



Welding
Alloys
Group



ACTING GLOBAL
WELDING LOCAL

WA Cored Wires™

Cladding against corrosion



This catalogue represents a selection of cored wires for cladding applications. Welding Alloys standard products for joining, hardfacing and thermal spraying feature in separate catalogues. We will gladly examine any special requests; and as experts in our field we treat them all individually. Please do not hesitate to contact us.

Innovative solutions through our leading cored wire technology



Since its foundation in 1966, the Welding Alloys Group, has become the global specialist in the development, manufacture and marketing of high alloy content cored wires. However, our technology extends into the application of welding. We design and build programmable equipment for joining and surfacing applications and provide the customers with all the technical and logistical services required for the successful usage of our products and technologies.

Using production machinery of our own design, Welding Alloys produces a wide range of non alloyed, low alloyed and high alloyed wires meeting or exceeding the most severe metallurgical or industrial standards. The requirements of the industry in the field of corrosion protection are renowned for being the most stringent and demanding.

In this environment our R & D works hand in hand with engineering companies, designers, constructors and users of vessels, piping, heat exchangers, valves, pumps and specific equipment and machinery to select the cladding consumables and techniques offering the best price to performance ratio.

Welding products and techniques evolve constantly. All descriptions, illustrations and properties given in this catalogue are subjected to changes and can only be considered as general guidance.

Contents

Properties and benefits of using cored wires in cladding applications for corrosion protection	4-5
WA Cored Wire for cladding	6-9
Industries using WA Cored Wires™	10
WA MultiSurfacer™ WA Integra™ Services	11

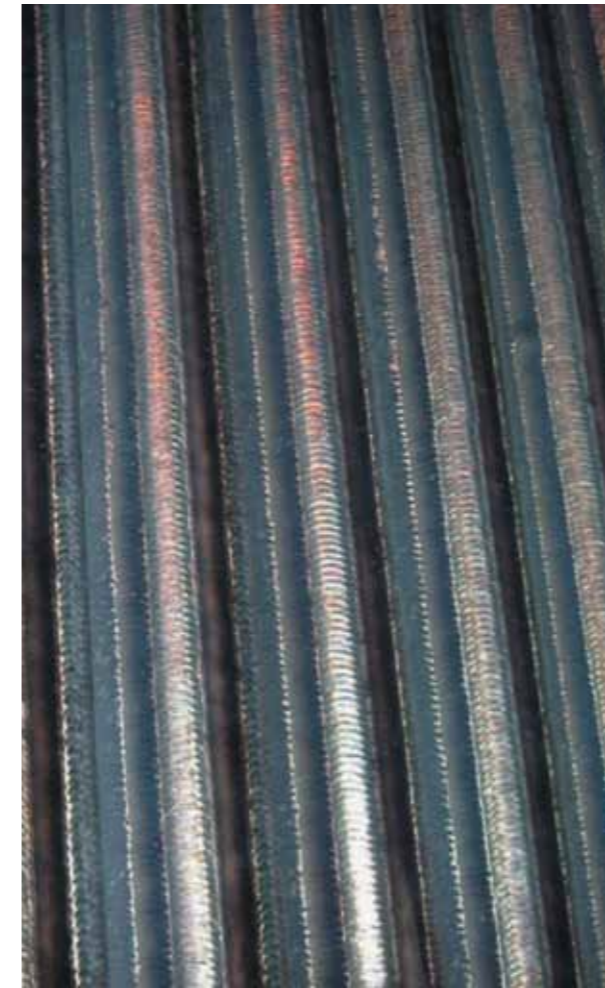
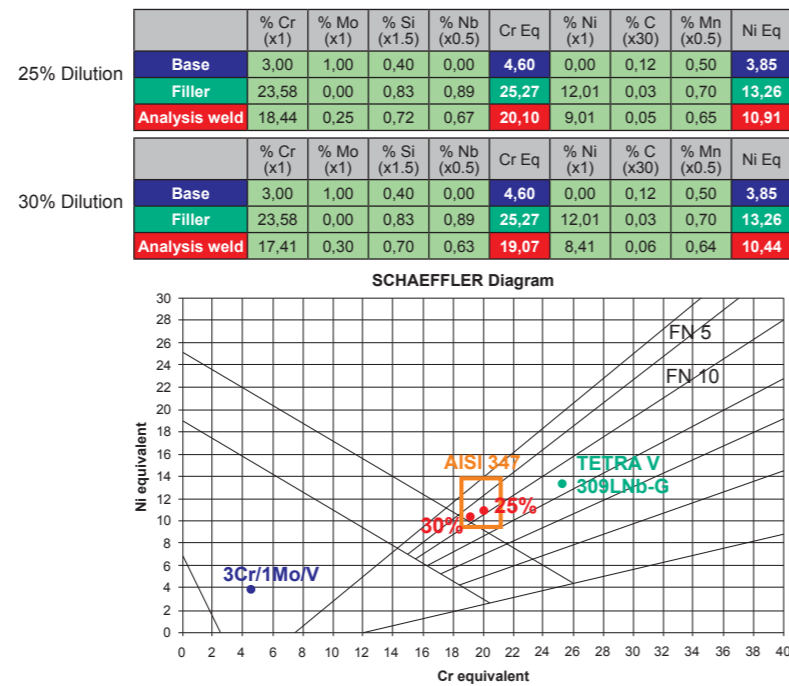


