

**Deloro**  
Wear Solutions



# HARDFACING ALLOYS

# DELORO WEAR SOLUTIONS GMBH

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**Deloro Wear Solutions is a global world-class provider and manufacturer of innovative metallic wear solutions.**

**We put at your disposal our metallurgical and process technology expertise to enhance performance of your critical components or processes exposed to any combination of mechanical, corrosive or heat related wear. Your productivity is our mission!**

**Our wide range of hard facing consumables comes in the form of rods, wires, powder and electrodes and can be custom engineered to meet individual customer needs.**

**In addition to hard facing alloys, Deloro Wear Solutions also offers solid and coated wear and corrosion-resistant components which we can finish – machine in-house to your drawing.**



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# HARDFACING 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. The Stellite™ alloys are mostly cobalt based with additions of Cr, C, W and/or Mo. They are resistant to cavitation, corrosion, erosion, abrasion and galling. The lower carbon alloys are generally recommended for cavitation, sliding wear or moderate galling. The higher carbon alloys are usually selected for abrasion, severe galling, or low-angle erosion. Stellite™ 6 is our most popular alloy as it provides a good balance of all of these properties. The Stellite™ alloys retain their properties at high temperatures where they also have excellent oxidation resistance. They are typically used in the temperature range 300 – 800° C. They can be finished to exceptional levels of surface finish with a low coefficient of friction to give good sliding wear.

## Deloro™ Alloys

The Deloro™ alloys are nickel based with additions of typically Cr, C, B, Fe and Si. They cover a very wide range of hardness from soft, tough, build-up alloys that are easily machined or hand finished to exceptionally hard, wear-resistant alloys. They can be selected for hardnesses of between 20 and 62 HRC depending on the application. Their low melting point makes these powders ideal for spray/fuse or powder welding applications. The lower hardness Deloro™ alloys are typically used for glass forming molds. The higher hardness Deloro™ alloys are used in severe wear applications, such as rebuilding the flights of feeder screws and they can be blended with carbides for an even harder deposit. They maintain their properties up to temperatures of about 700° C and also offer good oxidation resistance.

## Tribaloy™ Alloys

Tribaloy™ alloys, with either 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. Tribaloy™ alloys can be used up to 800–1000° C.

## Selection Table

	Alloy	Mechanical Wear	Corrosion	High operating temperature
<b>Resistance</b>	Stellite™	■ ■ ■	■ ■ ■	■ ■ ■ ■
	Deloro™	■ ■ ■	■ ■	■ ■
Low	Tribaloy™	■ ■ ■	■ ■ ■	■ ■ ■ ■
Satisfactory	Nistelle™	■	■ ■ ■ ■	■ ■ ■ ■
Very Good	Delcrome™	■ ■ ■	■	■ ■
Excellent	Stelcar™	■ ■ ■ ■	■ ■	■ ■
	Jet Kote™	■ ■ ■ ■	■ ■	■ ■



### **Nistelle™ Alloys**

Nistelle™ alloys are designed for corrosion resistance rather than wear resistance, particularly in aggressive chemical environments where their high chromium and molybdenum contents provide excellent pitting resistance. As a class, they are also generally resistant to high-temperature oxidation and hot gas corrosion. Care should be taken to select the correct alloy for any given corrosive environment.

### **Stelcar™ Alloys**

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

### **Jet Kote™ Powder**

Jet Kote™ powders are used for thermal spraying and they usually consist of either a carbide-metal combination (e.g., WC-Co or Cr<sub>3</sub>Cr<sub>2</sub>-NiCr) or a Stellite™ alloy.

### **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.



# TIG AND OXY-ACETYLENE WELDING

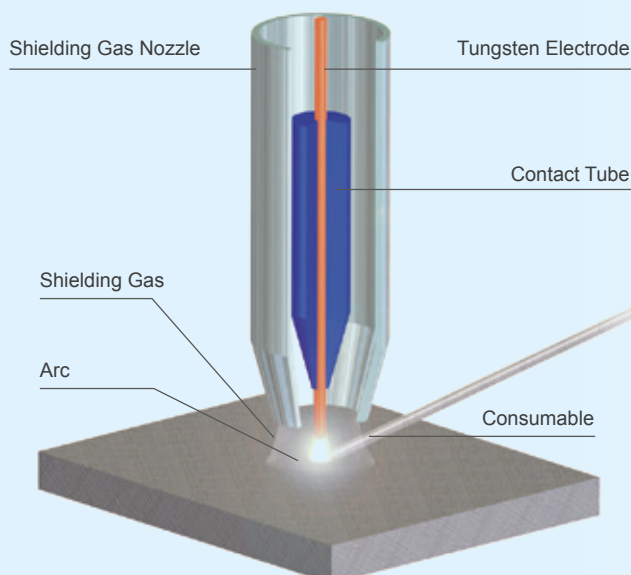
In TIG (Tungsten Inert Gas), also known as Gas Tungsten Arc Welding (GTAW), an arc is drawn between a non-consumable tungsten electrode and the workpiece. The electrode, the arc and the weld-pool are protected from the atmosphere with an inert shielding gas. The hardfacing material is in the form of 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.

Welding rods used for TIG welding 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.

#### Rod is available in these standard diameters:

- 2,6 mm (3/32") (special order)
- 3,2 mm (1/8")
- 4,0 mm (5/32")
- 5,0 mm (3/16")
- 6,4 mm (1/4")
- 8,0 mm (5/16")

These diameters are not available for any alloys. Special sizes on request.



## TIG and Oxy-Acetylene Welding

Alloy	Nominal analysis of welding rod <sup>1</sup>									UNS	ASME/ AWS <sup>2</sup>	Hardness (HRC) <sup>3</sup>
	Co	Cr	W	C	Ni	Mo	Fe	Si	Others			
<b>COBALT-BASED ALLOY BARE WELDING RODS</b>												
Stellite™ alloy 1	Bal.	32	12	2.45	< 3.0	< 1.0	< 3.0	< 2.0	< 0.5	R30001	(SF)A 5.21 ERCoCr-C	51–56
Stellite™ alloy 6	Bal.	30	4–5	1.2	< 3.0	< 1.0	< 3.0	< 2.0	< 0.5	R30006	(SF)A 5.21 ERCoCr-A	40–45
Stellite™ alloy 12	Bal.	30	8	1.55	< 3.0	< 1.0	< 3.0	< 2.0	< 0.5	R30012	(SF)A 5.21 ERCoCr-B	46–51
Stellite™ alloy 20	Bal.	33	16	2.45	< 3.0	< 1.0	< 3.0	< 2.0	< 0.5	—	—	53–59
Stellite™ alloy 21	Bal.	28	—	0.25	3	5.2	< 3.0	< 1.5	< 0.5	R30021	(SF)A 5.21 ERCoCr-E	28–40*
Stellite™ alloy 22	Bal.	28	—	0.30	1.5	12	< 3.0	< 2.0	< 0.5	—	—	41–49*
Stellite™ alloy 25	Bal.	20	14	0.1	10	< 1.0	< 3.0	< 1.0	< 0.5	—	—	20–45*
Stellite™ alloy 31	Bal.	26	7.5	0.5	10	—	< 2.0	< 1.0	< 0.5	R30031	—	20–35 *
Stellite™ alloy F	Bal.	26	12	1.7	22	< 1.0	< 3.0	< 2.0	< 0.5	R30002	(SF)A 5.21 ERCoCr-F	40–45 *
Stellite™ alloy 107	Bal.	31	4	2	24	—	< 2.0	< 3.0	< 0.5	—	—	38–47
Stellite™ alloy 190	Bal.	27	13.5	3.2	< 1.0	< 1.0	< 3.0	1.0	< 0.5	R30014	(SF)A 5.21 ERCoCr-G	54–59
Stellite™ alloy 250	Bal.	28	—	0.1	—	—	21	< 1.0	< 0.5	—	—	20–28
Stellite™ alloy 694	Bal.	28	19	1	5	—	< 3.0	1	1%V	—	—	48–54
Stellite™ alloy 706	Bal.	31	—	1.2	< 3.0	4	< 3.0	< 1.0	< 1.0	—	—	39–44
Stellite™ alloy 712	Bal.	31	—	1.55	< 3.0	8	< 3.0	< 2.0	< 1.0	—	—	46–51
ULTIMET™	Bal.	26	2	0.06	9	5	3	—	< 1.0	R31233	—	28–45*
<b>NICKEL-BASED ALLOY BARE WELDING RODS</b>												
Nistelle™ alloy C	—	17	5	0.1	Bal.	17	6	—	0.3%V	N30002	—	17–27*
Nistelle™ alloy 625	—	21	—	< 0.10	Bal.	8.5	< 5	—	3.3%	N06625	(SF)A 5.14 ERNiCrMo-3	90 HBR
Deloro™ alloy 40	—	12	—	0.4	Bal.	—	2–3	2.9	1.6% B	N99644	(SF)A 5.21 ERNiCr-A	36–42
Deloro™ alloy 50	—	12	—	0.5	Bal.	—	3–5	3.5	2.2% B	N99645	(SF)A 5.21 ERNiCr-B	48–55
Deloro™ alloy 55	—	12	—	0.6	Bal.	—	3–5	4.0	2.3% B	—	—	52–57
Deloro™ alloy 60	—	13	—	0.7	Bal.	—	3–5	4.3	3.0% B	N99646	(SF)A 5.21 ERNiCr-C	57–62
<b>INTER-METALLIC LAVES PHASE ALLOY WELDING RODS (TRIBALLOY™ ALLOYS)</b>												
Tribaloy™ alloy T-400	Bal.	8.5	—	< 0.08	< 1.5	28	< 1.5	2.5	< 1.0	R30400	—	54–58
Tribaloy™ alloy T-400C	Bal.	14	—	< 0.08	< 1.5	27	< 1.5	2.6	< 1.0	—	—	54–59
Tribaloy™ alloy T-401	Bal.	17	—	0.2	< 1.5	22	< 1.5	1.3	< 1.0	—	—	47–53
Tribaloy™ alloy T-700 (Ni based)	< 1.5	16	—	< 0.08	Bal.	32	< 1.5	3.4	< 1.0	—	—	50–58
Tribaloy™ alloy T-800	Bal.	18	—	< 0.08	< 1.5	28	< 1.5	3.4	< 1.0	—	—	55–60
Tribaloy™ alloy T-900	Bal.	18	—	< 0.08	16	22	—	2.7	< 1.0	—	—	52–57

<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specification/standard used when ordering.

