Welding Alloys

Hardfacing Welding Consumables

Cored wires to increase wear resistance of parts

For Welding **Professionals**

Contents

Our company

Welding Alloys has been a global leader in the production of advanced welding consumables for more than 50 years. We provide innovative wear protection solutions for even the most challenging service conditions, in a range of industries.

Complementary to our welding consumables, we manufacture a range of automated equipment for hardfacing, joining and cladding. We also offer engineered wear services in our workshops, or in situ, as well as a wide range of wear plates, pipes and components.

Since 1966, the Welding Alloys name has been synonymous with excellence in research and development (R&D), resulting in a steady stream of innovative products and advanced technical solutions and services.

Welding Alloys is a participating member of the United Nations Global Compact and supports all principles relating to the environment, labour, human rights, and anti-corruption. Reflecting this, we have developed welding wires that emit less harmful fumes, and we manufacture a range of our wires using processes that produce less harmful waste for the environment. We continue to improve our products and processes in order to reduce the negative impact on both the welder and the environment.

Quality & innovation

Welding Alloys has a wealth of experience and expertise in the design and manufacture of flux and metal cored welding wires. We have globally located R&D teams capable of designing a large range of hardfacing cored wires, based on a culture of continuous development and innovation.

Since inception in 1966, innovation has always played a key role at Welding Alloys. We partner with customers globally to develop new opportunities and unique solutions. Our R&D and technical teams remain at the heart of the business, able to solve the most complex industrial wear protection challenges.

We have total control over design, development and production. Our wires are produced using our own manufacturing equipment, which is installed in our production plants worldwide. This means we can ensure the highest quality is maintained throughout the manufacturing process. We pride ourselves on our stringent quality control measures. Regular laboratory tests and quality checks are carried out at various stages of production.

Welding Alloys backs its products and services with teams of technical experts active in 150 countries across the world who work closely with customers to deliver best-in-class solutions to every major industrial sector.

Innovation is at the core of everything we do, we never stop learning.

Industry solutions

Welding Alloys offers the widest range of hardfacing cored wires.

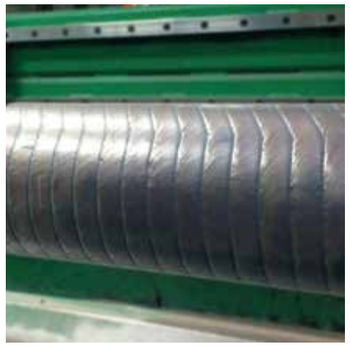
Our solutions are customer-based with a focus on the reduction of total cost of ownership. This is achieved by taking the time to understand our customers' operational requirements, needs and expectations, and delivering bespoke solutions focused on reducing maintenance costs and increasing the service life of parts.

Welding Alloys provides solutions in a range of different industries, including but not limited to:

- Cement
- Steel Making
- Sugar
- Power
- Mining, Quarries & Earthmoving
- Recycling & Waste
- Petrochemical, Oil & Gas
- Railways
- Hydropower
- Agriculture & Food
- Pulp & Paper
- Forging

Cement: hardfacing of a mill table

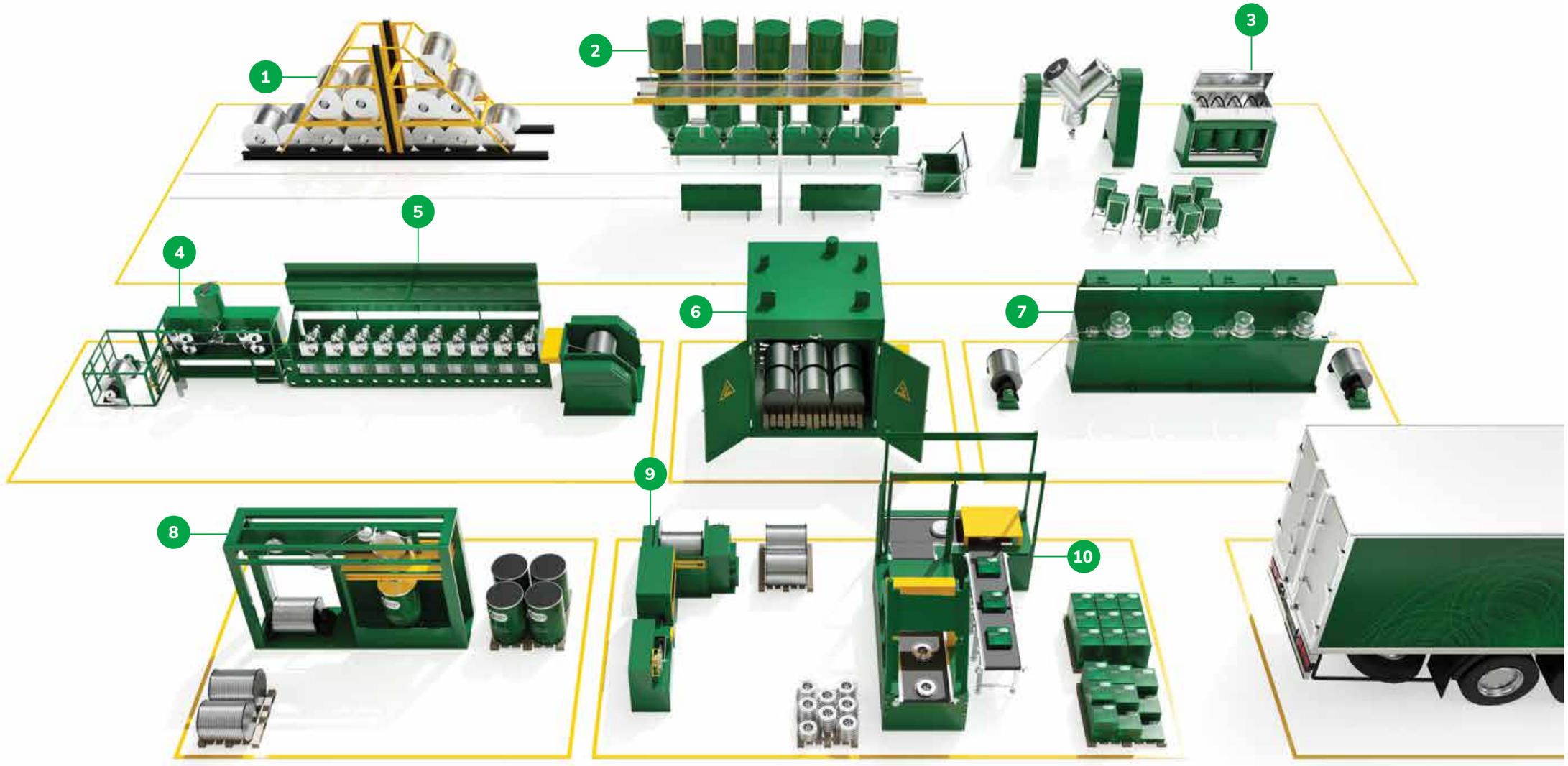
Mining: hardfaced excavator bucket



Steel: hardfaced continuous casting roll

Sugar: hardfacing of a crushing roll

World class cored wire manufacturing



1. Strip raw material
Different strip material and dimensions are used depending on the type of wire being manufactured.

2. Powder mix preparation
Welding Alloys blend management software provides a list, with quantities of each powder to obtain the required weld metal composition.

3. Powder mixing
The powders are mixed to produce a homogeneous blend throughout the batch. Some powders are mixed with binders to prevent segregation and improve weldability. Different mixers are used depending on the wire being produced to prevent cross contamination of elements.