Properties and benefits of using cored wires in cladding applications for corrosion protection

Cored wires can be produced in specific chemical compositions

In cladding, the detrimental effect of dilution with the base metal affects the mechanical characteristics and corrosion resistance of the deposit. WA has responded by:

- > Developing non-standard alloys designed to compensate for dilution (either under-alloyed or over-alloyed).
- > Enhancing quality control to ensure the products exceed the industry standards.
- > Tailoring chemical composition in small production batches to give greater flexibility.

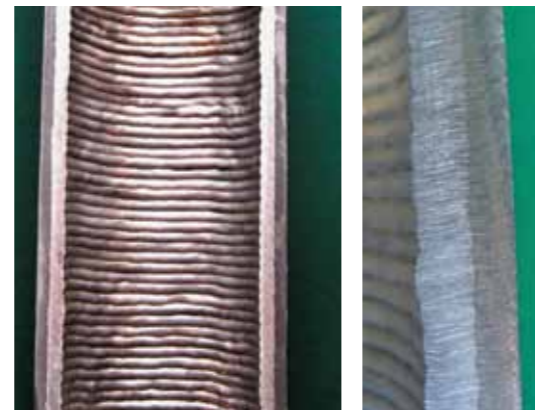


Cored wires are versatile and deliver high productivity

- > Several types of cored wires are manufactured (see tables), each type corresponding to a particular welding process. The range is wide, giving the user considerable choice over parameters such as deposition rates and dilution level. All wire types are designed to be welded semi-automatically or fully automatically.
- > Cored wires are designed for cladding or rebuilding in the horizontal or vertical position. Compared with solid wire or stick electrodes, training and qualification of operators is quicker. Compared with solid wire, quality is generally higher with lower defects and associated repair costs. Compared with stick electrodes; the deposition rate is up to 6 times higher.

Cored wires meet the most stringent specifications

- > For normal service conditions, the correct chemical composition of the deposit at and below the surface to a specific deposit thickness, is the only requirement to meet the application specifications.
- > For more stringent industrial requirements, for example in the presence of hydrogen, claddings achieved with WA cored wires have shown exceptional results under the "Hydrogen Induced Disbonding" test (ASTM G-146), when Post Weld Heat Treatment on Cr-Mo steels has been applied.
- > When called for, batches depositing metal with a strictly specified Ferrite Number (FN) are also produced, maintaining the quality both in weldability and in chemical characteristics.



WA Cored Wires processes

WA Cored Wires™	Ferritic or martensitic				Austenitic, Duplex or Super-Duplex				Nickel and Cobalt base		Nickel base	Copper base	
	CHROMECORE				TRI S	TETRA S	TETRA V	TUBE S	STELLOY	STELLOY	GAMMA	CORBRONZE	
	O	S	M-G	B-G	O	G	G	G	G	O	G	G	
Process EN ISO 4063	114	121	139	136	114	136	136	139	139	141	114	136	139
AWS Process	FCAW-S	SAW	FCAW-G FCAW-P	FCAW-G	FCAW	FCAW-G	FCAW-G	FCAW-G FCAW-P	FCAW-G FCAW-P	GTAW	FCAW-S	FCAW-G	FCAW-G
EN ISO class	U	M	M	N.A.	U	R	P	M	N.A.	M	U	N.A.	M
AWS class	T0-3	ECXXX	ECXXX	T0-4	T0-3	T0-1/4	T1-1/4	ECXXX	N.A.	ECXXX	N.A.	T0-4	N.A.
Slag - EN ISO 17633	Self shielded - U	Slag free - M	Slag free - M	Basic	Self shielded - U	Rutile slow freezing - R	Rutile fast freezing - P	Slag free - M	Slag free	Slag free	Self shielded - U	Basic slow freezing	Slag free
Welding positions	Flat	Flat	(All)	Flat and horizontal	Flat and horizontal	Flat and horizontal	All	(All)	Flat and horizontal	All	Flat	Flat and horizontal	Flat
Protection: Flux ISO Shielding gas - ISO 14175	None	Flux	I1, M12		None	M21, M20, CO2	M21, M20, CO2	I1, M12	I1, M12	I1	None	M21, M20	I1, I2, I3
Level of quality requirement	**	***	***	***	**	***	***	***	***	****	***	****	****