<sup>2</sup> When written certification to a standard is required, please specify this when ordering. Certain products can also be certified to AMS, SAE, and other standards. Please contact us for more details.

<sup>3</sup> Undiluted weld metal. Depending upon the process parameters and extent of dilution, the hardness of the weld deposit may vary from that provided in the above table.

\* Depending upon the degree of work hardening.

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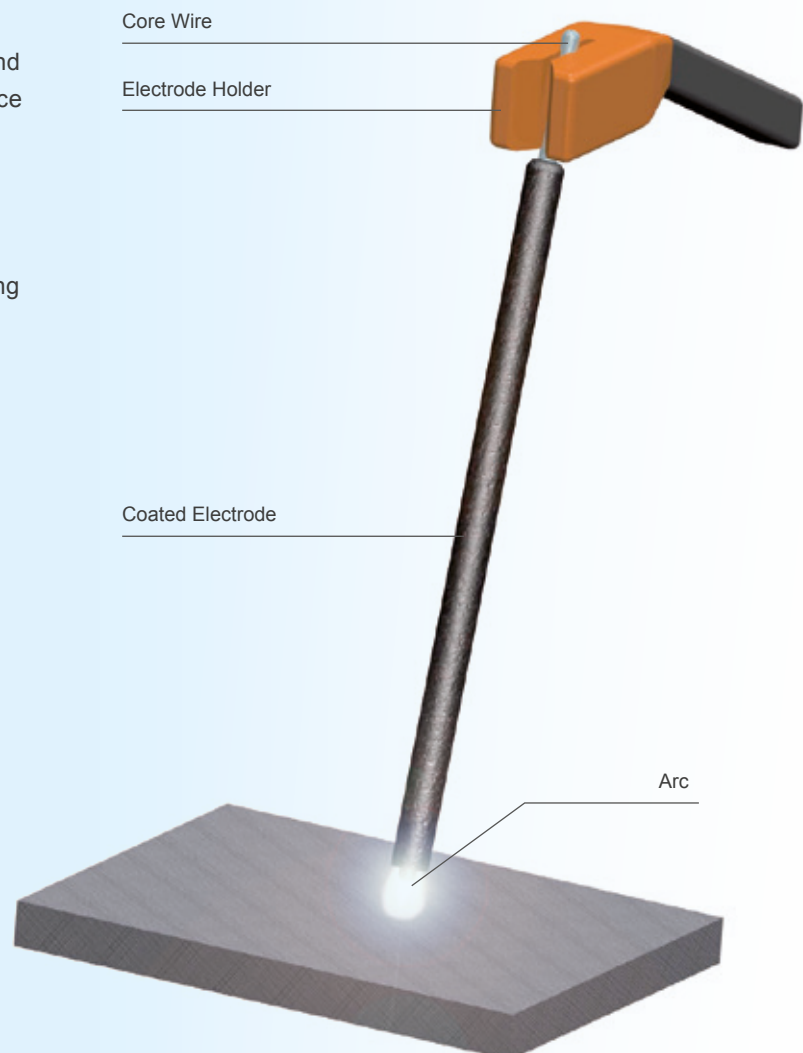


# MANUAL METAL ARC (MMA) WELD DEPOSITION

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In this process, an arc is drawn between a coated consumable electrode and the workpiece. The metallic core is melted by the arc and is transferred to the weld pool as molten droplets. 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.

MMA 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.





## MMA Weld Deposition

Alloy	Nominal analysis of undiluted weld metal <sup>1</sup>									UNS	ASME / AWS <sup>2</sup>	Hardness (HRC) <sup>3</sup>
	Co	Cr	W	C	Ni	Mo	Fe	Si	Others			
<b>COBALT-BASED ALLOYS ELECTRODES</b>												
Stellite™ alloy 1	Bal.	31	12	2.45	<3.0	<1.0	<3.0	<2.0	<1.0	W73001	(SF)A 5.13 ECoCr-C	51–56
Stellite™ alloy 6	Bal.	29	4	1.2	<3.0	<1.0	<3.0	<2.0	<1.0	W73006	(SF)A 5.13 ECoCr-A	39–43
Stellite™ alloy 12	Bal.	30	8	1.55	<3.0	<1.0	<3.0	<2.0	<1.0	W73012	(SF)A 5.13 ECoCr-B	45–50
Stellite™ alloy 20	Bal.	32	16	2.45	<3.0	<1.0	<3.0	<2.0	<1.0	—	—	53–57
Stellite™ alloy 21	Bal.	28	—	0.25	3	5.5	<3.0	<1.5	<1.0	W73021	(SF)A 5.13 ECoCr-E	28–40*
Stellite™ alloy 25	Bal.	20	14	0.1	10	<1.0	<3.0	<1.0	<1.0	—	—	20–45*
Stellite™ alloy 250	Bal.	28	—	0.1	—	—	21	<1.0	<1.0	—	—	20–28*
Stellite™ alloy 706	Bal.	30	—	1.2	<3.0	4	<3.0	<1.0	<1.0	—	—	39–44
Stellite™ alloy 712	Bal.	30	—	1.55	<3.0	8	<3.0	<2.0	<1.0	—	—	46–51
Ultimet™	Bal.	26	2	0.06	9	5	3	—	<1.0	—	—	28–45*
<b>NICKEL-BASED ALLOYS ELECTRODES</b>												
Nistelle™ alloy C	—	17	5	0.1	Bal.	17	6	—	0.3% V	W80002	—	17–27*

<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specification/standard used when ordering.

<sup>2</sup> When written certification to a standard is required, please specify this when ordering. Certain products can also be certified to AMS, SAE, and other standards. Please contact us for more details.

<sup>3</sup> Undiluted weld metal. Depending upon the process parameters and extent of dilution, the hardness of the alloy may vary from that provided in the above table.

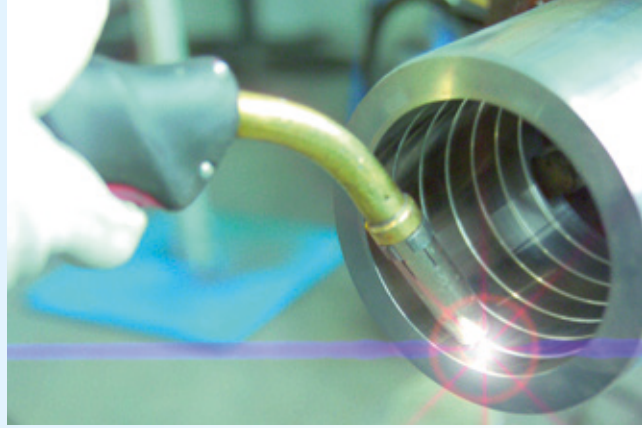
\* Depending upon the degree of cold-working

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### Electrodes are available in these standard diameters:

- 2,6 mm (3/32") (special order)
- 3,2 mm (1/8")
- 4,0 mm (5/32")
- 5,0 mm (3/16")
- 6,4 mm (1/4")

Electrodes are supplied in lengths of 350 mm (14") and are boxed in 5.0 kg (11 lb) boxes.

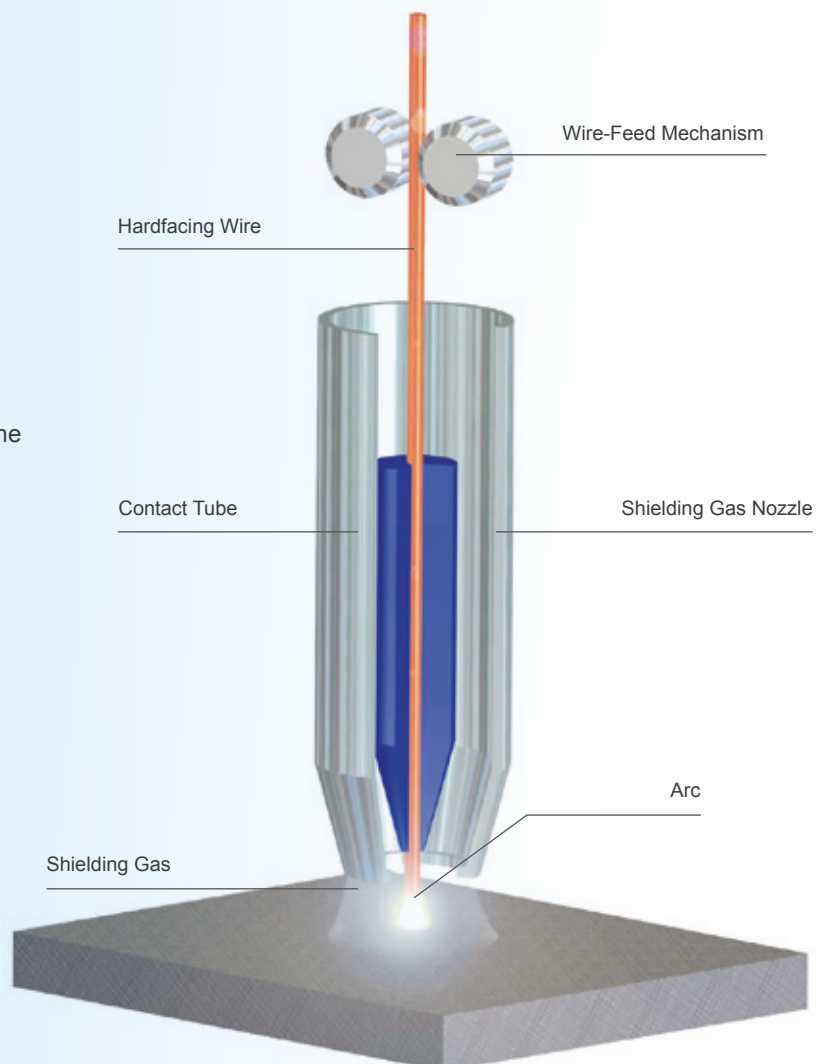


# MIG WELD DEPOSITION, SUBMERGED ARC WELDING

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 welding, also known as Gas Metal Arc Welding (GMAW), the weld pool is protected from the atmosphere by a stream of shielding gas. The MIG process is very flexible – it can be partially or fully mechanised and is suitable for a wide range of applications.

