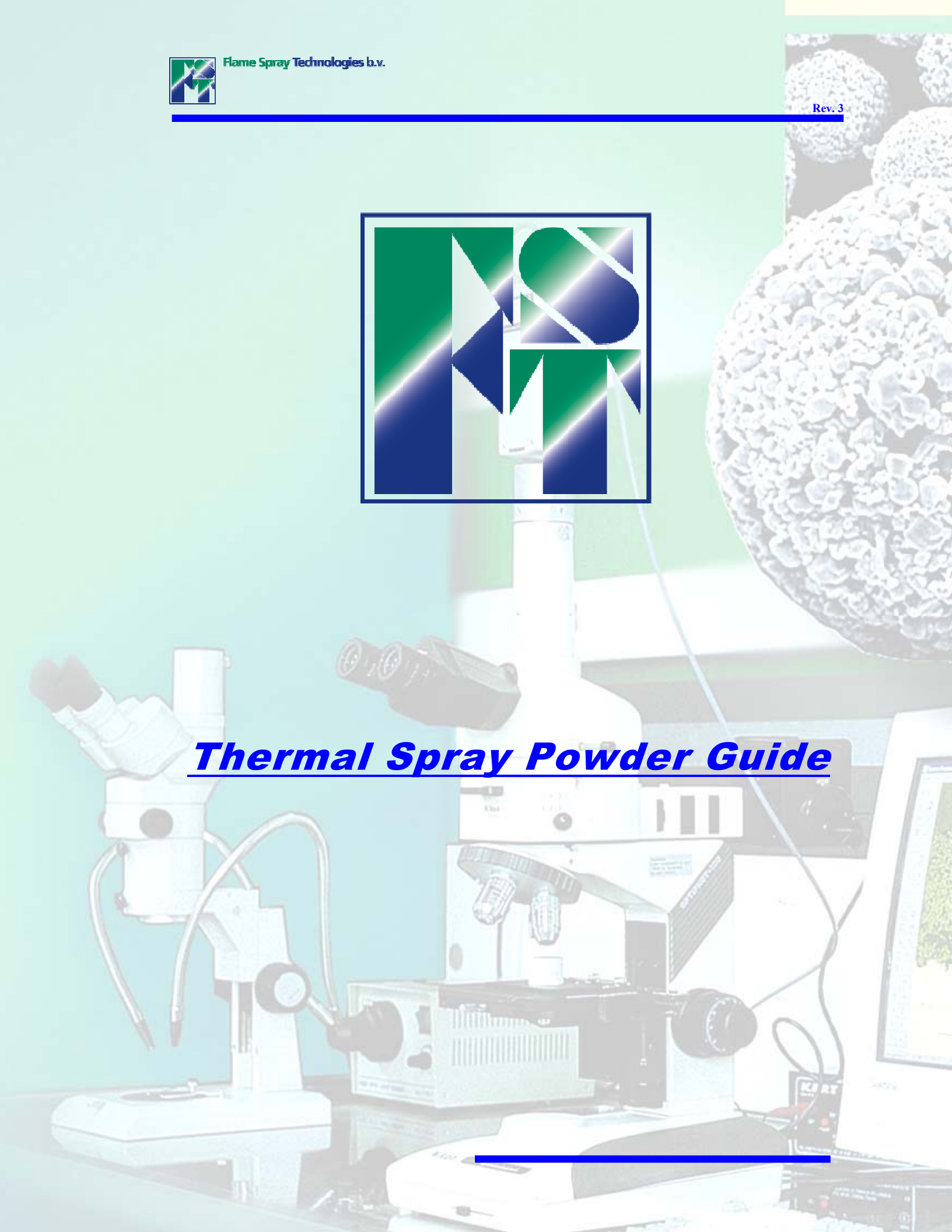




# ***Thermal Spray Powder Guide***





# Thermal Spray Consumables Guide

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## Thermal Spray Consumables Guide

### INTRODUCTION

For every company that operates thermal spray equipment, a good and reliable supply of high quality consumable products is important to guarantee the best possible, and most economical performance of the equipment, and to ensure continuous production.

Flame Spray Technologies has produced this powder guide with the purpose to provide our customers with a comprehensive and complete catalogue of the consumable products supplied.

In this consumable guide the most generally industrial used powder products are listed. If products other than listed in this catalogue are required, please contact our customer support team.

Further FST offer the complete **AMPERIT**<sup>®</sup> product range. For further information, please contact our customer support team.

**Flame Spray Technologies B.V.**

Tel: +31-26-319-0140

Fax: +31-26-319-0141

e-mail: [info@fst.nl](mailto:info@fst.nl)

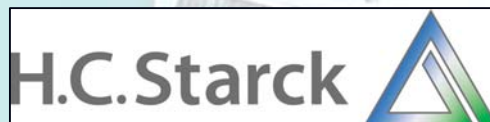
or

**Flame Spray Technologies Inc.**

Tel: +1-616-988-2622

Fax: +1-616-988-2629

E-mail: [fstincusa@aol.com](mailto:fstincusa@aol.com)





## Thermal Spray Consumables Guide

### PARTICLES SIZE CONVERSION CHART

MICRON	MESH
38	400
45	325
53	270
63	230
75	200
90	170
106	140
125	120
150	100

### BOND STRENGTH CONVERSION CHART

MPA	Psi
10	1450
25	3625
30	4350
35	5075
40	5800
50	7250
60	8700
70	10150



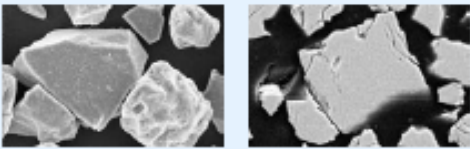
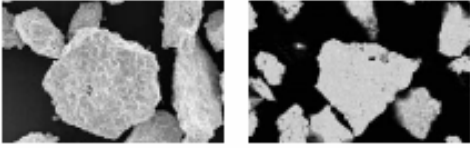
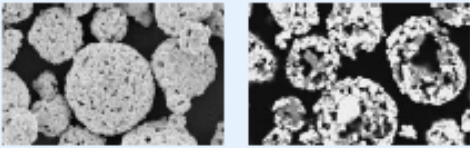
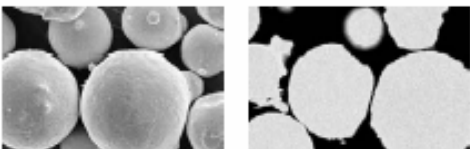
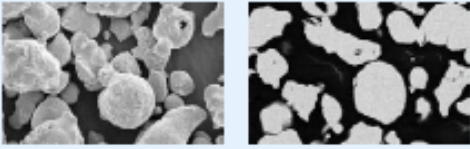
## Thermal Spray Consumables Guide