WA Cored Wire for cladding

Austenitic Single Pass

Standards		Target Chemical composition							Solution WA*		
AISI	EN	C%	Cr%	Ni%	Mo%	Nb%	N%	Others	Designation		Typical FN number
308L	19 9 L	< 0,04	19,0	10,0			0,03		TETRA S	803-G	6 - 10
									TETRAV	803-G	6 - 10
									TUBE S	803-G	6 - 10
347L	19 9 Nb	< 0,04	19,0	10,5		0,5	0,03		TETRA S	743-G	6 - 10
									TETRAV	743-G	6 - 10
									TUBE S	743-G	6 - 10
316L	19 12 3 L	< 0,04	19,0	12,0	2,8		0,03		TETRA S	613-G	6 - 10
									TETRAV	613-G	6 - 10
									TUBE S	613-G	6 - 10
318	19 12 3 Nb	< 0,04	19,0	11,5	2,8	0,6	0,03		TETRA S	813-G	6 - 10
									TETRAV	813-G	6 - 10
									TUBE S	813-G	6 - 10
317L	19 13 4 N L	< 0,04	19,0	13,0	3,5		0,04		TETRA S	713-G	5 - 8
									TETRAV	713-G	5 - 8
									TUBE S	713-G	5 - 8
385	20 25 5 Cu N L	< 0,04	21,0	25,0	4,8		0,08	Cu	TETRA S	583-G	0
									TETRAV	583-G	0
									TUBE S	583-G	0

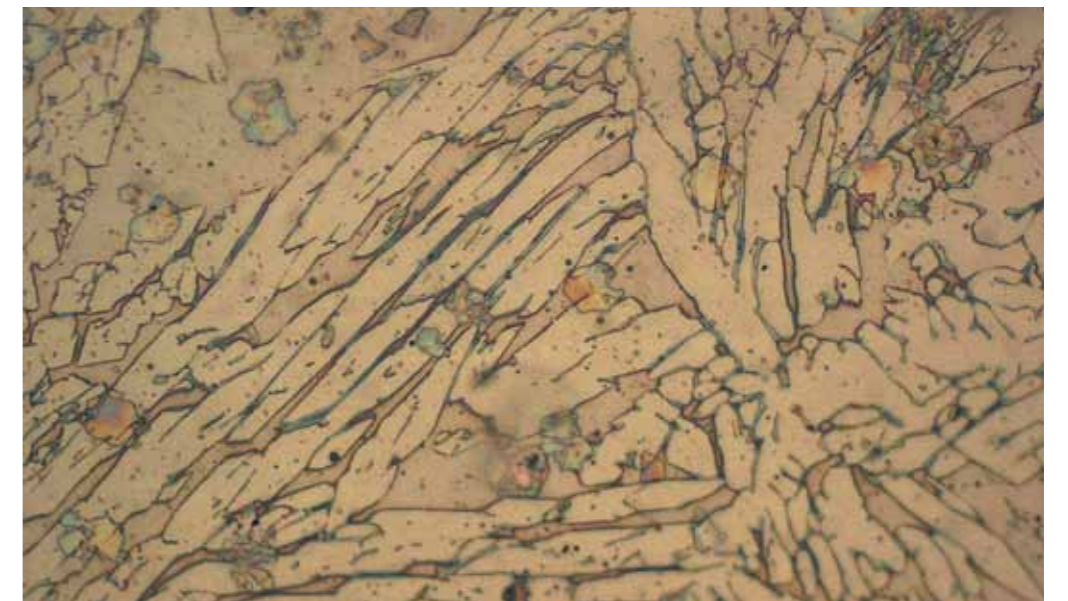
* Weld metal analysis and ferrite may vary according to wire analysis, base metal composition and welding procedure.
 * Carbon content in the layer depends 1) on the carbon content of the base metal 2) on the welding parameters.

