Welding Alloys Group

ACTING GLOBAL
WELDING LOCAL

TETRA S, TETRA V & TETRA SB

Stainless flux cored wires

Flux cored wires range

Welding Alloys Group offer the world's largest range of flux and metal cored welding wires for low, medium, high alloy hardfacing and cladding applications, mild steel fabrication, also stainless steel, nickel and cobalt based wires using its own manufacturing technology. The company also offers aluminium welding wires and covered electrodes. Advanced quality control systems ensure consumables meet or exceed industry standards while complying with relevant international approvals.

WA Group's unique expertise comes from years of commitment to research and the development of innovative, highly specialised products and solutions designed to combat wear in a wide range of industrial applications. In addition, the Group offers a wide range of services from its WA Integra™ division. Using WA manufactured products, WA Integra™ engineers are able to provide welding and technical support to industries requiring wear control and performance optimisation, on-site or from one of our strategically located WA Integra™ Service Centres.

This catalogue presents a range of flux cored wires for use in the stainless steel industry. We will gladly examine any special requests, please do not hesitate to contact us.

Contents

TETRA GRADE	AVAILABILITY					TYPICAL CHEMICAL COMPOSITION TETRA (ALL WELD METAL)								FN	Yield Strength Rp 0,2 [MPa]	Tensile Strength Rm [MPa]	Elongation As [%]	CVN +20°C [J]
	TETRA S			TETRA V														
	1.0	1.2	1.6	1.0	1.2	C	Mn	Si	Cr	Ni	Mo	Nb	other					
307-G	x	x	x	x	x	0.10	6.0	0.9	19.0	9.5	-	-	-	8	480	630	40	50
308L-G	x	x	x	x	x	0.03	1.4	0.7	19.5	10.5	-	-	-	8	400	560	40	60
309L-G	x	x	x	x	x	0.03	1.4	0.8	23.5	13	-	-	-	20	460	580	32	40
309MoL-G	-	x	x	-	x	0.03	1.4	0.8	23.5	12.5	2.8	-	-	30	610	760	27	50
310-G	-	x	x	-	x	0.12	2.4	0.6	24.0	20.5	-	-	-	0	410	600	35	60
312-G	-	x	x	-	x	0.10	1.3	0.9	29	8.6	0.3	-	-	> 50	650	860	22	40
316L-G	x	x	x	x	x	0.03	1.4	0.8	19.0	12.0	2.8	-	-	8	420	560	37	55
317L-G	-	x	x	-	-	0.03	1.4	0.7	19.5	13.0	3.5	-	-	7	440	580	30	45
318L-G	-	x	x	-	-	0.03	1.5	0.9	19.5	12.0	2.9	0.5	-	10	480	620	34	60
347L-G	x	x	x	x	x	0.03	1.4	0.7	19.0	10.5	-	0.5	-	8	470	650	35	70
20.9.3-G	-	x	x	-	x	0.05	1.5	0.8	20.5	9.7	2.9	-	-	25	530	710	30	55
308H-G	-	x	x	-	x	0.06	1.4	0.8	20.5	10.5	-	-	Bi < 20 ppm	5	470	620	40	60
309H-G	-	x	x	-	x	0.06	1.4	0.8	23.0	12.8	-	-	Bi < 20 ppm	10	495	600	33	50
347H-G	x	x	x	x	x	0.06	1.4	0.9	19.5	10.5	-	0.7	Bi < 20 ppm	6	470	620	35	60
904L-G	-	x	x	-	x	0.03	3	0.6	21.0	25.5	4.9	-	Cu 1,6	0	430	640	32	50
22.9.3L-G	-	x	x	-	x	0.03	1.4	0.8	23.0	9.0	3.2	-	N > 0,15	> 25	650	830	28	50
16.8.2-G	-	-	-	-	-	0.06	1.4	0.5	16.5	9.6	1.2	-	Bi < 20 ppm	4	460	620	40	70
309HT	-	x	x	-	x	0.06	1.4	1.0	22.0	10.0	-	-	Bi < 20 ppm	6	540	730	32	55
309LNb	-	x	x	-	x	0.03	1.4	0.7	23.0	12.5	-	0.8	-	15	480	650	35	45
329	-	x	x	-	x	0.08	0.7	0.8	25.0	4.0	-	-	-	80	570	750	20	45
LD62-G	-	x	x	-	x	0.02	1.8	0.7	24.0	8.5	0.2	-	N 0,18	35	580	740	30	65
D57L-G	-	x	x	-	x	0.03	1.4	0.6	25.0	9.5	3.8	-	Cu 1.5 N 0.24	> 40	710	890	24	45

