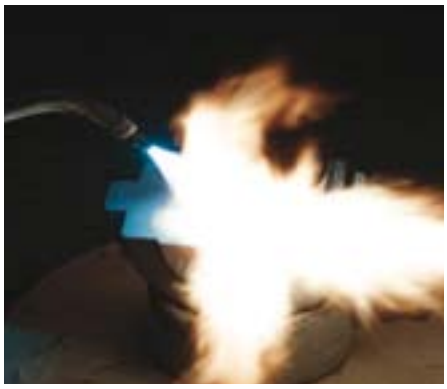
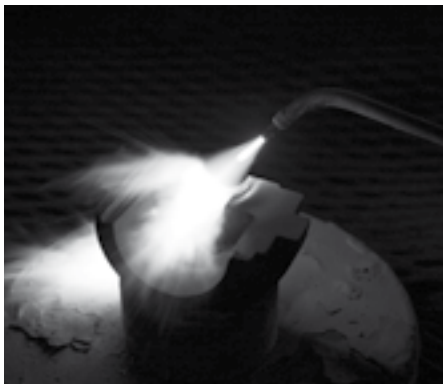
FORTE**COAT**

Thermal Surfacing Powders

Nickel and Cobalt Based Powders For

- Fusewelding
- Flame Spray
- HVOF
- Plasma Spray
- PTA Welding
- Laser Cladding

SENTESBiR

FORTE**COAT**

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About FORTECOAT Powders

Customer orientation and innovation backed by a dynamic and flexible structure has been trademarks of Sentes-Bir since its foundation. Values embracing change and continuity still shape the spirit of the company at the present.

Issues like quality, environmental commitment, comprehensive technical support, knowledge and partnership, cost-effectiveness, integration of manufacturing processes, advanced problem-solving skills and extensive research & development work render us an internationally successfull and steadily growing company. Thus we are able to meet even the most challenging industrial specifications, ensuring our reputation for excellence and trustworthiness.

ISO/TS 16949 and ISO 9001 Certified


CERTIFICATE OF APPROVAL

SENTES-BIR METALÜRJİ KİMYA ENERJİ ÜRETİM VE GERİ DÖNÜŞÜM TEKNOLOJİLERİ SANAYİ TİCARET A.Ş.
Ankara Caddesi No: 343, Kemalpaşa Organize Sanayi
Bölgesi/ 35730 İzmir
TURKEY

ISO/TS 16949:2009

Design and Manufacturing of Brazing Pastes and Hard Facing Powder Forged and Machined Steel Parts


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Ankara Caddesi No: 343 Kemalpaşa OSB 35730
İzmir / TURKEY

ISO 9001:2008

Design, Manufacturing and Sales of Brazing Alloys, Brazing Pastes and Fluxes, Hard Facing Powders and Metal Powders, Brazing Services

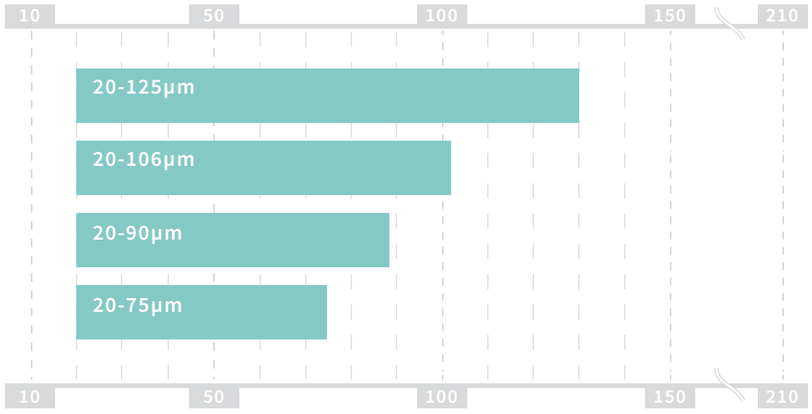
SENTESBİR

Fusewelding (Powder Welding)

Powder welding is a surface coating process, where a standart oxy-acetylene torch introduces the powder into the gas stream via an integrated hopper and sprayed onto the base material.