Wire is also used as the hardfacing consumable in the Submerged Arc Welding (SAW) 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, shielding the cooling weld pool from the atmosphere.



## MIG Weld Deposition

Alloy	Nominal analysis of undiluted weld metal <sup>1</sup>									UNS	ASME/ AWS <sup>2</sup>	Hardness (HRC) <sup>3</sup>
	Co	Cr	W	C	Ni	Mo	Fe	Si	Others			
<b>COBALT-BASED ALLOY CORED WIRE</b>												
Stellite™ alloy 1	Bal.	28	11.5	2.45	<3.0	< 1.0	<5.0	<2.0	<1.0	W73031	(SF)A 5.21 ERCCoCr-C	50–55
Stellite™ alloy 6	Bal.	30	4.5	1.2	<3.0	<1.0	<5.0	<2.0	<1.0	W73036	(SF)A 5.21 ERCCoCr-A	38–44
Stellite™ alloy 12	Bal.	29	8	1.55	<3.0	<1.0	<5.0	<2.0	<1.0	W73042	(SF)A 5.21 ERCCoCr-B	45–50
Stellite™ alloy 21	Bal.	28	—	0.25	3	5.2	<5.0	<1.5	<1.0	W73041	(SF)A 5.21 ERCCoCr-E	28–40 *
Stellite™ alloy 21 LC	Bal.	26	—	0.1	4	6.0	<5.0	<1.5	<1.5	Proprietary crack-resistant alloy specially developed for hardfacing of forging dies		25–40 *
Stellite™ alloy 25	Bal.	20	14	0.1	10	<1.0	<3.0	<1.0	<1.0	—	—	20–45 *
Stellite™ alloy 250	Bal.	28	—	0.1	—	—	21	<1.0	<1.0	—	—	20–28
Stellite™ alloy 706	Bal.	31	—	1.2	<3.0	4	<3.0	<1.0	<1.0	—	—	39–44
Stellite™ alloy 712	Bal.	31	—	1.55	<3.0	8	<3.0	<2.0	<1.0	—	—	46–51
ULTIMET™	Bal.	26	2	0.06	9	5	3	—	<1.0	R31233	—	28–45 *
<b>NICKEL-BASED ALLOY CORED WIRE</b>												
Nistelle™ alloy C	—	17	5	0.1	Bal.	17	6	—	0.3% V	N30002	—	17–27*
Deloro™ alloy 40	—	10	—	0.4	Bal.	—	2–3	2.9	1.6% B	W89634	(SF)A 5.21 ERNiCr-A	35–40
Deloro™ alloy 50	—	12	—	0.5	Bal.	—	3–5	3.5	2.2% B	W89635	(SF)A 5.21 ERNiCr-B	47–52
Deloro™ alloy 60	—	13	—	0.7	Bal.	—	3–5	4.3	3.0% B	W89636	(SF)A 5.21 ERNiCr-C	56–61
<b>INTER-METALLIC LAVES PHASE ALLOY CORED WIRE (TRIBALLOY™ ALLOYS)</b>												
Tribaloy™ alloy T-401	Bal.	17	—	0.2	<1.5	22	<1.5	1.3	—	—	—	46–52

<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specification/standard used when ordering.

<sup>2</sup> When written certification to a standard is required, please specify this when ordering. Certain products can also be certified to AMS, SAE, and other standards. Please contact us for more details.

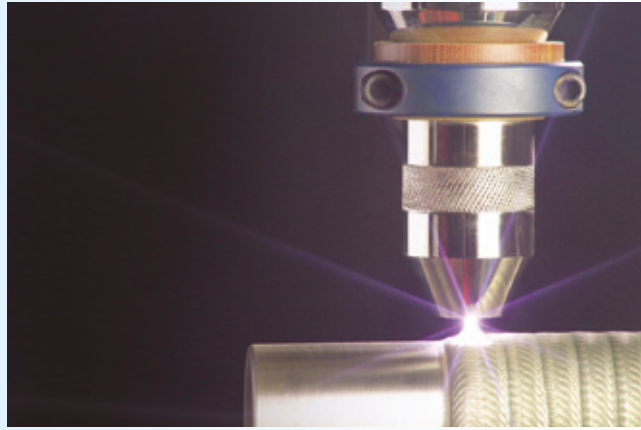
<sup>3</sup> Undiluted weld metal. Please note that the hardness of the Deloro™ Ni-based alloys is very sensitive to dilution. Depending upon the process parameters and extent of dilution, the hardness of the alloy may vary from that provided in the above table.

\* Depending on the degree of cold working.

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### Electrodes are available in these standard diameters:

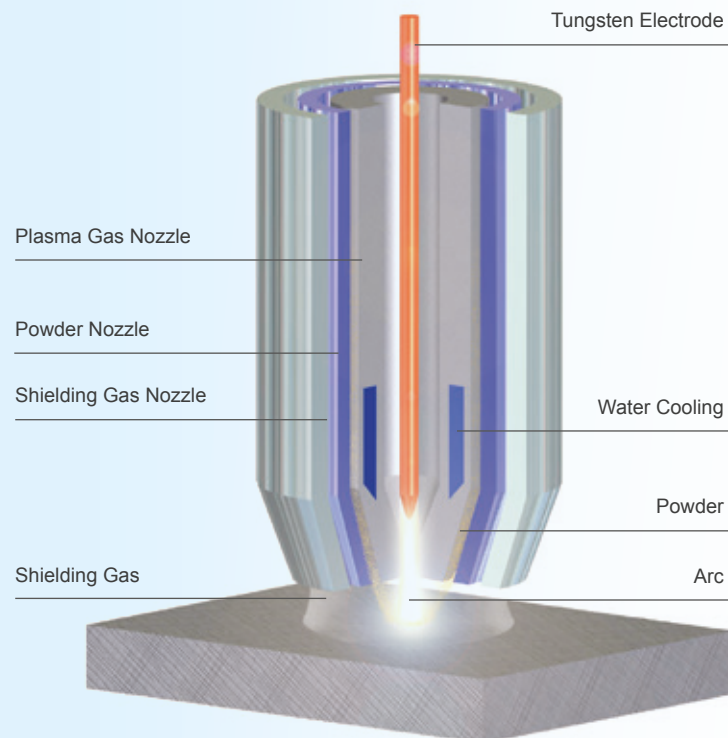
- 1,2mm (0.045") — supplied in 15 kg (33 lb) spools
- 1,6mm (0.062") — supplied in 15 kg (33 lb) spools
- 2,4mm (0.093") — typically supplied in 25 kg (55 lb) spools (optionally in 15 kg spools)
- 3,2mm (0.126") (special order) — supplied in 15 kg (33 lb) spools



# PLASMA TRANSFERRED ARC (PTA) WELD DEPOSITION

The PTA process is easily automated, providing a high degree of reproducibility of the weld overlays. In addition, because of the highly concentrated heat source, this process benefits from high powder utilization 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.

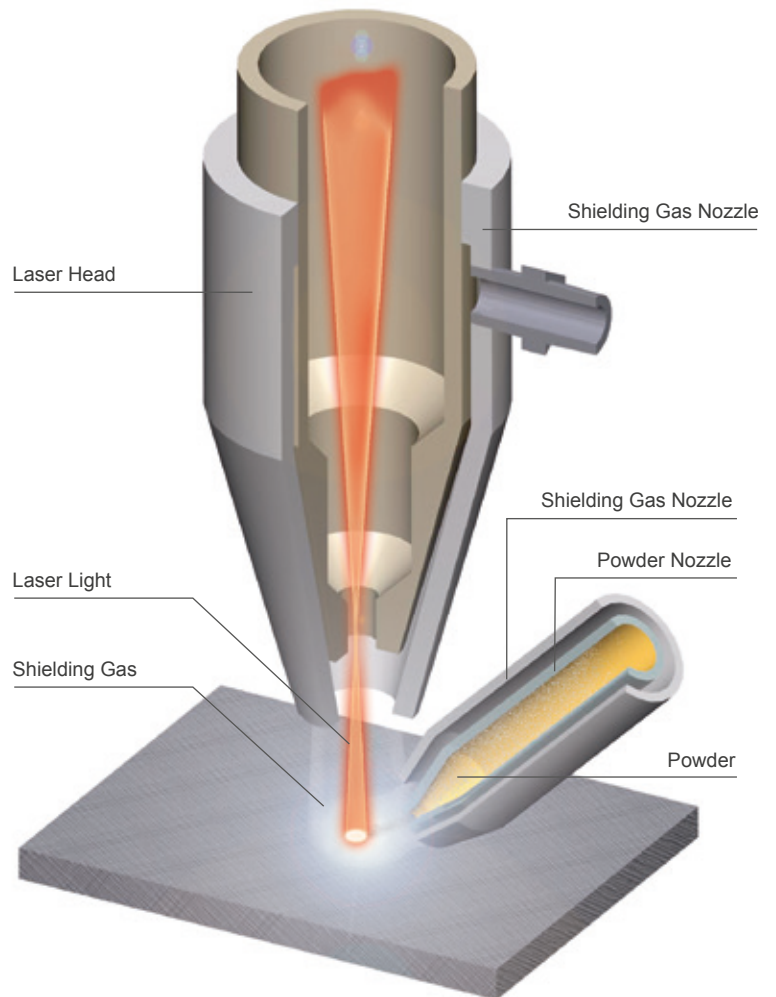


**!** We manufacture fit-for-purpose PTA equipment packages. For more information's please look at page 26.

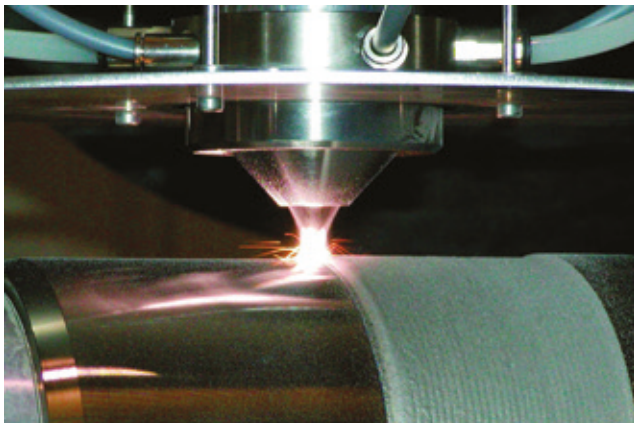
# LASER WELD DEPOSITION

When overlaying with a laser, an optical arrangement is used to focus the laser beam on the workpiece and heat it. Simultaneously, hardfacing 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, for a given hardfacing alloy, the fast cooling rate of the laser process produces an overlay with a significantly higher hardness and finer microstructure.