Austenitic Multiple Passes

Standards		Target Chemical composition							Solution WA				
AISI	EN	C%	Cr%	Ni%	Mo%	Nb%	N%	Others	First pass		Subsequent passes		
									Designation	Designation		Typical FN number	
308L	19 9 L	< 0,04	19,0	10,0			0,03		TETRA S	309L-G	TETRA S	308L-G	3 - 10
									TETRAV	309L-G	TETRAV	308L-G	3 - 10
									TUBE S	309L-G	TUBE S	308L-G	3 - 10
347L	19 9 Nb	< 0,04	19,0	10,5		0,5	0,03		TETRA S	309Lnb-G	TETRA S	308L-O	3 - 10
									TETRAV	309Lnb-G	TETRAV	308L-O	3 - 10
									TUBE S	309Lnb-G	TUBE S	308L-O	3 - 10
316L	19 12 3 L	< 0,04	19,0	12,0	2,8		0,03		TETRA S	309Lmo-G	TETRA S	347L-G	6 - 10
									TETRAV	309Lmo-G	TETRAV	347L-G	6 - 10
									TUBE S	309Lmo-G	TUBE S	347L-G	6 - 10
318	19 12 3 Nb	< 0,04	19,0	11,5	2,8	0,6	0,03		TETRA S	309Lmo-G	TETRA S	316L-G	6 - 10
									TETRAV	309Lmo-G	TETRAV	316L-G	6 - 10
									TUBE S	309Lmo-G	TUBE S	316L-G	6 - 10
317L	19 13 4 N L	< 0,04	19,0	13,0	3,5		0,04		TETRA S	309Lmo-G	TETRA S	316L-O	6 - 10
									TETRAV	309Lmo-G	TETRAV	316L-O	6 - 10
									TUBE S	309Lmo-G	TUBE S	316L-O	6 - 10
385	20 25 5 Cu N L	< 0,04	21,0	25,0	4,8		0,08	Cu	TETRA S	309Lmo-G	TETRA S	317L-G	5 - 10
									TETRAV	309Lmo-G	TETRAV	317L-G	5 - 10
									TUBE S	309Lmo-G	TUBE S	317L-G	5 - 10
385	20 25 5 Cu N L	< 0,04	21,0	25,0	4,8		0,08	Cu	TETRA S	309Lmo-G	TETRA S	317L-O	5 - 10
									TETRAV	309Lmo-G	TETRAV	317L-O	5 - 10
									TUBE S	309Lmo-G	TUBE S	317L-O	5 - 10
385	20 25 5 Cu N L	< 0,04	21,0	25,0	4,8		0,08	Cu	TETRA S	309Lmo-G	TETRA S	904L-G	0
									TETRAV	309Lmo-G	TETRAV	904L-G	0
									TUBE S	309Lmo-G	TUBE S	904L-G	0

Duplex Multiple Passes

Standards		Target Chemical composition							Solution WA					
AISI	EN	C%	Cr%	Ni%	Mo%	Nb%	N%	Others	First pass		Subsequent passes			
									Designation	Designation		Typical FN number	Typical PREN	
2205	22 9 3 N L	< 0,04	23,0	9,2	3,2	0,16	0,15		TETRA S	309L-G	TETRA S	22 9 3L-G	40	36
									TETRAV	309L-G	TETRAV	22 9 3L-G	40	36
									TUBE S	309L-G	TUBE S	22 9 3L-G	40	36
2507Cu	25 9 4 Cu N L	< 0,04	25,0	9,5	3,8	0,25	0,2	Cu	TETRA S	309Lnb-G	TETRA S	D57L-G	35	41
									TETRAV	309Lnb-G	TETRAV	D57L-G	35	41
									TUBE S	309Lnb-G	TUBE S	D57L-G	35	41
2507CuW	25 9 4 N L	< 0,04	24,5	9,3	3,8	0,24	0,2	Cu,W	TETRA S	309Lmo-G	TETRA S	D760L-G	35	42
									TETRAV	309Lmo-G	TETRAV	D760L-G	35	42
									TUBE S	309Lmo-G	TUBE S	D760L-G	35	42
2507	25 9 4 N L	< 0,04	25,0	9,5	3,8		0,25		TETRA S	309Lmo-G	TETRA S	D750L-G	35	42
									TETRAV	309Lmo-G	TETRAV	D750L-G	35	42
									TUBE S	309Lmo-G	TUBE S	D750L-G	35	42