Metal powder particles are melted and transferred to the surface of the workpiece to build a wear and corrosion resistant layer. Thus the base material and the sprayed layer are fused into each other as in the welding process. Powder welding is ideal to obtain smooth and well-bonded layers on flat surfaces, such as cast iron, stainless steel, low and high alloy steels, cast steels and flake.

The oxidation and distortion of the workpiece is minimized due to the hardfacing at lower temperatures.



Nickel Based Fuseweld Powders

Product Code	Hardness	Ni	Cr	B	Si	C	Fe
9033	30-35 HRC	Balance	7.5	1.5	3.6	0.32	3.0
9045	36-42 HRC	Balance	10.3	2.0	3.2	0.3	2.4
9053	50-56 HRC	Balance	13.0	2.3	3.3	0.5	3.9
9056	53-59 HRC	Balance	13.5	2.8	4.5	0.55	3.5
9062	58-62 HRC	Balance	16.0	3.1	4.3	0.7	4.2

Nickel Based Fuseweld Powders for Glass Industry

Product Code	Hardness	Ni	Cr	B	Si	C	Others
9120	14-18 HRC	Balance		0.60	1.8		P1.9
9122	20-24 HRC	Balance		0.75	2.2		P1.9
9125	23-27 HRC	Balance		0.85	2.4		P1.9
9127	23-27 HRC	Balance		0.9	2.7		P1.9
9128	26-30 HRC	Balance		1.0	3.7		P1.9
9129	27-31 HRC	Balance	3.0	1.0	2.7		P1.9
9130	28-32 HRC	Balance	4.0	0.9	2.0	0.15	P2.1 Mo2.7
9131	28-32 HRC	Balance	4.5	0.8	2.0	0.15	P2.1 Mo2.7
9134	32-36 HRC	Balance	4.0	1.0	2.7	0.15	P2.2 Mo2.7
9136	32-36 HRC	Balance	3.0	1.1	2.7	0.15	P2.35 Mo2.3

Nickel Based Non-Magnetic Fuseweld Powders

Product Code	Hardness	Ni	B	Si
9222	20-24 HRC	Balance	1.4	2.5
9238	36-40 HRC	Balance	2.1	3.0
9249	47-51 HRC	Balance	3.0	3.0

WC-Ni Alloy Matrix Powder for Fusewelding

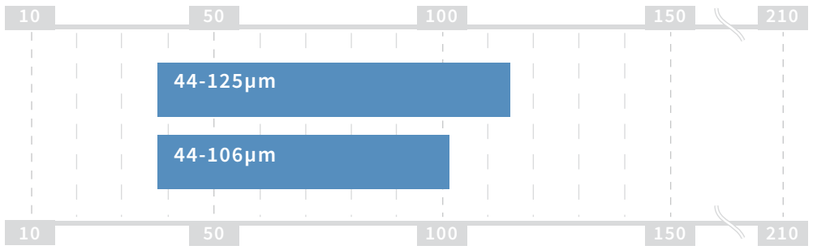
Product Code	Nickel Matrix	WC
15460	40 HRC powder 40%	WC-Cast carbide 60%
15480	40 HRC powder 20%	WC-Cast carbide 80%
15115	60 HRC powder 40%	WC-12Co 15%

* Other or customer specific blends are available.

Flame Spraying

Powder flame spraying entails a coating process, during which spray material in powder form is melted with the aid of an oxy-fuel gas flame and sprayed onto the surface of the workpiece via combustion gases. The flame temperature reaches approximately 3.100 ºC and powder particles accelerate up to 250 m/s depending on particle size, spraying distance and operational parameters of the spray gun depending on particle size, distance of spraying and various parameters of the spraying gun. There are more than 350 different types of spray powders available, where they are classified as self-fluxing and self-adhering. Thermal post-treatment is required for self fluxing powders generally, where the fusing process is carried out by oxy-acetylene torches. Heat treatment aids the adhesion of the spray coating to the base material greatly. An alternative method is powder flame spraying without secondary thermal treatment, namely the cold spraying method, where the temperature of the workpiece doesn't exceed 300 ºC. Duly the component undergoes no changes in its microstructure.