Picture: no coaxial powder supplying



Alloy	Nominal analysis of powder <sup>1</sup>									UNS	Hardness (HRC) <sup>2</sup>
	Co	Cr	W	C	Ni	Mo	Fe	Si	Others		
<b>COBALT-BASED ALLOY (GAS-ATOMIZED POWDERS)</b>											
Stellite™ alloy 1	Bal.	30	13	2.5	<2.0	<1.0	<2.0	<2.0	<1.0	R30001	51–60
Stellite™ alloy 4	Bal.	30	13.5	0.7	<2.5	<1.0	<2.5	<1.0	<1.0	R30404	40–50
Stellite™ alloy 6	Bal.	28.5	4.6	1.2	<2.0	<1.0	<2.0	<2.0	<1.0	R30106	40–46
Stellite™ alloy 6LC	Bal.	29	4.5	1.1	<2.0	<1.0	<2.0	<2.0	<1.0	—	38–44
Stellite™ alloy 6HC	Bal.	28.5	4.6	1.35	<2.0	<1.0	<2.0	<2.0	<1.0	—	43–53
Stellite™ alloy 156	Bal.	28	4	1.7	<2.0	<1.0	<0.5	<2.0	<1.0	—	46–54
Stellite™ alloy 12	Bal.	30	8.5	1.45	<2.0	<1.0	<2.0	<2.0	<1.0	R30012	43–53
Stellite™ alloy 20	Bal.	32.5	17.5	2.55	<2.0	<1.0	<2.0	<1.0	<1.0	—	52–62
Stellite™ alloy 21	Bal.	27.5	—	0.25	2.6	5.4	<2.0	<2.0	<1.0	R30021	27–40 *
Stellite™ alloy 22	Bal.	28	—	0.30	1.5	12	<3.0	<2.0	<0.5	—	41–49 *
Stellite™ alloy 25	Bal.	20	15	0.1	10	<1.0	2	<1.0	1.9%Mn	—	20–45 *
Stellite™ alloy 31	Bal.	26	7.5	0.5	10.5	<1.0	<2.0	<1.0	<0.5	R30031	20–35 *
Stellite™ alloy F <sup>3</sup>	Bal.	26	12.5	1.8	22	<1.0	<2.0	1.1	<0.5	R30002	40–45
Stellite™ alloy 190	Bal.	26	14	3.4	<2.0	<1.0	<2.0	<1.0	<1.0	R30014	55–60
Stellite™ alloy 250	Bal.	28	<1.0	0.1	<1.0	<1.0	20	<1.5	<1.0	—	20–28
Stellite™ alloy 694	Bal.	28.5	19.5	0.9	5	—	<3.0	<1.0	1%V	—	46–52
Stellite™ alloy 706	Bal.	29	—	1.25	<2.0	4.5	<2.0	<1.0	<1.0	—	39–44
Stellite™ alloy 712	Bal.	29	—	2.0	<2.0	8.5	<2.0	<1.0	<1.0	—	46–53
ULTIMET™	Bal.	26	2	0.07	9.4	5	3	<1.0	<1.0	R31233	20–45 *
<b>COBALT-BASED TRIBALLOY™ ALLOYS (GAS-ATOMIZED POWDERS)</b>											
Tribaloy™ alloy T-400	Bal.	8.5	—	<0.08	<1.5	29	<1.5	2.8	<1.0	R30400	51–57
Tribaloy™ alloy T-400C	Bal.	14	—	<0.08	<1.5	27	<1.5	2.6	<1.0	—	51–57
Tribaloy™ alloy T-401	Bal.	17	—	0.2	<1.5	22	<1.5	1.3	<1.0	—	45–50
Tribaloy™ alloy T-800	Bal.	17	—	<0.08	<1.5	29	<1.5	3.7	<1.0	—	53–61
Tribaloy™ alloy T-900	Bal.	18	—	<0.08	16	23	<1.5	2.8	<1.0	—	48–55
<b>NICKEL-BASED SUPERALLOYS (GAS-ATOMIZED POWDERS)</b>											
Nistelle™ alloy "Super C"	—	23	—	0.1	Bal.	18	<1.0	<1.0	—	—	15–25 *
Nistelle™ alloy C	—	17	4.5	0.1	Bal.	17	6	<1.0	0.3%V	—	17–27 *
Nistelle™ alloy C4C	—	16	—	—	Bal.	16	<1.0	<1.0	—	N06455	
Nistelle™ alloy C22	<2.0	21.5	3	—	Bal.	13.5	4	—	0.15%V	—	
Nistelle™ alloy C276	—	15.5	3.7	—	Bal.	16	5.5	<1.0	0.15%V	—	
Nistelle™ alloy X	1.5	22	<1.0	0.15	Bal.	9.1	18.5	<1.0	<1.0%	N06002	
Nistelle™ alloy 305	—	42	—	—	Bal.	—	—	0.5	<1.0%	—	
Nistelle™ alloy 2315	—	20	—	—	Bal.	—	—	<1.0	<1.0%	—	
Nistelle™ alloy 600	—	15.5	—	—	Bal.	—	8	<0.5	<1.0%	N06600	
Nistelle™ alloy 625	—	21.5	—	<1.0	Bal.	9	<1.0	<0.5	3.5% Nb	N06625	
Nistelle™ alloy 718	<2.0	21.5	3	—	Bal.	13.5	4	—	0.15%V	N07718	

Alloy	Nominal analysis of powder <sup>1</sup>									UNS	Hardness (HRC) <sup>2</sup>
	Co	Cr	W	C	Ni	Mo	Fe	Si	Others		
<b>NICKEL-BASED ALLOY (GAS-ATOMIZED POWDERS)</b>											
Deloro™ alloy 22	—	—	—	<0.05	Bal.	—	<1.0	2.5	1.4%B	—	20–22
Deloro™ alloy 30	—	9	—	0.2	Bal.	—	2.3	3.2	1.2%B	—	27–31
Deloro™ alloy 38	—	—	—	0.05	Bal.	—	0.5	3.0	2.1%B	—	35–39
Deloro™ alloy 40	—	7.5	—	0.3	Bal.	—	2.5	3.5	1.7%B	N99644	38–42
Deloro™ alloy 45	—	9	—	0.35	Bal.	—	2.5	3.7	1.9%B	—	44–47
Deloro™ alloy 46	—	—	—	0.05	Bal.	—	—	3.7	1.9%B	—	32–40
Deloro™ alloy 50	—	11	—	0.45	Bal.	—	3.3	3.9	2.3%B	N99645	48–52
Deloro™ alloy 55	—	12	—	0.6	Bal.	—	4.0	4.0	2.7%B	—	52–57
Deloro™ alloy 60	—	15	—	0.7	Bal.	—	4.0	4.4	3.1%B	N99646	57–62
Extrudalloy 50	15	21	—	1.3	Bal.	6	<1.0	3.0	2.3%B	—	—
<b>NICKEL-BASED TRIBALLOY® ALLOYS (GAS-ATOMIZED POWDERS)</b>											
Triballoy™ alloy T-700	<1.5	16	—	0.08	Bal.	32	<1.5	3.4	<1.0	—	45–52
<b>IRON-BASED HARDFACING ALLOYS (GAS-ATOMIZED POWDERS)</b>											
Delcrome™ 90	—	27	—	2.9	—	—	Bal.	<1.0	0.5%Mn	—	Depends on heat treatment
Delcrome™ 92	<0.5	<1.0	—	3.8	<1.0	10	Bal.	<1.0	<1%Mn	—	55–63
Delcrome™ 253	<0.5	28	—	1.9	16.5	4.5	Bal.	1.3	0.8%Mn	—	
Delcrome™ 316	<0.5	17	—	0.05	11	2.6	Bal.	2.5	0.4%Mn	—	<180 DPH
Delcrome™ 316L Delcrome™ 317	<0.5	18	—	<0.03	13	2.6	Bal.	1.8	0.7%Mn	—	<180 DPH
Tristelle™ TS-3	12	35	—	3.1	10	—	Bal.	4.8	0.3%Mn	—	47–51
Delcrome™ 6272	<0.5	25	—	2.5	14	7	Bal.	1.8	<1.0%	—	
<b>CARBIDES IN A CORROSION-RESISTANT HARD ALLOY MATRIX</b>											
Super Stelcar™ alloy 9365	WC in an alloy matrix										
Super Stelcar™ alloy 50 plus	WC in a Deloro™ 50 alloy matrix										
Super Stelcar™ alloy 60 plus	WC in a Deloro™ 60 matrix										

<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specifications/standard used when ordering.

<sup>2</sup> Undiluted weld metal. Depending upon the process parameters and extent of dilution, the hardness of the weld deposit may vary from that provided in the above table.

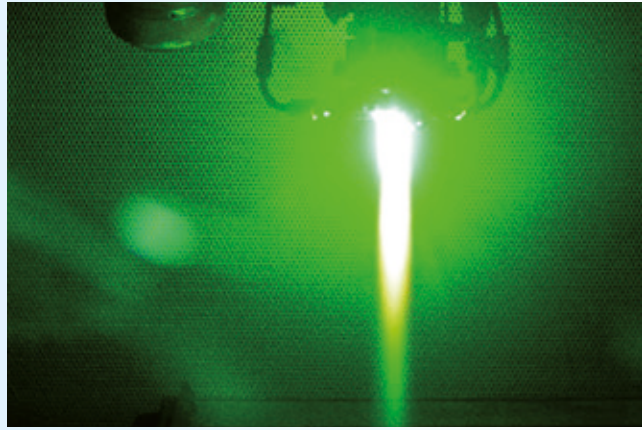
<sup>3</sup> Stellite™ Alloy F usually made to customer specification.