### COATING THICKNESS CONVERSION CHART

MICRON	mil
10	0.4
20	0.8
50	2.0
100	4.0
200	8.0
300	12.0

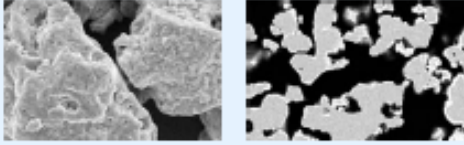
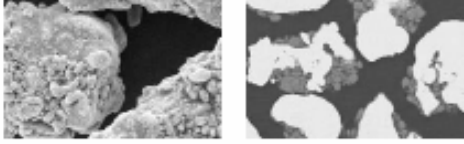
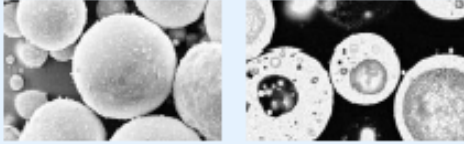
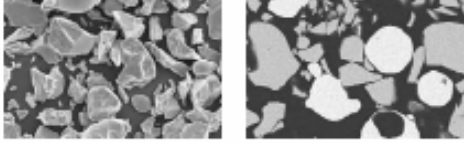


# POWDER PRODUCTION METHODS

Powder Type	Description	Characteristics	Examples
<p><b>Fused and crushed</b></p> 	<p>Fine materials will be melted using electric arc furnaces. The melt will be cooled down and crushed. Two main processes are known: tap and block</p>	<ul style="list-style-type: none"> <li>- Blocky</li> <li>- Irregular</li> <li>- Dense</li> </ul>	<p>Cr<sub>2</sub>O<sub>3</sub> Al<sub>2</sub>O<sub>3</sub> Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> TiO<sub>2</sub> ZrO<sub>2</sub>-Y<sub>2</sub>O<sub>3</sub></p>
<p><b>Sintered and crushed</b></p> 	<p>Raw materials (carbides, metals, oxides, etc.) will be blended and sintered in furnaces (under air, hydrogen or vacuum). The sinter cake will be crushed.</p>	<ul style="list-style-type: none"> <li>- Blocky</li> <li>- Irregular</li> <li>- Relatively dense</li> </ul>	<p>WC-Co Cr<sub>3</sub>C<sub>2</sub>-NiCr Cr<sub>2</sub>O<sub>3</sub>-based</p>
<p><b>Agglomerated / Agglomerated sintered</b></p> 	<p>Suspension of fine powders, organic binder and liquid (f.e. water) will be atomized through an atomizer disk or through a nozzle into a chamber. Droplets (agglomerates of powder, binder and liquid) will be dried and form solid particles. Typically the solid particles will be sintered afterwards.</p>	<ul style="list-style-type: none"> <li>- Spherical</li> <li>- Porous</li> <li>- Homogeneous distribution of different materials</li> </ul>	<p>WC-Co WC-Co-Cr Cr<sub>3</sub>C<sub>2</sub>-NiCr Mo Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> ZrO<sub>2</sub>-Y<sub>2</sub>O<sub>3</sub></p>
<p><b>Gas atomized</b></p> 	<p>Molten metal or liquid alloys will be atomized with a high speed gas stream (high pressure) after a nozzle into a chamber. Used gases are Ar, N<sub>2</sub>, He, air.</p>	<ul style="list-style-type: none"> <li>- Spherical</li> <li>- Dense</li> <li>- High purity</li> <li>- Low O content</li> </ul>	<p>MCrAlYs NiCr NiAl NiSF alloys Inconels Stellites</p>
<p><b>Water atomized</b></p> 	<p>Molten metal or liquid alloys will be poured through a nozzle and atomized with a high pressure water stream into a chamber.</p>	<ul style="list-style-type: none"> <li>- Irregular</li> <li>- Dense</li> <li>- Higher O content than gas atomized</li> </ul>	<p>NiCr NiAl</p>



# POWDER PRODUCTION METHODS

Powder Type	Description	Characteristics	Examples
<p><b>Dense coated</b></p> 	Starting from an aqueous metal salt solution in which particles to be coated will be distributed. The metal salt will be reduced with hydrogen by using an agitator autoclave under higher temperature and pressure. Typically used for Ni- and Co salts.	<ul style="list-style-type: none"> <li>- Blocky or irregular</li> <li>- Composite</li> </ul>	<p>Cr<sub>3</sub>Cr<sub>2</sub>Ni(Cr) Ni-Graphite WC-Ni</p>
<p><b>Porous coated</b></p> 	Coarser core material will be cladded on the surface with one or more finer powders using an organic binder. The materials and soluted organic binder will be put into a mixer, blended/milled and dried.	<ul style="list-style-type: none"> <li>- Blocky or irregular</li> </ul>	<p>Ni-Al NiCr-Al Ni-Mo-Al</p>
<p><b>Spheroidized</b></p> 	Agglomerated or sintered powders will be put through a plasma device. The particles will be partially melted and create a spherical shape with dense surfaces.	<ul style="list-style-type: none"> <li>- Spherical</li> <li>- Dense, porous and hollow</li> </ul>	<p>ZrO<sub>2</sub>-Y<sub>2</sub>O<sub>3</sub> Cr<sub>3</sub>Cr<sub>2</sub>-NiCr WC-Co</p>
<p><b>Blends</b></p> 	All kinds of powders can be blended together using appropriate mixers.	<ul style="list-style-type: none"> <li>- Different morphologies</li> <li>- Segregation possible</li> </ul>	<p>Mo-NiSF Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> Cr<sub>3</sub>Cr<sub>2</sub>-NiCr</p>



