

# Stainless Steels

DATA SHEET

B-63

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## 25%Cr SUPERDUPLEX WITH 2%Cu

### Alloy type

Superduplex ferritic-austenitic alloy with nominally 25%Cr-8%Ni-3.5%Mo-1.5%Cu-0.2%N.

### Materials to be welded

#### cast

<b>ASTM</b>	A240 UNS S32550 (wrought). A351 & A744 grade CD4MCu. A890 grade 1A/UNS J93370. A890 grade 1B/UNS J93372.
<b>DIN</b>	1.4515 (G-X3CrNiMoCuN 26 6 3). 1.4517 (G-X3CrNiMoCuN 26 6 3 3).
<b>BS</b>	3100 grade 332C13. 3146 grade ANC21.
<b>Proprietary</b>	Ferralium 255 and SD40 (Meighs). Uranus 50M, 55, 52N, 52N+ (CLI). Ferrinox 255 (Advanced Metals).

### Applications

These consumables are designed to match similar alloys, usually supplied as castings. The addition of copper improves corrosion resistance in sulphuric acid media and potentially increases strength and wear resistance, but as-welded toughness and pitting performance in chloride media are reduced in comparison to alloys with <1%Cu. Although the composition is controlled to ensure a minimum Pitting Resistance Equivalent (PRE) of 40 to match the superduplex alloys and maximise resistance to pitting consumables with <1%Cu may be preferred for non-sulphuric acid media unless PWHT is applied (see later).

Applications include **pumps** and **valves**, **corrosion/wear resisting parts**, and **process equipment** for use in **offshore oil and gas industries**, **pulp, paper and textile industries**, and **chemical and petrochemical plant**.

### Microstructure

In the as-welded, or solution annealed condition, the microstructure is duplex with about 25-60% ferrite.

### Welding guidelines

For general fabrication welds no preheat is generally required and interpass is kept below 150°C. For castings and other highly restrained welds a preheat-interpass range of 100-225°C is helpful in avoiding any risk of hydrogen cracking.

### PWHT

The consumables are designed to be predominantly used in the solution annealed condition. Castings will invariably require solution annealing and both electrode and flux cored wire provide higher toughness and somewhat lower strength after solution annealing. The G48A performance is also better following solution annealing. Typical PWHT is carried out at 1120°C for about 2-3 hours and then water quenched.

### Related alloy groups


Solid filler wire to match these alloys (AWS ER2553) has only 6%Ni, so welds usually have excess ferrite. The best alternative is Zeron<sup>®</sup> 100X with 0.7%Cu (DS B-61). Copper-free 2507 electrodes are also available (DS B-62).

### Products available

Process	Product	Specification
MMA	<b>Supermet 2506Cu</b>	AWS E2553-16
FCW	<b>Supercore 2507Cu</b>	-

