 C₃H₆ - 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"
<u>Console Type</u>	<u>JKII</u>	<u>JKIIA</u>
<u>Manifold Pressures, PSI</u>	(2) (7)	(3)
Oxygen	120	90
Main Fuel Gas	120	90
Carrier Gas	100	80
Hydrogen (Pilot)	25	
<u>Console Pressures, PSI</u>		
Oxygen	52-55	43-47
Main Fuel	70-75	60-65
Carrier	50-55	50-55
<u>Console Flows⁽⁴⁾</u>		
Oxygen	450	450
Main Fuel	1200	1180-1220
Carrier	30-35	65-75
<u>Console Settings</u>		
Oxygen		25.0
Main Fuel		65.6-67.8
Carrier		65.1-78.1
<u>Cooling Water⁽⁵⁾</u>		
°F IN	80-90	80-90
°F OUT	115-120	115-120
<u>Powder feed Settings</u>		
Dial Set (Approx.)	136	136
RPM (Approximate)	1.5	1.5
Feed Rate ⁽⁶⁾ , grams/Min.	30-35	30-35
<u>Spray Distance, Inches</u>	7-8	7-8

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