WA Cored Wire for cladding

Ferritic and Martensitic Multiple Passes

Standards		Target Chemical composition						Solution WA					
AISI	EN/ ISO	C%	Cr%	Ni%	Mn	Si	Others	First pass Designation		Subsequent passes Designation			Typical Hardness
410	X12Cr13	< 0.12	13,0		0,5	0,70		CHROMECORE	430-G	CHROMECORE	410-G	42 HRC	
								CHROMECORE	430-S	CHROMECORE	410-S	42 HRC	
								CHROMECORE	430-O	CHROMECORE	410-O	42 HRC	
420	X20Cr13	0,3	13,0		1,0	0,25		CHROMECORE	430-G	CHROMECORE	420-G	50 HRC	
								CHROMECORE	430-S	CHROMECORE	420-S	50 HRC	
								CHROMECORE	430-O	CHROMECORE	420-O	50 HRC	
410NiMo	X3CrNi13-4	< 0,04	12,5	4,5	0,5	0,70	Mo=0.45	CHROMECORE	430-G	CHROMECORE	410NiMo-G	200 HB	
								CHROMECORE	430-S	CHROMECORE	410NiMo-S	200 HB	
430	X6Cr17	0,08	17,5		0,9	0,70		CHROMECORE	430-G	CHROMECORE	430-G	220 HB	
								CHROMECORE	430-S	CHROMECORE	430-S	220 HB	
								CHROMECORE	430-O	CHROMECORE	430-O	220 HB	



Nickel Base

Standards		Target Chemical composition								Solution WA In two layers	
UNS number	EN	C%	Mn%	Cr%	Mo%	Nb%	W%	Fe	Others	Designation	
N06600	Ni6182	0,03	6,0	16,0	3,2	1,5		6		GAMMA	182
	NiCr15Fe6Mn									STELLOY	182
	NiCr20Mn6Fe4Nb	0,02	5,0	19,0	1,3	2,5		2,5		GAMMA	4648
	Ni6625	0,03	0,4	21,5	9	3,4		4		GAMMA	625
NiCr22Mo9Nb	STELLOY									625	
N10276	Ni6276	0,02	0,3	14,5	16		3	6		GAMMA	276
	NiCr15NiMo15Fe6W4									STELLOY	276
N08825	Ni8065	0,03	1,2	22,0	2,8			31	Ti:0.65; Cu:1.6	GAMMA	825
	NiFe30Cr21Mo3										

Copper Base

Standards		Target Chemical composition				Solution WA				
Closest UNS	Closest EN	Al	Mn	Fe	Ni	First pass Designation		Subsequent passes Designation		Typical Hardness
C61900	CuAl8Fe	9.0	0,5	3,5	0,4	CORBRONZE	100-G	CORBRONZE	201	210 HB
C63000	CuAl10Ni	9	1,0	2,0	4,8	CORBRONZE	100-G	CORBRONZE	202	210 HB
C62400		11,5	0,5	3,5	0,4	CORBRONZE	100-G	CORBRONZE	301	320 HB
		CuMn11Al8Fe3	8	11,5	3,0	2,0	CORBRONZE	100-G	CORBRONZE	CMA

Cobalt Base

Standards		Target Chemical composition						Solution WA In two layers		
UNS number	EN	C%	Cr%	W%	Mo%	Ni%	Fe%	Designation		Typical Hardness
R30006		1	26.0	5,0			< 3	STELLOY	6BC-G	38 HRC
								STELLOY	6-G	42 HRC
								STELLOY	6-O	44 HRC
								STELLOY	6HC-G	44 HRC
R300021		0,25	28,0		5.5	3.0	< 3	STELLOY	21-G	33 HRC
								STELLOY	21-O	33 HRC
								STELLOY	25-G	210 HB





Industries using WA Cored Wires™

Many designers, engineering companies and constructors of welded assemblies are enjoying the benefits of the economic and technical advantages offered by WA cored wires. Standard equipment made from steel and subsequently clad with corrosion resistant alloys (CRA) needs local protection with additional filler weld metal. WA cored wires are widely used here. Typical applications common to many industries are in pumps, valves, piping, condensers and heat exchangers. Other more specialised applications are as follows.

