

Thermal Spraying Powders and Arc Spraying Cored Wires





voestalpine Böhler Welding

Metallurgical Expertise for Best Welding Results

voestalpine Böhler Welding (formerly Böhler Welding Group) is a leading manufacturer and worldwide supplier of filler materials for industrial welding and brazing applications.

As a part of the voestalpine Group, Austria's largest steel manufacturer and one of the world's leading suppliers of specialized steel products, we are a part of a global network of metallurgy experts.

Our customers benefit from:

- Comprehensive welding and steel know-how under one roof
- Coordinated complete solutions comprised of steel and welding filler metals
- A partner offering maximum economic stability and technological expertise

Customer First

Absolute customer focus is our guiding principle. We see ourselves as a provider of solutions to challenging welding projects. We ensure that our customers get the right filler metals, use them correctly, and that all welding process parameters are adjusted for the best possible performance. We consider it as our responsibility to guarantee that we deliver to our customers, now and in the future, the best possible solutions. We also strive to develop new products, optimize existing products, and streamline processes so as to achieve very short turnaround times. We focus on technologically advanced industrial sectors and provide products that are geared to their specific requirements.

Three Competences – Three Brands

In our efforts to afford our customers the best possible support and promote development in line with specific targets, we have built our core competences within Joint Welding, Repair & Maintenance Welding and Soldering & Brazing.

This way we offer our customers the largest and most comprehensive product portfolio of filler materials within our three brands:

- Böhler Welding
- UTP Maintenance
- Fontargen Brazing



Tailor-made Protectivity™

UTP Maintenance – provides lasting “protection” and “productivity” of the plant. “Protectivity” is the result of supporting our customers with maximum performance. Decades of industry experience and application know-how in the areas of repair as well as wear and surface protection, combined with innovative and tailored products, guarantee the customers increased productivity and in addition protection and the highest performance of their components under the UTP Maintenance brand.

Solutions for demanding industries

Products of UTP Maintenance are focused on industries with high technical requirements and specialized applications.

Metallurgical know-how for research & development

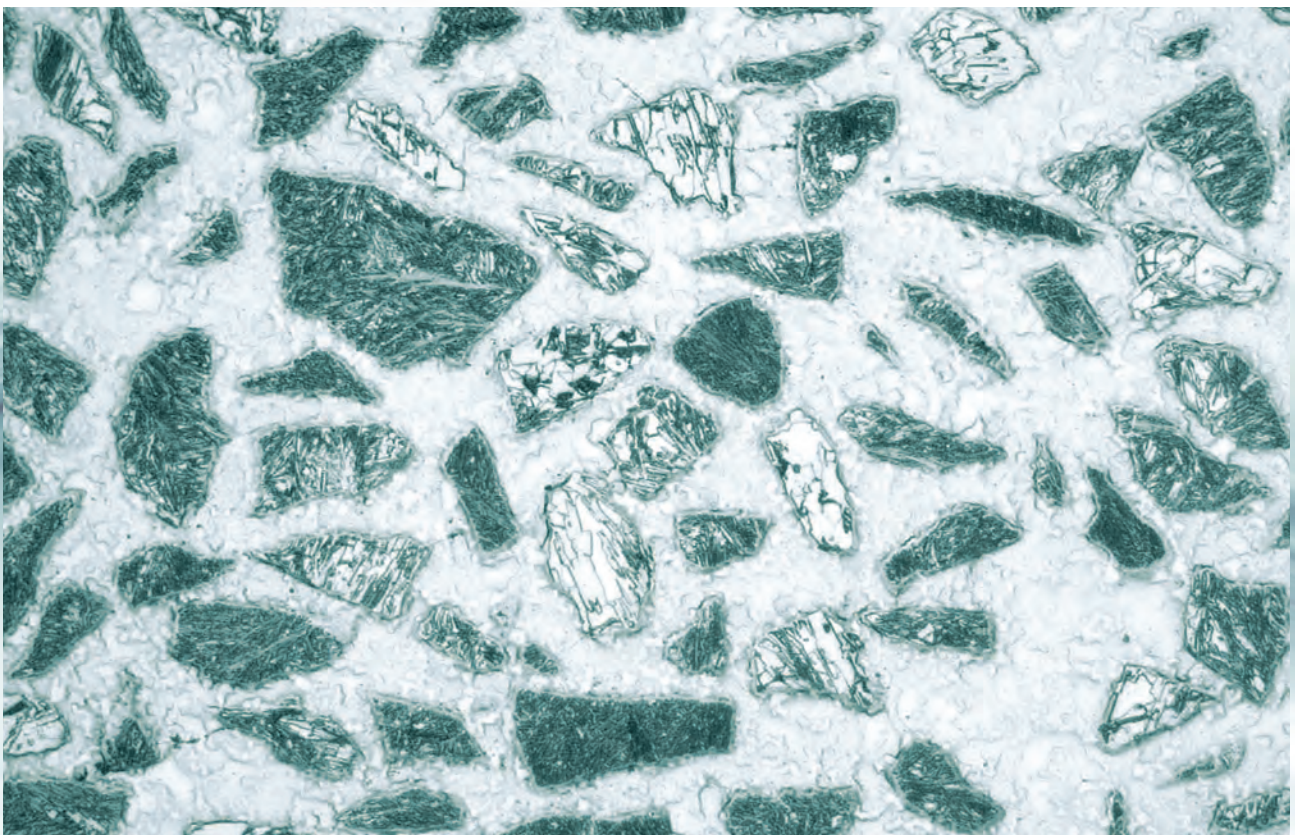
International customers and distributors are supported by experienced welding engineers by voestalpine Böhler Welding. In addition our ambition to be best in class motivates constant evolution through our total dedication to research and development and guarantees our customers are using the most technically advanced welding products available today. The product portfolio of UTP Maintenance comprises of innovative and tailored welding consumables from own production facilities as follows:

- Stick electrodes
- Solid wires and rods
- Flux cored wires
- Submerged arc wires and flux
- Welding strips and powders
- Spraying- and PTA powder

Our product range is comprehensive and covers the following steel alloys: Unalloyed and fine-grained steels, Low-alloy steels, Stainless and heat-resistant steels, Nickel-base alloys, Cast-iron, Copper and Copper-base alloys, Manganese steels, Tool steels and Cobalt steels.

Powder flame spraying

Flame spraying is one of a number of thermal coating processes. In powder flame spraying, the spray material, in powder form, is melted with an oxy-fuel gas flame, accelerated towards a component by the combustion gases and sprayed on to the surface of the component.



Sprayed on and melted down – micrograph of UTP SIMmelt™ NiBasW35

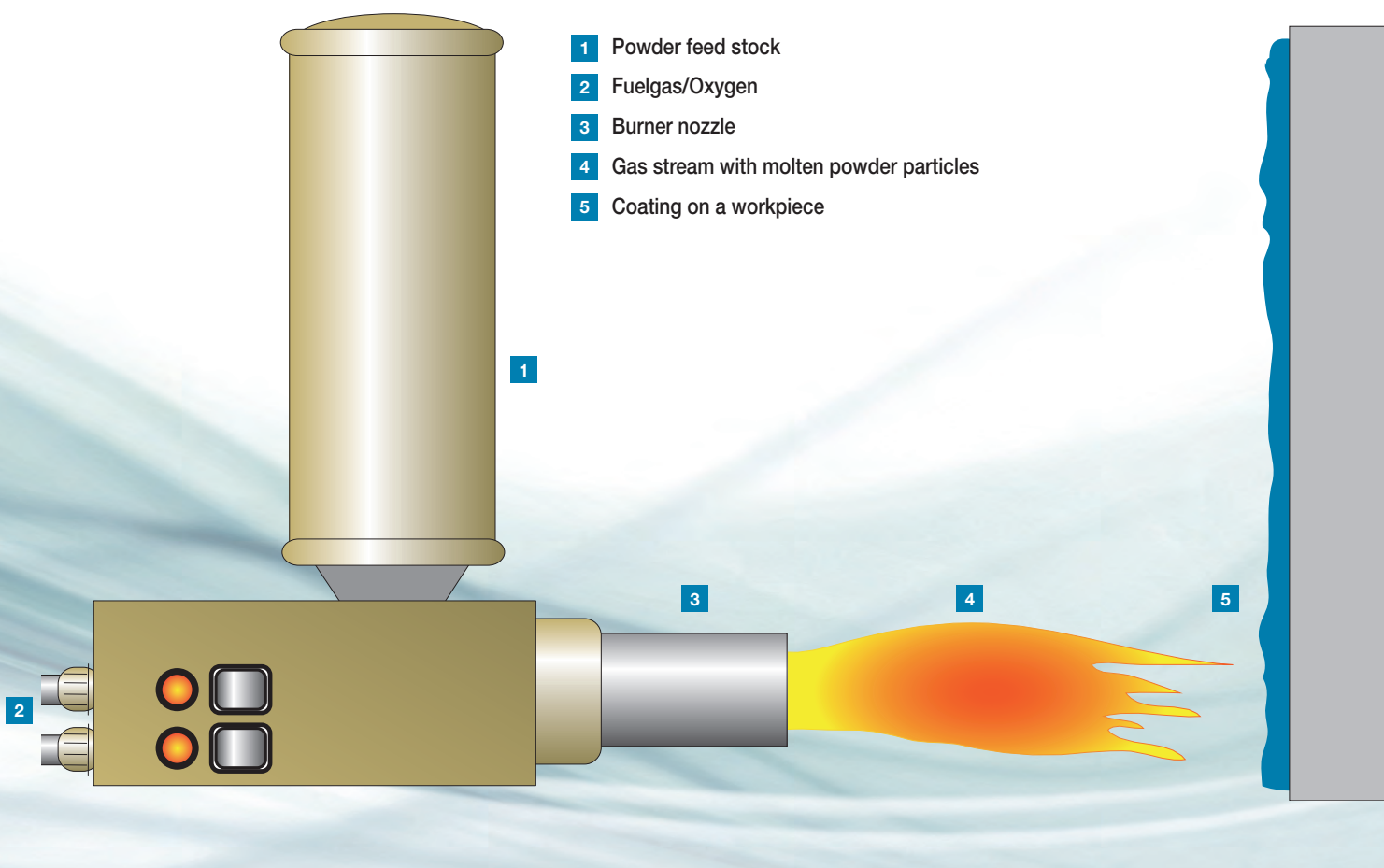
Metallic, oxide ceramic, carbide and plastic powders can be processed using spray guns specifically designed for those materials. Spray guns that frequently take the form of manual torches, preferably using acetylene as a fuel gas because of its high flame temperature, are chosen for metallic alloys based on nickel, iron or cobalt. The powder particles, which are partially melted by the flame, deform on impact with the surface of the component and are deposited there to form a spray coating with a lamellar structure. The main areas of application for thermal coatings are corrosion protection and wear protection.

Power flame spraying may be subdivided into cold and hot processes. In cold processes, the powders are only applied by the spray gun, and the spray coating is not subjected to any subsequent thermal treatment.

UTP Maintenance has, accordingly, designated these powders as COLDmelt™; these coatings typically have a porosity of between about 5 and 15%, depending on the process used. In hot processes, metal powders of materials known as self-fluxing alloys, based on Ni-B-Si, are employed.

The layer that has been sprayed on is melted down by an additional subsequent thermal treatment; this thermal compaction makes it possible to obtain coatings that are virtually free of pores.

Depending on the application, two processes have emerged for this: simultaneous and subsequent melting.



UTP Maintenance has designated these powders according to the process used:



Rotationally symmetrical parts are frequently coated using a two-stage process (subsequent melting), while a single-stage process (simultaneous melting) is often used for surfaces and edges.

SIMmelt™

Powders for simultaneous meltdown

Powder description

- Powders for flame spraying with simultaneous melting
- Self-fluxing alloys
- Powder types based on NiBSi C+Cr+Co+Cu + tungsten carbides

Powder characterization

- Alloyed metal powder (some with hard additives)
- Round grains (matrix)
- Smooth surface
- Gas atomized (except hard material additives)
- Typical grain size: -106 +20 micron, adjusted to the torch
- Spraying layer hardness ~ 150 HV up to > 60 HRC



