

Stainless Steels

DATA SHEET

B-31

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347 STAINLESS STEEL

Alloy type

347 austenitic stainless steel for joining 321 and 347 base materials.

Materials to be welded

ASTM-ASME	BS EN & DIN
321	1.4541
347	1.4543/1.4561/1.4550
CF8C (cast)	1.4552 (cast)

BS	UNS
321S31	S32100
347S31	S34700
347C17 (cast)	

Applications

Used to weld titanium and niobium stabilised 18/8 stainless steel types 321 and 347. Also suitable for unstabilised grades such as 304/304L. Service temperatures are typically -100°C to about 400°C.

Applications are similar to 308L (B-30) and include **food, brewery, pharmaceutical equipment, architectural and general fabrication, and nuclear engineering.**

The 347 consumables covered here are generally not suitable for service in elevated temperature structural applications where 0.04-0.08% carbon is specified for creep resistance, see data sheets C-11 and C-12.

For cryogenic applications requiring >0.38mm (15mils) Charpy lateral expansion at -196°C, use unstabilised weld metal with low carbon and controlled ferrite (B-30).

Microstructure

Austenite with a controlled level of ferrite, normally in the range 3-12FN.

Welding guidelines

No preheat, maximum interpass temperature 250°C; no PWHT required.

Additional information

There is a Technical Profile available on sub-arc welding with 347S96. There is also additional information available covering the Supercore flux cored wires.

Related alloy groups

The 308L consumables cover many of the same base materials and applications (B-30). For elevated temperature applications 347H consumables should be used (C-11).

Products available


Process	Product	Specification
MMA	Ultramet 347	AWS E347-16
	Ultramet B347	AWS E347-15
TIG/MIG/SAW	347S96	AWS ER347
SAW flux	SS300	BS EN SA AF2
	SSB	BS EN SA AF2
FCW	Supercore 347	AWS E347T0-1/4

General Data for all 347 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 border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Fe</th> <th>Mn</th> <th>Ni</th> <th>Cr</th> <th>Cu</th> <th>F *</th> <th>OES (mg/m³)</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>5</td> <td>0.8</td> <td>5</td> <td><0.2</td> <td>16</td> <td>1</td> </tr> </tbody> </table> <p>* F=28% for basic coated Ultramet B347 but this does not affect the OES.</p>	Fe	Mn	Ni	Cr	Cu	F *	OES (mg/m ³)	8	5	0.8	5	<0.2	16	1
Fe	Mn	Ni	Cr	Cu	F *	OES (mg/m ³)									
8	5	0.8	5	<0.2	16	1									

