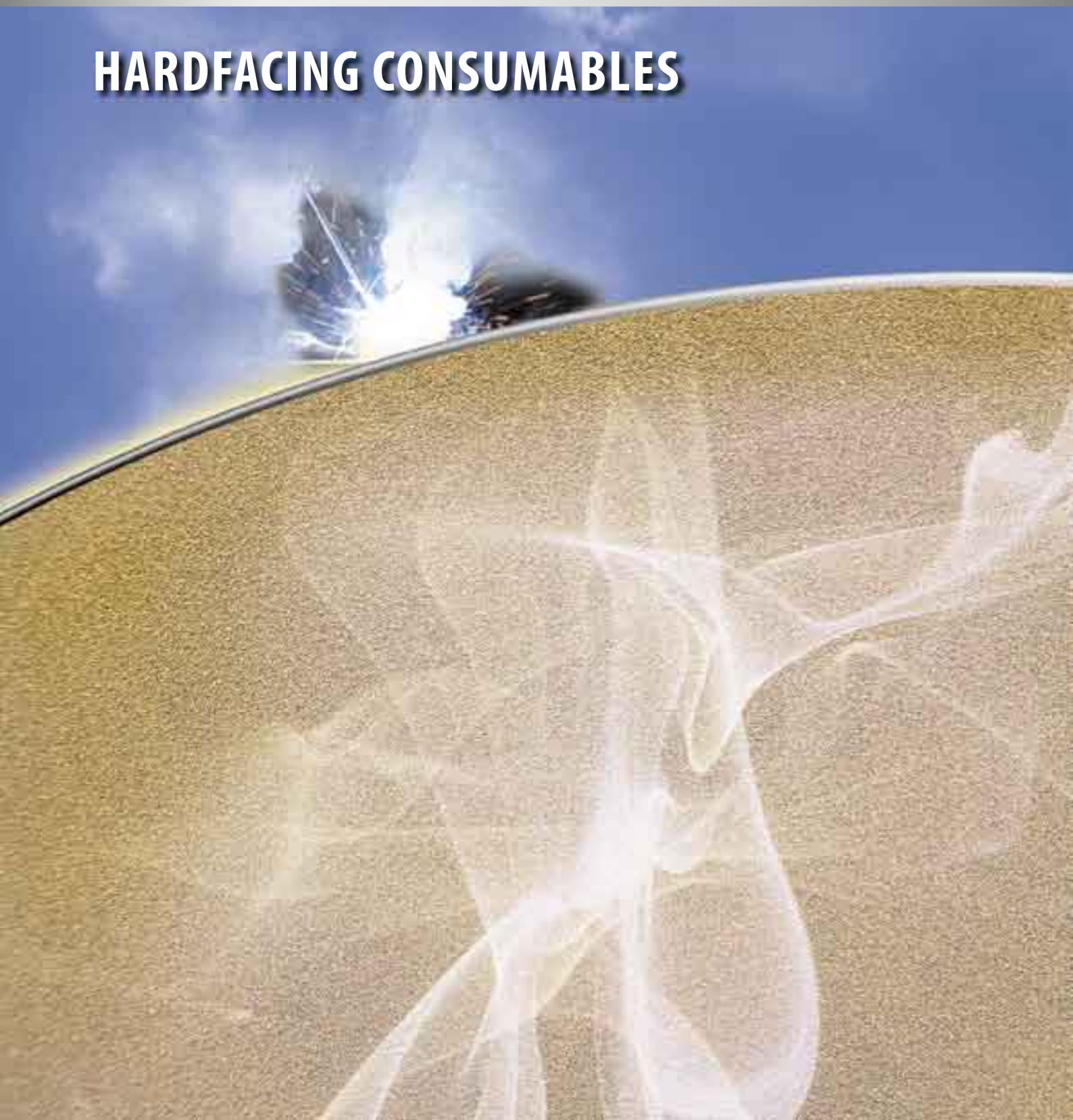
Stellite

Deloro Stellite

HARDFACING CONSUMABLES



Deloro Stellite GmbH

Deloro Stellite GmbH is a leading manufacturer of wear resistant products and supplier of solutions for wear problems.

Excellent product properties guarantee reliable resistance to combinations of corrosion, high temperatures and mechanical wear mechanisms.

In close co-operation with you, we strive for the optimum solution to your wear problems.

Hardfacing by Welding

Thermal Spraying

Our Alloys

Stellite® Alloys

The cobalt-based Stellite® alloys are our most well-known and successful alloys, with the best 'all-round' properties. They combine excellent mechanical wear-resistance, especially at high temperatures, with very good corrosion resistance.

Tribaloy® Alloys

Tribaloy® alloys, with either a nickel or cobalt base, were developed for applications in which extreme wear is combined with high temperatures and corrosive media. Their high Molybdenum content accounts for the excellent dry-running properties of Tribaloy® alloys and makes them very suitable for use in adhesive (metal-to-metal) wear situations.

Deloro® Alloys

Deloro® alloys are nickel-based alloys with a hardness of up to 62 HRC, which makes them ideal for mechanical wear-resistance. Their wear-resistance at higher temperatures is less than that of Stellite® alloys; their corrosion-resistance in Sodium Hydroxide and similar media is excellent.

Nistelle® Alloys

Nistelle® alloys are nickel-based alloys that were developed for protection against aggressive chemicals and other corrosive media. The high Chromium and Molybdenum contents guarantee excellent properties.

Stelcar® Alloys

Stelcar® alloys are mixtures of carbide particles and self-fluxing nickel- or cobalt-based powders. Due to their construction, Stelcar® materials are available only in powder form, for application by thermal spraying or hardfacing by welding.

Delcrome® Alloys

These iron-based alloys were developed to resist abrasive wear at lower temperatures, typically up to 200°C. When compared with our cobalt- and nickel-based alloys, their corrosion-resistance is also comparatively low.

Jet Kote® Powder

Jet Kote® powders are used for thermal spraying and they consist usually of either a carbide-metal combination (e.g. WC-Co or Cr_3C_2-NiCr) or a Stellite® alloy.

Selection Table

Alloy	Mechanical Wear	Corrosion	High Operating Temperature
Stellite®	✦✦✦	✦✦✦	✦✦✦✦
Deloro®	✦✦✦	✦✦	✦✦
Tribaloy®	✦✦✦	✦✦✦	✦✦✦✦
Nistelle®	✦	✦✦✦✦	✦✦✦
Delcrome®	✦✦✦	✦	✦✦
Stelcar®	✦✦✦✦	✦✦	✦✦
Jet Kote®	✦✦✦✦	✦	✦✦