4. Strip forming and powder feeding
The strip is formed into a U-shape ready to receive the powder. The strip powder ratio is continuously controlled; the right combination of the strip and the powder is what allows us to obtain the required chemical composition of the weld metal.

5. Wire rolling
The wire is closed to form an O-shape (our seamless cored wires are laser butt welded). The wire then goes through the rolling process to reduce the diameter and compact the powder.

6. Heat treatment
Certain wires are baked to remove moisture and oil from them before the final finishing and packing. Some wires require special baking in atmosphere controlled ovens.

7. Wire drawing
Wire drawing uses calibrated dies to produce a round wire with excellent control of the diameter. The addition of lubricants and rust protectors improves the feedability and storage life of the wires.

8. Drum packing
Different options are available: rotary, static or twist free, depending on the wire dimensions and customers' requirements.

9. Spooling
The wires are precision layer wound to control cast and helix in order to improve feedability.

10. Packaging
A range of packaging options are available depending on the customer's needs. Carefully chosen packaging material prevents moisture pickup during transport and storage.

Rail crossing repair with HARDFACE AP-O.

Work hardening manganese steels

Austenitic Mn steels and Austenitic Cr-Mn steels have the ability to rapidly work harden under impact loading, which makes them a great solution for a number of applications.

Cored wires with a high content of alloying elements (e.g. HARDFACE 19 9 6 and HARDFACE AP) are easily applicable and their weld metal deposits are well known for their high tolerance to dilution and cracks. Thanks to these properties, they can be deposited directly to low or medium alloy substrates, with no risk of forming a martensitic structure at the interface.

Their multi-purpose nature makes them an ideal choice for a number of applications (build up, buffer layer or hardfacing).

Products that have a similar chemical analysis to Hadfield 13% Mn steels must be applied with care. This is due to their intrinsic susceptibility to embrittlement when exposed to interpass temperatures higher than ~150°C. Their resistance to gouging abrasion is exceptional and unique, but special care should be adopted when applying these types of cored wires.

Product	Composition [%] - Fe balance					Hardness - 3 layers	
	C	Mn	Si	Cr	Ni	as welded	work hardened
HARDFACE 19 9 6	0.1	6	0.5	19	9	180 HB	45 - 50 HRC
HARDFACE AP	0.4	16	0.6	14		210 HB	45 - 55 HRC
HARDFACE NM	1	14	0.1	3.5	0.8	220 HB	46 - 50 HRC
HARDFACE NM14	1	14	0.5			200 HB	44 - 48 HRC
HARDFACE MAX IMPACT	0.8	20	0.4	2.5	1	250 HB	45 - 55 HRC

The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

Work hardening manganese steels selection guide

Product	Welding process	Standard diameters [mm]	EN 14700 standard	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavitation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
HARDFACE 19 9 6	-O	1.2 - 3.2	T Fe10	◆◆					◆	◆				◆		◆◆	◆	Strong tough austenitic weld metal composition that work hardens. Work hardening rate is lower than 13% Mn steel. Weld metal has excellent crack resistance with high tolerance to dilution. Suitable to use as a buffer layer before hardfacing, particularly on manganese steels and 'hard to weld' steels. **Applications:** steel mill rolls, tram / train rails and crossings, high speed forming rolls.
	-G	1.2 - 2.4																
	-S	2.0 - 3.2																
HARDFACE AP	-O	1.2 - 3.2	T Fe9	◆					◆	◆◆						◆◆	◆	Non-magnetic deposit highly resistant to impact and pressure. High rate of work hardening. Multi-purpose cored wire. Economic ductile buffer layer prior to hardfacing with chromium carbide cored wires. **Applications:** repair works on railway frogs and crossings, hammers, bars, cones and jaws for crushers.
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
HARDFACE NM	-O	1.2 - 2.8	T Fe9	◆					◆	◆◆						◆◆	◆	High rate of work hardening. Austenitic manganese steel deposit strongly resistant to impact and high pressure. **Applications:** reclaiming crusher jaws and rolls, gyratory mantles, blow bars, swing hammers, manganese dredge components such as buckets and tumblers.
	-G	1.2 - 2.4																
HARDFACE NM14	-O	1.2 - 2.8	T Fe9	◆◆					◆	◆◆	◆					◆◆	◆	Colour and structure of the deposit similar to Hadfield type 13% Mn steel. A buffer layer such as HARDFACE 19 9 6 or HARDFACE AP should be used prior to hardfacing low or medium alloyed steels with HARDFACE NM14. **Applications:** retouching of casting imperfections, parts undergoing high impact or heavy battering loads.
	-G	1.2 - 2.4																
HARDFACE MAX IMPACT	-O	1.6 - 3.2	T Fe9	◆◆	◆				◆	◆◆	◆					◆◆	◆	Non-magnetic deposit highly resistant to impact and pressure. Excellent work hardening properties. **Applications:** rebuilding components exposed to abrasion, high impact and heavy loads.

◆ suitable **◆◆ highly suitable** Gas shielded (-G) Open arc / self shielded (-O) Submerged arc (-S)

In situ hardfacing operation of recycling shredders using HARDFACE L-O.

Low & medium alloyed steels

Bainitic and/or martensitic metal deposits are particularly suited for applications combining moderate abrasion and impact.

These consumables are easy to apply and there is no restriction on the deposit thickness; they also have good machinability (depending on the final hardness).
The addition of key elements, such as molybdenum, tungsten or vanadium will increase the performance of the welding deposit, leading to better metal-to-metal and temperature resistance.
An example of this would be tool steel alloys (e.g. ROBODUR K 650-G, which offers a similar analysis to AISI H11 tool steel).

These folded and seamless wires can be applied manually, with automated welding machines or even with a robot. They offer excellent weldability, and depending on your needs and the application, Welding Alloys can provide the wire on spools, coils or even drums for larger quantity requirements.

Welding Alloys also offer a non-coppered version of the ROBODUR K range. The ROBODUR F range maintains all the features and benefits of the copper version, but is manufactured using a 'greener' process (no copper electroplating).

Product	Composition [%] - Fe balance							Hardness 3 layers as welded
	C	Mn	Si	Cr	Mo	V	W	
HARDFACE B	0.1	1.5	0.4	1				260 HB
HARDFACE T	0.15	1.5	1	1.5				360 HB
HARDFACE P	0.2	2	1	3				400 HB
HARDFACE L	0.5	1.7	2.2	8.5				55 - 60 HRC
HARDFACE LP	0.5	1.9	1	7.5				55 - 60 HRC
HARDFACE CHROMEFREE	0.5	1.2	0.9		2.8	3		50 - 56 HRC
ROBODUR K 250	0.1	1.5	0.5	1.6	0.2			250 HB
ROBODUR K 350	0.15	1.5	0.6	2	0.2			350 HB
ROBODUR K 450	0.3	1.5	0.6	2.5	0.5			450 HB
ROBODUR K 600	0.5	1.2	0.6	6	0.8			54 - 60 HRC
ROBODUR K CERAMIC	0.35	0.6	2.5	9.5				55 - 60 HRC
ROBODUR K 650	0.5	1.3	1.2	5.4	1.3	0.3	1.2	57 - 62 HRC

