

High Temperature Alloys

DATA SHEET

C-60

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HIGH CARBON 35Cr-45Ni-1Nb

Alloy type

High carbon 35Cr-45Ni-1Nb to match heat-resisting castings, which are often micro-alloyed with Ti and Zr.

Materials to be welded

Proprietary alloys include:

Paralloy H46M (Doncasters Paralloy)
 Manaurite XT/XTM (Manoir Industries)
 Centralloy ET45 Micro (Schmidt + Clemens-Centracero)
 Lloyds T80 (LBA)
 Lloyds T75MA (LBA)
 E3545Nb-MA (Engemasa)

Applications

These alloys have superior carburisation and oxidation resistance to alloys based on 25%Cr-35%Ni for service up to 1150°C but with some reduction in creep strength.

Applications include **pyrolysis coils** and **reformer tubes** for the **petrochemical** industry.

Microstructure

In the as-welded condition the multi-pass weld metal microstructure consists of austenite with primary eutectic and secondary precipitated carbides.

Welding guidelines

For the thicker section materials a preheat may prove beneficial owing to the low ductility of the material. There would not normally be any requirement for PWHT.

Related alloy groups

There are a number of other high carbon austenitic alloys for high temperature service e.g.. 25Cr-35Ni-1Nb types (data sheet C-50).

Products available

Process	Product	Specification
MMA	Thermet 35.45.Nb	-
TIG/MIG	35.45.Nb	-

THERMET 35.45.Nb

MMA electrode

Product description	Thermet 35.45.Nb is a basic coated electrode with some alloy additions in the coating and is made on a high purity NiCr core wire. Recovery is approximately 140% with respect to core wire, 65% with respect to whole electrode.												
Specifications	No relevant national specifications.												
ASME IX Qualification	QW432 F-No - , QW442 A-No -												
Composition (weld metal wt %)		C	Mn	Si	S	P	Cr	Ni	Nb	Mo	Ti	Fe	
	min	0.40	0.5	1.0	-	-	34	44	0.60	-	0.04	-	
	max	0.50	1.5	1.6	0.01	0.01	38	50	1.30	0.25	0.15	bal	
	typ	0.45	0.9	1.2	0.005	<0.01	35	47	0.8	0.05	0.07	13	
All-weld mechanical properties	As welded						min *	typical					
	Tensile strength						MPa	450	740				
	0.2% Proof stress						MPa	245	550				
	Elongation on 4d						%	3	6				
	Hardness						HV	-	270				
* Minimum values are for static castings.													

THERMET 35.45.Nb (continued)

MMA electrode

Operating parameters	DC +ve																						
	ø mm	2.5	3.2	4.0																			
	min A	70	85	110																			
	max A	95	120	160																			
Packaging data	ø mm	2.5	3.2	4.0																			
	length mm	300	300	350																			
	kg/carton	9.9	10.5	12.6																			
	pieces/carton	450	252	171																			
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 150 – 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"> <thead> <tr> <th>Fe</th> <th>Mn</th> <th>Cr⁶</th> <th>Ni</th> <th>Cu</th> <th>F</th> <th>OES (mg/m³)</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>6</td> <td>10</td> <td>9</td> <td><0.2</td> <td>18</td> <td>0.5</td> </tr> </tbody> </table>									Fe	Mn	Cr ⁶	Ni	Cu	F	OES (mg/m ³)	3	6	10	9	<0.2	18	0.5
Fe	Mn	Cr ⁶	Ni	Cu	F	OES (mg/m ³)																	
3	6	10	9	<0.2	18	0.5																	

35.45.Nb

Solid welding wire for TIG welding

Product description	Straight lengths and spooled wire for manual and automatic TIG/GTAW welding.												
Specifications	There are no national specifications for this wire.												
ASME IX Qualification	QW432 F-No -- , QW442 A-No --												
Composition (wire wt %)		C	Mn	Si	S	P	Cr	Ni	Nb	Mo	Ti	Zr	Fe
	min	0.40	0.8	1.0	-	-	34	44	0.6	-	0.04	-	-
	max	0.50	1.5	1.5	0.015	0.02	38	48	1.3	0.50	0.15	0.15	bal
	typ	0.43	1.0	1.2	0.005	0.012	36	46	0.9	0.05	0.1	0.05	13
All-weld mechanical properties	Typical values as welded						TIG						
	Tensile strength					MPa	690						
	0.2% Proof stress					MPa	550						
	Elongation on 4d					%	3						
	Hardness					HV	280						
Typical operating parameters	TIG												
	Shielding	Argon											
	Current	DC-											
	Diameter	2.4mm											
Parameters	120A, 12V												
Packaging data	ø mm	TIG						Spooled					
	1.2	-						12.5kg spool					
	2.4	2.5kg tube						-					
	3.2	2.5kg tube						-					
Fume data	Fume composition (wt %) (TIG fume negligible)												
	Fe	Mn	Cr ³	Ni	Mo	Cu	OES (mg/m ³)						
	15	5	28	28	<0.5	<0.5	1.8						