\* Depending upon the degree of work hardening.

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**PTA and laser hardfacing powders are available in these standard powder particle size ranges and custom sizes upon request.**

- WM 53–180µm
- WE 63–180µm
- E 53–150µm
- G 38–125µm
- HK 63–210µm
- W 63–150µm

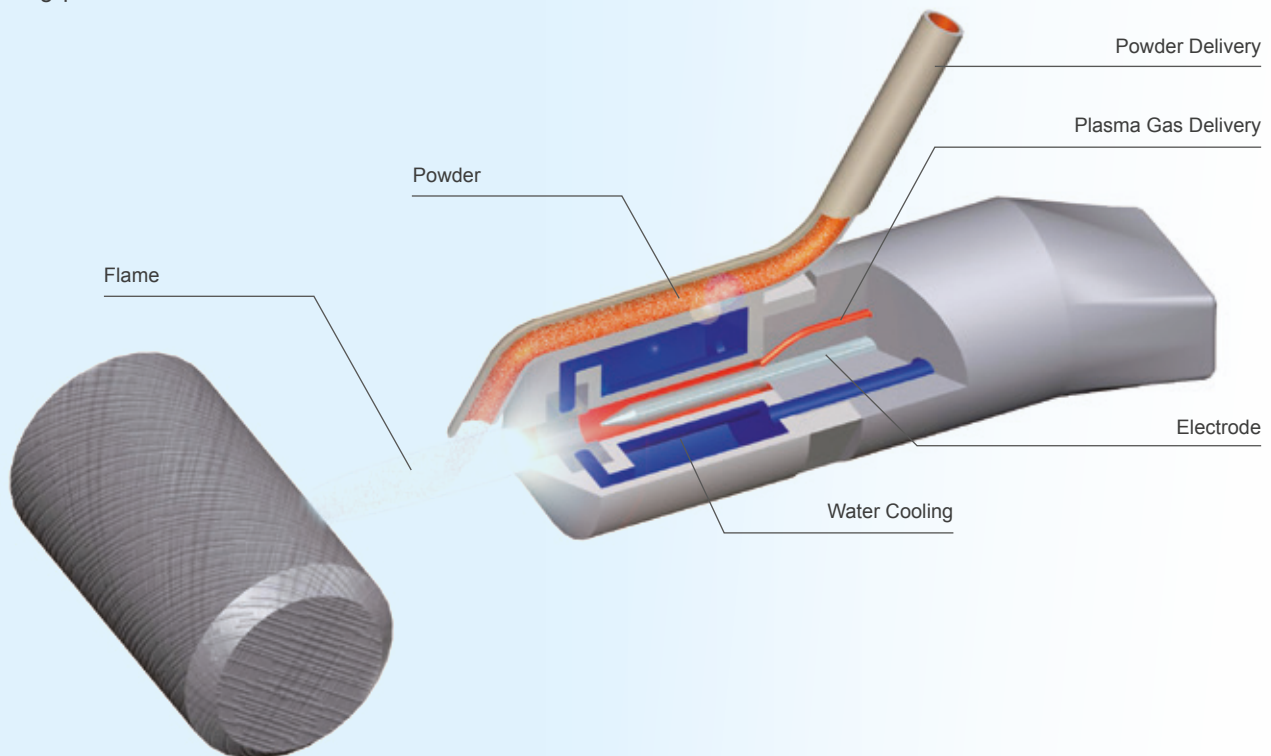


# PLASMA SPRAYING

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.



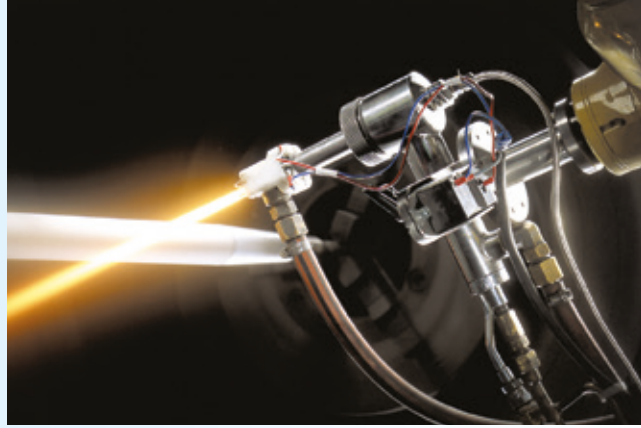


## Plasma Spraying Deposition

Product	Nominal analysis of powder <sup>1</sup>							Hardness <sup>2</sup>	Nominal size (µm)
<b>COBALT-BASED PLASMA SPRAY POWDERS</b>									
	Co	Ni	Cr	W	Mo	C	Others		
Stellite™ 157	Bal.	—	21	4.5	—	<0.2	B 2.4 Si 1.5	Not Available	45/5
Tribaloy™ T-400	Bal.	—	8.5	—	29	<0.08	Si 2.6	52 HRC	45/5
Tribaloy™ T-900	Bal.	16	18	—	23	<0.08	Si 2.7	52 HRC	75/D 53/10
<b>NICKEL-BASED PLASMA SPRAY POWDERS</b>									
	Ni	Fe	Cr	W	Mo	C	Others		
Deloro™ 55	Bal.	4	12	—	—	0.6	Si 4.0 B 2.7	52-57 HRC	Various
Deloro™ 60	Bal.	4	15	—	—	0.7	Si 4.4 B 3.1	58-62 HRC	Various
Nistelle™ C276	Bal.	5	15.5	3.8	16	—	—	Not Available	106/D 45/5
Nistelle™ 625	Bal.	<5	21.5	—	9	—	(Nb+Ta) 3.7	385-460 DPH 79-83 R15N (equiv. to HRC: ~37-46)	Various
Nistelle™ 2315	Bal.	—	20	—	—	—	—	Not Available	106/D 75/45 45/5
Nistelle™ 2350	Bal.	—	—	—	—	—	Al 5	~ 70 HRB	75/45
<b>GAS-ATMOZED IRON-BASED PLASMA SPRAY POWDERS</b>									
	Co	Ni	Fe	Cr	C	Others			
Delcrome™ 90	—	—	Bal.	27	2.8	Si 0.5		Not Available	53/10
Delcrome™ 92	—	—	Bal.	—	3.7	Mo 10		Not Available	45/D
Delcrome™ 316L/317	—	13	Bal.	17	0.03	Mo 2.5 Si 1		~ 180 DPH	106/38 106/D 45/5
Tristelle™ TS-3	12	10	Bal.	35	3	Si 5		>55 HRC	45/5

<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specifications/standard used when ordering.  
<sup>2</sup> Depending upon the process parameters the hardness of the alloy may vary from that provided in the above table.

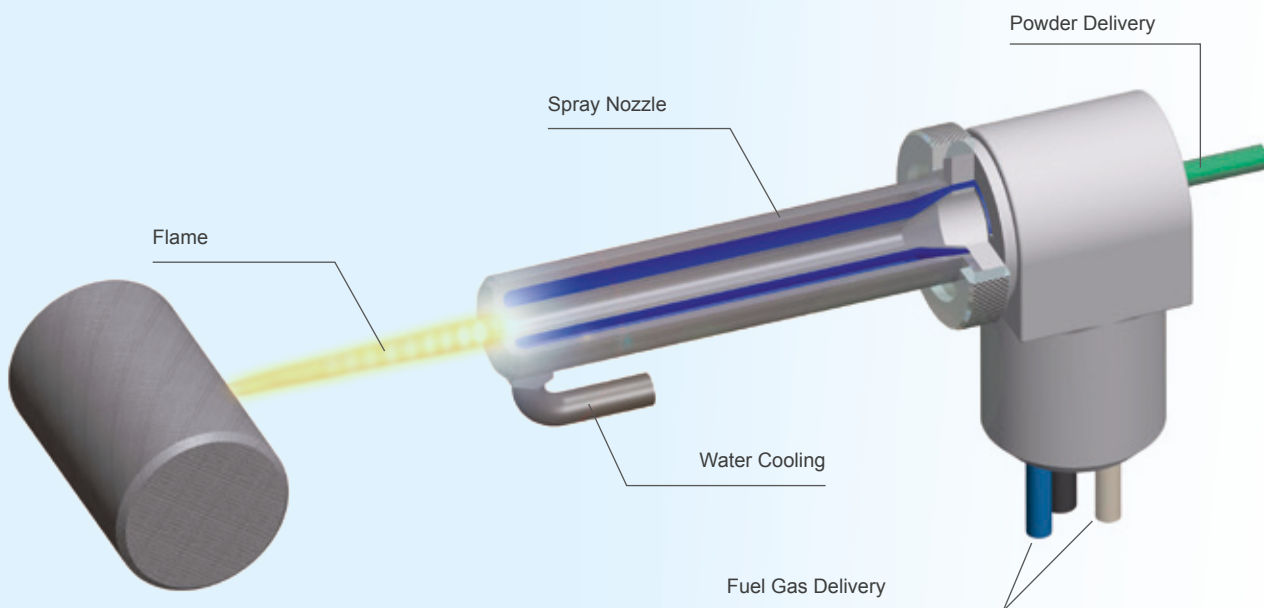
**Powders labelled “JK” are intended primarily for HFOV spraying with the Jet Kote™ or Diamond Jet™ torches but can also be used for plasma spraying. Some of these powders may be listed on page 19 and 20 in different nominal size ranges for other thermal spray processes.**



# HIGH-VELOCITY OXY-FUEL SPRAY (HVOF)

In the HVOF 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.



