

Stainless Steels

DATA SHEET

B-62

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25%Cr SUPERDUPLEX - 2507

Alloy type

25%Cr superduplex ferritic-austenitic stainless steel.

Materials to be welded

25%Cr superduplex:

UNS S32750, S32760 *
 ASTM A182 F53, F55
 BS EN 10088-2 X2CrNiMoN25-7-4 (1.4410)
 SAF 2507 (Sandvik/Avesta)
 Uranus 47N (CLI)

Castings:

UNS J93404
 ASTM A890 Gr5A, 6A *
 ACI CE3MN

* Zeron[®] 100 (see DS: B-61)

Applications

Superduplex stainless steel pipe, plate, fittings and forgings have an approximate 50:50 microstructure of austenite with a ferrite matrix. This, coupled with general alloying level confers:

- high strength compared with standard austenitic steels eg. type 316L.
- good general corrosion resistance in a range of environments.
- high resistance to chloride induced stress corrosion cracking (CSCC).
- high resistance to pitting attack in chloride environments eg. seawater.

These alloys are finding widening application in the **offshore oil/gas, chemical and petrochemical** process industries, eg. **pipework systems, flowlines, risers, manifolds** etc.

Microstructure

Multipass welds in the as-welded condition consist of a duplex austenite-ferrite microstructure with an approximate 30-60% ferrite level, depending on heat input/cooling conditions.

Welding guidelines

Preheat not generally required. Interpass temperature 150°C max. Heat input in the range 1.0–2.0 kJ/mm (depending on material thickness) should be acceptable but most codes restrict the max to 1.5 or 1.75kJ/mm.

PWHT

Although welds in wrought duplex stainless steels are almost always left in the as-welded condition, major repairs to castings are generally specified in the solution treated condition. Experience has indicated good properties following 1120°C/3-6h + water quench.

Additional information

Further information on the welding of 2507 superduplex is available in the Metrode Technical Profile on duplex and superduplex.

Related alloy groups

Zeron[®] 100 superduplex (data sheet B-61) and matching consumables for casting repair (solution annealed) applications.

Products available


Process	Product	Specification
MMA	2507XKS	BS EN 25 9 4 N L B
	Ultramet 2507	BS EN 25 9 4 N L R
TIG	2507	AWS ER2594
FCW	Supercore 2507	AWS E2594T0-4
	Supercore 2507P	AWS E2594T1-4

General Data for all 2507 MMA Electrodes

Storage	<p>3 hermetically sealed ring-pull metal tins per carton, with unlimited shelf life. Direct use from tin is satisfactory for longer than a working shift of 8h. Excessive exposure of electrodes to humid conditions will cause some moisture pick-up and increase the risk of porosity.</p> <p>For electrodes that have been exposed: Redry 200 – 300°C/1-2h to restore to as-packed condition. Maximum 400° C, 3 cycles, 10h total. Storage of redried electrodes at 50 – 200°C in holding oven or heated quiver: no limit, but maximum 6 weeks recommended. Recommended ambient storage conditions for opened tins (using plastic lid): < 60% RH, > 18°C.</p>																		
Fume data	<p>Fume composition, wt % typical:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Fe</th> <th>Mn</th> <th>Ni</th> <th>Cr</th> <th>Cu</th> <th>Mo</th> <th>V</th> <th>F *</th> <th>OES (mg/m³)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">7</td> <td style="text-align: center;">6</td> <td style="text-align: center;">1</td> <td style="text-align: center;">7</td> <td style="text-align: center;">0.5</td> <td style="text-align: center;">0.2</td> <td style="text-align: center;"><0.1</td> <td style="text-align: center;">16</td> <td style="text-align: center;">0.7</td> </tr> </tbody> </table> <p>* F = 28% for basic coated 2507XKS electrode but this does not affect the OES.</p>	Fe	Mn	Ni	Cr	Cu	Mo	V	F *	OES (mg/m ³)	7	6	1	7	0.5	0.2	<0.1	16	0.7
Fe	Mn	Ni	Cr	Cu	Mo	V	F *	OES (mg/m ³)											
7	6	1	7	0.5	0.2	<0.1	16	0.7											