Spray and fuse process from cast repair with UTP SIMmelt™ NiBas25

Description	Grain Size	Chemical Composition	Hardness	Properties and applications
SIMmelt™ NiBas22	-106 +20 µm	NiCuBSi	170-240 HV	Surfacing of grey cast iron, resistance to changes temperature and excellent sea-water resistance
SIMmelt™ NiBas25	-106 +20 µm	NiBSi	205-260 HV	Repair surfacing, high impact resistance, press moulds, bearings, pump vanes
SIMmelt™ NiBas25F	-53 + 20 µm	NiBSi	190-260 HV	Good wettability and smooth surfaces; surfacing on cast parts, moulds in the glass industry
SIMmelt™ NiBas30	-106 + 20 µm	NiBSi	260-310 HV	Anti-oxidation protection and bond coat in case of hard finishing passes, easy to machine cut; valve cones, gearwheels, bearings, moulds in the glass industry
SIMmelt™ NiBas40	-106 + 20 µm	NiCrBSiFe	40 HRC	Good resistance to corrosion and wear even at high operating temperatures; drawing dies, forging dies, tools in the plastics industry, ejector pins
SIMmelt™ NiBas50	-106 + 20 µm	NiCrBSiFe	50 HRC	Good resistance to corrosion and wear even at high operating temperatures; hard surfacing for valves, valve seats, impellers, guide rollers, pressure rollers
SIMmelt™ NiBas60	-106 + 20 µm	NiCrBSiFe	60 HRC	Good resistance to corrosion and wear even at high operating temperatures; pump rings, friction bearing surfaces, knife edges, press moulds, camshafts
SIMmelt™ Cobalt45	-106 + 20 µm	CoCrNiWFeSiB	400-460 HV	Resistant to changes in temperature, impact and corrosion; valve seats, knife edges, shears and scissor blades, friction bearings, hot punching tools
SIMmelt™ NiBasW35	-106 + 20 µm	NiCrBSiFe+WSC	Matrix 60 HRC	High level of protection against abrasive wear; slicing machine blades, conveyor chains, kneader parts
SIMmelt™ NiBasW55	-106 + 20 µm	NiCrCoBSiFe+WSC	Matrix 60 HRC	Highest abrasion resistance; mixer-settler parts and kneaders in the ceramics industry, die drawing tools, chopping blades, scrapers
SIMmelt™ NiBasW60	-106 + 20 µm	NiCrBSiFe+WSC	Matrix 60 HRC	Highest abrasion resistance; well suitable for automated spraying processes; separator screws, mixing shovels

SUBmelt™

Powders for subsequent melting

Powder description

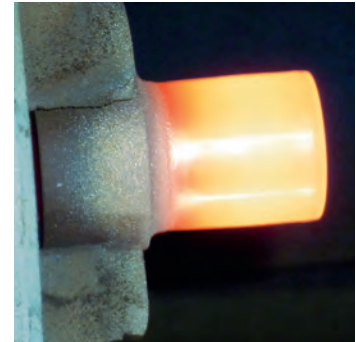
- Powders for flame spraying and subsequent melting
- Self fluxing alloys
- Powders types based NiBSi (+Cr +Co + tungsten carbide)

Powder characterization

- Alloyed metal powders (some with hard additives)
- Round grains (matrix)
- Smooth surface
- Gas atomized (except hard material additives)
- Typical grain size: -125 +45 microns
- Spray coating hardness ~200 HV to >60 HRC