# SUPERMET 2506Cu

Rutile coated MMA electrode for copper bearing superduplex

<b>Product description</b>	<p>MMA electrode made on a low carbon stainless steel core wire with a rutile flux containing additional elements for alloying and deoxidation. Nitrogen and nickel are controlled to give a balanced duplex structure to minimise the risk of cracking, particularly in highly restrained welds.</p> <p>Recovery is about 140% with respect to core wire, 65% with respect to whole electrode.</p>											
<b>Specifications</b>	<b>AWS A5.4</b> E2553-16 <b>BS EN 1600</b> E 25 9 3 Cu N L R 52 <b>BS 2926</b> (Nearest 25.6.2.Cu.R)											
<b>ASME IX Qualification</b>	<b>QW432</b> F-No 5, <b>QW442</b> A-No 8											
<b>Composition (weld metal wt %)</b>		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	N	PRE *
	min	--	0.5	--	--	--	24.0	7.5	2.9	1.5	0.18	40
	max	0.04	1.5	1.0	0.025	0.030	27.0	8.5	3.9	2.5	0.25	--
	typ	0.03	1	0.4	0.01	0.02	25.5	8	3.5	1.7	0.22	41
* PRE (Pitting Resistance Equivalent) = %Cr + 3.3%Mo + 16%N												
<b>All-weld mechanical properties</b>	Typical as-welded and PWHT					1120°C/2h + WQ		As-welded				
						min *	typical	min	typical			
	Tensile strength				MPa	690	775	760	925			
	0.2% Proof stress				MPa	485	575	550	780			
	Elongation on 4d				%	16	32	15	17			
	Elongation on 5d				%	--	--	15	16			
	Reduction of area				%	--	40	--	25			
	Impact energy		+ 20°C		J	--	70	--	35			
			- 30°C		J	--	60	--	22			
	Hardness				HV	--	260	--	340			
				HRC	--	--	--	30				
* These properties are appropriate for ASTM CD4MCu castings solution treated for optimum corrosion resistance; rapid cooling is important for best impact properties.												
<b>Operating parameters</b>	DC +ve or AC (OCV: 70V min) 											
	∅ mm	2.5	3.2	4.0	5.0							
	min A	60	75	100	130							
	max A	90	120	155	210							
<b>Packaging data</b>	∅ mm	2.5	3.2	4.0	5.0							
	length mm	300	350	350	450							
	kg/carton	12.0	15.0	14.1	16.5							
	pieces/carton	513	321	219	111							
<b>Storage</b>	<p><b>3 hermetically sealed ring-pull metal tins</b> 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:</p> <p><b>Redry</b> 200 – 250°C/1-2h to restore to as-packed condition. Maximum 300° C, 3 cycles, 10h total.</p> <p><b>Storage</b> 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): &lt; 60% RH, &gt; 18°C.</p>											
<b>Fume data</b>	Fume composition, wt % typical:											
		Fe	Mn	Ni	Cr	Cu	Mo	V	F	OES (mg/m <sup>3</sup> )		
		9	5	1	7.5	1	0.6	<0.1	16	0.6		

## SUPERCORE 2507Cu Rutile flux cored wire for Cu containing superduplex stainless steel

<b>Product description</b>	<p>Flux cored wire made with an alloyed stainless steel sheath and rutile flux system. The <b>Supercore 2507Cu</b> combines easy operability, high deposit quality and exceptional bead appearance for downhand and HV welding.</p> <p>Metal recovery is about 90% with respect to wire.</p>												
<b>Specifications</b>	There are no national specifications for this wire, the nearest relevant specification is AWS A5.22 E2553T0-4.												
<b>ASME IX Qualification</b>	<b>QW432</b> F-No --, <b>QW442</b> A-No --												
<b>Composition (weld metal wt %)</b>		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	N	PRE <sub>N</sub>	
	min	--	--	--	--	--	24.0	8.5	3.2	1.0	0.2	40	
	max	0.04	1.5	1.0	0.02	0.03	26.0	10.5	4.2	2.0	0.3	--	
	typ	0.03	0.8	0.5	0.005	0.02	24.5	9.3	3.7	1.4	0.25	41	
	Pitting resistance equivalent PRE <sub>N</sub> = Cr + 3.3Mo + 16N												
<b>All-weld mechanical properties</b>	Typical as welded and PWHT					1120°C/2h + WQ			As-welded				
						typical			min	typical			
	Tensile strength					MPa	760			750	780		
	0.2% Proof stress					MPa	450			550	590		
	Elongation on 4d					%	40			--	35		
	Elongation on 5d					%	39			20	33		
	Reduction of area					%	--			--	32		
	Impact energy			+20°C		J	65			--	40		
			-50°C		J	45			--	>27			
Hardness					HV	250			--	300			
<b>Operating parameters</b>	<b>Shielding gas:</b> 80%Ar-20%CO <sub>2</sub> at 20-25l/min. Proprietary gases may be used but argon should not exceed 85%.												
	<b>Current:</b> DC+ve ranges as below for Ar-20%CO <sub>2</sub> :												
	∅ mm	amp-volt range					typical			stickout			
	1.2	140 – 280A, 22 – 35V					180A, 28V			15 – 20mm			
1.2P	120 – 250A, 20 – 32V					180A, 26V			15 – 20mm				
<b>Packaging data</b>	Spools vacuum-sealed in barrier foil with cardboard carton: 15kg												
	<p>The as-packed shelf life is virtually indefinite.</p> <p>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.</p> <p>Where possible, preferred storage conditions are 60% RH max, 18°C min.</p>												
<b>Fume data</b>	Fume composition (wt %)												
		Fe	Mn	Ni	Cr <sup>3</sup>	Cr <sup>6</sup>	Cu	F	OES (mg/m <sup>3</sup> )				
		14	10	1.5	5	5	1	5	1.0				