Application areas include the chemical, glass, plastic and electrical industry, machine, pump and compressor constructions, e.g. shaft sleeves, roll-table rollers, bearing seats, ventilating fans, extruder screw rotors among others.



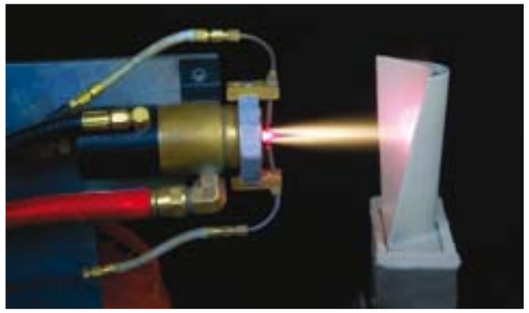
Nickel Based Flame Spray Powders

Product Code	Hardness	Ni	Cr	B	Si	C	Fe	Others
9025	20-27 HRC	Balance	3.8	1.3	3.5	0.20	2.5	
9029	33-37 HRC	Balance	6.0	1.2	4.5	0.35	2.0	
9033	30-35 HRC	Balance	7.5	1.5	3.6	0.32	3.0	
9045	36-42 HRC	Balance	10.3	2.0	3.2	0.3	2.4	
9053	50-56 HRC	Balance	13.0	2.3	3.3	0.5	3.9	
9056	53-59 HRC	Balance	13.5	2.8	4.5	0.55	3.5	
9062	58-62 HRC	Balance	16.0	3.1	4.3	0.7	4.2	

WC-Ni Alloy Matrix Powder for Flame Spray

Product Code	Nickel Matrix	WC
15235	60 HRC powder 65%	WC-8Ni 35 %
15135	60 HRC powder 65%	WC-12Co 35 %
15120	60 HRC powder 80%	WC-12Co 20%

* Other or customer specific blends are available.



HVOF

The high-velocity flame spraying (HVOF) process differs from the conventional flame spraying processes with the high flow speed of the flame rising up to 700 m/s, surpassing the speed of sound. the system consists of a spray gun, control unit, gas supply and a powder supply. The powder is introduced axially into the combustion chamber, where a gas flame is continiusly burning under high pressure. The high velocity of the gas jet is obtained as a result of the high pressure of the gas mixture and the expansion nozzle located downstream of the chamber. Thus, the powder particles inside the expansion nozzle are heated up and the powder particles are accelerated to very high speeds. As the heat is not excessive, the spray material does not undergo significant metallurgical changes. The HVOF method allows extremely thin coatings with low porosity and high bond strength.

However, rust, grease and oil must be removed from the surface of theworkpiece and should then be roughened to produce good bonding between the spayed layer and the subsrate. The spraying process has to follow the surface preparation immediately.

Propane, propylene, ethane, acetylene and hydrogen are the fuel gases, which can be used in te process. The main application area is to attain wear-,corrosion-,erosion-,heat- and abrasion-resistant layers in the chemical, petrochemical, textile, paper and automotive industry and electrically insulating coatings (oxides).

Plasma Spray

Plasma spraying is one of several arc spraying processes, where a high frequency arc is ignited between an anode and a tungsten cathode. The plasma is produced through the constriction of gases such as argon, helium, nitrogen, hydrogen or theşr mictures, which are forced under high pressure into the arc. This way, the gases dissociate and ionize, attaing high discharge velocities and thus transferring their thermal energy to the spray particles.