Melting pattern with UTP SUBmelt™ NiBas60



Melting pattern with UTP SUBmelt™ NiBas40

Description	Grain Size	Chemical Composition	Hardness	Properties and applications
SUBmelt™ NiBas40	-125 + 36 µm	NiCrBSiFe	40 HRC	Good resistance to corrosion and wear even at high operating temperatures; valve discs, conveyour chains, mixer parts, friction bearings, moulds in the glass industry, feed screws
SUBmelt™ NiBas50	-125 + 45 µm	NiCrBSiFe	50 HRC	Good resistance to corrosion and wear even at high operating temperatures; gauges, cogs, bearing surfaces, cylinders, guide mechanisms, mixer blades, continuously cast rollers, valve discs, glass industry
SUBmelt™ NiBas56	-125 + 45 µm	NiCrBSiFeCuMo	56 HRC	Toughened coatings; valve stems, mixer and stirrer shafts, bearing seats, wearing rings, pump shafts, impellers
SUBmelt™ NiBas60	-125 + 45 µm	NiCrBSiFe	60 HRC	Excellent resistance to wear and corrosion, high level of hardness with moderate dynamic compression stress; feed screws, running and sealing surfaces in valves, fittings and bearing seats
SUBmelt™ NiBasW35	-125 + 45 µm	NiCrBSiFe+WSC	Matrix 60 HRC	High abrasion resistance; stirrers, mixer blades, mould edges, extruder screws
SUBmelt™ NiBasW50	-125 + 45 µm	NiCrBSiFe+WSC	Matrix 60 HRC	Highest abrasion resistance; stirrer, mixing shovels, screw shafts
SUBmelt™ NiBasW60	-125 + 45 µm	NiCrBSiFe+WSC	Matrix 60 HRC	Highest abrasion resistance; stirrer, mixing shovels, screw shafts, for automatic spray processes

COLDmelt™

Powders without melting (cold process)



Cold Spray process with UTP COLDmelt™ stainless 18



Powder description

- Powder for thermal spraying without melting (cold process)
- Metal alloys, hard alloys, hard material additives, usually with bond layer

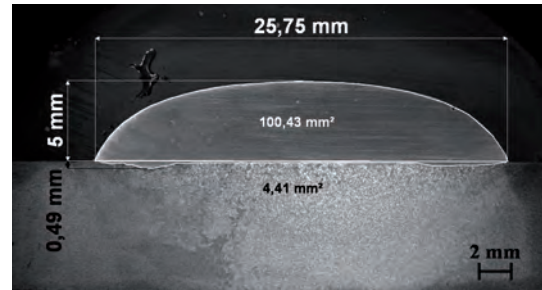
Powder characterization

- Metal or Metal alloyed (some with hard additives)
- Round grains (gas atomized)
