High Temperature Alloys

DATA SHEET **C-41**

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HIGH CARBON 18/37 HEAT RESISTING AUSTENITIC ALLOY

Alloy type

0.45%C-17%Cr-38%Ni high carbon austenitic heat resisting steel often called 18/37 or 37/18 alloy.

Materials to be welded

ASTM-ASME	DIN	BS
A297 HT & HU	1.4865	3100 Gr 330C11
A351 HT30		3100 Gr 331C40
		4534 Gr 8 & 9

Proprietary
Paralloy H38, H40, H33, H35 (Doncasters Paralloy)
Cronite HR5, HR17, HR31 (Cronite)
Lloyds T50 (LBA)
Thermalloy T50, T58 (Duraloy)
RA330-HC (Rolled Alloys)
Incoloy DS & 330 (Special Metals) (wrought)

Applications

Thermet R17.18H is designed to match fully austenitic high alloy heat resisting steels often called 17/38 or 38/17. Alloys of this type are produced as castings with about 0.4%C, or in wrought form with carbon of about 0.08%. Thermet R17.38H matches the composition of castings but experience has also shown it to be compatible wit the wrought alloys, although higher weld metal ductility will be obtained with a nickel base type (data sheet D-11).

The high nickel content and low thermal expansion of the alloys give good resistance to thermal shock. The alloy is also highly resistant to carburisation and oxidation but is not suitable for use in high sulphur bearing atmospheres.

These alloys retain good mechanical strength up to 1050-1100°C and are used for **heat treatment trays** and **containers**, **retorts** furnace **rollers**, **moulds**, **hearth** plates, **radiant tubes**, and **furnace fittings** and **headers** in the **heat treatment industries** and **high temperature process plants**.

Microstructure

In the as-welded condition the weld metal microstructure consists of austenite with eutectic and secondary carbides. Although fully austenitic the alloy is slightly magnetic with an apparent ferrite of up to 5FN.

Welding guidelines

Preheat is not generally required.

Related alloy groups

The AB type nickel base alloys are often used to weld the wrought versions of this alloy (data sheet D-11).

There is no matching solid wire for this alloy.

Products available

Process	Product	Specification
MMA	**Thermet R17.38H**	BS 15.35.H.R

THERMET R17.38H

MMA electrode to match high carbon 18/37 heat resisting alloys

Product description

MMA electrode with a basic-rutile flux covering on a high alloy core wire. Moisture resistant coating giving sound, porosity-free deposits. Sizes above 3.2mm are not recommended for positional welding.

Recovery is about 120% with respect to core wire, 65% with respect to whole electrode.

Specifications

AWS A5.4	(E330H-16)	Thermet R17.38H has higher C, Cr & Ni than AWS specification.
BS 2926	15.35.H.R	

ASME IX Qualification

QW432 F-No 5

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo
min	0.35	1.0	0.3	--	--	17.0	35.0	--
max	0.60	2.0	1.0	0.030	0.040	20.0	40.0	0.5
typ	0.45	1.5	0.5	0.01	0.015	18.5	38	0.4

All-weld mechanical properties

As welded		min	typical
Tensile strength	MPa	620	780
0.2% Proof stress	MPa	--	520
Elongation on 4d	%	10	16
Elongation on 5d	%	5	14
Reduction of area	%	--	15
Hardness	HV	--	250

These alloys are designed for operation at elevated temperatures and modest ambient temperature elongations in the range 10-20% are normal.

Operating parameters

DC +ve or AC (OCV: 70V 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	12.6	15.6	15.6
pieces/carton	639	396	264

Storage

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.
For electrodes that have been exposed:
Redry 200 – 250°C/1-2h to restore to as-packed condition. Maximum 250° 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.

Fume data

Fume composition, wt % typical:

Fe	Mn	Ni	Cr	Mo	Cu	F	OES (mg/m^3)
4	7	4	5	<0.1	<0.2	16	1