The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

Low & medium alloyed steels selection guide

Product	Welding process	Standard diameters [mm]	EN 14700 standard	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavitation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
FOLDED CORED WIRES																		
HARDFACE B	-O	1.2 - 3.2	T Fe1	◆							◆						◆◆	
	-S	2.4 - 3.2																
HARDFACE T	-O	1.2 - 3.2	T Fe1	◆							◆						◆◆	Bainitic and/or martensitic alloyed steels offering a crack-resistant deposit. Suitable for repairing, rebuilding and buffering many materials. Weld metal has excellent resistance to low abrasion combined with impact and compressive loads. Actual hardness of the weld metal deposit will highly depend on the base metal chemical analysis and the number of layers deposited. **Applications:** tractor and crane parts, track rollers, grousers, crusher hammers, shear blades, idlers, gear teeth.
	-S	2.4 - 3.2																
HARDFACE P	-O	1.2 - 3.2	T Fe1	◆							◆						◆◆	
	-S	2.4 - 3.2																
HARDFACE L	-O	1.2 - 3.2	T Fe8	◆	◆					◆					◆			
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
HARDFACE LP	-G	1.2 - 1.6	T Fe8	◆	◆					◆					◆			Similar applications as HARDFACE L-G or ROBODUR K CERAMIC-G, but with a rutile slag allowing all position welding.
HARDFACE CHROMEFREE	-G	1.2 - 1.6	T Z Fe2	◆	◆					◆	◆				◆			Chromium and nickel free welding deposit. Bainitic and martensitic welding deposit offering excellent resistance to low abrasion combined with impact. **Applications:** similar to our cored wires that have a hardness of 600 HB (55 - 60 HRC) - same wear performance.
SEAMLESS CORED WIRES																		
ROBODUR K 250	-G	1.0 - 1.6	T Fe1	◆							◆◆						◆◆	
ROBODUR K 350	-G	1.0 - 1.6	T Fe1	◆							◆◆						◆◆	Bainitic and/or martensitic alloyed steels offering a crack-resistant deposit. These wires can be used for repairing, rebuilding and buffering many materials. Weld metal has excellent resistance to low abrasion combined with impact and compressive loads. Actual hardness of the weld metal deposit will highly depend on the base metal chemical analysis and the number of layers deposited. These wires are also available without copper coating - our ROBODUR F range. **Applications:** tractor and crane parts, track rollers, grousers, crusher hammers, shear blades, idlers, gear teeth.
ROBODUR K 450	-G	1.0 - 1.6	T Fe1	◆							◆◆						◆◆	
ROBODUR K 600	-G	1.0 - 1.6	T Fe2	◆	◆					◆	◆				◆			
ROBODUR K CERAMIC	-G	1.0 - 1.6	T Fe8	◆	◆					◆	◆							
ROBODUR K 650	-G	1.0 - 1.6	T Fe8	◆	◆					◆	◆	◆			◆			The overalloyed version of the ROBODUR K 600-G providing resistance to the combined effects of abrasion, impact, thermal fatigue and metal-to-metal wear. Also available without copper coating - our ROBODUR F range. **Applications:** bucket teeth, bucket lips, bulldozer blades, crusher jaws, scraper blades, chutes, pump housings, conveyor screws, slide plates, gear teeth, crusher hammers, drilling bits, ploughshares, dies, impact drills.

◆ suitable **◆◆ highly suitable** Gas shielded (-G) Open arc / self shielded (-O) Submerged arc (-S)

Products with less harmful fumes or manufactured using a more sustainable process.

Closed die forging fabrication using HARDFACE W-G.

Tool steels

Typically, these types of cored wires are used for high temperature forming in repeated cycles. This is because the welding deposit offers good resistance to the combined effects of thermal fatigue, plastic deformation and fretting.

Depending on the chemical analysis, our consumables withstand a temperature range of 500-600°C without softening. Key elements such as molybdenum, vanadium, titanium and tungsten are added to ensure this.

Welding Alloys has globally located R&D and technical teams, with decades of experience and industry knowledge. If you have a specific requirement, we are able to develop custom solutions suited to your needs (alloying elements and slag content).

Product	Composition [%] - Fe balance							Hardness 3 layers as welded
	C	Mn	Si	Cr	Mo	V	Others	
HARDFACE AR	1.1	0.5	0.5	5	7.4	1.1	W: 2.3	57 - 63 HRC
HARDFACE WLC	0.25	2	0.8	6.5	1.5		W: 1.6	42 - 46 HRC
HARDFACE W	0.6	2	0.8	6.5	1.6		W: 1.6	52 - 56 HRC
HARDFACE WM	0.3	0.4	0.3	2.4		0.6	W: 4.3 Ni: 0.25	43 - 48 HRC
HARDFACE WMOLC	0.3	0.8	0.8	6.8	2	0.6	W: 2	50 - 53 HRC
HARDFACE DCO	0.15	0.5	0.8	13.5	3		Ni: 0.6 Co: 13	45 - 52 HRC
ROBOTOOL 46	0.2	1	0.5	5	4		Ti: 0.3	42 - 46 HRC
ROBOTOOL 47	0.15	1	0.5	6	3.5		Ti: 0.3	40 - 44 HRC
ROBOTOOL 58	0.35	1.3	0.5	7	2.2		Ti: 0.3	53 - 58 HRC

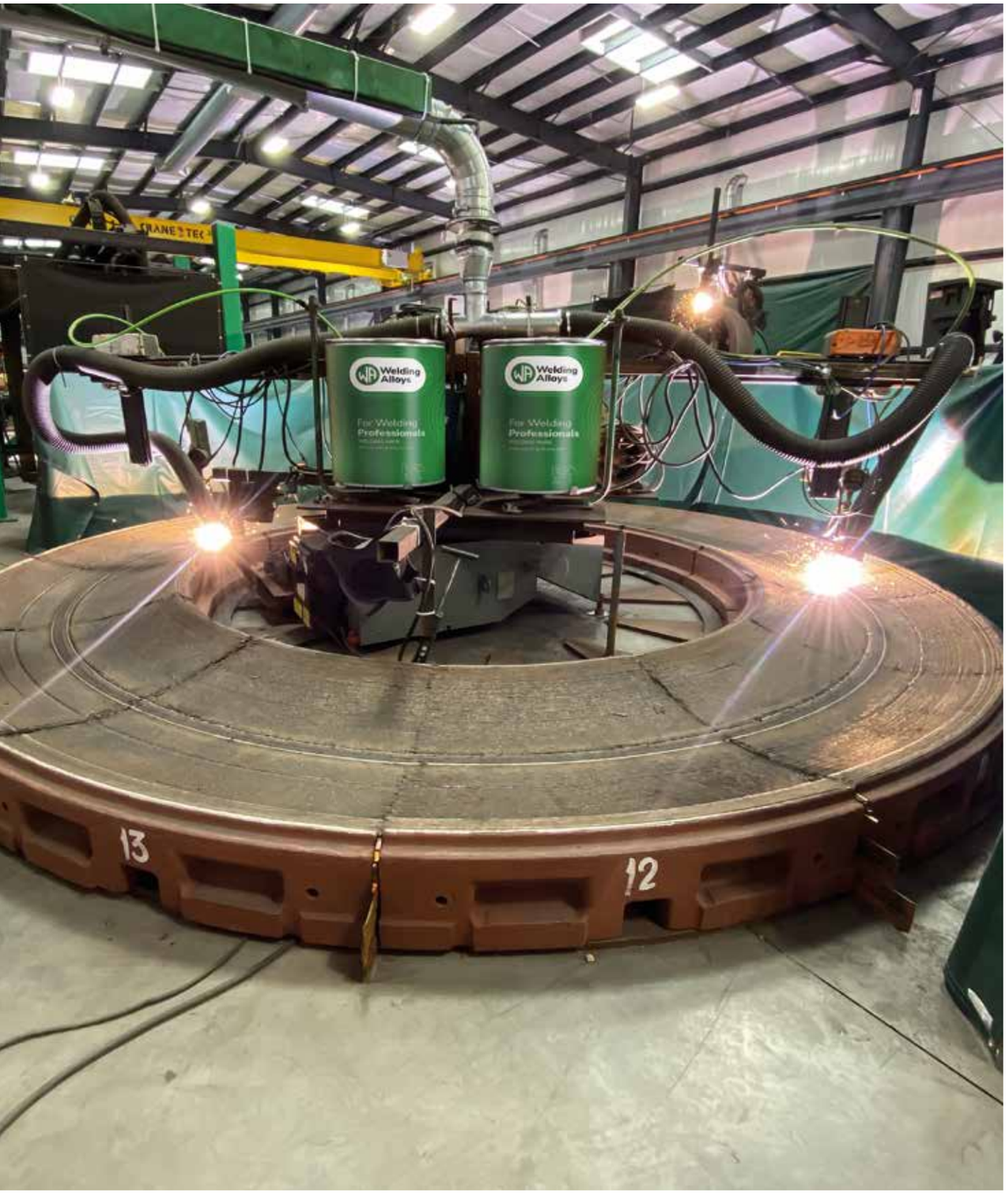
The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