The plasma arc is not transferred to the workpiece, it is contained within the plasma torch between a centered electrode (cathode) and a water-cooled spray nozzle forming the anode. The process is operated in normal atmosphere, in a shielding gas stream (e.g., argon), in a vacuum, or under water. The high temperature of the plasma gas stream make it very suitable for spraying high melting-point metals as well as their oxides.

The aerospace industry, medical technology (implants) and thermal barrier coatings are among common applications.

Nickel Based HVOF & Plasma Spray Powders

Product Code	Hardness	Ni	Cr	B	Si	C	Fe	Others
9029	33-37 HRC	Balance	6.0	1.2	4.5	0.35	2.0	
9033	30-35 HRC	Balance	7.5	1.5	3.6	0.32	3.0	
9045	36-42 HRC	Balance	10.3	2.0	3.2	0.3	2.4	
9053	50-56 HRC	Balance	13.0	2.3	3.3	0.5	3.9	
9062	58-62 HRC	Balance	16.0	3.1	4.3	0.7	4.2	
9305		Balance						Al5
9625*		Balance	21.5		<0.5	<0.05	0.35	Mo9 Nb3.5 Mn0.5

* Inconel 625 [1]

Cobalt Based HVOF & Plasma Spray Powders

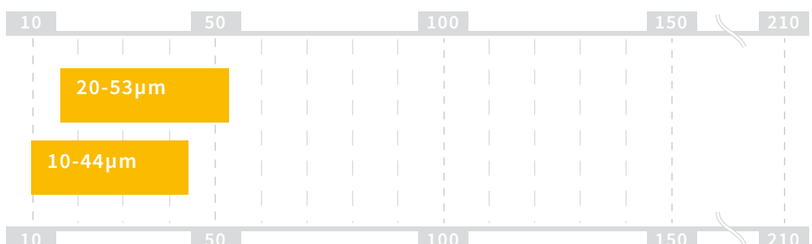
Product Code	Hardness	Co	Cr	C	W	Fe	Ni	Others
42001*	52-58 HRC	Balance	30.0	2.5	12.0	<3>	<2.0	Si, Mo, Mn
42006**	40-44 HRC	Balance	28.5	1.1	4.4	<3>	<2.0	Si, Mo, Mn
42006H	40-46 HRC	Balance	29.0	1.2	5.2	<3>	<2.0	Si, Mo, Mn
42012***	47-51 HRC	Balance	28.5	1.4	8.0	<3>	<2.0	Si, Mo, Mn
42021†	28-40 HRC	Balance	27.0	0.25		5.5	2.6	Si, Mo, Mn
42000F‡	42-46 HRC	Balance	26.0	1.75	12.0	<1.0	22.5	Si, Mo, Mn

* Stellite 1, ** Stellite 6, *** Stellite 12, † Stellite 21, ‡ Stellite F [2]

WC-Ni Alloy Matrix Powder for HVOF & Plasma Spray

Product Code	Nickel Matrix	WC
15350	40 HRC powder 50%	WC-12Co 50%

* Other or customer specific blends are available.



PTA Welding

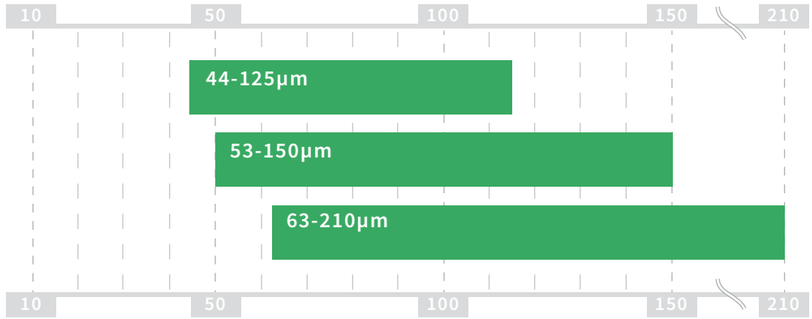
The PTA welding process involves melting of the surface or the workpiece material, where the area to be welded is continuously provided with metal powder. The surface material is supplied via a high-density arc, initiated between the tungsten electrode and the workpiece. The pilot arc ignites and stabilizes the primary arc, both having their own power sources. A plasma gas (argon, helium or mixtures of them) forms the plasma within the arc. This is located between the tungsten electrode (-) and the anode block (+) in the transferred arc. The powder supply to the torch is handled with a carrier gas provided through the outer nozzle, which completely melts on the workpiee surface, after being heated in the plasma jet.