- Smooth surface
- Spattered grain, uniform grain structure, water atomized (except for hard material additives)
- Typical grain size: -125 +36 microns
- Spray coating hardness ~23 JHB to >60 HRC

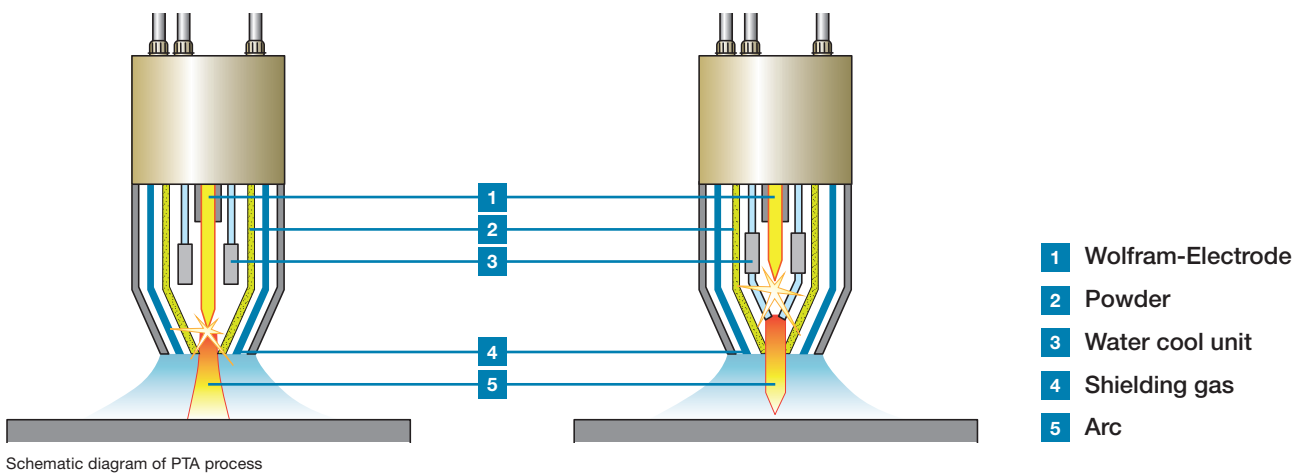
Description	Grain Size	Chemical Composition	Hardness	Properties and applications
COLDmelt™ Base 17	-106 + 36 µm	NiAl	150-190 HV	Bond coat, base powder for initial layer under further coats of wear resistant CrNi- and Cu-alloys
COLDmelt™ Base 20	-106 + 45 µm	NiAlMo	170-240 HV	Bond coat, base powder on iron-, copper- and aluminium materials, also "one-step-powder", possible to apply thick layers, good sliding behavior
COLDmelt™ Zn	-125 µm	Zn	23 HB	Active corrosion protection on steel under atmospheric stresses
COLDmelt™ Ni37	-106 + 36 µm	NiCrBSiFeAl	350-380 HV	Oxidation stability at moderate temperatures, high wear resistance; camshafts, bearings of rollings, cylinder liners, valve stems, hydraulic pistons, sliding ways etc
COLDmelt™ CuAl	-120 + 36 µm	CuAl	130 HV	Good sliding and emergency running properties; rollers, bearing journals, slideways
COLDmelt™ NiW15	-125 + 20 µm	NiCrBSiFeAl+WSC	Matrix 400 HV	Abrasion resistance for micro-particle surfacings, good oxidation stability; ventilator blades
COLDmelt™ Stainless 18	-106 + 36 µm	FeCrNiMo	180 HV	Corrosion resistant coatings; pump sleeves, shafts and parts requiring the characteristics of stainless steel in the chemical and petrochemical industry. Special applications where coats like 18/8, AWS 316 L, 1.4436 are necessary
COLDmelt™ Fe31	-125 + 45 µm	FeCrNi	260-350 HV	Chromium steel alloy with high oxidation stability, good machinability; coating on bearing journals, shafts, piston rods
COLDmelt™ OneStep 16	-106 + 45 µm	NiCrAlMoFe	170 HV	"One-step powder", also bond coat, repair and prophylactic protective coating, resistant to high temperatures; flue boilers, finned tube walls