Tool steels selection guide

Product	Welding process	Standard diameters [mm]	EN 14700 standard	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavitation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
FOLDED CORED WIRES																		
HARDFACE AR	-G	1.2 - 2.4	T Z Fe4	◆◆		◆	◆			◆◆		◆◆	◆		◆◆			Tubular wire for gas shielded arc welding giving a tough high speed steel deposit (precipitated fine carbides in a martensitic matrix). Exceptional wear resistance in cold cutting operations. Keeps its properties at temperatures up to 600°C (hardness may be increased to ~65 HRC after tempering for 2 hours at 500°C). **Applications:** cold shearing blades, machine tools, milling cutters, knives and wire guides.
HARDFACE WLC	-O	1.2 - 2.8	T Fe3	◆						◆	◆	◆	◆		◆		◆◆	Martensitic alloyed steel providing very good resistance to metal-to-metal and low stress abrasive wear. The higher the carbon content, the better the resistance to heavy impact and compressive stresses. HARDFACE W provides a hard deposit that keeps its properties over a long period of exposure to temperatures up to 500°C. HARDFACE W is slightly overalloying AISI H12 tool steels. HARDFACE WLC has low cracking sensitivity, which makes it suitable for rebuilding and buffering on very large components and alloyed steels. **Applications:** tooling for hot shearing, mill rolls, bells and hopper seats in blast furnaces, forging dies, deburring dies.
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
HARDFACE W	-O	1.2 - 2.8	T Z Fe3	◆			◆			◆◆	◆	◆	◆		◆◆		◆	
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
HARDFACE WM	-G	1.2 - 2.4	T Fe3	◆						◆◆	◆◆	◆◆	◆		◆◆		◆◆	Martensitic steel deposit with a medium hardness of 47 HRC. Exceptional oxidation resistance and toughness at high temperatures - up to 600°C. **Applications:** repairing and hardfacing of tools undergoing thermal shock, mechanical fatigue and adhesive wear.
HARDFACE WMOLC	-G	1.2 - 2.4	T Fe3	◆						◆◆	◆◆	◆◆	◆		◆◆		◆	Martensitic welding deposit providing hardness in the range of 52 HRC. The high content of vanadium, tungsten, and chromium improves resistance to heat checking, and provides overall improvement to mechanical properties at elevated temperatures - up to 600°C. The welding deposit is an overalloyed version of AISI H13 tool steels. **Applications:** tooling for hot shearing, hot punches, hot extrusions dies, mill guides.
HARDFACE DCO	-O	1.6 - 2.4	T Z Fe3	◆◆			◆	◆	◆	◆		◆◆	◆◆	◆	◆◆	◆	◆	Special martensitic alloyed steel deposit offering similar performance to cobalt based alloys. This Fe-Cr-Co-Mo welding deposit is especially suited to resist metal-to-metal wear, oxidation, cavitation and corrosion at temperatures up to 550°C.
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
SEAMLESS CORED WIRES																		
ROBOTOOL 46	-G	1.2 - 1.6	T Z Fe8	◆						◆	◆	◆	◆		◆◆		◆	Copper coated and non-copper coated wires available. The higher the carbon content, the better the resistance to heavy impact and compressive stresses. ROBOTOOL wires are suitable for hardfacing parts undergoing metal-to-metal wear, compression and moderate impact loads at high temperatures. **Applications:** tooling for hot shearing, mill rolls, bells and hopper seats in blast furnaces, forging dies, deburring dies.
ROBOTOOL 47	-G	1.2 - 1.6	T Z Fe8	◆						◆	◆	◆	◆		◆◆		◆	
ROBOTOOL 58	-G	1.2 - 1.6	T Fe3	◆						◆	◆	◆	◆		◆◆		◆	

◆ suitable **◆◆ highly suitable** Gas shielded (-G) Open arc / self shielded (-O) Submerged arc (-S)

Products with less harmful fumes or manufactured using a more sustainable process.



Hardfacing of a cement mill table and roll (behind) with a high chromium cast iron deposit.

Highly alloyed steels with hard phases

These wires are composed of hard phases in a matrix where the structure depends on the composition of the filler metal.

Products having a high boron content offer the best solution to fight against a wide variety of pure abrasive wear. HARDFACE BN, HARDFACE BNC and HARDFACE NCWB are able to achieve a high hardness from the first layer, however, applying a second layer or repairing an existing hardfacing deposit with these wires is not recommended (risk of spalling).

A huge range of cored wires can be designed and manufactured simply by adjusting or adding specific elements. For example, by adding the suitable amount of niobium, our HARDFACE HCNB-O will provide better wear performance from the first layer, compensating the effect of dilution onto the substrate.

With most of these wires, shrinkage cracks will occur in the deposit. These are the result of the natural relaxation of stresses in the deposit. Stress-relief cracking does not usually occur when using cored wires that have been designed for impact resistance.

Product	Composition [%] - Fe balance								Hardness	
	C	Mn	Si	Cr	Mo	Nb	V	Others	3 layers as welded	Hard phases microhardness [HV]
HARDFACE BN	0.5	2	1.4					Ni: 2 B: 4.5	60 - 65 HRC	2100 - 3300
HARDFACE BNC	2.5	2	0.9	12		5		B: 2.2	64 - 68 HRC	1350 - 3300
HARDFACE NCWB	1.1	0.6	0.7	22	4	3.5		W: 6.5	66 - 70 HRC	950 - 1450
HARDFACE X	1	0.3	1	8	0.6			4	60 - 65 HRC	1350 - 3300
HARDFACE FC	5	1.2	0.7	18					58 - 64 HRC	950 - 1450
HARDFACE HC	5	1	1.5	27					58 - 64 HRC	950 - 1450
HARDFACE HCNB	5.2	0.2	1.5	27		2.2			60 - 65 HRC	950 - 2000
HARDFACE CN	5	0.5	1	22		7			62 - 64 HRC	950 - 2000
HARDFACE CV	5.5	0.5	1	22	3	6	0.4	W: 1	62 - 64 HRC	950 - 2900
HARDFACE VN	5	0.7	1.2	22.5			10		62 - 65 HRC	950 - 2900
HARDFACE CNV	5.5	0.5	1.5	22	5	6	1	W: 2	63 - 67 HRC	950 - 2900
HARDFACE TIC	1.8	1.2	0.8	6.5	1.2		0.2	Ti: 5	57 - 60 HRC	950 - 3200
HARDFACE NB	1.5	0.8	0.8	6.5		6			55 - 58 HRC	950 - 3200
HARDFACE 168NB	1.3	1	1.8	6		8.5		Ti: 0.2	55 - 58 HRC	950 - 3200