✦ low resistance

✦✦ satisfactory resistance

✦✦✦ very good resistance

✦✦✦✦ excellent resistance

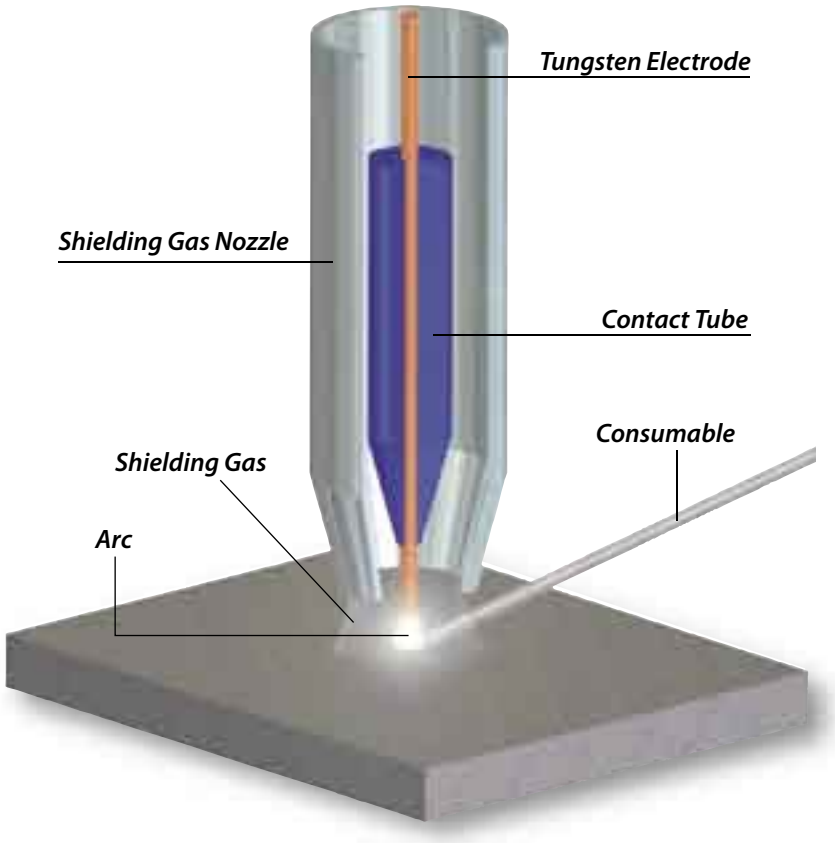
TIG Welding/Oxyacetylene Welding

- Manual Operation
- Can be Mechanised
- Low Dilution

TIG Welding/ Oxy-acetylene Welding

In TIG (Tungsten Inert Gas) welding, an arc is drawn between a non-consumable tungsten electrode and the workpiece. The electrode, the arc and the weld-pool are protected from the atmosphere with an inert shielding gas. For manual welding the hardfacing material is in the form of a rod. Advantages of the TIG process include simple manual operation and good control of the welding arc. The process can also be mechanised, in which case a manipulator is used to move the workpiece in relation to the welding torch and the hardfacing rod or wire.

Rods are also used for hardfacing with the oxy-acetylene welding process. With the correct operation, a very low level of iron dilution can be achieved in the overlay.



Alloy	Nominal Analyses										Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	B	Other	HRC
Cobalt Base											
Stellite® alloy 1	30.0	2.5	-	-	12.0	-	Bal.	-	-	-	51-58
Stellite® alloy 6	28.0	1.1	-	-	4.0	-	Bal.	-	-	-	39-43
Stellite® alloy 12	29-31	1.4-1.8	-	-	8.0	-	Bal.	-	-	-	47-51
Stellite® alloy 20	33.0	2.45	-	1.0	17.5	-	Bal.	<2.5	-	-	53-56
Stellite® alloy 21	27.0	0.25	6.0	-	-	2.0	Bal.	-	-	-	28-40*
Stellite® alloy 22	28.0	0.3	12.0	-	-	1.5	Bal.	-	-	-	41-49
Stellite® alloy 25	20.0	0.1	-	-	15.0	10.0	Bal.	<3.0	-	-	20-45*
Stellite® alloy 190	26.0	3.25	1.0	0.85	14.5	3.0	Bal.	3.0	-	-	50-53
Stellite® alloy 250	28.0	0.1	-	-	-	-	Bal.	20.0	-	-	19-29
Stellite® alloy 694	28.0	1.0	-	1.0	19.0	-	Bal.	<2.5	-	-	48-51
Stellite® alloy 712	29.0	1.85	9.0	0.5	-	<3.0	Bal.	<3.0	-	-	46-51
Stellite® alloy F	25.0	1.7	-	-	12.0	22.0	Bal.	-	-	-	40-45
Ultimet®	26.0	0.06	5.0	-	2.0	9.0	Bal.	3.0	-	-	28-45*
Tribaloy® alloy T-400	8.5	<0.08	28.5	2.6	-	-	Bal.	-	-	Ni+Fe <3.0	46-53
Tribaloy® alloy T-400 C	14.0	<0.08	27.0	2.4	-	-	Bal.	-	-	-	47-52
Tribaloy® alloy T-401	17.0	0.2	22.0	1.3	-	-	Bal.	-	-	-	45-50
Tribaloy® alloy T-800	18.0	<0.08	28.0	3.4	-	-	Bal.	-	-	-	53-60
Nickel Base											
Deloro® alloy 22 (VC)	1.2	-	-	2.5	-	Bal.	-	-	1.3	-	19-24
Deloro® alloy 40	11.0	0.45	-	2.5	-	Bal.	-	2.25	<2.5	-	35-42
Deloro® alloy 40 G (VC)	7.5	0.3	-	4.0	-	Bal.	-	5.0	1.1	-	30-35
Deloro® alloy 50	12.0	0.35	-	3.5	-	Bal.	-	5.0	2.5	-	49-52
Deloro® alloy 60	15.0	0.75	-	4.0	-	Bal.	-	4.0	3.5	-	57-62
Nistelle® alloy C	17.0	0.1	17.0	-	5.0	Bal.	-	6.0	-	-	17-27*
Tribaloy® alloy T-700	15.5	<0.08	32.5	3.4	-	Bal.	-	-	-	Co+Fe <3.0	42-48

*depending upon the degree of cold-working

Rods are available in these standard diameters: **3.2mm | 4.0mm | 5.0mm | 6.4mm**
Rods with diameters of **0.8mm** or **2.5mm** are available on request.

Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

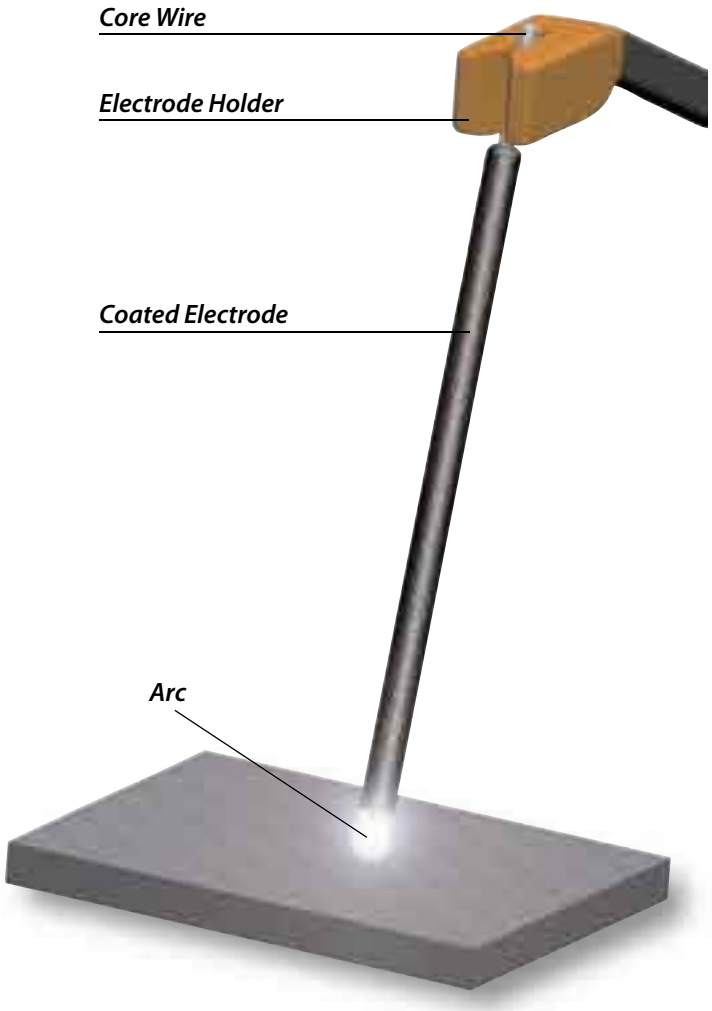
Manual Metal Arc Welding

- Flexible
- Low Cost
- Mobile
- Ideal for Repairs

Manual Metal Arc Welding

In this process an arc is drawn between a coated consumable electrode and the workpiece. The metallic core-wire is melted by the arc and is transferred to the weld-pool as molten drops. The electrode coating also melts to form a gas shield around the arc and the weld pool as well as a slag on the surface of the weld-pool, thus protecting the cooling weld-pool from the atmosphere. The slag must be removed after each layer.

Manual Metal Arc welding is still a widely-used hardfacing process. Due to the low cost of the equipment, the low operating costs of the process and the ease of transporting the equipment, this flexible process is ideally suited to repair work.