Plasma powder surfacing (PPS/PTA)

Plasma powder surfacing (PPS), also known as the plasma transferred arc (PTA) process, is a thermal coating process. In contrast to the spraying processes, this method is a welding process and so involves metallurgical bonding of the applied material to the base material.



Cross section of PTA surfacing with PLASweld™ Ledurit 60



However, if the parameters are set optimally, the degree to which it blends with the base material can be reduced to a minimum. The PTA process is employed primarily for surfacing of wear resistant and corrosion resistant coatings on to a base material. The process is characterized by the use of two separately controllable electric arcs. One of these is the (non-transferred) pilot arc; this arc is formed between the non-melting (tungsten) electrode and the plasma nozzle. It accelerates the plasma gas and enables ignition of the (transferred) main arc. This arc burns with a high energy density between the electrode and the workpiece. With the aid of the electric arc, both the base material and the metal powder that serves as the welding consumable are fused together, which then gives rise to the deposited protective coating. Ar, H₂, He, or mixtures of gas are employed as a processing gas. This serves, firstly, as a plasma gas and, secondly, as a shielding gas and as a carrier gas for the powder. Because of its high degree of automation, the PTA process is clearly most suitable for series parts and offers advantages here with regard to:

- High reproducibility
- Low degree of dilution with base material
- Small concentrated heat-affected zone
- High surfacing rates possible
- Alloy multiplicity in powder form
- Material combinations with hard substances

UTP Maintenance offers these PTA powders as nickel-based, cobalt-based and iron-based alloys. The powders are designated PLASweld™ in keeping with the process for which they are intended. The grain sizes should be chosen according to the type of system; powder grain sizes between 150 and 210 µm are selected for the standard range of PTA.

Another method of using metal powder as a welding consumable is provided by laser powder surfacing. Here, a laser serves as the source of heat for partially melting the surface of the workpiece and fusing the welding consumable in powder form. The high-energy focus of the laser allows precisely targeted surfacing, which makes it possible to provide wear protection at specific places without negatively affecting (e.g. through a high heat input) the properties of the rest of the component. Because the coating thicknesses are usually small and the processing times short for laser powder surfacing, PLASweld™ powder of a finer grain size, typically 45-106 µm, can be used here.