# HVOF Deposition

Product	Powder Type	Nominal analysis of powder <sup>1</sup>					Hardness <sup>2</sup>	Nominal size (µm) and manufacturing method		
		Co	Ni	Cr	W	C				
<b>TUNGSTEN CARBIDE HVOF POWDERS</b>										
JK™ 112H	WC-12Co with fine carbides	12	—	—	Bal.	5.5	1140–1296 DPH 92.7–94.6 R15N	53/10 Agglomerated, sintered & densified.		
JK™ 112P (Also sold as JK™ 7112)	WC-12Co with fine carbides	12	—	—	Bal.	5.5	960–1150 DPH 89–93 R15N (equiv. to HRC: ~67–71)	45/10 Agglomerated, sintered & densified.		
JK™ 114 (Also sold as JK™ 7114)	WC-12Co with coarse carbides	12	—	—	Bal.	4	1000–1150 DPH 87–94 R15N (equiv. to HRC: ~68–71)	45/10 Agglomerated, sintered & crushed.		
JK™ 117 (Also sold as JK™ 7117)	WC-17Co with intermediate carbides	17	—	—	Bal.	5.2	960–1240 DPH 90–95 R15N (equiv. to HRC: ~67–72)	53/15 Agglomerated & sintered		
JK™ 119	WC-9Co with coarse carbides	9	—	—	Bal.	4.3	860–1170 DPH 89–94 R15N (equiv. to HRC: ~65–71)	45/5 Sintered & crushed, blocky.		
JK™ 120H (Also sold as JK™ 7109)	WC-10Co-4Cr	10	—	4	Bal.	5.4	1160–1370 DPH 93–95 R15N (equiv. to HRC: ~71–73)	45/5 Agglomerated, sintered & densified.		
JK™ 120P (Also sold as JK™ 7109)	WC-10Co-4Cr	10	—	4	Bal.	5.4	825–1030 DPH 89–91 R15N (equiv. to HRC: ~65–71)	53/10 Agglomerated, sintered & densified.		
JK™ 125 (Also sold as JK™ 7175)	A mixed carbide with nickel 70%(W, Cr)xCy 25%WC 6%Ni	—	6	20	Bal.	5	900–1100 DPH 89–92 R15N (equiv. to HRC: ~66–70)	53/10 Agglomerated, sintered & densified.		
JK™ 6189	WC 10Ni with large carbides	—	10	—	Bal.	3.7	Not available	53/10 Sintered & crushed		
<b>CHROMIUM CARBIDE HVOF POWDERS</b>										
JK™ 135 (Also sold as JK™ 7184)	75% Cr3C2 25% NiCr	—	20	Bal.	—	9.7	1140–1296 DPH 92.7–94.6 R15N	53/10 Agglomerated, sintered & densified.		
<b>GAS-ATOMIZED STELLITE™ COBALT-BASED HVOF POWDERS</b>										
Product	Stellite™ Alloy No.	Nominal analysis of powder <sup>1</sup>							Hardness <sup>2</sup>	Nominal size (µm)
		Co	Ni	Cr	W	Mo	C	Others		
JK™ 571 (Also sold as JK™ 7221)	21	Bal.	2.5	28	—	5.5	0.25	Si 2	400–520 DPH 80.5–84.5 R15N (equiv. to HRC: ~40–50)	53/10
JK™ 572 (Also sold as JK™ 7212)	12	Bal.	—	29.5	8	—	1.4	Si 1.5	680–675 DPH 88.1–89.5 R15N	53/10
JK™ 573 (Also sold as JK™ 7231)	31	Bal.	10.5	25.5	7.5	—	0.5	—	32 HRC	45/10
JK™ 575 (Also sold as JK™ 7201)	1	Bal.	—	30	12	—	2.5	—	Not available	53/10
JK™ 576 (Also sold as JK™ 7206)	6	Bal.	—	28	4.5	—	1.1	Si 1.1	495–580 DPH 81.5–86.5 R15N (equiv. to HRC: ~43–54)	53/10
JK™ 577	SF6	Bal.	14.5	19	7.5	—	0.7	Si 2.5 B 1.6	635–790 DPH (505-525 when fused) ~ 85.5 R15N (equiv. to HRC: ~50–51)	53/10
JK™ 579 (Also sold as JK™ 7225)	25	Bal.	10	20	15	1	0.1	Si 1 Mn 1.5	450–490 DPH 82–85.5 R15N (equiv. to HRC: ~43–50) (varies strongly depending on spray parameters)	53/10

Powders labelled "JK" are intended primarily for HVOF spraying with the Jet Kote™ or Diamond Jet™ torches but can also be used for plasma spraying. Some of these powders may be listed below in different nominal size ranges for other thermal spray processes.

<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specifications/standard used when ordering.

<sup>2</sup> Depending upon the process parameters, the hardness of the weld deposit may vary from that provided in the above table.

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Diamond Jet™ is a registered trademark of Sulzer Metco.

# HVOF Deposition

Product	Alloy Name/ Powder Type	Nominal analysis of powder <sup>1</sup>							Hardness <sup>2</sup>	Nominal size (µm)
<b>GAS-ATOMIZED TRIBALOY™ COBALT-BASED HVOF POWDERS</b>										
		Co	Ni	Cr	W	Mo	C	Others		
JK™ 554 (Also sold as JK™ 7560)	T-400	Bal.	—	8.5	—	29	<0.08	Si 2.6	450–600 DPH 86–87.5 R15N (equiv. to HRC: ~52–55)	53/10
JK™ 558H Typically used with hydrogen fuel	T-800	Bal.	—	18	—	28	<0.08	Si 3.4	670–780 DPH 89–92 R15N (equiv. to HRC: ~58–64)	45/5
JK™ 558P Typically used with carbon fuel (Also sold as JK™ 7580)	T-800	Bal.	—	18	—	28	<0.08	Si 3.4	455–620 DPH 83.5–88.5 R15N (equiv. to HRC: ~46–56)	53/10
JK™ 559H (Special order)	T-900	Bal.	16	18	—	23	<0.08	Si 2.7	~ 700 DPH	45/5
JK™ 559P (Special order)	T-900	Bal.	16	18	—	23	<0.08	Si 2.7	~ 500 DPH	53/10
ULTIMET™ for JK™ and Plasma Spray	ULTIMET™	Bal.	9	26	2	5	0.06	Si 0.3	~ 500 DPH	53/20
<b>GAS-ATOMIZED NICKEL-BASED POWDERS</b>										
		Ni	Fe	Cr	W	Mo	C	Others		
JK™ 347	Nistelle™ 2347	Bal.	—	—	—	5	—	Al 6	332–336 DPH 75.3–78.1 R15N	63/15
JK™ 350 (Also sold as JK™ 7301)	Nistelle™ 2350	Bal.	—	—	—	—	—	Al 5	285–335 DPH 71–76 R15N	63/15
JK™ 557 (Also sold as JK™ 7570)	Tribaloy™ T-700	Bal.	—	15.5	—	32.5	<0.08	Si 3.4	~ 700 DPH	45/10
JK™ 584 (Also sold as JK™ 7640)	Deloro™ 40	Bal.	2.5	7.5	—	—	0.25	Si 3.5 B 1.7	~ 40 HRC	53/10
JK™ 585 (Also sold as JK™ 7650)	Deloro™ 50	Bal.	2.9	11	—	—	0.45	Si 4 B 2.3	~ 50 HRC	53/10
JK™ 586 (Also sold as JK™ 7660)	Deloro™ 60	Bal.	4	15	—	—	0.7	Si 4.4 B 3.1	~ 60 HRC	53/10
JK™ 591H	Nistelle™ C	Bal.	5.5	16.5	4.5	17	—	—	400–440 DPH ~ 83 R15N (equiv. to HRC: ~44–45)	45/5
JK™ 591P (Also sold as JK™ 7391)	Nistelle™ C	Bal.	5.5	16.5	4.5	17	—	—	375–390 DPH ~ 80 R15N (equiv. to HRC: ~39–41)	63/15
Nistelle™ Super C (Jet Kote™)	Nistelle™ “Super C”	Bal.	—	23	—	18	—	—	410 DPH (equiv. to HRC: ~ 41)	P: 53/15 H: 45/10
JK™ 594 (Also sold as JK™ 7392)	Nistelle™ C-4C	Bal.	—	16	—	16.5	—	—	380–440 DPH ~ 81–83 R15N (equiv. to HRC: ~40–44)	53/15
JK™ 625 (Also sold as JK™ 7342)	Nistelle™ 625	Bal.	<5	21.5	—	9	—	(Nb+Ta) 3.7	385–460 DPH ~ 79–83 R15N (equiv. to HRC: ~37–46)	53/20
JK™ 718 (Also sold as JK™ 7341)	Nistelle™ 718	Bal.	18	19	—	3	0.06	(Nb+Ta) 5 Al 0.5, Ti 1	275–470 DPH 72.5–81.5 R15N (equiv. to HRC: ~25–45)	45/15
<b>GAS-ATOMIZED IRON-BASED HVOF POWDERS</b>										
		Co	Ni	Fe	Cr	C	Others			
JK™ 513 (Also sold as JK™ 7330)	316 Stainless Steel	—	13	Bal.	17	0.1	Mo 2.5 Si 1		260–315 DPH 69–75 R15N	53/10

Powders labelled “JK” are intended primarily for HFOV spraying with the Jet Kote™ or Diamond Jet™ torches but can also be used for plasma spraying. Some of these powders may be listed below in different nominal size ranges for other thermal spray processes.

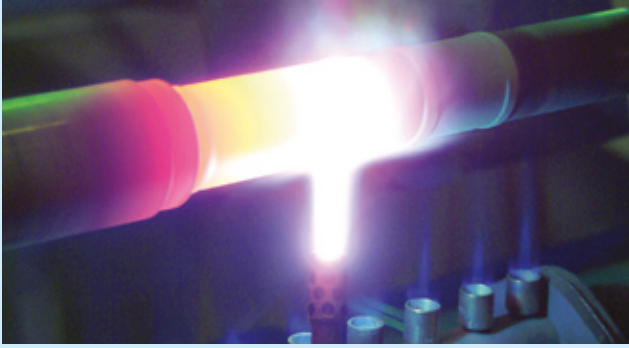
<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specifications/standard used when ordering.

<sup>2</sup> Depending upon the process parameters, the hardness of the weld deposit may vary from that provided in the above table.

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## FLAME SPRAYING WITH SUBSEQUENT FUSING (SPRAY AND FUSE)

Spray and fuse is a two-stage process, the powder alloy being deposited first by flame spraying and then fused. During fusing, the deposit is partially remelted and allowed to resolidify.