ULTRAMET 347

All-positional rutile MMA electrode for 321/347

Product description	<p>MMA rutile flux coated 347 electrode on high purity 304L core wire. Ultramet 347 has all the benefits of an advanced rutile flux design, including all-positional fixed pipework welding with the 2.5/3.2mm diameter electrodes.</p> <p>Recovery is about 110% with respect to core wire, 65% with respect to whole electrode.</p>																																													
Specifications	AWS A5.4 BS EN 1600 BS 2926 DIN 8556		E347-16 E 19 9 Nb R32 19.9.Nb.R E 19 9 Nb R 23																																											
ASME IX Qualification	QW432 F-No 5, QW442 A-No 8																																													
Composition (weld metal wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	Nb	Cu	FN																																		
	min	--	0.5	--	--	--	18.0	9.0	--	10xC	--	4																																		
	max	0.04	2.0	0.9	0.025	0.030	21.0	11.0	0.50	1.00	0.50	12																																		
	typ	0.02	0.7	0.7	0.01	0.02	19	9.5	0.05	0.4	0.07	6																																		
All-weld mechanical properties	<table border="1" style="width: 100%;"> <thead> <tr> <th colspan="2">As welded</th> <th>min</th> <th>typical</th> </tr> </thead> <tbody> <tr> <td>Tensile strength</td> <td>MPa</td> <td>560</td> <td>650</td> </tr> <tr> <td>0.2% Proof stress</td> <td>MPa</td> <td>350</td> <td>500</td> </tr> <tr> <td>Elongation on 4d</td> <td>%</td> <td>30</td> <td>40</td> </tr> <tr> <td>Elongation on 5d</td> <td>%</td> <td>25</td> <td>37</td> </tr> <tr> <td>Reduction of area</td> <td>%</td> <td>--</td> <td>52</td> </tr> <tr> <td rowspan="3">Impact energy</td> <td>+ 20°C</td> <td>J</td> <td>70</td> </tr> <tr> <td>-196°C</td> <td>J</td> <td>20</td> </tr> <tr> <td>-196°C</td> <td>J</td> <td>53 (1050°C + WQ)</td> </tr> </tbody> </table>												As welded		min	typical	Tensile strength	MPa	560	650	0.2% Proof stress	MPa	350	500	Elongation on 4d	%	30	40	Elongation on 5d	%	25	37	Reduction of area	%	--	52	Impact energy	+ 20°C	J	70	-196°C	J	20	-196°C	J	53 (1050°C + WQ)
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Operating parameters	DC +ve or AC (OCV: 50V min) <div style="text-align: right;">  </div> <table border="1" style="width: 100%; margin-top: 10px;"> <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>∅ mm</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>min A</td> <td>60</td> <td>75</td> <td>100</td> <td>130</td> </tr> <tr> <td>max A</td> <td>90</td> <td>120</td> <td>155</td> <td>210</td> </tr> </tbody> </table>													2.5	3.2	4.0	5.0	∅ mm					min A	60	75	100	130	max A	90	120	155	210														
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ULTRAMET B347

Basic pipe-welding electrode for 321/347

Product description	<p>MMA electrode with basic carbonate-fluoride flux on high purity 304L core wire. Designed to give good moisture resistance and hence freedom from weld porosity. The electrode is particularly suited to positional welding of fixed pipework qualified in the ASME 5G/6G position and is tolerant to adverse wind and draughts under site conditions. Compared with rutile types, the basic flux gives a more convex fillet bead profile and although the slag does not self-lift, it is easily removed and gives welds of exceptional appearance and quality.</p> <p>Recovery is about 110% with respect to core wire, 65% with respect to whole electrode.</p>													
Specifications	AWS A5.4 BS EN 1600 BS 2926 DIN 8556	E347-15 E 19 9 Nb B 42 19.9.Nb.B E 19 9 Nb B 20+												
ASME IX Qualification	QW432 F-No 5, QW442 A-No 8													
Composition (weld metal wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	Nb	Cu	FN		
	min	--	0.5	--	--	--	18.0	9.0	--	10xC	--	4		
	max	0.06	2.0	0.9	0.025	0.030	21.0	11.0	0.50	1.00	0.50	12		
	typ	0.03	1.2	0.3	0.01	0.02	19	9.5	0.05	0.5	0.07	6		
All-weld mechanical properties	As welded							min	typical					
	Tensile strength							MPa	560	650				
	0.2% Proof stress							MPa	350	500				
	Elongation on 4d							%	30	40				
	Elongation on 5d							%	25	37				
	Reduction of area							%	--	52				
	Impact energy		- 50°C					J	--	90				
Operating parameters	DC +ve													
	∅ mm			2.5				3.2			4.0			5.0
	min A			60				75			100			130
	max A			90				120			155			210
Packaging data	∅ mm			2.5				3.2			4.0*			5.0
	length mm			300				350			350/450			450
	kg/carton			12.0				13.5			13.5/17.4			17.4
	pieces/carton			669				396			258/267			162
	* 350mm is the standard length, 450mm is available to order.													