* all high carbon grades: Bi <=0,002%

NOTE : All mechanical properties listed are typical values which may vary substantially with base plate, parameters and other variables out of the manufacturer's control.

	AVAILABILITY		TYPICAL CHEMICAL COMPOSITION TETRA SB (ALL WELD METAL)								FN	Yield strength [MPa] Rp 0,2	Tensile Strength [MPa] Rm	A% Elongation	CVN +20°C [J]
	TETRA SB														
	1.2	1.6	C	Mn	Si	Cr	Ni	Mo	N	Cu					
308L-G	x	x	0.03	1.4	0.7	20.0	10.5	-	-	-	8	400	560	40	-196°C: 50
310-G	x	x	0.12	2.4	0.6	24.0	20.5	-	-	-	0	410	600	35	80
22.9.3L-G	x	x	0.03	1.4	0.8	23.0	9.0	3.2	0.16	-	45	650	830	28	-60°C: 45
465-G	x	x	0.02	3.5	0.24	25.0	22.0	2.2	0.13	-	0	410	600	35	80
D57L-G	x	x	0.03	1.4	0.6	25.0	9.5	3.8	0.26	1.0	40	720	910	25	-45°C: 47

Advantages and performances

Why TETRA range for stainless steel ?

TETRA S

- Considerable reduction in moisture pick up
- Insensitivity to gas traces, even at high energy input
- Slag removal improved further
- Mechanical properties well above the requirements of AWS / EN specifications
- Easy welding from 130 A – 24 V to 250 A – 35 V (diam. 1.2 mm)
- Weldable under mixed gas as well as under pure CO2

TETRA V

- Improved weldability in all postions
- Better mechanical properties
- For pipe welding, 5G position included

TETRA SB

- Benefits of an exclusive basic slag system
- Best resistance to hot cracking
- Neat weld beads, free of adherences
- Impact toughness improved by 50 to 100 %
- Excellent proven corrosion resistance
- No interference of embrittling additives found in rutile slag systems

Flange welded with TETRA S 22 9 3L-G.

Hydrolyeser column in duplex stainless steel.

Tube welded with TETRA V 317L-G.

How to get the best results

Wire extension (Stick-out)

Too long Stick-out (SO) reduces the shielding and penetration.
Too short Stick-out can cause porosity and shroud blockage with spatter.
Nozzle should be recessed below shroud lip (S) : 5-10 mm

	Intensity (Amperes) : Typical values		
	100 - 180 A	190-270 A	280-350 A
Stick-Out (Ø 1,2)	15-20 mm	20-25 mm	
Stick-Out (Ø 1,6)	15-20 mm	20-25 mm	20-25 mm

Torch Angle 20 - 40°

Always Pull the Arc.

Wire feeding - four feed rolls are better than two

Do not over-tighten feed rolls. Wire must leave welding tip as round and free of cuts as on entry to wire feed rolls.
U or V-shape rolls are preferable for proper wire feeding.

$$\text{HEAT INPUT (kJ/cm)} = 0{,}8 \times \frac{U \times I}{V} \times \frac{60}{1000}$$

U = Arc Volts (V) ; I = Arc Amps (A) ; V = Welding speed (cm/mn)
Austenitic and ferritic stainless needs to be kept as cold as possible.
No preheating is needed, and keep current and voltage as low as possible.
Faster travel keeps heat input down.