The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

Highly alloyed steels with hard phases selection guide

Product	Welding process	Standard diameters [mm]	EN 14700 standard	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavitation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
COMBINATION OF ABRASION AND LOW IMPACT																		
HARDFACE BN	-O	1.2 - 2.8	T Z Fe13		◆◆			◆◆										Ultra-hard single layer deposit designed to resist pure abrasion - for welding on unalloyed steels with C < 0.5% Contains boron carbides of extreme hardness. Chromium free deposit. **Applications:** equipment used in agriculture, quarrying, mining and civil engineering, screw conveyors, hoppers.
HARDFACE BNC	-O	1.2 - 2.8	T Z Fe16		◆◆		◆◆	◆◆										Ultra-hard single layer deposit, extreme resistance to high stress abrasion, erosion, low impact, and temperatures up to 650°C. Contains borides, chromium and niobium carbides of extreme hardness. **Applications:** screw and chain conveyors, screens, fans, crushers.
HARDFACE NCWB	-G	1.2 - 2.4	T Z Fe8		◆◆		◆◆	◆◆										Ultra-hard deposit offering high abrasion resistance in a single layer deposit. Complex carbides and borides homogeneously dispersed in an austenitic matrix. Extreme resistance to abrasion, low impact and/or elevated temperatures up to 750°C. **Applications:** screw conveyors, fans, equipment used in agriculture and mining, trenchers.
	-O	1.2 - 2.8																
COMBINATION OF ABRASION AND MODERATE IMPACT																		
HARDFACE X	-G	1.2 - 1.6	T Z Fe8		◆◆	◆◆		◆		◆								Abrasion and impact resistant deposit with niobium and chromium carbides in a martensitic matrix. High hardness obtained from the first layer without stress relief cracks. For use where chrome carbide type alloys are too brittle, but high abrasion resistance is still required. **Applications:** drag line bucket lips, auger flights, tyre shredders, slitter blades, extruder screws, tamper feet, rendering screws, dredge parts, tamper tools.
HARDFACE FC	-O	1.2 - 3.2	T Fe16		◆◆	◆◆		◆										Highly abrasion resistant chromium carbide deposit with a metallographic structure consisting of a martensitic cast iron. Severe abrasion and moderate impact resistance. **Applications:** wear plates, mineral conveying equipment, screw conveyors, shovel buckets, dredger pumps, mixers.
HARDFACE HC	-O	1.2 - 3.2	T Fe15		◆◆	◆◆		◆										Highly abrasion resistant chromium carbide deposit. Combination of primary and eutectic chromium carbides in a tough austenitic matrix. HARDFACE HCP-O is the equivalent wire that can be used if out of position welding is required. **Applications:** wear plates, mineral conveying equipment, screw conveyors, shovel buckets, dredger pumps, mixers.
HARDFACE HCNB	-O	1.2 - 3.2	T Fe16		◆◆	◆◆		◆		◆								High chromium cast iron deposit with controlled niobium addition. High abrasion resistance right from the first layer. Suitable for hardfacing components subject to extremely severe abrasive wear and moderate impact. **Applications:** gyratory crusher cones and mantles, dredge pump bodies, sand dredge parts, extruder screws, mining and earthmoving equipment, blast furnace bells, crusher hammers.
HARDFACE CN	-O	1.6 - 3.2	T Fe15		◆◆	◆◆	◆	◆										Highly abrasion resistant deposit containing niobium and chromium carbides. Very good wear resistance to fine abrasive particles of high hardness. **Applications:** wear plates, vertical crushers, fan blades, chutes.
HARDFACE CV	-O	1.6 - 3.2	T Fe16		◆◆	◆◆	◆◆	◆										High chromium cast iron deposit with a high concentration of complex carbides. Resistant to abrasion and impact at high temperatures. **Applications:** thick deposits for sinter processing in steel making, for example: drop zones, sinter breaker stars, sinter bars, thermal treatment of metal ores.
HARDFACE VN	-O	1.6 - 3.2	T Fe16		◆◆	◆◆	◆◆	◆◆										Highly abrasion resistant chromium-vanadium complex carbides in a hard and tough austenitic matrix. Resistant to mineral abrasion and temperatures up to 600°C. **Applications:** wear plates, mineral conveying equipment, screw conveyors, vertical crushers, fan blades, chutes, crushers.
HARDFACE CNV	-O	1.2 - 3.2	T Fe16		◆◆	◆◆	◆◆	◆◆										High chromium cast iron deposit with a high concentration of niobium, molybdenum, tungsten and vanadium, resulting in hexagonal primary and eutectic carbides, nodular niobium carbides and complex combined carbides in an austenitic matrix. Resistant to combined abrasion and impact at temperatures up to 700°C. **Applications:** ore sintering, crushing, blast furnace hoppers and throats, extractor fans.
COMBINATION OF ABRASION AND HIGH IMPACT																		
HARDFACE TIC	-O	1.2 - 3.2	T Fe8		◆◆	◆◆		◆		◆◆	◆							Finely dispersed titanium and chromium carbides in an austenitic matrix. Extreme resistance to abrasion, high pressure and heavy impact. **Applications:** crushing of hard materials, shredders, asphalt kneaders, vertical shaft impact crusher rotors, roller presses, cane knives and shredders.
HARDFACE NB	-G	1.2 - 1.6	T Fe6		◆◆	◆◆		◆		◆◆	◆							Finely dispersed niobium and chromium carbides in a martensitic matrix. The crack free welding deposit is resistant to abrasion, high pressure and impact. **Applications:** crusher rollers and hammers, crusher cones, leading edges, teeth of excavator buckets and bulldozer blades.
HARDFACE 168NB	-O	1.6 - 2.4																

◆ **suitable** ◆◆ **highly suitable** Gas shielded (-G) Open arc / self shielded (-O) Submerged arc (-S)

Products with less harmful fumes or manufactured using a more sustainable process.

Hardfacing of a screw conveyor using HARDFACE STAINCARBW.

Tungsten carbides

Cored welding wires filled with advanced tungsten carbides provide extreme resistance to abrasive wear. Cast tungsten carbides are added to the wire during the production process. With low welding parameters, these pass directly through the welding arc without melting, therefore it is vital to ensure an even distribution of WC in the welding deposit. If the welding parameters are too high, this will result in the carbides dropping to the bottom of the weld pool (resulting in reduced wear protection).

The wires presented below offer great versatility in terms of operability since it is possible to use them with or without a shielding gas.