2507XKS

Basic pipe-welding electrode for superduplex

Product description	<p>Basic coated all-positional MMA electrode for welding superduplex alloys for service in the as-welded condition. This electrode is overmatching with respect to nickel content to achieve correct austenite-ferrite microstructural phase balance. It is designed for the most demanding vertical and overhead welding positions such as fixed pipework qualified in the ASME 5G/6G position, and for applications requiring the highest toughness.</p> <p>Recovery is about 105% with respect to core wire, 65% with respect to whole electrode.</p>											
Specifications	AWS A5.4			E2594-15								
	BS EN 1600			E 25 9 4 N L B 4 2								
ASME IX Qualification	QW432 F-No 5, QW442 A-No -											
Composition (weld metal wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	N	PRE _N
	min	--	0.5	--	--	--	24.0	8.5	3.5	--	0.20	40
	max	0.04	2.0	1.0	0.02	0.03	26.0	10.5	4.5	0.5	0.30	46
	typ	0.03	1	0.5	0.01	0.02	25	9.5	3.8	0.1	0.22	41
All-weld mechanical properties	As welded						min	typical		>1120°C/>3h + WQ transverse *		
	Tensile strength		MPa				800	870		>760		
	0.2% Proof stress		MPa				550	700		--		
	Elongation on 4d		%				22	28		--		
	Elongation on 5d		%				18	25		--		
	Reduction of area		%				--	45		--		
	Impact energy		+20°C		J		--	85		--		
			-50°C				--	60		>80		
		-75°C				--	35		--			
Hardness		HV				--	280-330		<300			
* Representative properties for solution treated welds in castings of ASTM A890 grade 5A. Ferrite >30%.												
Operating parameters	DC +ve											
	∅ mm	2.5		3.2		4.0		5.0				
	min A	50		70		100		130				
	max A	75		95		155		190				
Packaging data	∅ mm	2.5		3.2		4.0		5.0				
	length mm	300		350		350		350				
	kg/carton	12.0		13.5		13.5		13.5				
	pieces/carton	669		420		267		165				

ULTRAMET 2507

Rutile all-positional electrode for superduplex

Product description	Rutile coated MMA electrode for welding superduplex alloys for service in the as-welded condition. This electrode is overmatching with respect to nickel content to achieve the correct austenite-ferrite microstructural phase balance. Recovery is about 105% with respect to core wire, 65% with respect to whole electrode.													
Specifications	AWS A5.4		E2594-16											
	BS EN 1600		E 25 9 4 N L R 3 2											
ASME IX Qualification	QW432 F-No -, QW442 A-No -													
Composition (weld metal wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	N	PRE _N		
	min	--	0.5	--	--	--	24.0	8.5	3.5	--	0.20	40		
	max	0.04	1.5	1.0	0.02	0.03	26.0	10.5	4.5	0.5	0.30	46		
	typ	0.03	1	0.8	0.01	0.02	25	9.5	4	0.1	0.23	42		
All-weld mechanical properties	As welded						min	typical						
	Tensile strength						MPa	750	890					
	0.2% Proof stress						MPa	550	750					
	Elongation on 4d						%	22	26					
	Elongation on 5d						%	20	24					
	Reduction of area						%	--	35					
	Impact energy						-20°C	J	--	28				
							-50°C	J	--	>21				
	Hardness						HV	--	275-315					
						HRC	--	28						
Operating parameters	DC +ve or AC (OCV: 55V min)													
														
	ø mm	2.5		3.2		4.0								
	min A	60		75		100								
max A	90		120		155									
Packaging data	ø mm	2.5		3.2		4.0								
	length mm	300		350		350								
	kg/carton	11.4		13.5		13.8								
	pieces/carton	609		393		249								