## Thermal Spray Consumables Guide

# CROSS REFERENCE LIST

FST Nb	Sulzer Metco	Praxair	HC Starck	Page nb
<b>C-234.51</b>	210	ZRO103		26
<b>C-293.691</b>	204	ZRO182	Amperit 832/827	26
<b>C-328.23</b>	101NS	ALO105	Amperit 742	10
<b>C-338.23</b>	130	ALO187	Amperit 748	10
<b>C-339.23</b>	130	ALO187	Amperit 744	11
<b>C-341.23</b>	131	ALO121	Amperit 745	11
<b>C-342.23</b>	131	ALO121	Amperit 746	10
<b>C-408.23</b>	102		Amperit 782	23
<b>C-505.23</b>	105NS	ALO101	Amperit 740	10
<b>C-604.01/25</b>	Amdry 6420/6417	CRO131/167	Amperit 704	13
<b>C-650.32</b>	136	CRO192	Amperit 716	13
<b>K-607.23</b>		1356VM	Amperit 551	24
<b>K-611.23</b>		1310VM	Amperit 547	24
<b>K-624.01/23</b>	SM5812, 72F-NS	1342VM	Amperit 518	24
<b>K-647.23</b>	SM5847	1350VM	Amperit 558	24
<b>K-651.23</b>			Amperit 559	24
<b>K-661.23</b>				24
<b>K-674.23</b>	SM73F	1343VM	Amperit 526	24
<b>K-856.23</b>	Amdry 5260	1375VM	Amperit 588/584	12
<b>K-855.21</b>	81VF-NS	CRC106	Amperit 585	12
<b>M-111A.691</b>	601NS			8
<b>M-250.71</b>	54NS	AL104		9
<b>M-300A.33</b>	56	1166F	Amperit 175	19
<b>M-301.33</b>	43F/C-NS	1262F, NI107	Amperit 250	19
<b>M-307.93</b>	443NS	NI122		19
<b>M-326.33</b>	Diamalloy 1005	1256F		21
<b>M-328A.33</b>	Diamalloy 1006	1278F		21





## Thermal Spray Consumables Guide

### CROSS REFERENCE LIST

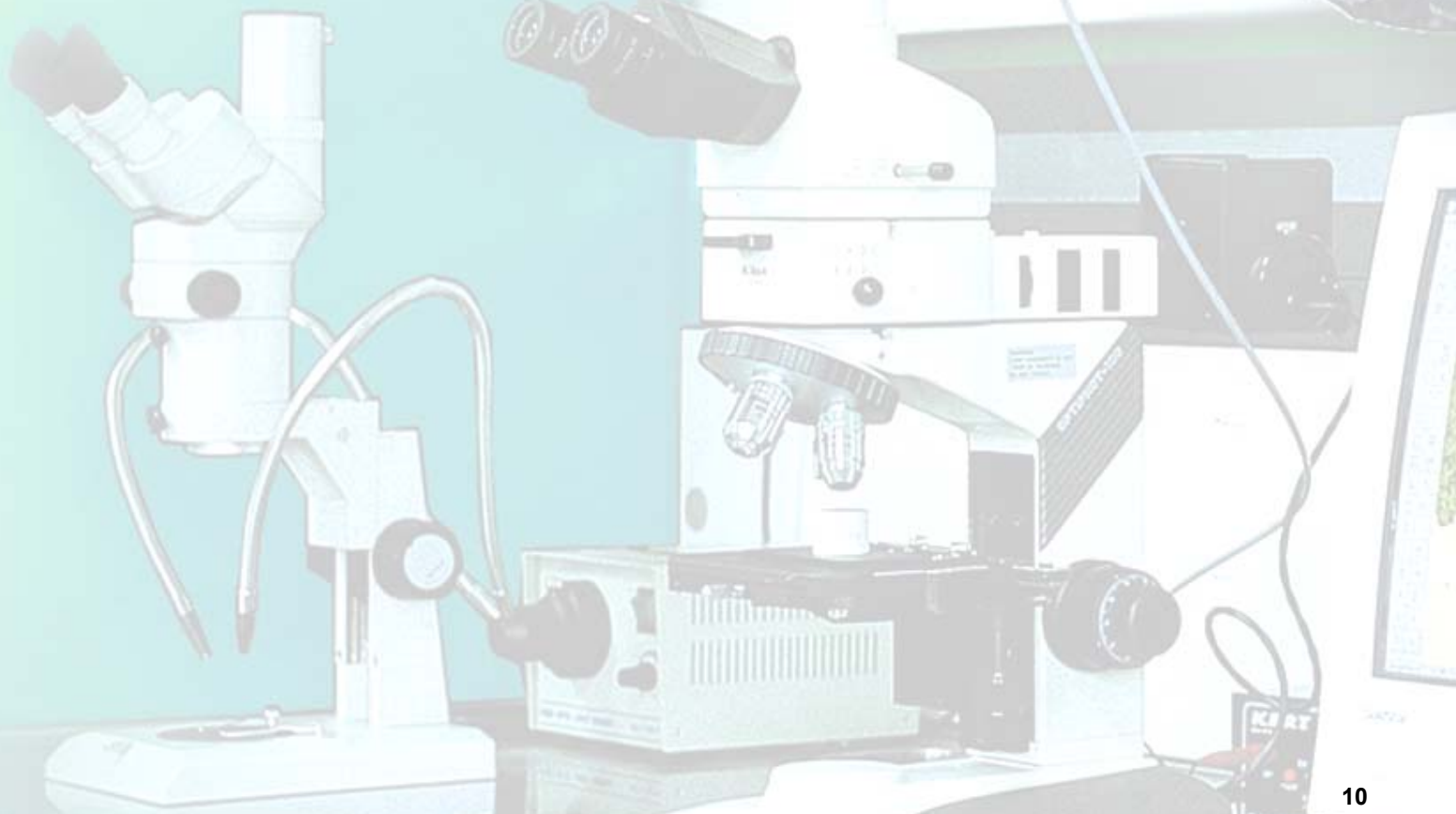
FST Nb	Sulzer Metco	Praxair	HC Starck	Page nb
M-341.33		1269F		21
M-359A.71	450NS	NI109		20
M-373.71	447NS	NI453		20
M-391.71	307NS		Amperit 205	8
M-392.71	308NS		Amperit 207	8
M-453.71	45VF/C-NS			14
M-484A.33		1256F		14
M-497.33	68F-NS	1248T		14
M-683.33	41C/1003	1236F	Amperit 377	16
M-687.93	42C			16
M-720.93	32C			22
M-721.91	36C			22
M-722.32	34F			22
M-723A.93	31C-NS			21
M-771A.33	15F, Diamalloy 2001	1275H	Amperit 335	19
M-800.31/71		MO102	Amperit 106	18
M-855.691	Amdry 1371		Amperit 119	18
M-931.33	57F-NS	CU103		15
M-952.33	51F-NS	CU104-2		15
M-958.54	58NS	CU102		15