PLASweld™

Powders for hard facing

Powder description

- Alloyed metal powder (some with hard additives)
- Round grain, smooth surface, gas atomized (except hard material additives)
- Typical particle size: -150 +50 microns or -200 +63 microns
- Surface hardening of about 180 HV (buffer layers) up to 60 HRC

	Description	Grain Size	Chemical Composition	Hardness	Properties and applications
Cobalt-Base	PLASweld™ Celsit 706	-150 + 50 µm*	CoCrWC	41 HRC	Qualities to protect against adhesive and abrasive wear, high-temperature resistant; hardsurfacing of running and sealing surfaces in valves carrying gas, water and acid, hot-working tools subject to high stresses, valve seats, valve collets for combustion engines, grinding, mixing, carrying and drilling tools, dies and press moulds
	PLASweld™ Celsit 706HC	-150 + 50 µm*	CoCrWC	43 HRC	
	PLASweld™ Celsit 708	-150 + 50 µm*	CoCrNiWC	45 HRC	
	PLASweld™ Celsit 712	-150 + 50 µm*	CoCrWC	48 HRC	
	PLASweld™ Celsit 712HC	-150 + 50 µm*	CoCrWC	49 HRC	
	PLASweld™ Celsit 721	-150 + 50 µm*	CoCrMoNiC	32 HRC	High corrosion resistance and resistance to adhesive (metal-to-metal) wear, buffer material for hard stellite qualities; medical engineering
Ferrum-Base	PLASweld™ Ledurit 60	-150 + 50 µm*	FeCrC	57 HRC	Highly wear-resistant, preferred for protection against mineral wear with low impact; feed screws, excavator teeth
	PLASweld™ Ledurit 68	-150 + 50 µm*	FeCrCBV	62 HRC	Hardfacing on parts with extremely high rubbing wear; grinding rolls, screw conveyor, excavator parts
	PLASweld™ Ferro55	-150 + 50 µm*	FeCrMo	55 HRC	Ferrous based alloy combining high strength, toughness and temperature resistance up to 550°C. Applicable on hot and cold work steels. Cutting tools, forging tools, roller, mandrel. Powder also available for laser welding with finer grain size (e.g. 45-106 µm)
	PLASweld™ Ferro45	-150 + 50 µm*	FeCrMo	45 HRC	
	PLASweld™ Ferro39	-150 + 50 µm*	FeCrMo	39 HRC	
	PLASweld™ FerroV10	-150 + 50 µm*	FeCrV	60 HRC	Ferrous based powder with vanadium carbides, well balanced combination of abrasion resistance and toughness; industry knives, tools
	PLASweld™ FerroV12	-150 + 50 µm*	FeCrV	61 HRC	Ferrous alloy with finely distributed Vanadium carbides in a martensitic matrix. High resistance against abrasion. Hardfacing on highly loaded edges
	PLASweld™ FerroV15	-150 + 50 µm*	FeCrV	61 HRC	Martensitic alloy with high Vanadium and Chromium content against a combination of wear and corrosion. Cutting tools, scraper
Nickel-Base	PLASweld™ NiBasW60	-150 + 50 µm*	NiBSi+WSC	Matrix 60 HRC	Specially developed nickel base matrix for highest abrasion stresses, rolling and mineralic wear, sliding abrasion, impact demand applications. For excavator parts, drilling tools, screws in the plastic industry and mining
	PLASweld™ NiBas 776	-150 + 50 µm*	NiCrMoW	170 HV	Corrosion and high-temperature resistant coatings, forging hammers, saddles, continuous cast rollers/ buffer layer, mixer blades
	PLASweld™ NiBas 068HH	-150 + 50 µm*	NiCrFeNb	170 HV	Buffer layer preferred for stellite qualities, corrosion-resistant; pressure vessel construction, petrochemical industry, power plants
	PLASweld™ NiBas 6222Mo	-150 + 50 µm*	NiCrMoNb	200 HV	Nickel base powder for cladding, similar corrosion and temperature resistant alloys and for surfacing on mild steels. Chemical and petrochemical industries and for repair purposes (valve cladding in ship engines)