Plasma trasferred arc welding (PTA) process has several well-known advantages such as minimal mixing of base and coating material (5-10%), precise adjustment of the penetration depth, high energy density of the plasma arc, a small heat-affected zone, a high deposition rate (up to 20 kg/h), a true metallurgical bond between the substrate and the coating and the flexible use of alloys.

The welding process can easily be automated due to the continuous addition of the powder and is thus ideal for mass production processes. Applications include coating of materials such as low-alloyed steel, stainless steel, cast iron, bronze and nickel-base super-alloys among others. Nickel-base, cobalt-base, and iron-base alloys are most common powders used as surfacing agents.

Laser Cladding

Laser cladding comprises of a laser beam, which is used to heat the workpiece by means of a powder nozzle. The powder and the base material surface are melted with the aid of the laser radiation and a clean metallic bond, a small heat affected zone and a fine grain structure is provided as a result. The resulting overlay with a significantly higher harness and finer microstructure is due to the fast cooling rate of the lasetr prosess compared to other welding methods.



Nickel Based PTA & Laser Cladding Powders

Product Code	Hardness	Ni	Cr	B	Si	C	Fe	Others
9029	33-37 HRC	Balance	6.0	1.2	4.5	0.35	2.0	
9062	58-62 HRC	Balance	16.0	3.1	4.3	0.7	4.2	
9056	53-59 HRC	Balance	13.5	2.8	4.5	0.55	3.5	
9053	50-56 HRC	Balance	13.0	2.3	3.3	0.50	3.9	
9033	30-35 HRC	Balance	7.5	1.5	3.6	0.32	3.0	
9045	36-42 HRC	Balance	10.3	2.0	3.2	0.30	2.4	
9238	36-40 HRC	Balance		2.1	3.0			
9249	47-51 HRC	Balance		3.0	3.0			
9625*		Balance	21.5		<0.5	<0.05	0.35	Mo9 Nb3.5 Mn0.5

* Inconel 625 [1]

Cobalt Based PTA & Laser Cladding Powders

Product Code	Hardness	Co	Cr	C	W	Fe	Ni	Others
42001*	52-58 HRC	Balance	30.0	2.5	12.0	<3>	<2.0	Si, Mo, Mn
42006**	40-44 HRC	Balance	28.5	1.1	4.4	<3>	<2.0	Si, Mo, Mn
42006H	40-46 HRC	Balance	29.0	1.2	5.2	<3>	<2.0	Si, Mo, Mn
42012***	47-51 HRC	Balance	28.5	1.4	8.0	<3>	<2.0	Si, Mo, Mn
42021†	28-40 HRC	Balance	27.0	0.25		5.5	2.6	Si, Mo, Mn
42000F‡	42-46 HRC	Balance	26.0	1.75	12.0	<3>	22.5	Si, Mo, Mn

* Stellite 1, ** Stellite 6, *** Stellite 12, † Stellite 21, ‡ Stellite F [2]

Iron Based PTA & Laser Cladding Powders

Product Code	Hardness	Fe	Cr	C	Si	Ni	Mn	Mo
304L*	<200 HV	Balance	18.0	<0.04	0.5	11.0	1.3	
316L*	<200 HV	Balance	17.0	0.02	0.8	13.0	1.5	2.2
410*		Balance	12.5	0.12	0.3			
420*		Balance	13.0	0.20	0.5		0.5	

* AISI standards [3]

• Hardness values are according to heat treatment.
•• Other alloy compositions are available.