Product	Composition		Hardness	
		WC content	3 layers as welded	Hard phases microhardness [HV]
HARDFACE STEELCARBW	Composite deposit containing tungsten carbide particles in a steel matrix	50 - 60% depending on Ø	61 - 65 HRC*	950 - 2000
HARDFACE STAINCARBW	Composite deposit containing tungsten carbide particles in a stainless steel matrix	50 - 60% depending on Ø	60 - 63 HRC*	2000 - 2500
HARDFACE NICARBW	Composite deposit containing tungsten carbide particles in a nickel-boron-silicon matrix	50 - 60% depending on Ø	45 - 55 HRC*	2000 - 2800

*matrix hardness

The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

Tungsten carbides selection guide

Product	Welding process	Standard diameters [mm]	EN 14700 standard	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavitation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
HARDFACE STEELCARBW	O / G	1.6 - 2.8	T Fe20		◆◆			◆										Iron based cored wire filled with tungsten carbides, resulting in hard carbide particles in a martensitic matrix. Economical solution when compared to advanced nickel based alloys filled with tungsten carbides. Lower wear performance rate than HARDFACE NICARBW. Possible to weld with or without gas shielding. **Applications:** bucket teeth, wood chipper spouts, scraper blades, crusher bars, components for agriculture.
HARDFACE STAINCARBW	O / G	1.6 - 2.8	T Z Fe20		◆◆		◆◆	◆◆						◆				Cored wire filled with tungsten carbides, resulting in hard carbide particles embedded in a soft corrosion resistant matrix. Possible to weld with or without gas shielding. **Applications:** bucket teeth, wood chipper spouts, scraper blades, crusher bars, components for agriculture, conveyor screws, trenchers.
HARDFACE NICARBW	O / G	1.6 - 2.8	T Ni20		◆◆		◆◆	◆◆						◆◆				Nickel based cored welding wire filled with advanced cast tungsten carbides. Possible to weld with or without gas shielding. Optimised hard particle distribution in the matrix by following the proper welding procedure. **Applications:** bucket teeth, wood chipper spouts, scraper blades, crusher bars, components for agriculture, conveyor screws, trenchers.

◆ **suitable** ◆◆ **highly suitable** Gas shielded (-G) Open arc / self shielded (-O) Submerged arc (-S)

Hard coating of a screw flight using a high chromium cast iron deposit.

Thermal arc spraying

Within the spectrum of thermal spraying technologies, the arc spraying process stands out for its cost-effectiveness and efficiency. This methodology offers a robust solution for a diverse array of applications, providing superior resistance against various forms of wear, including abrasion, erosion, thermal degradation, metal-to-metal friction, and corrosion.

The twin wire arc spraying process utilises two conductive wires, each assigned an opposite electrical charge. These wires melt under the influence of the electric arc, and are then atomized by a stream of dry compressed air to form a cohesive coating layer. Cored wires, notable for their versatile chemical composition, significantly enhance the adaptability of this process to specific application requirements.

Our HARDSPRAY product line encompasses both iron-based and nickel-based cored wires, precisely engineered to combat all forms of wear. These coatings are characterised by their exceptional density, minimal porosity, and superior bond strength, ensuring optimal performance under the most demanding conditions.

We also supply WA SPRAY solid wires, featuring two of the most popular thermal spray solutions available on the market, to complete the range.

Our portfolio of thermal spray wires is designed to provide solutions across a range of operating environments, combating various mechanical and thermal stresses.

Product	Composition [%]												Hardness
	C	Mn	Si	Cr	Ni	Mo	Nb	W	B	Al	Fe	Others	
HARDSPRAY HB4	0.1	1.5	1.5	29					3.8		Bal.		Matrix: 45-55 HRC Carbides: 1000-1150 HV0.1
HARDSPRAY 140	1.2			22	0.5	4	3.5	6.5	4.5		Bal.		65-70 HRC
HARDSPRAY NI WC	0.4		5		Bal.				2			WSC: 62	Matrix: 45-55 HRC Carbides: 2000-2800 HV0.1
HARDSPRAY NI CBS	0.4		4.5	20	Bal.	2			0.7				700-800 HV0.1
HARDSPRAY NI Al5					Bal.					5			180-200 HV
HARDSPRAY NI Cr20				20	Bal.								100-150 HB
WA SPRAY CuAl9										9		Cu: Bal	63-65 HRB
WA SPRAY 13Cr	0.3	0.6	1	13							Bal.		35-45 HRC

The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

Thermal arc spraying selection guide

Product	Coating process	Standard diameters [mm]	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavtation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
CORED WIRES																	
HARDSPRAY HB4	-TS	1.6 - 3.2		◆◆	◆	◆	◆					◆	◆		◆	◆	FeCrBSi amorphous alloy. Highly abrasion and corrosion resistant deposit. High chrome-like finish can be obtained after grinding. **Applications:** boilers, feeding system in the chemical industry, casings, fans.
HARDSPRAY 140	-TS	1.6 - 3.2		◆◆		◆◆	◆				◆◆	◆	◆			◆	Amorphous alloy. Very fine particle deposit. Abrasion and corrosion resistant and can withstand temperatures up to 900 °C. High chrome-like finish can be obtained after grinding. **Applications:** screws, casings, cyclones, fans.
HARDSPRAY NI WC	-TS	1.6 - 3.2		◆◆		◆◆	◆◆						◆◆				Composite deposit containing tungsten carbide particles in a Ni-B-Si matrix. Exceptional abrasion resistance. **Applications:** chutes, screws.
HARDSPRAY NI CBS	-TS	1.6 - 3.2		◆		◆						◆◆	◆◆			◆	Nickel based alloy. NiCrBSi cored wire used for oxidation and corrosion resistance. Good resistance to chloride-induced corrosion in boilers, in temperatures up to 450 °C. **Applications:** components used in chemical plants, the food industry, boiler tubes.
HARDSPRAY NI Al5	-TS	1.6 - 3.2					◆				◆	◆◆	◆◆			◆	Developed for bonding layer on low and medium alloyed base materials. High bond strength, bonds to most metal substrates. Excellent abrasion and oxidation resistance at high temperatures. **Applications:** bond coat.
HARDSPRAY NI Cr20	-TS	1.6 - 3.2									◆	◆	◆◆			◆	Specially developed for bonding layer on highly-alloyed base materials. Excellent corrosion and oxidation resistance at high temperatures up to 650 °C **Applications:** bond coat.
SOLID WIRES																	
WA SPRAY CuAl9	-TS	1.6								◆	◆		◆			◆◆	Aluminium bronze used for element restoration jobs. Combined resistance to corrosion and to mechanical and thermal fatigue. **Applications:** bearings, aluminium bronze components, bond coat.
WA SPRAY 13Cr	-TS	1.6	◆◆				◆			◆◆	◆◆	◆	◆			◆	Hard martensitic stainless steel with 13% chromium and high carbon content. Resistant to wear from friction, erosion, corrosion and thermal fatigue. Can be polished. **Applications:** machine elements, cylinder liners, pistons, crankshaft bearings, hydraulic rams

◆ suitable **◆◆ highly suitable**

Automatic cladding application using our Roll Cladder machine and our CHROMECORE submerged arc cored wires.

Ferritic & martensitic stainless steels

Martensitic stainless steel deposits with over 12% Cr offer good resistance to thermal fatigue and corrosion. These grades are ideal for applications where there is hot metal-to-metal wear. Martensitic stainless steels are widely used in steelmaking and forging for casting, rolling and forming operations. The addition of elements such as nitrogen, vanadium, tungsten or even cobalt increase the resistance of these alloys to high temperatures and corrosion.

When surfacing a low or medium alloyed base metal with martensitic stainless steels, it is advantageous to apply a special buffer layer, which is overalloyed in chromium (~ 17% Cr), to guarantee metallurgical soundness and to avoid cracking in service.