In flame-spraying, the powder 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.

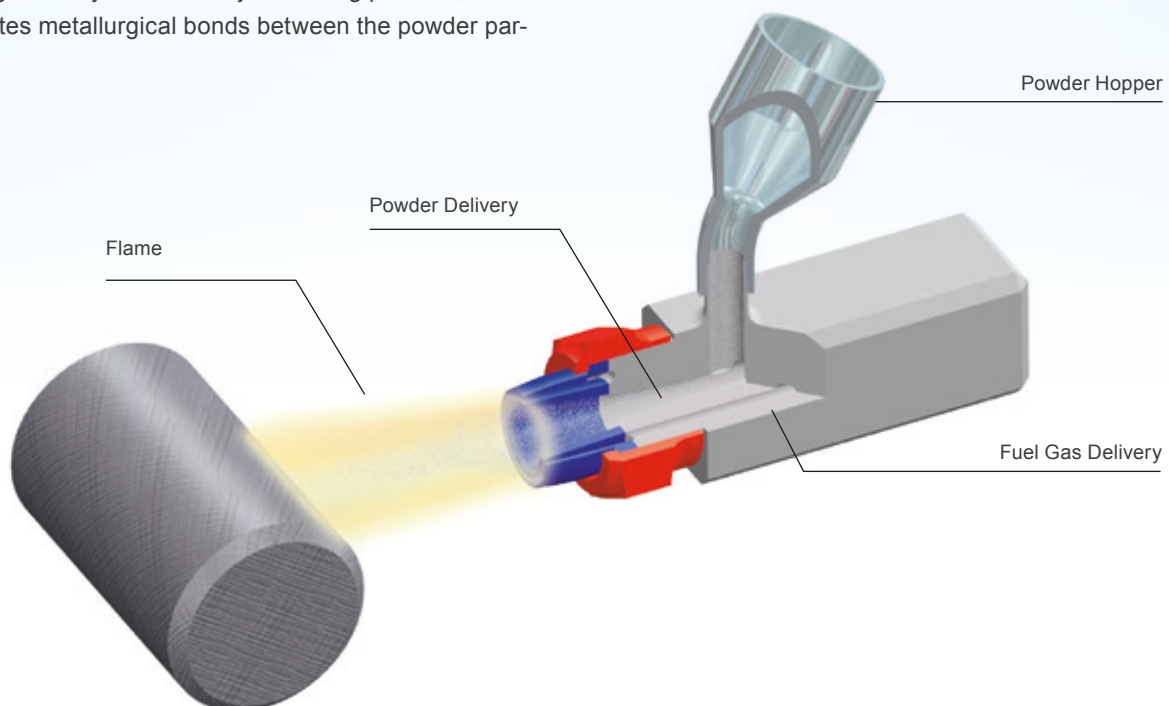
The second stage of the process, fusing the sprayed coating to the workpiece, is usually done with an oxyacetylene burner. Alternatively, for mass production, fusing can be carried out by induction heating or in a vacuum furnace.

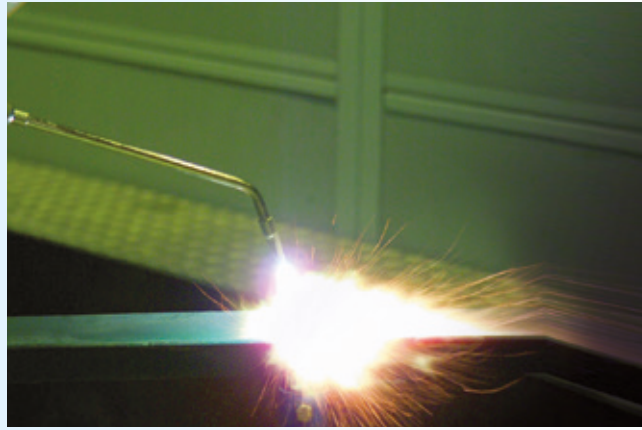
The bonding of the sprayed coating to the workpiece is significantly increased by the fusing process, which creates metallurgical bonds between the powder par-

titles and also between the coating and the workpiece. The coating becomes liquid and gas tight.

This process is used for the deposition of relatively thin (0,25 to 1,5 mm) layers, usually on the surface of small cylindrical objects such as pump shafts, packing gland sleeves and pistons, as an alternative to the greater deposit thickness obtained from oxy-acetylene and arc processes. The process can also be used for the facing of flat surfaces, but its possibilities for this type of work are limited.

Since the deposit is thinner and more uniform than that obtained by other welding methods and the heat for fusion is applied uniformly and rapidly, shrinkage and distortion of the component is frequently very small. When the fusing operation is carried out correctly, dilution of the deposit by the base metal is negligible.

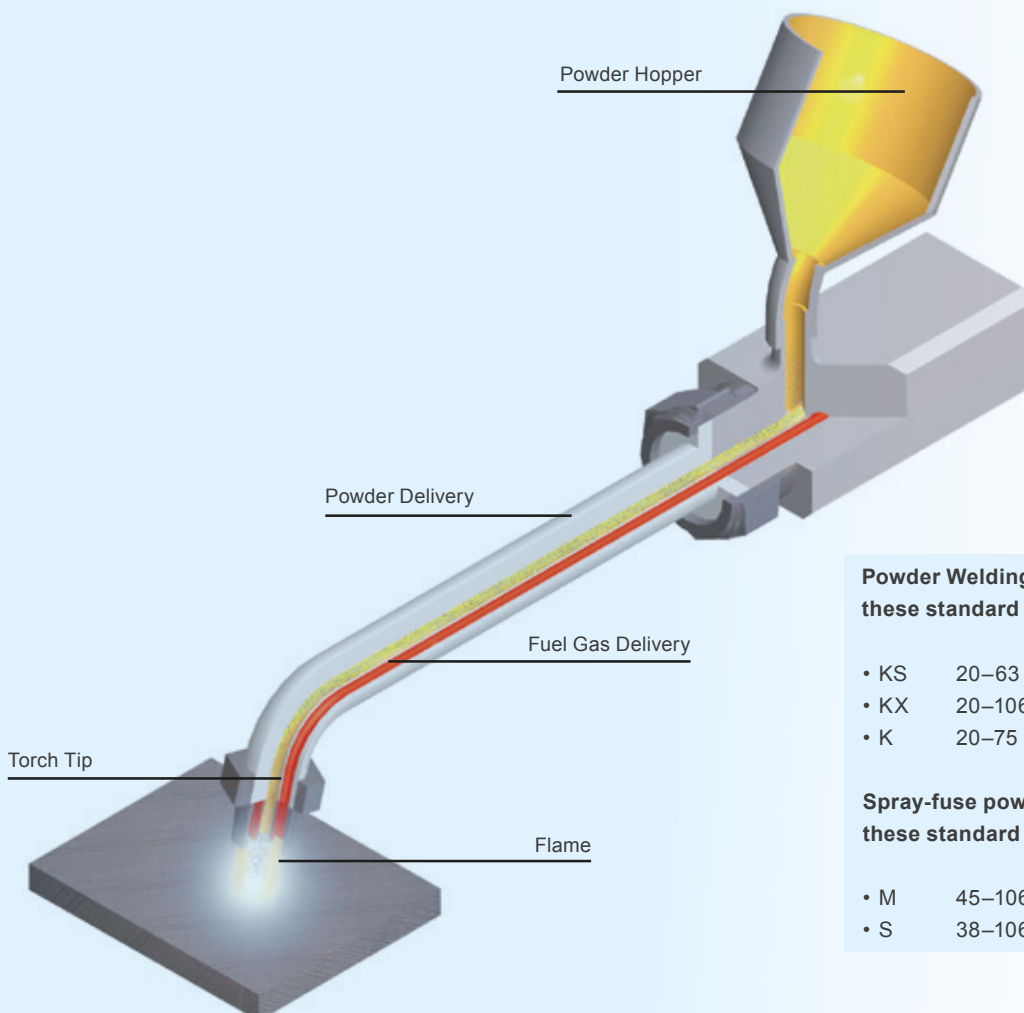




# POWDER WELDING

A specially-designed oxy-acetylene 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 transferred to the workpiece through the flame.

The powder-weld process is ideal for the deposition of smooth, thin, well-bonded layers on flat surfaces on a wide range of substrates, including cast iron. The hardfacing takes place at lower temperatures, which minimizes oxidation and distortion of the workpiece and enables easy surfacing of edges.



**Powder Welding powders are available in these standard size ranges:**

- KS 20–63  $\mu\text{m}$
- KX 20–106  $\mu\text{m}$
- K 20–75  $\mu\text{m}$

**Spray-fuse powders are available in these standard size ranges:**

- M 45–106  $\mu\text{m}$  (Metco torch)
- S 38–106  $\mu\text{m}$  (Eutectic torch)