# Thermal Spray Consumables Guide

## ABRADABLES

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
AlSi-Polyester	Si 12% Polyester 40% Al Bal  Blend	<b>M-111A.691</b>	-90+15 µm	<ul style="list-style-type: none"> <li>• Air Plasma</li> <li>• High quality abradable coating for use in the compressor section of Jet Engines</li> <li>• Used in Turbo charges and land based turbines</li> <li>• Useful up to 325°C (620°F)</li> <li>• Equivalent to: <b>Metco 601</b></li> </ul>
Nickel Graphite	C 25% Ni Bal  Clad	<b>M-391A.901</b>	-106+32 µm	<ul style="list-style-type: none"> <li>• Flame</li> <li>• High quality abradable coating</li> <li>• Useful up to 480°C (900°F)</li> <li>• Self lubricating</li> <li>• Equivalent to: <b>Metco 307NS</b></li> </ul>





## Thermal Spray Consumables Guide

# ALUMINUM BASE ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
Al	Al 99% Gas atomized	<b>M-250.71</b>	-90+45 µm	<ul style="list-style-type: none"><li>• Corrosion resistant in coastal and industrial atmospheric conditions</li><li>• Good for repair of aluminum and magnesium parts</li><li>• Good electrical and thermal conductivity</li><li>• Non-magnetic, can be used for electromagnetic shielding</li><li>• Equivalent to: <b>Metco 54NS, AL-104</b></li></ul>



## Thermal Spray Consumables Guide

# ALUMINUM OXIDE

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
Al <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub> 99,5% Fused	<b>C-505.23</b>	-45+15 µm	<ul style="list-style-type: none"> <li>• Good for abrasion, erosion and sliding wear applications</li> <li>• Good in alkali and acid environments</li> <li>• Excellent dielectric properties</li> <li>• Useful up to 1600°C (3000°F)</li> <li>• Equivalent to: <b>Metco 105NS, ALO101</b></li> </ul>
Al <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> 97/3	Al <sub>2</sub> O <sub>3</sub> 97% TiO <sub>2</sub> 3% Fused	<b>C-328.23</b>	-45+15 µm	<ul style="list-style-type: none"> <li>• Good for abrasion, erosion and sliding wear applications</li> <li>• Good in alkali and acid environments</li> <li>• Useful up to 540°C (1000°F)</li> <li>• Equivalent to: <b>Metco 101, ALO105</b></li> </ul>
Al <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> 87/13	Al <sub>2</sub> O <sub>3</sub> 87% TiO <sub>2</sub> 13% Fused	<b>C-338.23</b>	-45+15 µm	<ul style="list-style-type: none"> <li>• Good for abrasion, erosion and sliding wear applications</li> <li>• Good in alkali and acid environments</li> <li>• Useful up to 540°C (1000°F)</li> <li>• Similar to Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub>, 97/3, but softer and less resistant to chemicals</li> <li>• Equivalent to: <b>Metco 130, ALO187</b></li> </ul>
Al <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> 60/40	Al <sub>2</sub> O <sub>3</sub> 60% TiO <sub>2</sub> 40% Fused	<b>C-342.23</b>	-45+15 µm	<ul style="list-style-type: none"> <li>• Good for abrasion, erosion applications</li> <li>• Lower wear resistance; better grindability than coatings containing less titania</li> <li>• Polished coatings are used in chemical industry because of their low degree of wettability for dilute solutions of common acids</li> <li>• Useful up to 540°C (1000°F)</li> <li>• Similar to Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub>, 87/13, but softer and less resistant to chemicals</li> <li>• Equivalent to: <b>Metco 131, ALO121</b></li> </ul>