Product	Composition [%] - Fe balance											Hardness 3 layers as welded
	C	Mn	Si	Cr	Ni	Mo	W	V	Co	N	Other	
CHROMECORE 430	0.05	1	0.8	17.5								220 HB
CHROMECORE 434N	0.05	1.2	0.7	17	3.2	0.5				0.08		35 - 40 HRC
CHROMECORE 434DN	0.05	1.2	0.8	16.5	3.5	0.5	0.8	0.5	2	0.08		38 - 42 HRC
CHROMECORE 410	0.08	1.2	0.8	12.5								40 - 43 HRC
CHROMECORE 420	0.3	1	0.6	13								48 - 52 HRC
CHROMECORE 414	0.05	1.2	1	13.5	4	0.5						38 - 43 HRC
CHROMECORE 414MM	0.15	1.2	0.5	12.5	2.3	1.2		0.20				43 - 47 HRC
CHROMECORE 414N	0.08	1	1	13.5	4.3	0.7				0.09		40 - 45 HRC
CHROMECORE 414DN	0.05	1.2	0.8	13.5	4.5	0.5	0.8	0.5	2	0.07		40 - 45 HRC
CHROMECORE 414NX	0.1	1.1	0.5	13.5	3.2	1.3		0.15		0.09	REE*	42 - 48 HRC
CHROMECORE 414COILER	0.3	1	0.7	12	1.3	0.6	0.3					50 - 55 HRC

The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

*Rare Earth Elements

Ferritic & martensitic stainless steels selection guide

Product	Welding process	Standard diameters [mm]	EN 14700 standard	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavitation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
CHROMECORE 430	-O	1.6 - 3.2	T Fe7	◆◆					◆		◆◆	◆◆	◆	◆			◆◆	Alloy depositing a 17% chromium ferritic stainless steel. Combined resistance to corrosion, frictional wear and temperature. Resistant to seawater and dilute organic acids. The addition of nitrogen or even vanadium, tungsten and cobalt will increase wear performance. **Applications:** anti-corrosion surfacing or buffer layer before martensitic stainless steel hardfacing; for example: continuous casting rolls, valve seats, shafts, pump bodies and rotors.
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
CHROMECORE 434N	-O	1.6 - 3.2	T Fe7	◆◆					◆		◆◆	◆◆	◆	◆			◆◆	
	-S	2.4 - 3.2																
CHROMECORE 434DN	-O	1.6 - 3.2	T Z Fe7	◆◆					◆		◆◆	◆◆	◆	◆			◆◆	
	-S	2.4 - 3.2																
CHROMECORE 410	-O	1.6 - 3.2	T Fe7	◆◆				◆	◆	◆	◆◆	◆◆	◆	◆			◆	Alloy depositing a 13% chromium martensitic stainless steel. Resistant to wear from friction, erosion, corrosion and thermal fatigue. Can be polished. **Applications:** continuous casting rolls, tooling for moulded glass, valve seats, impellers.
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
CHROMECORE 420	-O	1.6 - 2.8	T Fe8	◆◆				◆			◆◆	◆◆	◆	◆			◆	Hard martensitic stainless steel with 13% chromium and high carbon content. Resists frictional wear. **Applications:** mechanical components suffering atmospheric corrosion, rolling mill guides, static brakes for railway marshalling yards.
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
CHROMECORE 414	-O	1.6 - 3.2	T Fe7	◆◆				◆	◆	◆	◆◆	◆◆	◆	◆			◆◆	Alloy depositing a 13% chromium ferritic-martensitic stainless steel. CHROMECORE 414MM - addition of nickel and molybdenum. Homogeneous deposit structure with controlled ferrite content. Designed to resist metal-to-metal wear, corrosion, friction and thermal fatigue. The addition of nitrogen or even vanadium, tungsten and cobalt will increase wear performance. **Applications:** continuous casting rolls, hot-rolling mills, steam turbines, valve seats.
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
CHROMECORE 414MM	-G	1.2 - 2.4	T Fe7	◆◆				◆	◆	◆	◆◆	◆◆	◆	◆			◆	
	-S	2.4 - 3.2																
CHROMECORE 414N	-O	1.2 - 2.8	T Z Fe7	◆◆				◆	◆	◆	◆◆	◆◆	◆	◆			◆◆	
	-S	2.4 - 3.2																
CHROMECORE 414DN	-O	1.2 - 2.8	T Z Fe7	◆◆				◆	◆	◆	◆◆	◆◆	◆	◆◆			◆◆	
	-S	2.4 - 3.2																
CHROMECORE 414NX	-O	1.6 - 3.2	T Z Fe7	◆◆				◆	◆	◆	◆◆	◆◆	◆	◆◆			◆◆	Nitrogen-alloyed 414 martensitic stainless steel, strengthened with niobium, vanadium and rare earth elements for resistance to tempering, creeping, oxidation and corrosion. The addition of rare earth elements improves corrosion resistant properties, as well as mechanical properties. **Applications:** continuous casting rolls, hot-rolling mills, steam turbines, valve seats.
	-G	1.2 - 2.4																
	-S	2.4 - 3.2																
CHROMECORE 414COILER	-S	2.4 - 3.2	T Z Fe7	◆◆				◆	◆	◆	◆◆	◆◆	◆	◆			◆	Alloy depositing a 13% chromium ferritic-martensitic stainless steel with addition of nickel and molybdenum. High hardness due to the higher carbon content. Resistant to friction, galling, erosion, corrosion and thermal fatigue. **Applications:** continuous casting rolls, particularly on the straightening and horizontal zone.

◆ suitable **◆◆ highly suitable** Gas shielded (-G) Open arc / self shielded (-O) Submerged arc (-S)

Open die forging process showing rounded saddles hardfaced with STELLOY Ni520-G.

Nickel based alloys

Superalloys, also known as heat-resistant alloys or high-temperature alloys, are classified into different groups. Nickel based and cobalt based make up part of them.

Nickel based superalloys have the ability to maintain high creep strength, oxidation and corrosion resistance at high service temperatures (up to about 1100°C). Regarding hardfacing applications, our nickel based superalloy cored wires are 100% compatible with open-die forging applications (such as shafts, presses or hammers).

There are two metallurgical reasons as to why these nickel based superalloys perform so highly. First, elements such as molybdenum, tungsten, cobalt and chromium have been proven to strengthen solid solutions, and will favour the high temperature strength of the welding deposit.

Second, elements such as titanium and aluminium will have an age hardening effect by forming a face-centred cubic structure, providing maximum strength through precipitation.

Several studies involving nickel based superalloys have shown that these welding deposits can be difficult to work with because they have a tendency to crack during welding. By controlling the chemical analysis of our cored wires (e.g. aluminium to titanium ratio), Welding Alloys helps customers ensure they stay in the safest zone, whilst also achieving the expected hardfacing deposit.

Product	Composition [%] - Ni balance								Hardness -3 layers	
	C	Mn	Si	Cr	Fe	Mo	W	Others	as welded	work hardened
STELLOY C	0.02	0.6	0.8	16	4	16	5		200 HB	350 HB
STELLOY CCo	0.02	1.2	0.6	15.5	2	16	4.4	Co: 2.3	220 HB	350 HB
STELLOY Ni520	0.06	0.1	0.2	13	1.5	6	1	Co: 11.5 Ti: 3 Al: 2	250 HB	38 - 42 HRC
STELLOY Ni519Co2	0.03	0.1	0.1	20	0.4	6.1	1	Co: 12 Ti: 3 Al: 2	250 HB	32 - 40 HRC