2507

Solid welding wire for superduplex

Product description	Solid wire for TIG.													
Specifications	AWS A5.9 ER2594 BS EN ISO 14343-A W 25 9 4 N L													
ASME IX Qualification	QW432 F-No 6, QW442 A-No 8													
Composition (wire wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	W	Cu	N	PRE _N	
	min	--	--	--	--	--	24.0	8.0	3.0	--	--	0.20	40	
	max	0.03	2.5	1.0	0.02	0.03	27.0	10.5	4.5	0.5	0.5	0.30	--	
	typ	0.02	0.8	0.4	0.005	0.02	25	9.3	3.9	0.05	0.05	0.25	42	
All-weld mechanical properties	Typical values as welded						min	TIG						
	Tensile strength						MPa	760	870					
	0.2% Proof stress						MPa	550	695					
	Elongation on 4d						%	15	36					
	Elongation on 5d						%	20	32					
	Reduction of area						%	--	68					
	Impact energy						-50°C	J	--	130				
Hardness cap/mid						HV	--	300						
Typical operating parameters	TIG													
	Shielding Argon													
	Current DC-													
	Diameter 1.6/2.4mm													
Voltage 100A, 12V														
Packaging data	TIG													
	1.6 2.5kg tube													
	2.0 2.5kg tube													
	2.4 2.5kg tube													
Fume data	MIG fume composition (wt %) (TIG fume negligible)													
		Fe	Mn	Cr ³	Ni	Mo	Cu	OES (mg/m ³)						
	28	10	22	8	2	1.3	2.3							

SUPERCORE 2507, 2507P

Rutile flux cored wires for superduplex stainless steel

Product description	Flux cored wire made with an alloyed stainless steel sheath and rutile flux system. The Supercore 2507 combines easy operability, high deposit quality and exceptional bead appearance for downhand and HV welding. Supercore 2507P combines easy operability, high deposit quality for both positional pipework and downhand welding. Metal recovery is about 90% with respect to the wire.													
Specifications	AWS A5.22 BS EN ISO 17633-A	Supercore 2507 E2594T0-4 T 25 9 4 N L R M21 3					Supercore 2507P E2594T1-4 T 25 9 4 N L P M21 2							
ASME IX Qualification	QW432 F-No --, QW442 A-No --													
Composition (weld metal wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	W	N	PRE _N	
min	--	0.5	--	--	--	--	24.0	8.5	3.5	--	--	0.20	40	
max	0.04	2.0	1.0	0.02	0.03	0.03	26.0	10.5	4.5	0.5	0.5	0.30	--	
typ	0.03	1.0	0.5	0.010	0.02	0.02	24.5	9.3	3.8	0.05	0.05	0.23	41	
Pitting resistance equivalent PRE _N = Cr + 3.3Mo + 16N														
All-weld mechanical properties	As welded						min	typical						
Tensile strength							MPa	760	870					
0.2% Proof stress							MPa	550	660					
Elongation on 4d							%	15	30					
Elongation on 5d							%	18	29					
Reduction of area							%	--	38					
Impact energy *		+20°C				J	--	60						
		-20°C				J	--	45						
		-50°C				J	--	35						
Hardness							HV	--	300					
* Values given are for Supercore 2507P . Impact values for Supercore 2507 are typically: 45J at +20°C. 35J at -20°C and 30J at -50°C.														
Operating parameters	Shielding gas: 80%Ar-20%CO ₂ at 20-25l/min. Proprietary gases may be used but argon should not exceed 85%. Current: DC+ve ranges as below for Ar-20%CO ₂ :													
	Ø mm	amp-volt range					typical	stickout						
	1.2	120 – 280A, 22 – 34V					180A, 29V	15 – 20mm						
	1.2P	120 – 250A, 22 – 32V					150A, 25V	15 – 20mm						
Packaging data	Spools vacuum-sealed in barrier foil with cardboard carton: 15kg The as-packed shelf life is virtually indefinite. Resistance to moisture absorption is high, but to maintain the high integrity of the wire surface and prevent any possibility of porosity, it is advised that part-used spools are returned to polythene wrappers. Where possible, preferred storage conditions are 60% RH max, 18°C min.													
Fume data	Fume composition (wt %)													
	Fe	Mn	Ni	Cr ³	Cr ⁶	Cu	F	OES (mg/m ³)						
	14	10	1.5	5	5	< 1	5	1.0						