TETRA over electrodes
Reduced moisture pick up
Kg/hr - double or better
In stop-start defects
In cost/kg welded
In consistency
Only single wire diameter requirement

TETRA over submerged arc
Lower heat input
Not flux-additions dependant
No flux handling
Slag inclusions
Fast set-up
Less penetration
Welding out-of-position

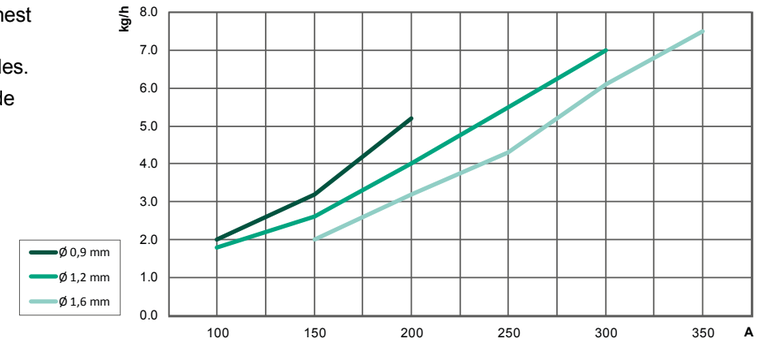
TETRA over solid wire
Deposition rate
Bead appearance
Finishing costs
Out-of-position welding
Cold laps, and porosity
Penetration profile

TETRA over TIG
Speed
Operator appeal
Cost of weld metal

Performance

TETRA deposition rate is the highest in the industry, commonly three times faster than manual electrodes.
Wire diameter 1.2 mm covers wide range of application cases.

TETRA deposition rates



Shielding Gases

NF EN ISO 14175	C02 (%)	Ar (%)	Flow Rate (L/min)	
			Typical	High Energy
M21	15 < C02 ≤ 25	Rest	12-18	18-30
M20	5 < C02 ≤ 15	Rest	12-18	18-30
C1	100%	-	12-18	18-30

The use of all gases in preferences 1 to 3 will give sound weld metal. The carbon content of the weld metal increases marginally with increased CO_2 content. Slag detachment behaviour may alter slightly with gas composition and with base metal, particularly when welding stainless to carbon steels.

Welding examples and packaging

Welding positions

Standards								
EN-ISO	PA	PA	PB	PC	PD	PE	PF	PG
ASME IX	1G	1F	2F	2G	4F	4G	3G	3G

Example of down-hand fillet welding

Position: PB/2F
Current: 220 to 240 V
Voltage: 27 to 29 V
Welding speed: 30 to 35 cm/min
Deposition rate: 4,7 kg/hr (100% arc time)

TETRA V 312-G 1,2 mm.

Example of overhead welding

Position: PD/4F
Current: 160 to 180 A
Voltage: 27 to 27 V
Welding speed: 30 to 40 cm/min
Deposition rate: 4,4 kg/h (100% arc time)

TETRA V 20 9 3-G 1,2 mm.

Example of vertical up welding

Position: PF/3Gu
Current: 140 to 170 A
Voltage: 22 to 23 V
Welding speed: 7 to 15 cm/min
Deposition rate: 3,2 to 3,8 kg/h (100% arc time)

TETRA V 20 9 3-G 1,2 mm.

Application examples

Gas cooler in duplex stainless steel.

High pressure reboiler in SS 316L.