Alloy	Nominal Analyses										Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	B	Other	HRC
Cobalt Base											
Stellite® alloy 1	30.0	2.5	-	-	12.0	-	Bal.	-	-	-	51-58
Stellite® alloy 6	28.0	1.1	-	-	4.0	-	Bal.	-	-	-	39-43
Stellite® alloy 12	29-31	1.4-1.8	-	-	8.0	-	Bal.	-	-	-	47-51
Stellite® alloy 20	33.0	2.45	-	1.0	17.5	<2.5	Bal.	<2.5	-	-	53-56
Stellite® alloy 21	27.0	0.25	6.0	-	-	2.0	Bal.	-	-	-	28-40*
Stellite® alloy 25	20.0	0.1	-	-	15.0	10.0	Bal.	<3.0	-	-	20-45*
Stellite® alloy 250	28.0	0.1	-	-	-	-	Bal.	20.0	-	-	19-29
Nickel Base											
Nistelle® alloy C	17.0	0.1	17.0	-	5.0	Bal.	-	6.0	-	-	17-27*

*depending upon the degree of cold-working

Electrodes are available in these standard diameters: **3.2mm | 4.0mm | 5.0mm | 6.4mm**
Other diameters are available on request.

Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

Gas Metal Arc (MIG/MAG) Welding, Submerged-arc Welding

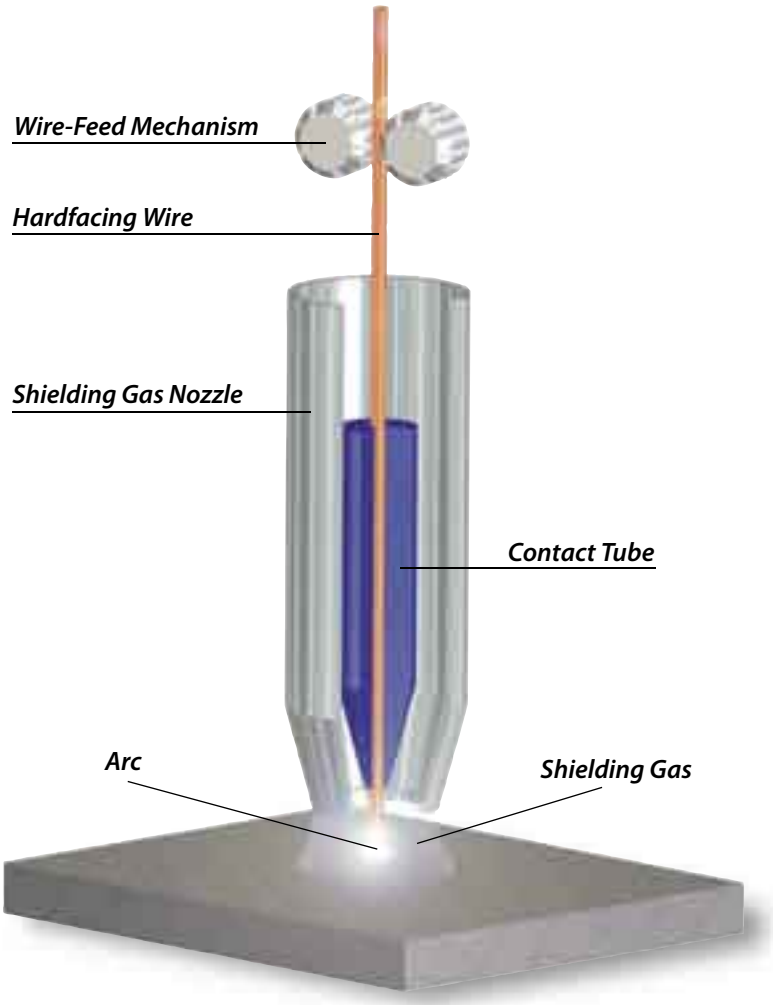
- Flexible Operation
- Can be Partially or Fully Mechanised
- Wide Application Range

Gas Metal Arc Welding (MIG/MAG), Submerged Arc Welding

In these arc welding processes, consumable hardfacing wire is fed continuously from a spool through the welding torch into the arc, where it is melted and transferred to the workpiece.

In the case of MIG/MAG welding, the weld-pool is protected from the atmosphere with a stream of shielding gas. These MIG/MAG processes are very flexible, i.e. they can be partially or fully mechanised and they are suitable for a wide range of applications.

Wire is also used as the hardfacing consumable in the submerged-arc welding process. In this process a mineral-based fluxing powder flows around the consumable wire and is melted by the arc. It forms a gaseous shield around the arc and also forms a slag on top of the weld-pool, thereby shielding the cooling weld-pool from the atmosphere.



Alloy	Nominal Analyses										Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	Mn	Other	HRC
Cobalt Base											
Stellite® alloy 1	29.0	2.5	-	1.0	12.0	-	Bal.	3.5	1.0	-	51-58
Stellite® alloy 6	28.0	1.2	-	1.0	4.5	<3.0	Bal.	5.0	1.5	-	39-43
Stellite® alloy 6 LC	28.0	0.9	-	1.0	5.0	-	Bal.	5.0	1.5	-	34-36
Stellite® alloy 12	30.0	1.9	-	1.0	8.5	-	Bal.	5.0	1.5	-	47-51
Stellite® alloy 21	27.0	0.2	5.0	-	3.0	3.0	Bal.	5.0	-	-	28-40*
Stellite® alloy 306	24.0	0.5	-	1.0	3.0	5.0	Bal.	<7.0	-	Nb 5.0	37-41
Ultimet®	26.0	0.06	5.0	0.3	2.0	9.0	Bal.	3.0	-	-	28-45*

*depending upon the degree of cold-working

Wire is available in these standard diameters: **1.2mm | 1.6mm | 2.4mm | 3.2mm**
Other diameters are available on request.

Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

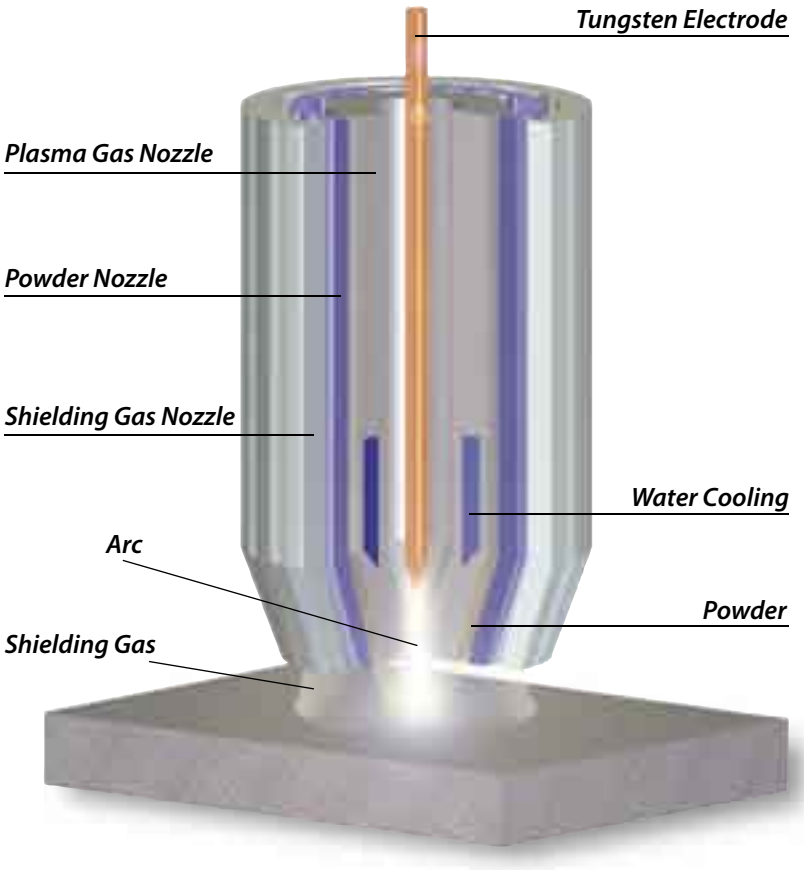
PTA Welding

- Highly Automated
- High Powder Utilisation
- Low Dilution
- Very Wide Range of Hardfacing Materials

PTA Welding

The Plasma-Transferred-Arc process recommends itself due to its ease of automation and thus a high degree of reproducibility of the welded overlays. In addition, because of the highly concentrated heat source, this process benefits from high powder utilisation and can achieve a very low level of iron dilution in the overlay.