## Spray and Fuse & Powder Welding

Alloy	Nominal analysis of powders									Hardness (HRC) <sup>2</sup>
	Co	Cr	W	C	Ni	B	Fe	Si	Others	
<b>COBALT-BASED ALLOYS (GAS-ATOMIZED POWDERS)</b>										
Stellite™ alloy SF1	Bal.	19	13	1.3	13.5	2.45	3	2.8	<0.5% Mn	50–60
Stellite™ alloy SF6	Bal.	19	7.5	0.8	14	1.7	3	2.6	<0.5% Mn	40–48
Stellite™ alloy SF12	Bal.	19	9	1.1	14	1.9	3	2.8	<0.5% Mn	42–52
Stellite™ alloy SF20	Bal.	19	15	1.6	14	2.9	3	3.2	<0.5% Mn	55–65
Stellite™ alloy 157	Bal.	21	4,5	0.1	<2.0	2.5	<2.0	1.6	<0.5% Mn	45–55
<b>NICKEL-BASED ALLOYS (GAS-ATOMIZED POWDERS)</b>										
Deloro™ alloy 15	–	–	–	<0,05	Bal.	1.1	0.5	2.0	20% Cu	180–230 DPH
Deloro™ alloy 21	–	3	–	<0,05	Bal.	0.8	<0.5	2.1	2.2%	240–280 DPH
Deloro™ alloy 22	–	–	–	<0,05	Bal.	1.4	<1.0	2.5	–	18–24
Deloro™ alloy 25	–	–	–	<0,06	Bal.	1.7	<1.0	2.7	–	22–28
Deloro™ alloy 29	–	3	–	<0,05	Bal.	0.9	<0.5	2.2	2.2%	27–30
Deloro™ alloy 30	–	9	–	0.2	Bal.	1.2	2.3	3.2	–	29–39
Deloro™ alloy 34	–	4.5	–	0.15	Bal.	1.2	0.3	2.8	2.5% Mo 2.2% Other	33–37
Deloro™ alloy 35	–	4	–	0.4	Bal.	1.6	1.5	3.4	–	32–42
Deloro™ alloy 36	–	7	–	0.3	Bal.	1.2	3	3.7	–	34–42
Deloro™ alloy 38	–	–	–	0.05	Bal.	2.1	0.5	3.0	–	35–42
Deloro™ alloy 40	–	7.5	–	0.3	Bal.	1.7	2.5	3.5	–	38–45
Deloro™ alloy 45	–	9	–	0.35	Bal.	1.9	2.5	3.7	–	42–50
Deloro™ alloy 50	–	11	–	0.45	Bal.	2.3	3.3	3.9	–	47–53
Deloro™ alloy 55	–	12	–	0.6	Bal.	2.7	4.0	4.0	–	52–60
Deloro™ alloy 60	–	15	–	0.7	Bal.	3.1	4.0	4.4	–	57–65
Deloro™ alloy 75	–	17	–	0.9	Bal.	3.5	4.5	4.5	2% Cu 3% Mo	53–63
Deloro™ alloy 6116	–	15.3	–	0.03	Bal.	4.0	–	–	–	–
<b>COMPOSITE ALLOYS</b>										
Stelcar™ Powders	Blends of WC, WC/Co and Deloro™ alloy powders. Size and chemistry to customer requirements									
Super Stelcar™ 40	Blend of tungsten carbide (40%) and Deloro 50™ alloy (60%)									
Super Stelcar™ 50	Blend of tungsten carbide (50%) and Deloro 50™ alloy (50%)									
Super Stelcar™ 60	Blend of tungsten carbide (60%) and Deloro 50™ alloy (40%)									
Super Stelcar™ 70	Blend of tungsten carbide (70%) and Deloro 50™ alloy (30%)									

Other alloy compositions may be available on request.

<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specification/standard used when ordering.

<sup>2</sup> Undiluted weld metal. Depending upon the process parameters the hardness of the alloy may vary from that provided in the above table.

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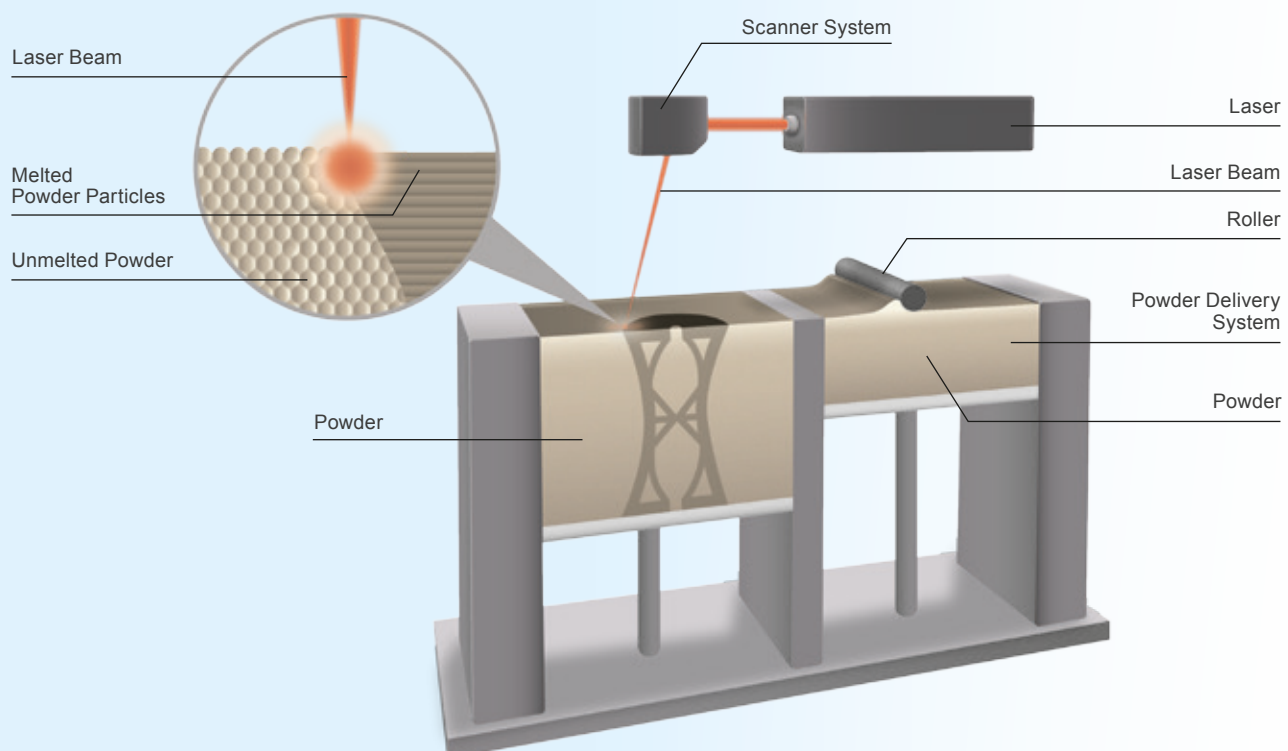
# ADDITIVE LAYER MANUFACTURING

Additive layer manufacturing of metallic parts based on a powder-bed technology, such as Selective Laser Melting, Electron Beam Melting or Binder Jet Method, require special specification of the powder used for the processes.

The quality, costs and amount of reworking of 3D-parts varies with powder properties, e.g. regarding grain size (fraction) and flow ability.

In each of the ALM processes the part is manufactured by building up layer upon layer, either directly melted or using a binder and followed by a sintering process.

The manufacturing in layers makes it possible to produce parts with challenging geometries which is not possible with conventional methods.





## ALM Deposition

Alloy	Nominal analysis of powder <sup>1</sup>							
	Co	Cr	W	C	Ni	Mo	Fe	Others
<b>COBALT-BASED ALLOY</b>								
Stellite™ alloy F75	Bal.	28	—	<0.35	<0.5	6.0	<0.75	Si, Mn, W
Stellite™ alloy 6	Bal.	28	4.5	1.2	<3.0	<1.0	<3.0	Si, Mn
Tribaloy™ alloy T-400	Bal.	8.5	—	<0.08	<1.5	28.0	<1.5	Si
Tribaloy™ alloy T-800	Bal.	18	—	<0.08	<1.5	28.0	<1.5	Si
<b>NICKEL-BASED ALLOY</b>								
Nistelle™ alloy 625	—	21	—	<0.1	Bal.	8.5	<5.0	—
<b>IRON-BASED ALLOY</b>								
Delcrome™ alloy 316L	<0.5	18	—	<0.03	13	2.6	Bal.	0.7%Mn, Si

**These Alloys are our common standard selection. We produce CoCrMo and CoCrW powders for medical applications also. Our standards cuts ALM applications are 45/10 µm and 38/10 µm. Customized chemistries and grain size distributions are possible on special request. Please contact us for more details.**

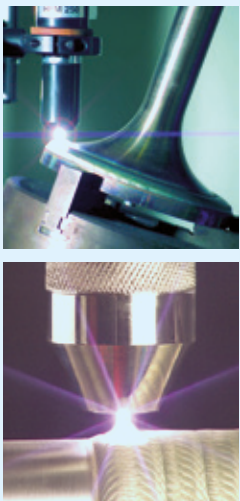
<sup>1</sup> Nominal analysis is a guideline only for standard product. Does not include all incidental elements and may differ depending on the exact specification/standard used when ordering.

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# PTA POWDER CLADDING SYSTEMS

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In addition to providing coating services, Deloro Wear Solutions designs and manufactures state-of-the-art PTA equipment, customized to work with our materials on your shop floor. Consider the added operational control you achieve with a turn-key equipment and material solutions.



## **BASIC LINE – PTA powder cladding systems without manipulation**

- Power sources from 250 A - 500 A
- Hand held torches for manual operation including foot pedal
- Machine torches for integration in existing handling system
- Manual or electronic mass flow controllers
- Powder feeder
- Oscillation unit for torch and integration in existing handling systems

## **COMPACT LINE – customized PTA powder cladding systems with PLC controlled manipulation, size of workpiece limited**

- Power sources from 250 A - 350 A
- Up to 3 linear axes and 1 tilting and 1 turning axis
- Machine torches for outer and inner diameter cladding
- Powder feeder
- Manual or electronic mass flow controllers
- Automated Welding
- Master Slave programming
- Non-rotationally geometries possible
- Visual control via camera possible (option)

## **PREMIUM LINE – fully customized PTA powder cladding systems with PLC controlled manipulation**

- Linear axes, tilting and turning axes and/or robotic axes as necessary for cladding task
- Machine torches for outer and inner diameter cladding
- Powder feeders with different powder volume
- Electronic mass flow controllers
- Automated Welding
- Master Slave programming
- Non-rotationally geometries possible
- Visual control via camera possible (option)

## **SYSTEM SOFTWARE for COMPACT LINE and PREMIUM LINE**

- Innovative calculation of welding time and speed
- Easy-to-use Human-Machine-Interface
- User guided programming
- Teach in of welding paths for different weld geometries
- Master-Slave combination of drives
- Authorization levels with RFID-Chip
- Operator administration with RFID-Chip
- Parameter tracking and documentation
- Chronological process visualization
- Tele maintenance via Internet



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Services, Consumables  
and Equipment



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a wide range of cobalt,  
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alloys as well as tungsten  
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components



**Deloro**  
Microfusione

Leading manufacturing  
services provider for highly-  
demanding air- and vacuum-  
cast super alloy investment  
castings

## Hardfacing Alloys

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