## Thermal Spray Consumables Guide

# ALUMINUM OXIDE

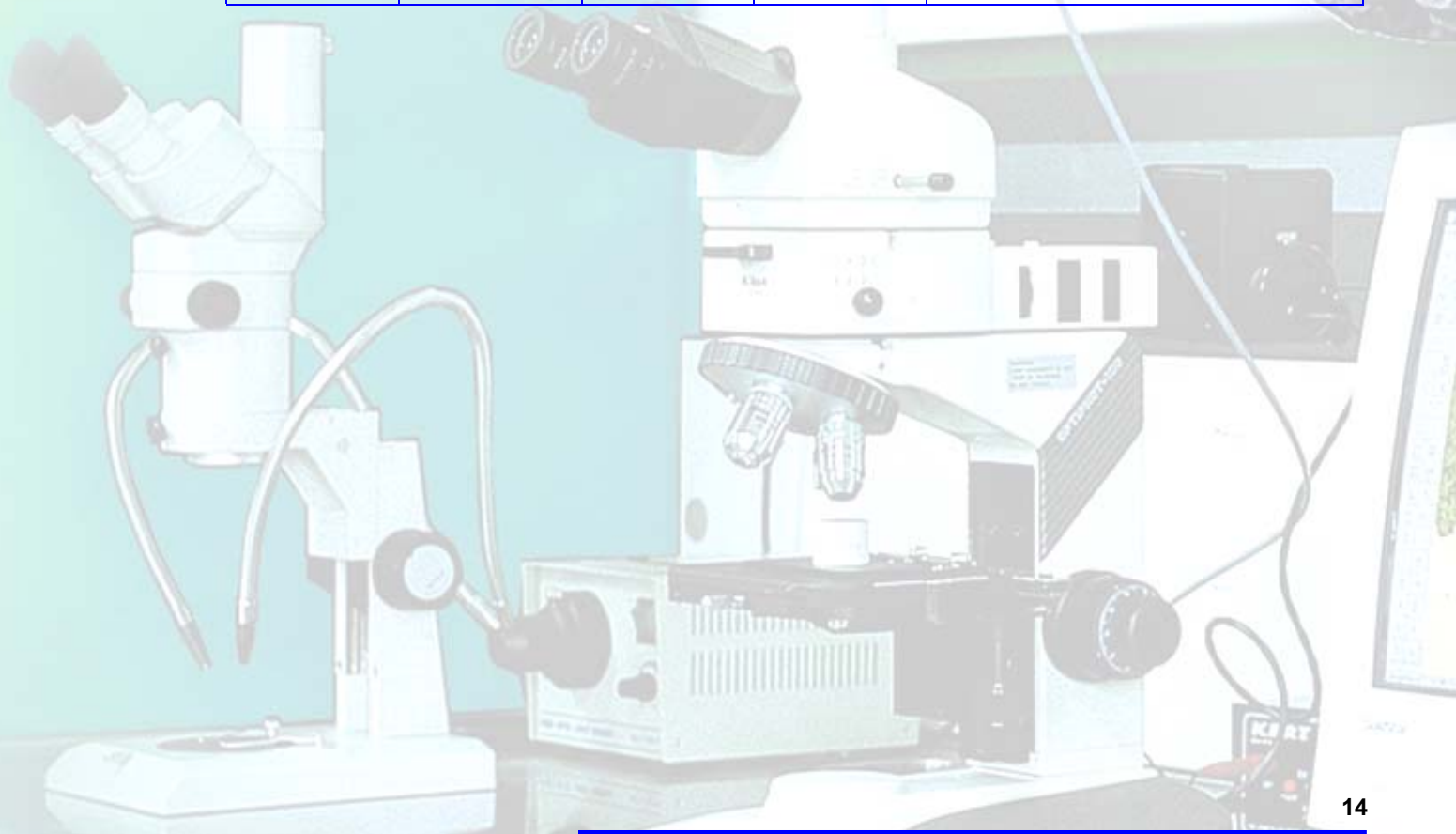
Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
Al <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> 87/13	Al <sub>2</sub> O <sub>3</sub> 87% TiO <sub>2</sub> 13%  Blended	<b>C-339.23</b>	-45+15 µm	<ul style="list-style-type: none"><li>• Good for abrasion, erosion and sliding wear applications</li><li>• Good in alkali and acid environments</li><li>• Useful up to 540°C (1000°F)</li><li>• Similar to Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub>,97/3, but softer and less resistant to chemicals</li><li>• Equivalent to: <b>Metco 130, ALO187</b></li></ul>
Al <sub>2</sub> O <sub>3</sub> -TiO <sub>2</sub> 60/40	Al <sub>2</sub> O <sub>3</sub> 60% TiO <sub>2</sub> 40%  Blended	<b>C-341.23</b>	-45+15 µm	<ul style="list-style-type: none"><li>• Good for abrasion, erosion applications</li><li>• Lower wear resistance; better grindability than coatings containing less titania</li><li>• Polished coatings are used in chemical industry because of their low degree of wettability for dilute solutions of common acids</li><li>• Useful up to 540°C (1000°F)</li><li>• Similar to Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub>,87/13, but softer and less resistant to chemicals</li><li>• Equivalent to: <b>Metco 131, ALO121</b></li></ul>



## Thermal Spray Consumables Guide

# CHROME CARBIDE

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
CrC-NiCr 75/25	C 10% Ni 20% Cr Bal.  Agglomerated & Sintered	<b>K-856.23</b>	-45+15 µm	<ul style="list-style-type: none"> <li>• HVOF</li> <li>• Useful up to 870°C (1600°F)</li> <li>• Good corrosion, abrasion, particle erosion, fretting and cavitations resistance</li> <li>• Good hot gas corrosion resistance</li> <li>• Excellent for high temperature wear applications</li> <li>• Equivalent to: <b>Amdry 5260, 1375VM</b></li> </ul>
CrC-NiCr 75/25	C 10% Ni 20% Cr Bal.  Blended	<b>K-855.21</b>	-45+5 µm	<ul style="list-style-type: none"> <li>• Air Plasma</li> <li>• Useful up to 870°C (1600°F)</li> <li>• Good corrosion, abrasion, particle erosion, fretting and cavitations resistance</li> <li>• Good hot gas corrosion resistance</li> <li>• Excellent for high temperature wear applications</li> <li>• Equivalent to: <b>81VF-NS, CRC106</b></li> </ul>





## Thermal Spray Consumables Guide

# CHROME OXIDE

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
Cr <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub> 99,5%  Fused	<b>C-604.01</b>  <b>C-606.25</b>	-25+5 µm  -45+22 µm	<ul style="list-style-type: none"><li>• Air Plasma</li><li>• Hard, dense wear resistant coating</li><li>• Insoluble in acids, alkalis and alcohol</li><li>• Useful up to 540 °C (1000°F)</li><li>• Excellent engraving properties</li><li>• Used for anilox rolls, pump seal areas, wear rings etc.</li><li>• Equivalent to: <b>CRO-167, Amdry 6420, Amperit 704</b></li></ul>
Cr <sub>2</sub> O <sub>3</sub> /SiO <sub>2</sub> /TiO <sub>2</sub>	Cr <sub>2</sub> O <sub>3</sub> Bal. SiO <sub>2</sub> 5% TiO <sub>2</sub> 3%  Blend	<b>C-650.32</b>	-53+15 µm	<ul style="list-style-type: none"><li>• Similar to C-604</li><li>• Better impact resistance than C-604</li><li>• Equivalent to: <b>Metco 136</b></li></ul>