Because the hardfacing materials are in powder form, it is possible to produce overlays from many different materials and combinations of materials with a wide range of hardness and other properties. For this reason Deloro Stellite offers the widest range of hardfacing materials for this process.



Alloy	Nominal Analyses										Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	B	Other	HRC
Cobalt Base											
Stellite® alloy 1	30.0	2.5	-	1.0	12.0	<3.0	Bal.	<3.0	-	-	51-58
Stellite® alloy 6	28.0	1.2	-	1.1	4.5	<3.0	Bal.	<3.0	-	-	39-43
Stellite® alloy 12	30.0	1.4-1.9	-	1.5	8.5	<3.0	Bal.	<3.0	-	-	47-51
Stellite® alloy 20	33.0	2.5	-	-	17.0	<3.0	Bal.	<3.0	-	-	53-56
Stellite® alloy 21	27.0	0.25	5.5	1.6	-	2.5	Bal.	<3.0	-	-	28-40*
Stellite® alloy 22	28.0	0.3	12.0	-	-	1.5	Bal.	-	-	-	41-49
Stellite® alloy 25	20.0	0.1	-	-	15.0	10.0	Bal.	2.0	-	Mn 1.5	20-45*
Stellite® alloy 694	28.0	0.85	-	-	19.5	5.0	Bal.	<3.0	-	-	48-51
Stellite® alloy 706	29.0	1.2	5.0	<2.0	-	<3.0	Bal.	<3.0	-	-	39-43
Stellite® alloy 712	29.0	2.0	8.5	<2.0	-	<3.0	Bal.	<3.0	-	-	46-51
Stellite® alloy F	25.0	1.7	-	1.1	12.0	22.0	Bal.	<3.0	-	-	40-45
Tribaloy® alloy T-400	8.5	-	29.5	2.6	-	-	Bal.	-	-	-	46-53
Tribaloy® alloy T-400C	14.0	-	27.0	2.4	-	-	Bal.	-	-	-	47-52
Tribaloy® alloy T-401	17.0	0.2	22.0	1.3	-	-	Bal.	-	-	-	45-50
Tribaloy® alloy T-800	17.5	-	28.0	3.4	-	-	Bal.	-	-	-	54-60
Ultimet®	26.0	-	5.0	-	2.0	9.0	Bal.	3.0	-	-	28-45*
Nickel Base											
Deloro® alloy 15	-	0.03	-	2.0	-	Bal.	-	-	1.1	Cu 20.0	180-230 (HV)
Deloro® alloy 22	-	0.03	-	2.4	-	Bal.	-	-	1.4	-	20-22
Deloro® alloy 25	-	0.05	-	2.7	-	Bal.	-	-	1.8	-	25-28
Deloro® alloy 30	7.0	0.15	-	3.4	-	Bal.	-	3.0	1.2	-	27-30
Deloro® alloy 36	7.0	0.3	-	3.7	-	Bal.	-	3.0	1.2	-	33-38
Deloro® alloy 38	-	0.05	-	3.0	-	Bal.	-	-	2.1	-	35-39
Deloro® alloy 40	7.5	0.25	-	3.5	-	Bal.	-	2.5	1.7	-	38-42
Deloro® alloy 45	9.0	0.35	-	3.7	-	Bal.	-	2.5	1.9	-	44-47
Deloro® alloy 50	11.0	0.45	-	4.0	-	Bal.	-	3.0	2.3	-	48-52
Deloro® alloy 56	17.0	0.6	2.5	4.5	-	Bal.	-	3.0	3.6	Cu 2.5	54-58
Deloro® alloy 60	15.0	0.7-0.9	-	4.3	-	Bal.	-	3.5	3.1	-	58-62
Deloro® alloy 90	5.5	0.25	-	3.0	-	Bal.	-	2.4	1.0	Al 1.0	30-33
Tribaloy® alloy T-700	15.5	-	32.5	3.4	-	Bal.	-	-	-	-	42-48
Nistelle® alloy C	16.5	-	17.0	-	4.5	Bal.	<2.5	5.5	-	-	17-27*
Nistelle® alloy C4	16.0	-	16.0	-	-	Bal.	<2.0	<2.0	-	-	n.a.
Nistelle® alloy C276	15.5	-	16.0	-	3.8	Bal.	<2.5	5.0	-	-	n.a.
Nistelle® alloy 625	21.5	-	9.0	-	-	Bal.	-	<5.0	-	Nb 3.6	25 (40 hardened)
Nistelle® alloy 718	19.0	0.6	3.0	-	-	Bal.	-	18.0	-	Nb 1.0 Al 0.5 Ti 1.0	270-470 (HV)

*depending upon the degree of cold-working

PTA powder is available in these standard particle-size ranges: **HD: -250µm +45µm** | **W: -150µm +63µm** | **G: -125µm +45µm**

Other particle-size ranges and Iron Based Alloys are available on request.

Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

Laser Overlaying

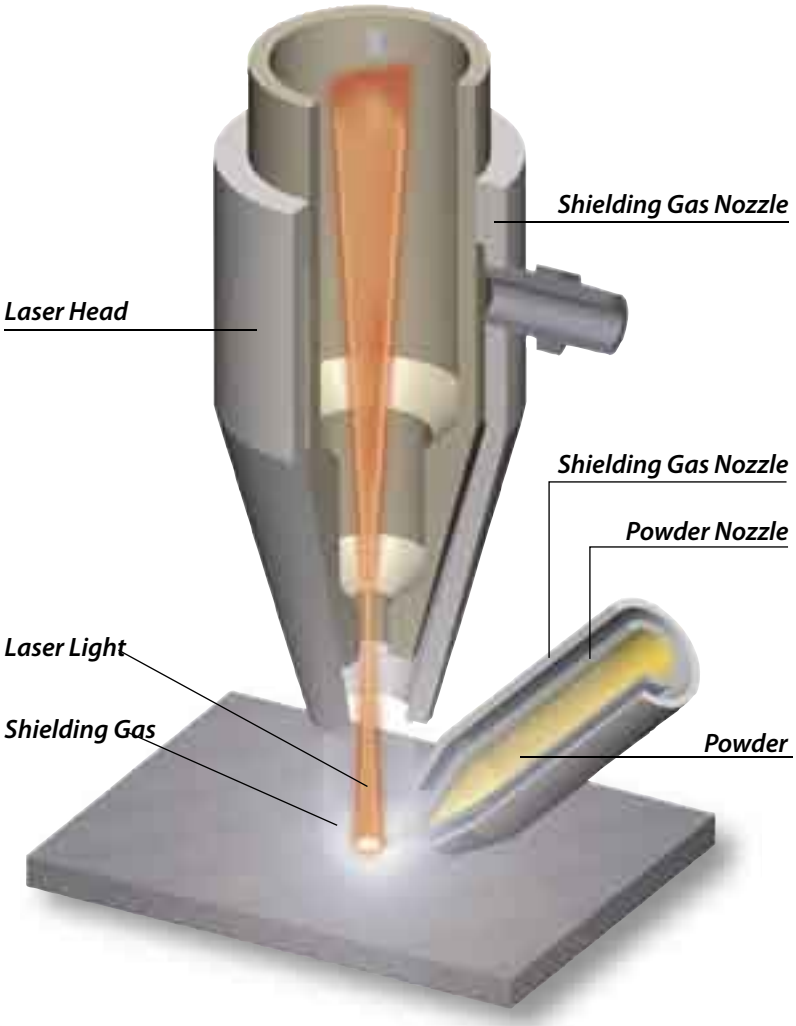
- Low Heat Input
- Fast Cooling
- Almost Stress-free Overlays
- High Hardness
- Fine Microstructure

(Picture: coaxial powder-feed)

Laser Overlaying

When overlaying with a laser an optical arrangement is used to focus the laser beam on the workpiece and heat it. Simultaneously hard-facing material in the form of powder or wire is introduced into the laser beam and melted. Due to the narrow heat-affected zone and the fast cooling rate the heat input is low, thereby producing an almost stress-free overlay.