Nickel Based PTA Powders for Glass Industry

Product Code	Hardness	Ni	Cr	B	Si	C	Fe	Others
9029	33-37 HRC	Balance	6.0	1.2	4.5	0.35	2.0	
9333	30-35 HRC	Balance	5.6	1.2	3.0	0.25	2.5	Al1.2
9325	20-25 HRC	Balance	3.3	1.1	3.1	0.15	2.5	Al0.5
9134	32-36 HRC	Balance	4.0	1.0	2.7	0.15		P2.2 Mo2.7

PTA Powder Engine Valves

Product Code	Hardness	Fe	Cr	C	Si	Ni	Mn	Mo
62006*	37-41 HRC	Balance	28	1.8	1.3	11	<1.0	4.5
Ni60	>20 HRC	17	17	0.6	3.5	Balance		

* Eatonite 6 [4]

WC-Ni Alloy Matrix Powders for PTA & Laser Cladding

Product Code	Nickel Matrix	WC
15550	55 HRC powder 50%	WC-Cast carbide 50%
15560	55 HRC powder 40%	WC-Cast carbide 60%
15660	60 HRC powder 40%	WC-Cast carbide 60%
15750	55 HRC powder 50%	WC-spherical 50%

* Other or customer specific blends are available.



Applications

Petrochemical, Oil & Gas

In chemical and petrochemical industry main wear causes are corrosion and eroison. ForeCoat thermal spray powders provide superior resistance to corrosive and abrasive wear problems. Application example are:

- Valves and valve seats
- Rods
- Plungers
- Pump shafts
- Couplings
- Compressor parts
- Decanter screws
- Wash pipes
- Valve fittings

Steel Industry

ForteCoat hardfacing materials are provided abrasion and corrosion resistant parts to steel and steel coatings industry. Application examples are:

- Furnace roll surfaces
- Tensioner roll surfaces
- Correcting roll surfaces
- Annealing roll surfaces
- Rod mill guide rollers
- Descaling roll surfaces
- Run-out table rollers
- Downcoiler top pinch rolls
- Ingot tong bits
- Slag stopper
- Coke slipper
- Pot roll surfaces
- Stab roll surfaces
- Tensioner roll surfaces
- Correcting roll surfaces
- Annealing roll surfaces
- Pickling bath roll surfaces

Agriculture & Mining

- Comveyor parts
- Grates
- Cutting blades
- Clinker grinders
- Shovel bucket teeths

Automotive

ForteCoat provides wear solutions for a number of other, broader transportation-related applications.

- Engine valve
- Valve seat



Applications

Glass Container

SentesBIR provides high performance products for the glass industry. We continue to innovate products which help glass manufacturers achieve performance leves by extending the life of critical parts and performance, and by reducing contaimination.

Manufacturers of glass components require elevated temperatures to “work” the glass. The heat and the abrasive nature of molten glass cause wear on many components. ForteCoat products are used on mould edges to prevent such wear and therefore maximize production efficiencies. Application example are:

- Plungers
- Narrow neck plungers
- Funnel
- Mould neck
- Mould base
- Mould
- Bottom mould
- Bottom plate
- Ring
- Sealer
- Baffle
- Blow head
- Guide ring
- Neckring
- Holders, support
- Repair of mould

Plastic & Rubber

Plastic and rubber production parts are subjected to a combination of corrosion and abrasive wear that cah quickly eat away ordinary materials. ForteCoat nickel and cobalt alloys help to reduce metal to metal wear and improve performance, tight running clearances and corrosive environments. Application examples are:

- Extrusion screws
- Mixers
- Barrels
- Pelletizers
- Granulators

Pulp & Paper

- Wire guides
- Knife clamps
- Anvils
- Knives

Footnote

1. *INCONEL® is a trademark of Inco Corp., USA*
2. *STELLITE® is a trademark Kennemetal Inc., USA*
3. *AISI standards.*
4. *EATONITE® is a trademark of Eaton Corp., USA*

FORTECOAT

Thermal Surfacing Powders

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