## Thermal Spray Consumables Guide

# COBALT BASE ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
T-800	Mo 28% Cr 17% Si 3% Co Bal  Gas Atomized	<b>M-497.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• HVOF, Air Plasma</li> <li>• Excellent wear properties from room temperature up to 810°C (1500°F)</li> <li>• Good hot hardness, oxidation and corrosion properties</li> <li>• Low coefficient of friction</li> <li>• Similar to Tribaloy® 800</li> <li>• Equivalent to: <b>Metco 68F-NS, 1248T</b></li> </ul>
T-400	Mo 28% Cr 8,5% Si 2.5%  Gas Atomized	<b>M-495.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• HVOF, Air Plasma</li> <li>• Excellent wear properties from room temperature up to 810°C (1500°F)</li> <li>• Good hot hardness, oxidation and corrosion properties</li> <li>• Low coefficient of friction</li> <li>• Similar to Tribaloy® 400</li> <li>• Equivalent to: <b>Metco 66F-NS, 1247T</b></li> </ul>
Alloy 6	Cr 28% W 5% C 1.2% Si 1% Co Bal  Gas Atomized	<b>M-484.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• HVOF, Air Plasma</li> <li>• Excellent wear Properties</li> <li>• Produces hard, dense coatings</li> <li>• High temperature wear and corrosion properties</li> <li>• Equivalent to: <b>1256F</b></li> </ul>
CoCrNiWC	Cr 25.5% Ni 10.5% W 7.5% C 0,5% Co Bal  Gas Atomized	<b>M-453.71</b>	-90+45 µm	<ul style="list-style-type: none"> <li>• Resist wear by abrasive grains, hard surfaces, fretting and particle erosion in high temperature environments between 540 and 810°C</li> <li>• Equivalent to: <b>Metco 45VF/C-NS</b></li> </ul>

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## Thermal Spray Consumables Guide

# COPPER BASE ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
Cu-Ni	Cu 62% Ni 38%  Gas Atomized	<b>M-931.33</b>	-53+20 $\mu\text{m}$	<ul style="list-style-type: none"><li>• HVOF, Air Plasma</li><li>• Protect against galling and fretting</li><li>• Dense coatings</li><li>• Equivalent to: <b>Metco 57NS</b></li></ul>
Al-Bronze	Al 9.5% Fe 1% Cu Bal  Gas Atomized	<b>M-952.33</b>	-53+20 $\mu\text{m}$	<ul style="list-style-type: none"><li>• HVOF, Air Plasma</li><li>• Good bearing material</li><li>• Resistant to fretting and galling at low temperatures</li><li>• Easily machined coating</li><li>• Equivalent to: <b>Metco 51F-NS</b></li></ul>
CuNiIn	Ni 36% In 5% Cu Bal  Gas Atomized	<b>M-958.54</b>	-75+45 $\mu\text{m}$	<ul style="list-style-type: none"><li>• Air Plasma</li><li>• Dense coating with good resistance against galling and fretting</li><li>• Equivalent to: <b>Metco 58NS</b></li></ul>



## Thermal Spray Consumables Guide

# IRON BASE ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
316 Stainless	Cr 17% Ni 12% Mo 2,5% Si 1% C 0,1% Fe Bal.  Atomized	<b>M-684.33</b>	-53+20 $\mu\text{m}$	<ul style="list-style-type: none"><li>• Good corrosion properties</li><li>• Smooth and easy to machine coatings</li><li>• Good against fretting, cavitation and erosion</li><li>• Good for dimensional restoration and build-up</li><li>• Equivalent to: <b>1236F, 41C</b></li></ul>
431 Stainless	Cr 16% Ni 2% C 0,2% Fe Bal.  Atomized	<b>M-687.93</b>	-125+45 $\mu\text{m}$	<ul style="list-style-type: none"><li>• Corrosion resistant coating used mostly for repair and wear applications, requiring a hard ground finish</li><li>• The coating may contain martensitic phases</li><li>• Equivalent to: <b>42C</b></li></ul>



# Thermal Spray Consumables Guide

## MOLYBDENUM BASE ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
Mo	Mo 99%  Sintered	<b>M-800.31</b>  <b>M-800.71</b>	-53+10 µm  -90+45 µm	<ul style="list-style-type: none"> <li>• Air Plasma</li> <li>• Tough coatings with fair hardness and excellent sliding properties.</li> <li>• Fret resistant</li> <li>• Bonds well to steel</li> <li>• Used for pump parts, piston rings, synchronizing rings, press fits, valves, gears and other similar applications</li> <li>• Equivalent to: <b>MO102, Amperit 106</b></li> </ul>
Mo-25NiS/F	Mo 75% NiCrSiB 25%  Blended	<b>M-855.691</b>	-90+15 µm	<ul style="list-style-type: none"> <li>• Air Plasma</li> <li>• Useful up to 350°C</li> <li>• Low coefficient of friction</li> <li>• Wear resistant coating with excellent sliding properties</li> <li>• Bonds well to steel</li> <li>• Used for pump parts, piston rings, synchronizing rings, press fits, valves</li> <li>• Equivalent to: <b>Amdry 1371, Amperit 119</b></li> </ul>



## Thermal Spray Consumables Guide

# NICKEL BASE ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
NiCrSiB	Cr 17% Fe 4% Si 4% B 3,5% C 1% Bi Bal.  Gas Atomized	<b>M-771A.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• HVOF</li> <li>• Self Fluxing type alloy</li> <li>• Good corrosion and wear resistance</li> <li>• Serviceable up to 820°C (1500°F)</li> <li>• Coatings are dense and essentially oxide free</li> <li>• Equivalent to: <b>1275H, Diamalloy 2001</b></li> </ul>
Pure Ni	Ni 99,5%  Gas Atomized	<b>M-300A.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• Air Plasma, HVOF</li> <li>• Can be used for salvage and build-up of Nickel based alloys that have been damaged or mis-machined</li> <li>• Easily machined</li> <li>• Coatings are dense and moderate hard</li> <li>• Equivalent to: <b>Metco 56, 1166F</b></li> </ul>
NiCr 80/20	Cr 20% Ni Bal.  Atomized	<b>M-301A.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• HVOF, Air Plasma</li> <li>• Good to resist oxidation and corrosion gases up to 980°C (1800°F)</li> <li>• Good for general repair and build-up</li> <li>• Suitable as ceramic bondcoat</li> <li>• Good bonding</li> <li>• Equivalent to: <b>43F/C-NS</b></li> </ul>
NiCrAl	Cr 18% Al 6% Ni Bal.  Composite	<b>M-307A.93</b>	-125+45 µm	<ul style="list-style-type: none"> <li>• Air Plasma</li> <li>• Self bonding to most metallic surfaces</li> <li>• Good oxidation and corrosion properties</li> <li>• Good for general repair and build-up</li> <li>• Thick coatings are possible</li> <li>• Equivalent to: <b>443NS</b></li> </ul>