Compared with other welding processes with higher heat inputs, for a given hardfacing alloy the fast cooling rate of the laser process produces an overlay with a significantly higher hardness and a finer microstructure.



(Picture: non-coaxial powder feed)

Alloy	Nominal Analyses									Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	B	HRC
POWDER										
Cobalt Base										
Stellite® alloy 6	28.0	1.2	-	1.1	4.5	<3.0	Bal.	<3.0	-	40-44
Stellite® alloy 12	30.0	1.4-1.9	-	1.5	8.5	<3.0	Bal.	<3.0	-	48-52
Stellite® alloy 21	27.0	0.25	5.5	1.6	-	2.5	Bal.	<3.0	-	28-40*
Stellite® alloy 22	28.0	0.3	12.0	-	-	1.5	Bal.	-	-	41-49
Stellite® alloy 31	25.5	0.5	-	-	7.5	10.5	Bal.	-	-	30-35
Tribaloy® alloy T-400	8.5	-	28.5	2.6	-	-	Bal.	-	-	46-53
Tribaloy® alloy T-400C	14.0	-	27.0	2.4	-	-	Bal.	-	-	47-52
Tribaloy® alloy T-401	17.0	0.2	22.0	1.3	-	-	Bal.	-	-	45-50
Tribaloy® alloy T-800	17.5	-	28.0	3.4	-	-	Bal.	-	-	54-60
Ultimet®	26.0	-	5.0	-	2.0	9.0	Bal.	3.0	-	28-45*
Nickel Base										
Deloro® alloy 40	7.5	0.25	-	3.5	-	Bal.	-	2.5	1.7	38-42
Deloro® alloy 50	11.0	0.45	-	4.0	-	Bal.	-	3.0	2.3	48-52
Deloro® alloy 60	15.0	0.7-0.9	-	4.3	-	Bal.	-	3.5	3.1	58-62

Alloy	Nominal Analyses									Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	B	HRC
WIRE										
Cobalt Base										
Stellite® alloy 6	28.0	1.2	-	1.1	4.5	<3.0	Rest	<3.0	-	39-43
Stellite® alloy 12	30.0	1.4-1.9	-	1.5	8.5	<3.0	Rest	<3.0	-	47-51
Stellite® alloy 31	25.5	0.5	-	-	7.5	10.5	Rest	-	-	30-35
Stellite® alloy 694	28.0	0.85	-	-	19.5	5.0	Rest	<3.0	-	48-52
Tribaloy® alloy T-800	17.5	-	28.0	3.4	-	-	Rest	-	-	54-60

*depending upon the degree of cold-working

All particle-size ranges of powder are available on request.
Wire is available in the standard diameter of **0.8mm**. Other diameters are available on request.
Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

Flame-spraying with subsequent Fusing

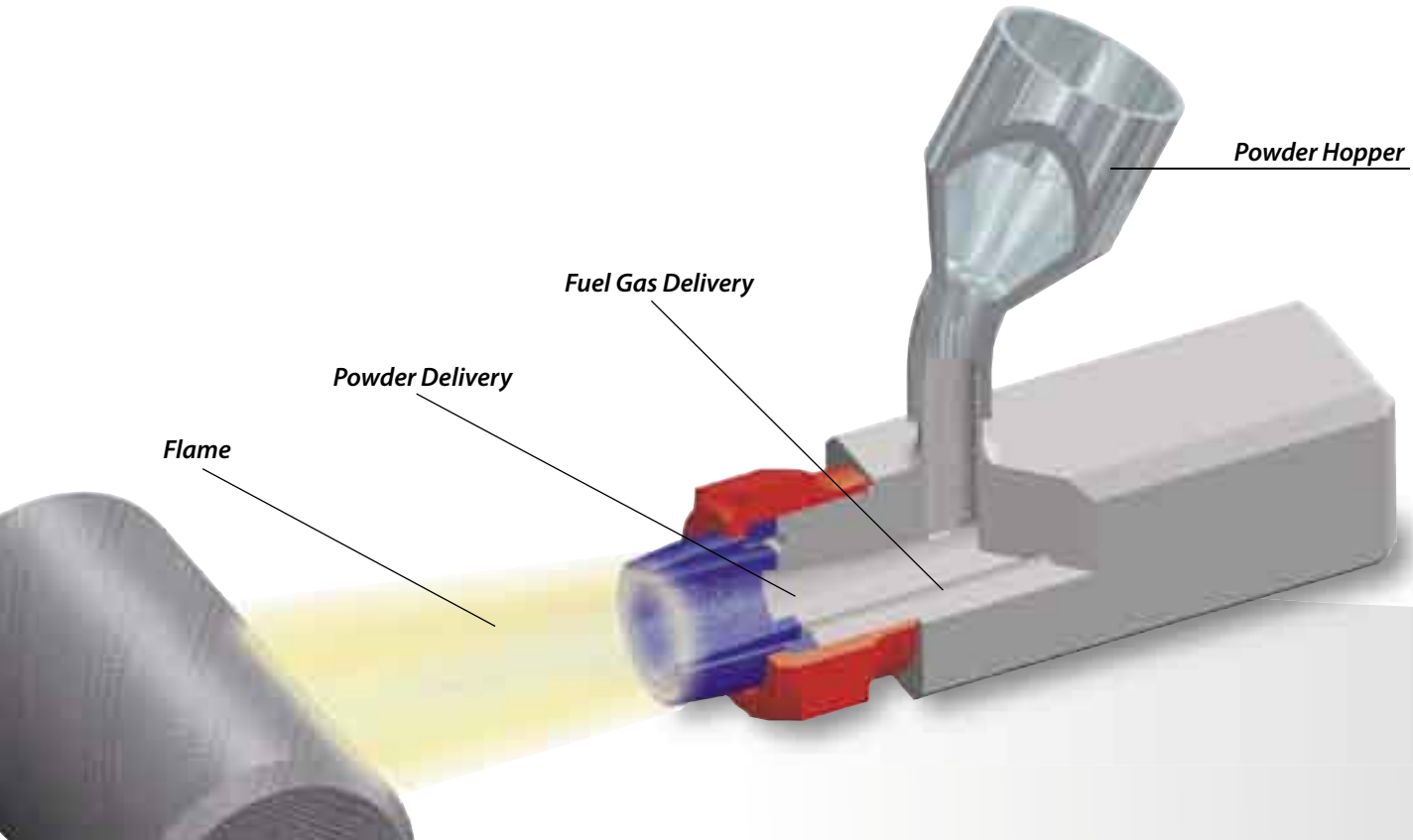
- Metallurgical Bonding
- Can use Induction or Vacuum Furnaces
- Liquid- and Gas-tight

Flame-spraying with subsequent Fusing

In flame spraying with powder the particles are softened or melted in an oxyacetylene flame and transferred to a prepared workpiece by the expanding gases. An additional gas stream can be used to assist with powder particle transfer.

The second stage of the process, fusing the sprayed coating to the workpiece, is usually done with an oxyacetylene burner. Alternatively, for series production, fusing can be carried out by induction heating or in a vacuum furnace.

The bonding of the sprayed coating to the workpiece is significantly increased by the fusing process, which creates metallurgical bonds between the powder particles and also between the coating and the work-piece. The coating becomes liquid- and gas-tight.