Packaging (other packaging available to order)

	Spool (to order)	Spool (stock)	Pay off pak (to order)
Diameter mm	1.0 , 1.2	1.0 , 1.2 , 1.6	1.2, 1.6
Weight	5 kg	15 kg	250 kg

The real value of Welding Alloys Cored Wires: ISO 9001 certified quality system

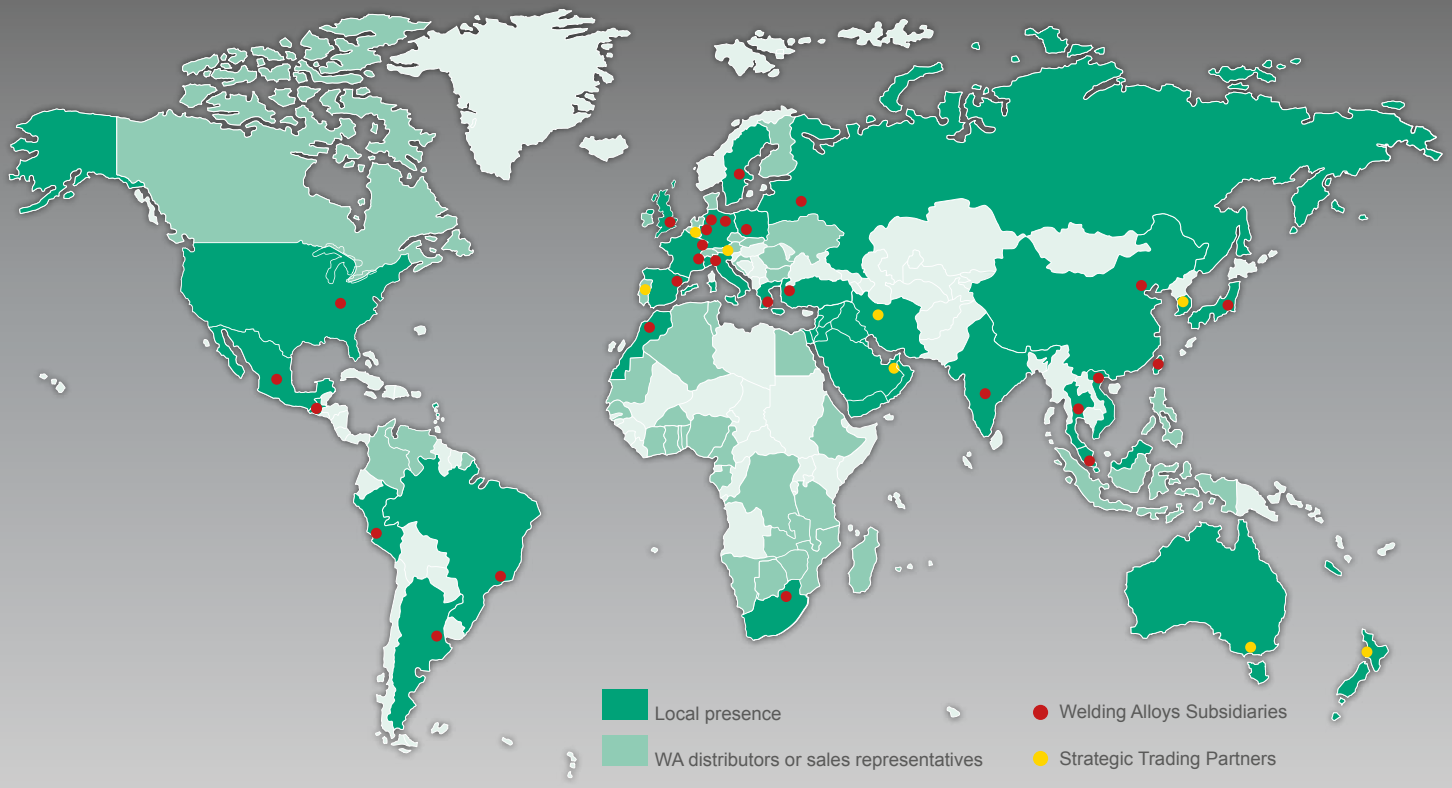
Our Technical ‘Spark’ Solves Your Industrial Challenges

WA Consumables
The go-to provider
of advanced welding
consumables

WA Machines
The go-to provider
of automated equipment
for wear protection

WA Integra™
The go-to provider
of engineered wear
protection solutions

A worldwide presence



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