Oil and Gas extraction:

- Christmas tree
- Valves
- Swivel joints
- Piping
- Separators

Petroleum refining and petrochemical industries:

- Coke drums
- Cracking units
- Desulphuration reactor
- Amine absorbers
- Coal gasifying units

Fertilisers:

- Drying drums
- Mixers

Steel:

- Continuous casting rollers
- Stacks
- Fume collectors

Waste incineration plants:

- Boiler panels
- Superheater and reheater tubes
- Scrubbers

Paper industry:

- Digesters
- Black liquor recovery boilers
- Paper rolls

Other industries:

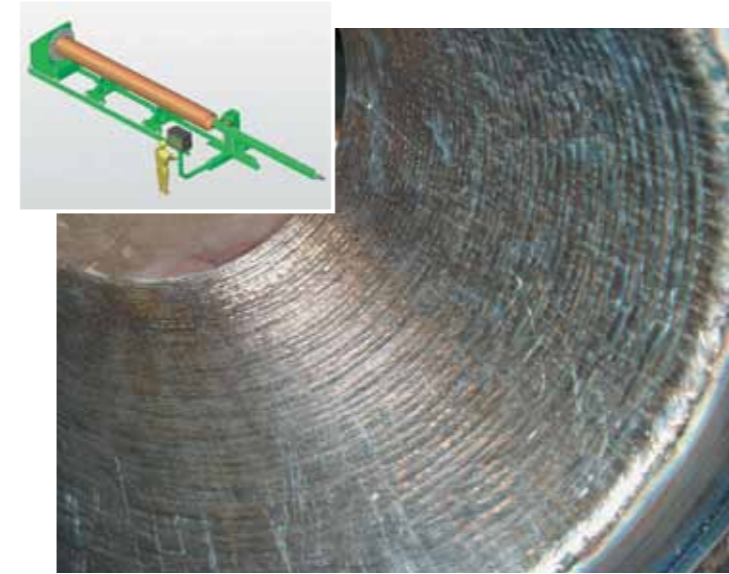
- Pharmaceutical industry
- Marine
- Defence



WA MultiSurfacer™

WA Integra™ Services

Automated cladding for industrial applications



More than thirty years ago, the Welding Alloys Group started producing automated equipment to improve the quality and efficiency of surfacing while reducing costs. Today, the MultiSurfacer standard range of automatic cladding equipment includes stationary machines for internal and external pipe cladding and for flat surface cladding. Our manufacturing unit also designs special cladding machines for curved and complex surfaces. The Boiler Tube Cladder is used by our WA Integra service centres for in situ curative protection of waste incineration boilers and by boiler manufacturers for preventative protection of specific areas.

Worldwide service for industries



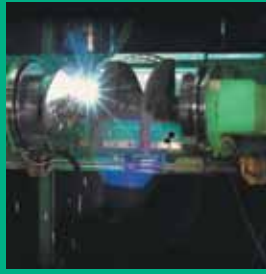
The Welding Alloys Group has more than forty years of successful experience in cladding products, automated equipment and applications. This know-how is made available to industry through its international network of Integra™ Service Centres. Specialised in surfacing, these centres are able to produce finished components to specification or, using proprietary techniques and WA cored wires, develop tailor-made solutions to problems involving the most severe operating conditions.



A perfectly controlled technology



WA Cored Wires™
Design and manufacture
of all types of cored
welding wires



WA MultiSurfacer™
Design and manufacture
of automated welding
equipment for hardfacing
and rebuilding applications



WA Integra™ Services
Innovative hardfacing
and rebuilding solutions
by welding

A worldwide presence

United Kingdom
(Head office)
Welding Alloys Ltd

Argentina
Welding Alloys Argentina S.A.

Australia (Trading Partner)
Specialised Welding Products Pty Ltd

Brazil
Welding Alloys Brasil Ltda

China
Welding Alloys China Ltd

Egypt
Welding Alloys Egypt

Finland
Welding Alloys Finland Oy

France
Welding Alloys France SAS

Germany
Welding Alloys
Deutschland GmbH

Greece
Welding Alloys Hellas EPE

India
Welding Alloys
South Asia Pvt Ltd

Iran
Aliaj Joosh Iran

Italy
Welding Alloys Italiana s.r.l.

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Welding Alloys Japan

Malaysia
Welding Alloys (Far East) Sdn. Bhd.

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Morocco
Welding Alloys Maroc Sarl

Poland
Welding Alloys Polska Sp. z o.o.

Russia
ZAO Welding Alloys

South Africa
WASA (PTY) Ltd

South Korea
Welding Alloys Korea Ltd

Spain
Welding Alloys España

Sweden
Welding Alloys Sweden

Thailand
Welding Alloys (Thailand) Co. Ltd

Turkey
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Ukraine
Welding Alloys Ukraine

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