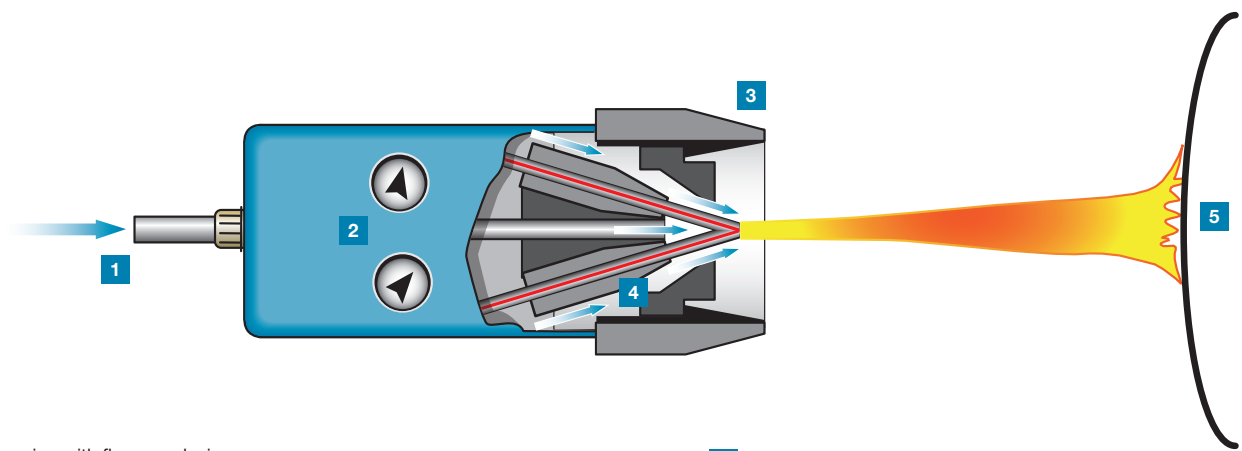
* Also available in grain size -200 +63 µm or according to customers requirements

Cored wires

Arc spraying with flux-cored wires process

Arc Spraying is the highest productivity thermal spraying process. A DC electric arc is struck between two continuous consumable wire electrodes that form the spray material.

Compressed gas (usually air) atomizes the molten spray material into fine droplets and propels them towards the substrate. The process is simple to operate and can be used either manually or in an automated manner.



Arc spraying with flux-cored wires process

- 1** Primary atomizing air
- 2** Constant wire feeding
- 3** Torch
- 4** Electrically conductive wire
- 5** Work-piece

Product name	Alloy Type	Low stress abrasion	High stress abrasion	Corrosion	Heat
SK 235-M	High alloyed steels		•	•	
SK 255-M	High alloyed steels		•		
SK 420-M	High alloyed steels			•	
SK 848-M	High alloyed steels			•	•
SK 825-M	Nickel alloys			•	•
SK 830-MF	Nickel alloys	•		•	•
SK 840-MF	Nickel alloys			•	
SK 850-MF	Nickel alloys			•	•
SK 858-M	Nickel alloys			•	•
SK 860-MF	Nickel alloys		•	•	•
SK 868-M	Nickel alloys			•	•
SK 900-MF	Nickel alloys		•	•	•

voestalpine Böhler Welding

Welding know-how joins steel

With over 100 years of experience, voestalpine Böhler Welding is the global top address for the daily challenges in the areas of joint welding, wear and corrosion protection as well as brazing. Customer proximity is guaranteed by more than 40 subsidiaries in 25 countries, with the support of 2,200 employees, and through more than 1,000 distribution partners worldwide. With individual consultation by our application technicians and welding engineers, we make sure that our customers master the most demanding welding challenges. voestalpine Böhler Welding offers three specialized and dedicated brands to cater for our customers' and partners' requirements.



Lasting connections – More than 2,000 products for joint welding in all conventional arc welding processes are united in a product portfolio that is unique throughout the world. Creating lasting connections is the brand's philosophy in welding and between people.



Tailor-made Protectivity™ – Decades of industry experience and application know-how in the areas of repair of cracked material, anti-wear and cladding, combined with innovative and custom-tailored products, guarantee customers an increase in the productivity and protection of their components.



In-depth know-how – Through deep insight into processing methods and ways of application, Fontargen Brazing provides the best brazing and soldering solutions based on proven products with German technology. The expertise of this brand's application engineers has been formulated over many years of experience from countless application cases.