# Thermal Spray Consumables Guide

## NICKEL BASE ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
NiAl 95/5	Al 5% Ni 95%  Composite	<b>M-358B.71</b>	-90+45 µm	<ul style="list-style-type: none"> <li>• Air Plasma</li> <li>• Self bonding to most metallic surfaces</li> <li>• Good oxidation and abrasion resistance</li> <li>• Recommended for use as oxidation resistant bond coats which can be used up to 800°C (1470°F)</li> <li>• Good for general repair and build-up</li> <li>• Thick coatings are possible</li> <li>• Equivalent to: <b>450NS</b></li> </ul>
NiAlMo	Al 5.5% Mo 5% Ni Bal.  Composite	<b>M-373A.71</b>	90+45 µm	<ul style="list-style-type: none"> <li>• Air Plasma</li> <li>• Coatings are self bonding and very tough and capable of exhibiting good erosion and impact resistance</li> <li>• General purpose material for producing medium hard coatings for hard bearing and wear resistance applications</li> <li>• Equivalent to: <b>Metco 447NS</b></li> </ul>



## Thermal Spray Consumables Guide

# NICKEL BASE ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
Inconel 625	Cr 21,5% Mo 9,0% Nb 3,6% Ti <0,4% Al <0,4% Fe <0,5% Ni Bal  Gas atomized	<b>M-326.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• HVOF, Air plasma</li> <li>• Excellent high temperature oxidation and corrosion properties</li> <li>• Good for repair and build-up of similar chemistry super alloy components</li> <li>• Useful up to 980°C (1800°F)</li> <li>• Similar to Inconel® 625*</li> <li>• Equivalent to: <b>Diamalloy 1005, 1265F</b></li> </ul>
Inconel 718	Cr 18,5% Fe 19,0% Mo 3,0% Nb 5,0% Ti 1,0% Al 0,6% Ni Bal  Gas atomized	<b>M-328A.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• HVOF, Air plasma</li> <li>• Excellent high temperature oxidation and corrosion properties</li> <li>• Good for repair and build-up of similar chemistry super alloy components</li> <li>• Useful up to: 980°C (1800°F)</li> <li>• Equivalent to: <b>1278F, Diamalloy 1006</b></li> </ul>
Alloy C-276	Cr 15,5% Mo 15,5% W 3,5% Fe 5,5% Ni Bal  Gas atomized	<b>M-341.33</b>	-53+20 µm	<ul style="list-style-type: none"> <li>• HVOF, Air plasma</li> <li>• Excellent high temperature oxidation and corrosion properties</li> <li>• Good for repair and build-up of similar chemistry super alloy components</li> <li>• Equivalent to: <b>1269F</b></li> </ul>

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## Thermal Spray Consumables Guide

# NICKEL S/F ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
NiCrSiB (60HRC)	Cr 14,30% Fe 4,00% Si 4,25% B 3,00% C 0,70% Ni Bal.  Atomized	<b>M-771A.93</b>	-125+45 µm	<ul style="list-style-type: none"> <li>• Self Fluxing type alloy</li> <li>• Excellent corrosion and wear resistance</li> <li>• Serviceable up to 820°C (1500°F)</li> <li>• Coatings are dense and essentially oxide free</li> <li>• Equivalent to: <b>15E</b></li> </ul>
NiCrSiB (50 HRC)	Cr 12,20% Fe 3,80% Si 3,70% B 2,20% C 0,55% Ni Bal.  Atomized	<b>M-780A.93</b>	-125+45 µm	<ul style="list-style-type: none"> <li>• Self Fluxing type alloy</li> <li>• Similar to M-771A but with improved ductility</li> <li>• Good corrosion and wear resistance</li> <li>• Coatings are dense and essentially oxide free</li> <li>• Equivalent to:</li> </ul>
NiCrSiB (40 HRC)	Cr 10,00% Fe 2,50% Si 3,10% B 2,10% C 0,40% Ni Bal.  Atomized	<b>M-782A.93</b>	-125+45 µm	<ul style="list-style-type: none"> <li>• Self Fluxing type alloy</li> <li>• Similar to M-780A but with improved ductility</li> <li>• Less corrosion and wear resistance than M-780</li> <li>• Coatings are dense and essentially oxide free</li> <li>• Equivalent to:</li> </ul>
NiCrSiB (35 HRC)	Cr 7,50% Fe 2,20% Si 3,30% B 1,70% C 0,45% Ni Bal.  Atomized	<b>M-784A.93</b>	-125+45 µm	<ul style="list-style-type: none"> <li>• Self Fluxing type alloy</li> <li>• Similar to M-782A but softer</li> <li>• Coatings are dense and essentially oxide free</li> <li>• Easy to machine</li> <li>• Equivalent to:</li> </ul>
NiCrSiBCuMo (60 HRC)	Cr 16,50% Fe 3,00% Si 4,50% B 3,80% C 0,55% Cu 2,10% Mo 5,00% Ni Bal.  Atomized	<b>M-777A.91</b>	-106+45 µm	<ul style="list-style-type: none"> <li>• Self Fluxing type alloy</li> <li>• Coatings are resistant to wear by abrasive grains, hard surfaces, particle erosion, fretting and cavitation</li> <li>• Equivalent to: <b>16C</b></li> </ul>



## Thermal Spray Consumables Guide

# NICKEL S/F ALLOYS

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
WCCo + NiS/F	WC-Co 80% NiS/F 20%  Blend	<b>M-720.93</b>	-125+45 µm	<ul style="list-style-type: none"> <li>Coatings are extremely wear resistant to abrasive grains, hard surfaces, fretting and particle erosion.</li> <li>Useful up to 540°C (1000°F)</li> <li>Equivalent to: <b>32C</b></li> </ul>
WCNi-NiS/F	WC-Ni 35% NiS/F 65%  Blend	<b>M-721.91</b>	-106+45 µm	<ul style="list-style-type: none"> <li>Coatings are extremely wear resistant to abrasive grains, hard surfaces, fretting and particle erosion.</li> <li>The most wear resistant of all self fluxing coatings</li> <li>Essentially Cobalt free for stain resistance</li> <li>Equivalent to: <b>36C</b></li> </ul>
NiCrSiBW (63 HRC) <b>NEW</b>	Cr 15,00% Fe 3,50% Si 4,00% B 3,00% C 0,80% W 17,30% Ni Bal.  Atomized	<b>M-785.91</b>	-106+45 µm	<ul style="list-style-type: none"> <li>Unique alloy. Contains Chrome and Tungsten for maximum abrasion and corrosion resistance</li> <li>For high temperature, high abrasive applications (1180 C)</li> </ul>