Alloy	Nominal Analyses										Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	B	Other	HRC
Cobalt Base											
Stellite® alloy 157	22.0	0.1	-	1.6	4.5	1.5	Bal.	-	2.4	-	50-54
Stellite® alloy 158	26.0	0.75	-	1.2	5.5	-	Bal.	-	0.7	-	40-45
Stellite® alloy 159	18.5	0.1	5.5	3.3	-	27.0	Bal.	2.0	3.2	-	52-56
Stellite® alloy SF 1	19.0	1.3	-	3.0	13.0	13.0	Bal.	<4.0	2.2	-	54-58
Stellite® alloy SF 6	19.0	0.7	-	2.5	7.5	13.0	Bal.	<4.0	1.7	-	43-46
Stellite® alloy SF 12	19.0	1.0	-	2.8	9.0	13.0	Bal.	<4.0	1.8	-	46-50
Stellite® alloy SF 20	19.0	1.5	-	2.8	15.0	13.0	Bal.	<4.0	3.0	-	58-62
Nickel Base											
Deloro® alloy 15	-	0.03	-	2.0	-	Bal.	-	-	1.1	Cu 20.0	180-220 (HV)
Deloro® alloy 22	-	0.03	-	2.4	-	Bal.	-	-	1.4	-	20-22
Deloro® alloy 36	7.0	0.3	-	3.7	-	Bal.	-	3.0	1.2	-	33-38
Deloro® alloy 40	7.5	0.25	-	3.5	-	Bal.	-	2.5	1.7	-	38-42
Deloro® alloy 45	9.0	0.35	-	3.7	-	Bal.	-	2.5	1.9	-	44-47
Deloro® alloy 50	11.0	0.45	-	4.0	-	Bal.	-	3.0	2.3	-	48-52
Deloro® alloy 56	17.0	0.6	2.5	4.5	-	Bal.	-	3.0	3.6	Cu 2.5	54-58
Deloro® alloy 60	15.0	0.7-0.9	-	4.3	-	Bal.	-	3.5	3.1	-	58-62
Deloro® alloy 62	14.0	0.7	-	3.6	9.5	Bal.	-	3.5	3.2	-	62-64

Powder is available in these standard particle-size ranges: **S: -106µm +38µm**
M: -125µm +45µm

Other particle-size ranges are available on request.

Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

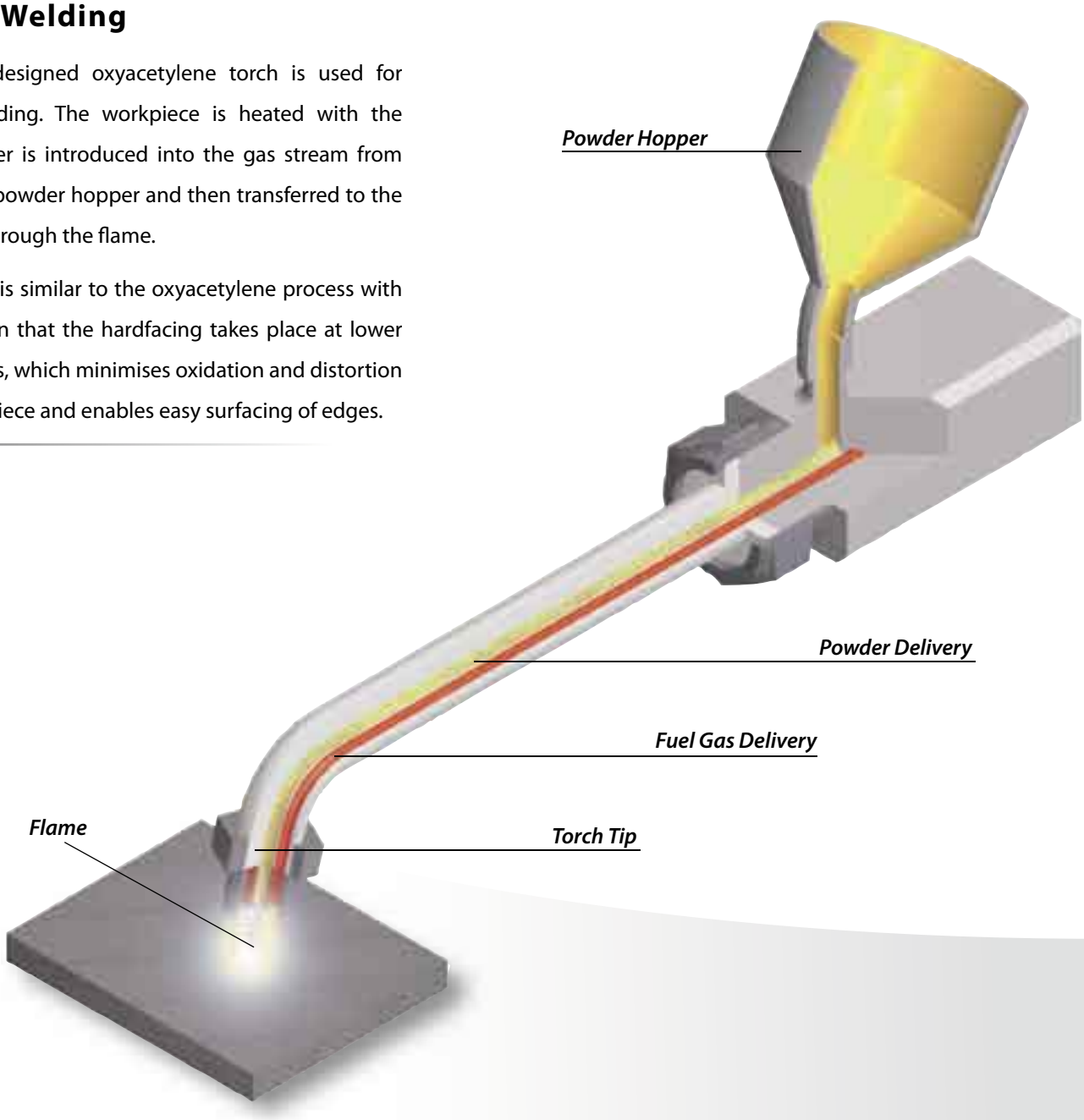
Powder Welding

- Low Dilution
- Easy Application
- Low Distortion
- Ideal for Edge-building

Powder Welding

A specially-designed oxyacetylene torch is used for powder welding. The workpiece is heated with the torch, powder is introduced into the gas stream from the integral powder hopper and then transferred to the workpiece through the flame.

This process is similar to the oxyacetylene process with the exception that the hardfacing takes place at lower temperatures, which minimises oxidation and distortion of the workpiece and enables easy surfacing of edges.



Alloy	Nominal Analyses										Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	B	Other	HRC
Cobalt Base											
Stellite® alloy 157	22.0	0.1	-	1.6	4.5	1.5	Bal.	-	2.4	-	50-54
Stellite® alloy 159	18.5	0.1	5.5	3.3	-	27.0	Bal.	2.0	3.2	-	52-56
Nickel Base											
Deloro® alloy 15	-	0.03	-	2.0	-	Bal.	-	-	1.1	Cu 20.0	180-220 (HV)
Deloro® alloy 21	3.0	0.03	-	2.0	-	Bal.	-	-	0.7	P 2.0	26-45*
Deloro® alloy 22	-	0.03	-	2.4	-	Bal.	-	-	1.4	-	20-22
Deloro® alloy 23	-	0.04	-	2.5	-	Bal.	-	-	1.6	-	25-27
Deloro® alloy 25	-	0.05	-	2.7	-	Bal.	-	-	1.8	-	25-28
Deloro® alloy 29	3.0	0.03	-	2.2	-	Bal.	-	-	1.0	P 2.2	27-30
Deloro® alloy 30	7.0	0.15	-	3.4	-	Bal.	-	3.0	1.2	-	27-30
Deloro® alloy 33	4.5	0.15	2.5	2.8	-	Bal.	-	-	1.3	P 2.0	36-40
Deloro® alloy 35	4.7	0.17	-	3.1	-	Bal.	-	2.0	1.6	-	33-37
Deloro® alloy 36	7.0	0.32	-	3.7	-	Bal.	-	3.0	1.2	-	33-38
Deloro® alloy 38	-	0.05	-	3.0	-	Bal.	-	-	2.1	-	35-39
Deloro® alloy 40	7.5	0.25	-	3.5	-	Bal.	-	2.5	1.7	-	38-42
Deloro® alloy 50	11.0	0.45	-	4.0	-	Bal.	-	3.0	2.3	-	48-52
Deloro® alloy 56	17.0	0.6	2.5	4.5	-	Bal.	-	3.0	3.6	Cu 2.5	54-58
Deloro® alloy 60	15.0	0.7-0.9	-	4.3	-	Bal.	-	3.5	3.1	-	58-62

