

Nickel Base Alloys

DATA SHEET

E-45

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ALLOY C

Alloy type

Alloy C is a Ni-15%Cr-16%Mo-4%W-5%Fe nickel base alloy.

Materials to be welded

cast

ASTM A494 CW-12MW
 A743/A744 CW-12M
DIN 2.4883 (G-NiMo16Cr)

Also used for surfacing and overlays.

Applications

The weld deposit composition matches cast alloy C with Ni-15%Cr-16%Mo-4%W-5%Fe. Wrought forms of this alloy (C276) have low C and Si, see data sheet D-30. Cast versions of the alloy typically have higher carbon and silicon (like the original wrought alloy C which is now obsolete) but repair welds are usually solution treated for optimum corrosion resistance.

A controlled level of carbon raises strength and response to work-hardening. These properties extend to elevated temperatures, and with good resistance to impact and thermal fatigue the weld metal finds extensive use for surfacing or build-up of hot-work forging dies, especially where large volumes of weld metal must be deposited economically. It is also used as a buffer layer prior to surfacing with more exotic nickel or cobalt base alloys.

Although these consumables are not intended for aggressive chemical plant applications this alloy has intrinsically high resistance to general corrosion, pitting attack and stress corrosion in high chloride environments such as seawater. It is useful for corrosion resistant overlays especially when combined with erosion or cavitation. These properties are also exploited for site repairs without preheat on high strength martensitic stainless steels used for hydro turbines.

Microstructure

Solid solution strengthened high nickel austenite with some carbides and microsegregation typical of as-deposited weld metal.

Welding guidelines

Preheat is not generally required but may be necessary for higher carbon hardenable steels. For best corrosion resistance interpass temperature should be kept below 150°C and heat input restricted to 1.5kJ/mm.

Related alloy groups

Alloy C276 (D-30), alloy 59 (D-31) and alloy C22 (D-32) are also NiCrMo.

Products available


Process	Product	Specification
MMA	Nimrod C	BS EN: E Ni2
	Nimax C	BS EN: E Ni2

General Data for all Alloy C 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 200–250°C/1-2h to restore to as-packed condition. Maximum 350° 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>Mo</th> <th>Cu</th> <th>F</th> <th>OES (mg/m³)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4</td> <td>10</td> <td>5</td> <td>5</td> <td>0.2</td> <td>16</td> <td>1</td> </tr> </tbody> </table>	Fe	Mn	Ni	Cr	Mo	Cu	F	OES (mg/m ³)	1	4	10	5	5	0.2	16	1
Fe	Mn	Ni	Cr	Mo	Cu	F	OES (mg/m ³)										
1	4	10	5	5	0.2	16	1										


NIMROD C

Rutile alloy C electrode primarily used for surfacing

Product description	<p>MMA electrode manufactured on special nickel-chromium core wire, with an alloyed basic-rutile flux coating. Primarily used for surfacing and cladding; for joining applications the Nimrod C276KS (data sheet D-30) is preferred.</p> <p>Recovery is about 130% with respect to core wire, 65% with respect to whole electrode.</p>													
Specifications	BS EN 14700 DIN 8555 AWS A5.11		E Ni2 E23-UM-200-CKT (ENiCrMo-5 has similar composition)											
ASME IX Qualification	QW432 F-No 44													
Composition (weld metal wt %)	typ	C	Mn	Si	S	P	Cr	Ni	Mo	W	Fe	V	Cu	Co
		0.04	0.4	0.6	0.01	0.01	15	56	15.5	3.5	5.5	0.1	0.05	0.05
All-weld mechanical properties	As welded						min *		typical					
	Tensile strength						MPa		495		715			
	0.2% Proof stress						MPa		275		510			
	Elongation on 4d						%		4		18-30			
	Hardness						Cap/mid HV		--		230/255		Work hardens to about 450HV.	
	* Minimum properties are for ASTM A494 CW-12MW castings which are solution treated at 1120°C + WQ.													
Operating parameters	DC +ve or AC (OCV: 70V min)													
	∅ mm	2.5				3.2			4.0					
	min A	60				75			100					
	max A	90				120			155					
Packaging data	∅ mm	2.5				3.2			4.0					
	length mm	260				310			310					
	kg/carton	12.0				12.9			13.5					
	pieces/carton	657				339			234					

NIMAX C

High recovery alloy C electrode primarily used for surfacing

Product description	MMA electrode with special metal powder rutile- basic flux coating on high conductivity pure nickel core wire. Recovery is about 150% with respect to core wire, 65% with respect to whole electrode.													
Specifications	BS EN 14700		E Ni2											
	DIN 8555		E23-UM-200-CKT											
	AWS A5.11		(ENiCrMo-5 has similar composition)											
ASME IX Qualification	QW432 F-No 44													
Composition (weld metal wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	W	Fe	V	Cu	Co
	typ	0.05	0.8	0.7	0.01	0.02	16	56	16.5	3.6	5.5	0.1	0.05	0.05
All-weld mechanical properties	As welded						min *		typical					
	Tensile strength						MPa		495		680			
	0.2% Proof stress						MPa		275		540			
	Elongation on 4d						%		4		10-25			
	Hardness						HV		--		240		Work hardens to about 450HV.	
	* Minimum properties are for ASTM A494 CW-12MW castings which are solution treated at 1120°C + WQ.													
Operating parameters	DC +ve													
	ø mm		5.0											
	min A		160											
	max A		260											
Packaging data	ø mm		5.0											
	length mm		450											
	kg/carton		18.0											
	pieces/carton		102											