## Thermal Spray Consumables Guide

# TITANIUM OXIDE

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
TiO <sub>2</sub>	TiO <sub>2</sub> 99% Fused	<b>C-408.23</b>	-45+15 µm	<ul style="list-style-type: none"><li>• Moderate abrasive wear resistance</li><li>• Lower hardness than Al<sub>2</sub>O<sub>3</sub>-TiO<sub>2</sub> coatings</li><li>• Decorative "black" coatings</li><li>• Slightly conductive; Static electricity does not build-up on coating surface</li><li>• Soluble in alkalis and sulfuric acid</li><li>• Equivalent to: <b>Metco 102</b></li></ul>



## Thermal Spray Consumables Guide

# TUNGSTEN CARBIDE

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
WC-Co 88/12	Co 12% C 5.1% W Bal.  Agglomerated & Sintered	<b>K-624.01</b>	-25+5 µm	<ul style="list-style-type: none"> <li>• Air Plasma, HVOF</li> <li>• Hard, dense coatings with good abrasion, erosion and sliding wear resistance.</li> <li>• Low oxidation and corrosion resistance</li> <li>• Useful up to 480°C (900°F)</li> <li>• Excellent low temperature wear properties</li> <li>• Equivalent to: <b>SM5812, 1342VM AMPERIT 518</b></li> </ul>
		<b>K-624.23</b>	-45+15 µm	
WC-Co 83/17	Co 17% C 5.1% W Bal.  Agglomerated & Sintered	<b>K-674.23</b>	-45+15 µm	<ul style="list-style-type: none"> <li>• HVOF</li> <li>• Higher Co level then K-624 results in improved toughness, impact strength and ductility</li> <li>• Useful up to 480°C (900°F)</li> <li>• Low oxidation and corrosion resistance</li> <li>• Equivalent to: <b>73F, 1343VM, AMPERIT 526</b></li> </ul>
WC-NiMoCrFeCo 85/15  <b>NEW</b>	C 5.5% Ni 10% Mo 2.75% Cr 2.75% Fe 1.1% Co 0.45% W Bal.  Agglomerated & Sintered	<b>K-661.23</b>	-45+15 µm	<ul style="list-style-type: none"> <li>• HVOF</li> <li>• Hard, dense and wear resistant coatings with excellent corrosion protection.</li> <li>• Matrix is formed by Alloy C</li> <li>• Good cavitations protection</li> <li>• Application can be found in; Off-Shore, Petrochemical industries</li> </ul>
WC-Co-Cr 86/10/4	C 5.5% Co 10% Cr 4% W Bal.  Agglomerated & Sintered	<b>K-647.23</b>	-45+15 µm	<ul style="list-style-type: none"> <li>• HVOF</li> <li>• The CoCr matrix shows higher corrosion and abrasion resistance than the Co matrix materials</li> <li>• Usable in wet corrosive environments</li> <li>• Dense, smooth coatings with fine microstructure and high bond strengths</li> <li>• Used for Hard Chrome Replacement</li> <li>• Equivalent to: <b>1350VM, SM5847 AMPERIT 558</b></li> </ul>



## Thermal Spray Consumables Guide

# TUNGSTEN CARBIDE

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
WC-Co-Cr 86/6/8	C 5.5% Co 6% Cr 8% W bal.  Agglomerated & Sintered	<b>K-651.23</b>	-45+15 µm	<ul style="list-style-type: none"><li>• HVOF</li><li>• The 6/8 CoCr matrix shows higher corrosion resistance than the CoCr 10/4 matrix materials</li><li>• Usable in wet corrosive environments</li><li>• Dense, smooth coatings with fine microstructure and high bond strengths</li><li>• Used for Hard Chrome Replacement</li></ul>
WC-Ni 88/12	C 5.4% Ni 12% W Bal.  Agglomerated & Sintered	<b>K-611.23</b>	-45+15 µm	<ul style="list-style-type: none"><li>• HVOF</li><li>• Useful up to 480°C (900°F)</li><li>• Higher corrosion resistance than WC-Co coatings</li></ul>
WC-CrC-Ni 73/20/7	C 5.5% Ni 7.25% Cr 19% W Bal.  Agglomerated & Sintered	<b>K-607.23</b>	-45+15 µm	<ul style="list-style-type: none"><li>• HVOF</li><li>• Useful up to 760°C (1400°F)</li><li>• Higher corrosion, oxidation and chemical resistance than other WC based coatings</li><li>• Smooth coating with fine micro structure</li><li>• Equivalent to: <b>1356VM</b></li></ul>



## Thermal Spray Consumables Guide

# ZIRCONIUM OXIDE

Powder Type	Composition	FST p/n	Size Range	Typical Properties and Applications
ZrO <sub>2</sub> -Y <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub> Bal Y <sub>2</sub> O <sub>3</sub> 8%  Agglomerated & Sintered	<b>C-293.691</b>	-90+16 μm	<ul style="list-style-type: none"><li>• Excellent thermal barrier properties</li><li>• Stabilizes during spray process</li><li>• Useful up to 1300°C (2450°F)</li><li>• Very good thermal shock resistance</li><li>• Equivalent to: <b>204, ZRO182</b></li></ul>
ZrO <sub>2</sub> -22MgO	ZrO <sub>2</sub> Bal MgO 22%  Fused	<b>C-234.51</b>	-75+10 μm	<ul style="list-style-type: none"><li>• Good thermal barrier properties</li><li>• Resistant to molten metals</li><li>• Good particle erosion resistance</li><li>• Useful up to 930°C (1700°F)</li><li>• Equivalent to: <b>210</b></li></ul>