*depending upon the degree of cold-working

Powder is available in these standard particle-size ranges: **K: -75µm +20µm**
KX: -106µm +20µm
KS: -53µm +20µm

Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

Plasma Spraying

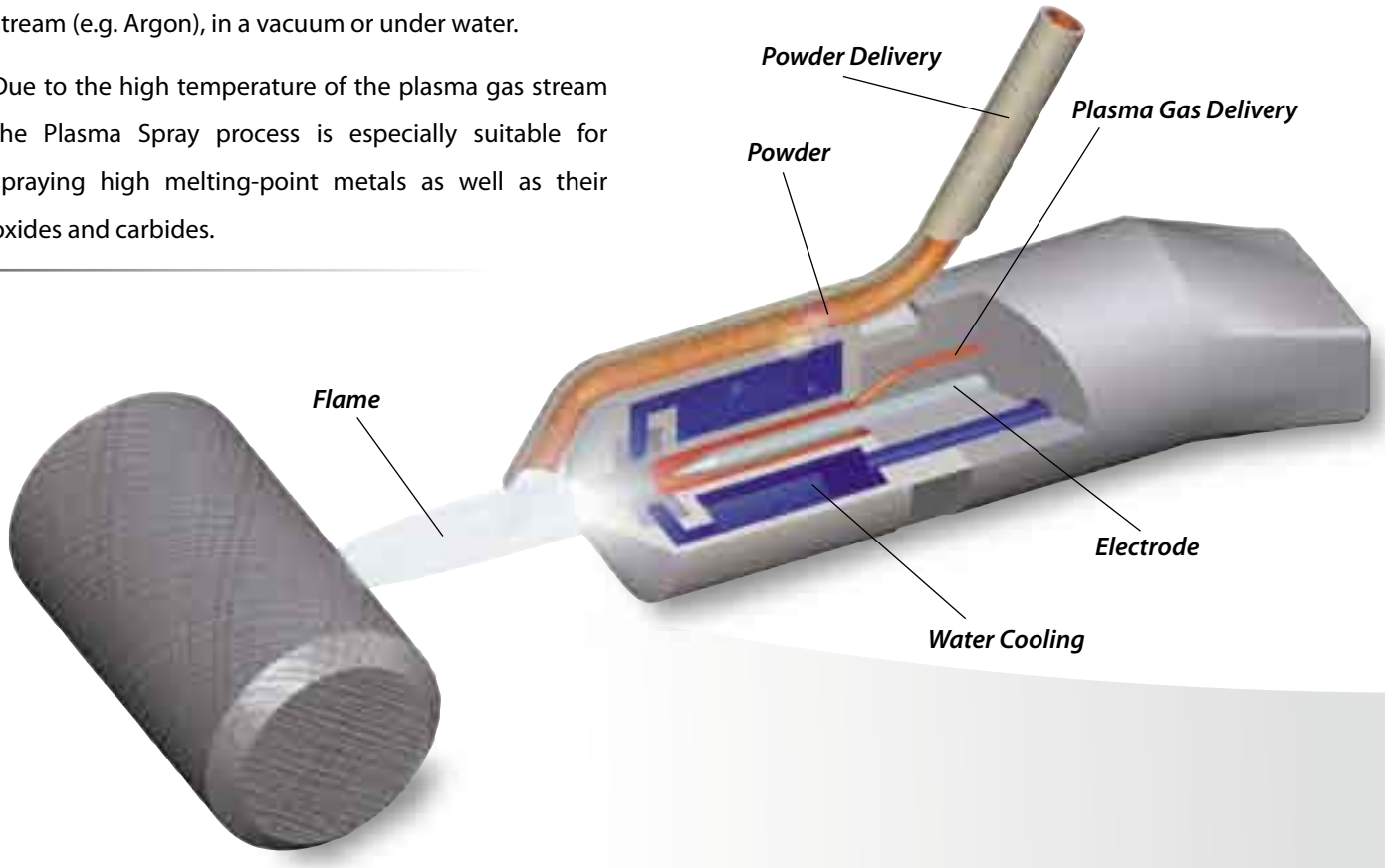
- Operates in Several Environments
- Ideal for High Melting-point Materials

Plasma Spraying

In the Plasma Spraying process powder is softened or melted in the plasma gas stream, which also transfers the particles to the workpiece.

The plasma arc is not transferred to the workpiece, it is contained within the plasma torch between an axial electrode and a water-cooled nozzle. The process is operated in normal atmosphere, in a shielding gas stream (e.g. Argon), in a vacuum or under water.

Due to the high temperature of the plasma gas stream the Plasma Spray process is especially suitable for spraying high melting-point metals as well as their oxides and carbides.



Alloy	Nominal Analyses										Hardness
	Cr	C	Mo	Si	W	Ni	Co	B	WC	Cr_3C_2	HRC
Cobalt Base											
Stellite® alloy 1	30.0	2.5	-	1.0	12.0	<3.0	Bal.	-	-	-	51-58
Stellite® alloy 6	28.0	1.2	-	1.1	4.5	<3.0	Bal.	-	-	-	39-43
Stellite® alloy 12	30.0	1.4-1.9	-	1.5	8.5	<3.0	Bal.	-	-	-	47-51
Stellite® alloy 21	27.0	0.25	5.5	1.6	-	2.5	Bal.	-	-	-	28-40*
Stellite® alloy 31	25.5	0.5	-	-	7.5	10.5	Bal.	-	-	-	30-35
Stellite® alloy 694	28.0	0.85	-	-	19.5	5.0	Bal.	-	-	-	48-51
Stellite® alloy SF 1	19.0	1.3	-	3.0	13.0	13.0	Bal.	2.2	-	-	54-58
Stellite® alloy SF 6	19.0	0.7	-	2.5	7.5	13.0	Bal.	1.7	-	-	43-46
Stellite® alloy SF 12	19.0	1.0	-	2.8	9.0	13.0	Bal.	1.8	-	-	46-50
Stellite® alloy SF 20	19.0	1.5	-	2.8	15.0	13.0	Bal.	3.0	-	-	58-62
Tribaloy® alloy T-400	8.5	-	29.5	2.6	-	-	Bal.	-	-	-	46-53
Tribaloy® alloy T-800	17.5	-	28.0	3.4	-	-	Bal.	-	-	-	54-60
Nickel Base											
Deloro® alloy 40	7.5	0.25	-	3.5	-	Bal.	-	1.7	-	-	38-42
Deloro® alloy 50	11.0	0.45	-	4.0	-	Bal.	-	2.3	-	-	48-52
Deloro® alloy 60	15.0	0.7-0.9	-	4.3	-	Bal.	-	3.1	-	-	58-62
Nistelle® C	16.5	-	17.0	-	4.5	Bal.	<2.5	-	-	-	17-27*
Tribaloy® alloy T-700	15.5	-	32.5	3.4	-	Bal.	-	-	-	-	42-48
Jet Kote Powder											
JK® 7109	4.0	-	-	-	-	-	10.0	-	86.0	-	1000 (HV 0.3)
JK® 7112	-	-	-	-	-	-	12.0	-	88.0	-	1100 (HV 0.3)
JK® 7117	-	-	-	-	-	-	17.0	-	83.0	-	1000 (HV 0.3)
JK® 7175	-	-	-	-	-	5.0	-	-	60.0	35.0	1100 (HV 0.3)
JK® 7184	5.0	-	-	-	-	20.0	-	-	-	75.0	800 (HV 0.3)
JK® 7310	20.0	-	-	-	-	80.0	-	-	-	-	280 (HV 0.3)

*depending upon the degree of cold-working

Powder is available in these standard particle-size ranges: **JK: -53µm +20µm**
PSF: -45µm
PSC: -106µm

Other particle-size ranges are available on request.

Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

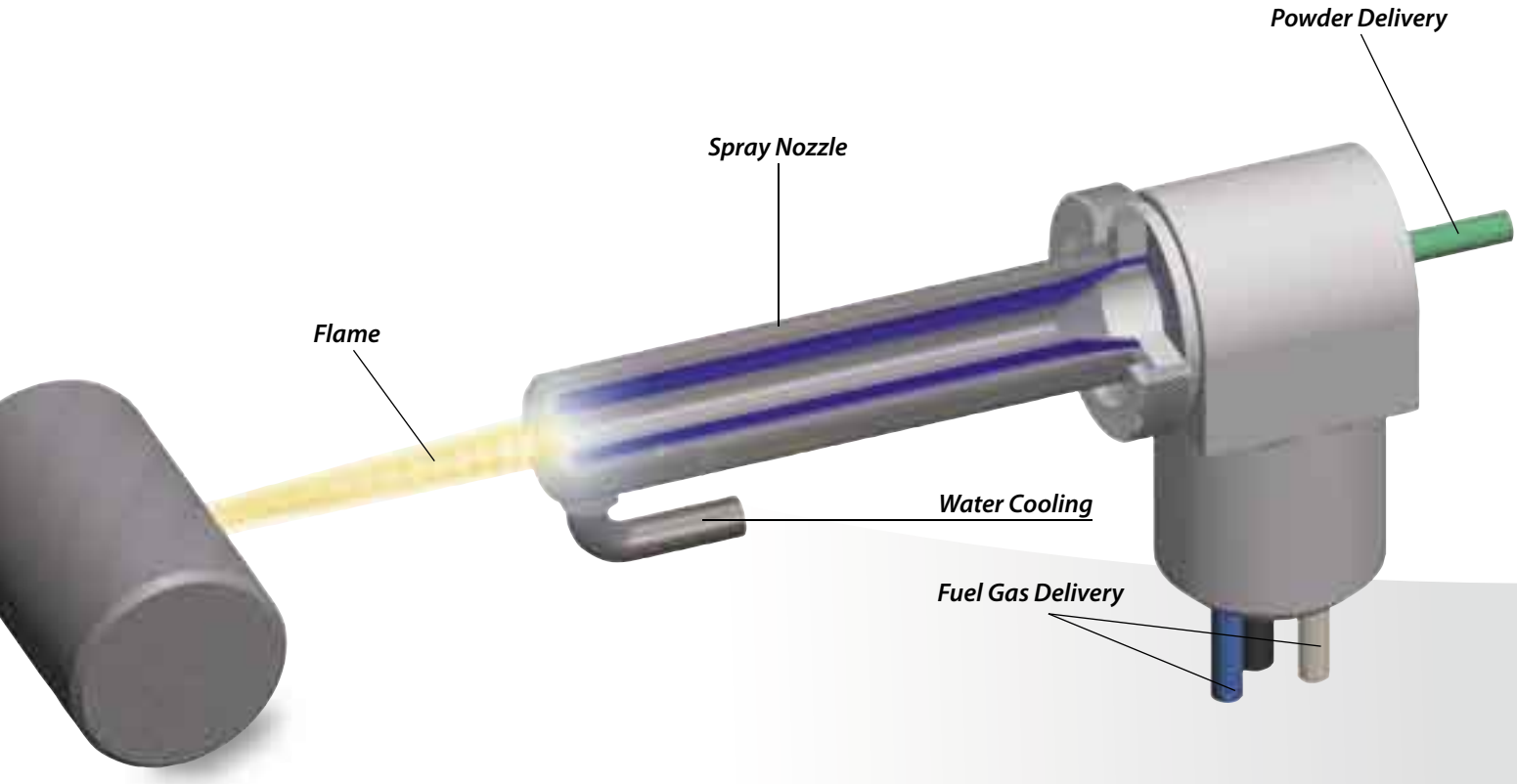
High Velocity Flame Spraying (HVOF)

- Very Dense Coatings
- Excellent Bonding
- Minimal Metallurgical Changes
- Minimal Temperature Effects

High Velocity Flame Spraying (HVOF)

In the High Velocity Flame Spraying process, powder is introduced axially into a chamber in which a gas flame is constantly burning under high pressure. The exhaust gas exits through an expansion nozzle which produces a high velocity gas stream. The powder particles are heated in this gas stream and transferred by it with high kinetic energy to the surface of the workpiece, forming a dense coating with excellent bonding properties.

Due to the moderate transfer of heat to the powder particles and to the workpiece, which remains relatively cool, there is little metallurgical change to the sprayed material and the workpiece.



Alloy	Nominal Analyses											Hardness
	Cr	C	Mo	Si	W	Ni	Co	Fe	B	WC	Other	HV 0.3
Carbide-containing Powder												
JK® 7108	4.0	-	-	-	-	-	10.0	-	-	Bal.	-	900-1100
JK® 7109	4.0	-	-	-	-	-	10.0	-	-	Bal.	-	900-1100
JK® 7110	4.0	-	-	-	-	-	10.0	-	-	Bal.	-	900-1100
JK® 7112	-	-	-	-	-	-	12.0	-	-	Bal.	-	1000-1200
JK® 7114	-	-	-	-	-	-	12.0	-	-	Bal.	-	1000-1150
JK® 7117	-	-	-	-	-	-	17.0	-	-	Bal.	-	900-1100
JK® 7132	-	-	-	-	-	12.0	-	-	-	Bal.	-	950-1150
JK® 7175	-	-	-	-	-	5.0	-	-	-	25.0	70.0 $(W.Cr)_xC_y$	1000-1200
JK® 7184	5.0	-	-	-	-	20.0	-	-	-	-	75.0 Cr_3C_2	700-900
Cobalt Base												
JK® 7201	30.0	2.5	-	-	12.0	-	Bal.	-	-	-	-	550-650
JK® 7206	28.0	1.1	-	1.1	4.5	-	Bal.	-	-	-	-	350-470
JK® 7212	29.5	1.4-1.7	-	-	8.0	-	Bal.	-	-	-	-	450-550
JK® 7221	28.0	0.25	5.5	2.0	-	2.5	Bal.	-	-	-	-	250-350
JK® 7540	8.5	-	29.0	2.6	-	-	Bal.	-	-	-	-	500-600
JK® 7580	18.0	-	28.0	3.4	-	-	Bal.	-	-	-	-	700-750
Nickel Base												
JK® 7301	-	-	-	-	-	Bal.	-	-	-	-	Al 5.0	n.a.
JK® 7310	20.0	-	-	-	-	Bal.	-	-	-	-	-	250-300
JK® 7313	10.0	0.25	-	-	-	Bal.	-	5.0	-	-	-	250-350 (HB)
JK® 7341	19.0	0.6	3.0	-	-	Bal.	-	18.0	-	-	Nb 5.0 Al 0.5 Ti 1.0	270-470
JK® 7342	21.5	-	9.0	-	-	Bal.	-	<5.0	-	-	Nb+Ta 3.7	250-350
JK® 7380	-	-	>99.5	-	-	-	-	-	-	-	<0.5	700-900
JK® 7391	16.5	<0.12	17.0	-	4.5	Bal.	-	5.5	-	-	-	200-300
JK® 7392	16.0	<0.08	16.5	-	-	Bal.	-	-	-	-	-	n.a.
JK® 7393	15.5	<0.08	16.0	-	3.8	Bal.	-	5.0	-	-	-	n.a.
JK® 7394	21.0	<0.08	13.5	-	3.0	Bal.	-	4.0	-	-	-	n.a.
JK® 7395	-	-	28.5	-	-	Bal.	-	5.0	-	-	-	n.a.
JK® 7570	15.5	<0.08	32.5	3.4	-	Bal.	-	-	-	-	-	400-450
JK® 7640	7.5	0.25	-	3.5	-	Bal.	-	-	1.7	-	-	350-450
JK® 7650	11.0	0.45	-	4.0	-	Bal.	-	2.9	2.3	-	-	500-550
JK® 7660	15.0	0.7	-	4.4	-	Bal.	-	4.0	3.1	-	-	600-700
Iron Base												
JK® 7330	17.0	0.03	2.5	1.0	-	13.0	-	Bal.	-	-	-	250-350

Powder is available in the standard particle-size range of **-53µm +20µm**.
Other particle-size ranges are available on request.
Carbide-containing powders are available in either the agglomerated/sintered form or the agglomerated/sintered/densified form. Depending upon the process parameters, the hardness of the welded deposit can vary from the values provided in the above table.

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