The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

Nickel based alloys selection guide

Product	Welding process	Standard diameters [mm]	EN 14700 standard	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavitation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
STELLOY C	-O	2.4 - 2.8	T Ni2				◆		◆	◆	◆	◆	◆	◆		◆	◆	Nickel based alloy with a chemical analysis matching the C276 parent alloy (Ni-15%Cr-16%Mo-4%W). Resistant to oxidation, corrosion and mechanical stresses at high temperatures up to 1100°C. High tolerance to dilution makes this wire suitable for buffering before hardfacing with STELLOY Ni520 or STELLOY Ni519Co2. **Applications:** pumps and valves for the chemical and petrochemical industries.
	-G	1.6 - 2.4																
	-S	2.4 - 3.2																
STELLOY CCo	-O	2.4 - 2.8	T Ni2				◆◆		◆	◆	◆	◆	◆◆	◆		◆	◆	Nickel based alloy (NiCrMo) with the addition of cobalt. Resistant to oxidation, corrosion and mechanical stresses at high temperatures up to 1100°C. Cobalt gives the deposit improved resistance to high temperatures, thermal fatigue and high temperature corrosion. **Applications:** tube extension dies, mill guides, hot extrusion dies, hot working tools.
	-G	1.6 - 2.4																
STELLOY Ni520	-G	1.6 - 2.4	T Ni4				◆◆		◆	◆	◆◆	◆◆	◆◆	◆		◆◆	◆	Nickel based superalloys offering extremely high temperature resistance combined with good mechanical properties, thermal shock and corrosion resistance. Titanium and aluminium elements form intermetallic precipitates at the grain boundaries, which strengthen the welding deposit. Recommended with buffer layer of STELLOY C or STELLOY CCo. **Applications:** high speed forging tools, forging hammers, tube extrusion mandrels.
STELLOY Ni519Co2	-G	2.4	T Ni4				◆◆		◆	◆	◆◆	◆◆	◆◆	◆		◆◆	◆	

◆ **suitable** ◆◆ **highly suitable** Gas shielded (-G) Open arc / self shielded (-O) Submerged arc (-S)

Robotic cladding of a valve using STELLOY 21-G.

Cobalt based alloys

Cobalt based cored wires are mainly alloyed with carbon, chromium and tungsten. However, sometimes they are alloyed with nickel and molybdenum. These alloys are especially suited to applications involving high temperatures, as they retain high hardnesses over time. Chromium provides a protective layer and thus plays an anti-oxidation role. Chromium, tungsten and molybdenum combine with carbon to create hard carbides.

These alloys are ideal for resisting wear caused by metal-to-metal friction at high temperatures and in the presence of abrasives.

Their low coefficient of friction and their self-polishing tendency, makes them highly scratch-resistant and helps maintain an excellent surface quality.

To avoid cracking, any welding operation with this type of filler metal requires preheating.

Based on decades of technical knowledge and experience in the production of cored wires, Welding Alloys have globally located R&D and technical teams that are capable of developing a large range of tailored cobalt based wires.

Product	Composition [%] - Co balance							Hardness -3 layers	
	C	Mn	Si	Cr	W	Fe	Others	as welded	work hardened
STELLOY 25	0.15	1.5	1	20	14	4	Ni: 9.5	210 HB	38 - 42 HRC
STELLOY 21	0.35	1	1	28		3	Ni: 3.2 Mo: 5.5	33 HRC	45 - 48 HRC
STELLOY 6 BC	0.9	1	1.2	29	5	3.5	Ni: < 3	36 - 40 HRC	
STELLOY 6	1.1	1	1.2	29	5	3.5	Ni: < 3	40 - 44 HRC	
STELLOY 6 HC	1.2	1	1.2	29	5	3.5	Ni: < 3	42 - 46 HRC	
STELLOY 12	1.5	1	1	30	7.5	3.5	Ni: < 3	44 - 48 HRC	
STELLOY 1	2.4	1	1.2	28.5	12.5	3.5	Ni: < 3	52 - 55 HRC	

The technical datasheets for these products are available on our website.
The safety datasheets are also available on request.

Cobalt based alloys selection guide

Product	Welding process	Standard diameters [mm]	EN 14700 standard	AWS A5.21	Metal-to-metal friction	Mineral abrasion	Abrasion under pressure	Hot abrasion	Erosion	Cavitation	Impact	Mechanical fatigue	Thermal fatigue	Hot oxidation	Corrosion	Cutting	Work hardening	Machining	Description and applications
STELLOY 25	-G	1.2 - 1.6	T Z Co	-	◆					◆	◆◆	◆◆	◆◆	◆◆	◆◆		◆	◆◆	Low carbon cobalt base, easy to apply due to its low cracking tendency. Highly resistant to temperature and metal-to-metal wear. Maintains a good level of hardness at high temperatures. **Applications:** extrusion dies, nozzles, pump shafts.
STELLOY 21	-G -TIG -LD	1.2 - 1.6	T Co1	ERCCoCr-E	◆◆					◆◆	◆◆	◆	◆◆	◆◆	◆◆	◆◆	◆	◆◆	Low carbon cobalt base, with low cracking tendency. Ideal choice for resistance to multiple combinations of stress, such as corrosion and cavitation. Maintains a good level of hardness at high temperatures. Can be work hardened and polished. Low coefficient of friction. **Applications:** industrial valve work, forging dies and hot shearing blades.
STELLOY 6 BC	-G	1.2 - 1.6			◆			◆	◆		◆	◆◆	◆◆	◆◆	◆◆			◆◆	
STELLOY 6	-G -TIG -LD	1.2 - 1.6	T Co2	ERCCoCr-A	◆			◆	◆		◆	◆◆	◆◆	◆◆	◆◆	◆◆			◆	Combines all the outstanding properties of cobalt based alloys, including abrasion and erosion resistance. Medium hardness deposit with good machinability. Tailored compositions are also possible by adjusting the carbon content. A lower carbon content, and therefore lower cracking tendency, facilitates machining. A higher carbon content allows the required hardness to be obtained on low alloy steels from the first layer. **Applications:** hot shearing tools, petrochemical and industrial valves, valves and valve seats of marine engines, pump sleeves and shafts.
STELLOY 6 HC	-G	1.2 - 1.6			◆			◆◆	◆◆		◆	◆	◆◆	◆◆	◆◆			◆	
STELLOY 12	-G -TIG -LD	1.2 - 1.6	T Co2	ERCCoCr-B	◆			◆◆	◆◆		◆	◆	◆	◆◆	◆◆	◆◆		◆	Good resistance to mineral abrasion due to its high hardness. Particularly suited for use on cutting tools. **Applications:** wood cutting tools, screw conveyors and augers for rubber and plastics, saw blades.
STELLOY 1	-G	1.2 - 1.6	T Co3	ERCCoCr-C	◆			◆◆	◆◆					◆◆	◆◆	◆◆		◆	Highest hardness of the cobalt based alloy range, offering excellent resistance to abrasion and corrosion. Self polishing, promotes scratch free sliding of abrasive materials. **Applications:** rubber kneaders, mixer blades, plastic extrusion screws.

◆ **suitable** ◆◆ **highly suitable** Gas shielded (-G) Laser deposit (-LD) Gas tungsten arc welding (-TIG)

Packaging

Welding Alloys cored wires are available in various packaging types, to suit your specific welding needs.

The table below presents our standard packaging options. For any alternative packaging requirements, please contact your local Welding Alloys subsidiary.

Type*	Weight	EN ISO 544 standard
Metal Basket Spool	25 kg 15 kg 5 kg	B 450 BS 300
Plastic Spool	15 kg 5 kg	S 300 S 200
Drum	Up to 330 kg	

**Packaging options may vary by region, consult your local Welding Alloys subsidiary.*

Our global footprint

Our specialists and industry experts are active in 150 countries across the world and have an in-depth understanding of the operating conditions and customer requirements across a wide range of sectors.

Find your nearest subsidiary

Notes

Welding Alloys

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Visit website