347S96

Solid welding wire for TIG, MIG & SAW of 321/347

Product description	Solid wire for TIG, MIG and SAW.												
Specifications	AWS A5.9 BS EN ISO 14343-A BS EN ISO 14343-B DIN 8556	ER347 19 9 Nb SS347 (SG X5CrNiNb 19 9 (1.4511))						BS 2901: PT2 347S96					
ASME IX Qualification	QW432 F-No 6, QW442 A-No 8												
Composition (wire wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	Nb	Cu	FN	
	min	--	1.0	0.30	--	--	19.0	9.0	--	10xC	--	4	
	max	0.08	2.5	0.65	0.020	0.030	21.0	11.0	0.3	1.0	0.3	12	
	typ	< 0.04	1.5	0.4	0.005	0.02	19.5	9.7	0.2	0.6	0.1	8	
All-weld mechanical properties	Typical values as welded							TIG					
	Tensile strength							MPa	660				
	0.2% Proof stress							MPa	450				
	Elongation on 4d							%	42				
	Elongation on 5d							%	40				
	Impact energy		- 50°C					J	150				
			- 196°C					J	35				
	Hardness cap/mid							HV	220/240				

347S96 (continued)

Typical operating parameters		TIG	MIG	SAW
	Shielding		Argon *	Ar+2%O ₂ **
Current		DC-	DC+	DC+
Diameter		2.4mm	1.2	2.4mm
Parameters		100A, 12V	260A, 26V	350A, 28V
	* Also required as a purge for root runs.			
	** Also proprietary Ar and Ar-He mixtures with <3%CO ₂ .			

Packaging data	ø mm	TIG	MIG	SAW
	1.0	--		15kg spool
1.2	--		15kg spool	--
1.6		2.5kg tube	--	25kg coil
2.0		To order	--	--
2.4		2.5kg tube	--	25kg coil
3.2		2.5kg tube	--	25kg coil

Fume data	MIG fume composition (wt %) (TIG and SAW fume negligible)						
	Fe	Mn	Cr ³	Ni	Mo	Cu	OES (mg/m ³)
	32	12	16	8	<0.5	<0.5	3.1

SUPERCORE 347

Downhand rutile flux cored wire for 321/347

Product description	Flux cored wire made with an austenitic stainless steel sheath and rutile flux system. Supercore 347 combines easy operability, high deposit quality and good weld bead appearance for downhand and HV welding. Metal recovery is about 90% with respect to wire.												
Specifications	AWS A5.22	E347T0-1/4											
	BS EN ISO 17633-A	T19 9 Nb R C/M 3											
	BS EN ISO 17633-B	TS347-FB0											
ASME IX Qualification	QW432 F-No 6, QW442 A-No 8												
Composition (weld metal wt %)		C	Mn	Si	S	P	Cr	Ni	Mo	Nb	Cu	FN	
	min	--	0.5	--	--	--	18.0	9.0	--	8xC	--	4	
	max	0.08	2.0	1.0	0.025	0.030	21.0	11.0	0.3	1.0	0.3	12	
	typ	0.03	1.2	0.4	0.01	0.02	19	10.5	0.1	0.5	0.1	8	
All-weld mechanical properties	As welded					min		typical					
	Tensile strength					MPa		550	600				
	0.2% Proof stress					MPa		350	435				
	Elongation on 4d					%		30	47				
	Elongation on 5d					%		25	42				
	Reduction of area					%		--	50				
Impact energy					+ 20°C	J	--	90					
Operating parameters	Shielding gas: 80%Ar-20%CO ₂ at 20-25l/min. Proprietary gases may be used but argon should not exceed 85% argon. The wire is suitable for use on CO ₂ but with some loss of cosmetic appearance and increased spatter.												
	Current: DC+ve ranges as below (for 100%CO ₂ increase voltage by 2-3V):												
	ø mm	amp-volt range					typical			stickout			
1.2	120-280A, 22-34V					180A, 29V			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)					
	17	11	2	4	5	<1	5	1					