

Stainless Steels

DATA SHEET

B-62

METRODE PRODUCTS LTD
 HANWORTH LANE, CHERTSEY
 SURREY, KT16 9LL
 Tel: +44(0)1932 566721
 Fax: +44(0)1932 565168 Sales
 Fax: +44(0)1932 569449 Technical
 Fax: +44(0)1932 566199 Export
 Email: info@metrode.com
 Internet: http://www.metrode.com

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 style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="border-bottom: 1px solid black;">Fe</th> <th style="border-bottom: 1px solid black;">Mn</th> <th style="border-bottom: 1px solid black;">Ni</th> <th style="border-bottom: 1px solid black;">Cr</th> <th style="border-bottom: 1px solid black;">Cu</th> <th style="border-bottom: 1px solid black;">Mo</th> <th style="border-bottom: 1px solid black;">V</th> <th style="border-bottom: 1px solid black;">F *</th> <th style="border-bottom: 1px solid black;">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	<p>AWS A5.4 E2594-15 BS EN 1600 E 25 9 4 N L B 4 2</p>																																																														
ASME IX Qualification	QW432 F-No 5, QW442 A-No -																																																														
Composition (weld metal wt %)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>C</th> <th>Mn</th> <th>Si</th> <th>S</th> <th>P</th> <th>Cr</th> <th>Ni</th> <th>Mo</th> <th>Cu</th> <th>N</th> <th>PRE_N</th> </tr> </thead> <tbody> <tr> <td>min</td> <td>--</td> <td>0.5</td> <td>--</td> <td>--</td> <td>--</td> <td>24.0</td> <td>8.5</td> <td>3.5</td> <td>--</td> <td>0.20</td> <td>40</td> </tr> <tr> <td>max</td> <td>0.04</td> <td>2.0</td> <td>1.0</td> <td>0.02</td> <td>0.03</td> <td>26.0</td> <td>10.5</td> <td>4.5</td> <td>0.5</td> <td>0.30</td> <td>46</td> </tr> <tr> <td>typ</td> <td>0.03</td> <td>1</td> <td>0.5</td> <td>0.01</td> <td>0.02</td> <td>25</td> <td>9.5</td> <td>3.8</td> <td>0.1</td> <td>0.22</td> <td>41</td> </tr> </tbody> </table>		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														
	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	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2"></th> <th rowspan="2"></th> <th colspan="2">As welded</th> <th colspan="2">>1120°C/>3h + WQ transverse *</th> </tr> <tr> <th>min</th> <th>typical</th> <th>min</th> <th>typical</th> </tr> </thead> <tbody> <tr> <td>Tensile strength</td> <td>MPa</td> <td>800</td> <td>870</td> <td colspan="2">>760</td> </tr> <tr> <td>0.2% Proof stress</td> <td>MPa</td> <td>550</td> <td>700</td> <td colspan="2">--</td> </tr> <tr> <td>Elongation on 4d</td> <td>%</td> <td>22</td> <td>28</td> <td colspan="2">--</td> </tr> <tr> <td>Elongation on 5d</td> <td>%</td> <td>18</td> <td>25</td> <td colspan="2">--</td> </tr> <tr> <td>Reduction of area</td> <td>%</td> <td>--</td> <td>45</td> <td colspan="2">--</td> </tr> <tr> <td rowspan="3">Impact energy</td> <td>+20°C</td> <td>J</td> <td>--</td> <td>85</td> <td>--</td> </tr> <tr> <td>-50°C</td> <td>J</td> <td>--</td> <td>60</td> <td>>80</td> </tr> <tr> <td>-75°C</td> <td>J</td> <td>--</td> <td>35</td> <td>--</td> </tr> <tr> <td>Hardness</td> <td>HV</td> <td>--</td> <td>280-330</td> <td colspan="2"><300</td> </tr> </tbody> </table> <p>* Representative properties for solution treated welds in castings of ASTM A890 grade 5A. Ferrite >30%.</p>			As welded		>1120°C/>3h + WQ transverse *		min	typical	min	typical	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	J	--	60	>80	-75°C	J	--	35	--	Hardness	HV	--	280-330	<300	
				As welded		>1120°C/>3h + WQ transverse *																																																									
		min	typical	min	typical																																																										
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	J	--	60	>80																																																										
	-75°C	J	--	35	--																																																										
Hardness	HV	--	280-330	<300																																																											
Operating parameters	<p>DC +ve </p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>2.5</th> <th>3.2</th> <th>4.0</th> <th>5.0</th> </tr> </thead> <tbody> <tr> <td>ø mm</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>min A</td> <td>50</td> <td>70</td> <td>100</td> <td>130</td> </tr> <tr> <td>max A</td> <td>75</td> <td>95</td> <td>155</td> <td>190</td> </tr> </tbody> </table>		2.5	3.2	4.0	5.0	ø mm					min A	50	70	100	130	max A	75	95	155	190																																										
	2.5	3.2	4.0	5.0																																																											
ø mm																																																															
min A	50	70	100	130																																																											
max A	75	95	155	190																																																											
Packaging data	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>2.5</th> <th>3.2</th> <th>4.0</th> <th>5.0</th> </tr> </thead> <tbody> <tr> <td>ø mm</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>length mm</td> <td>300</td> <td>350</td> <td>350</td> <td>350</td> </tr> <tr> <td>kg/carton</td> <td>12.0</td> <td>13.5</td> <td>13.5</td> <td>13.5</td> </tr> <tr> <td>pieces/carton</td> <td>669</td> <td>420</td> <td>267</td> <td>165</td> </tr> </tbody> </table>		2.5	3.2	4.0	5.0	ø mm					length mm	300	350	350	350	kg/carton	12.0	13.5	13.5	13.5	pieces/carton	669	420	267	165																																					
	2.5	3.2	4.0	5.0																																																											
ø mm																																																															
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		C	Mn	Si	S	P	Cr	Ni	Mo	W	Cu	N	PRE
(wire wt %)	min	--	--	--	--	--	24.0	8.0	3.0	--	--	0.20	^N 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												
	ø mm	2.5kg tube											
	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	Supercore 2507 E2594T0-4						Supercore 2507P E2594T1-4						
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	--	--	--	--	--	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	0.5	0.30	--	
	typ	0.03	1.0	0.5	0.010	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						%	20	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					