Repair & Maintenance

DATA SHEET **E-21**

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307 FOR DISSIMILAR WELDS

Alloy type

Strong tough austenitic weld metal composition for dissimilar joints and buffer layers.

Materials to be welded

Dissimilar combinations of CMn, stainless, hardenable, wear-resistant and armour steels. Also suitable for 13%Mn manganese (Hadfield) steel.

Applications

Mixed welding applications including the welding of mild, stainless, hardenable, and armour steels to themselves or each other with or without preheat. Tolerance to dilution (resistance to hot cracking) is provided by the high manganese content, unlike armour welding and 309 types which depend on a high ferrite level. In some cases, they may offer an alternative to high nickel weld metal in joints between **cast iron** and **stainless steels**. Weldments subject to PWHT retain ductility with satisfactory toughness down to -50°C. Reasonable scaling resistance up to 850°C.

Can be used as **buffer layers** to weld or reclaim 13% Mn (Hadfield) steel used in rock crushing plant and earth moving equipment. Buffer layer work hardens and can be used as a base for **Workhard 13Mn** or **Methard 650** or **850**. Has also been found satisfactory as buffer layer on **cast iron** prior to hardsurfacing.

Use as **surfacing** consumable which work hardens from 200 to 400 HV, suitable for repair of **alloy rails**, **crossing parts**, **frogs** etc. without need for preheat, however, the work-hardening rate is lower than 13% Mn steel and overlays of more than 1 layer may suffer unacceptable collapse under heavy rolling loads. In this case they may be used as a buffer under Workhard 13Mn.

Microstructure

Consists of austenite with approximately 5FN.

Welding guidelines

Preheat not generally required unless welding thick sections, except that HAZ properties of higher carbon hardenable steels should be taken into consideration in relation to service conditions.

When welding 13%Mn (Hadfield) steels in order to minimise embrittlement and cracking the work piece must be kept cool. This means that the following controls should be applied: no preheat, maximum interpass controlled to 150°C maximum, low heat input, small weld beads and cool with water if necessary.

Related alloy groups

For dissimilar joints etc. the 309L (B-50), 309Mo (B-51), armour welding consumables (E-20) and 29.9 types (E-22) may also be suitable.

Products available

Process	Product	Specification
MMA	**MetMax 307R**	AWS E307-26
	19.9.6Mn	BS EN E 18 8 Mn R
MIG	**19.9.6Mn**	BS EN G 18 8 Mn Si

General Data for all MMA Electrodes

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 – 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.

Fume data

Fume composition, wt % typical:

	Fe	Mn	Ni	Cr	Cu	Mo	F	OES (mg/m^3)
Metmax 307R	19	11	1	5	< 0.2	-	18	1
19.9.6Mn	18	15	1	5	< 0.2	-	18	1

METMAX 307R

Rutile high recovery MMA electrode

Product description

Rutile high recovery, metal powder, electrode made on high purity steel core wire. Moisture resistant coating ensures sound porosity free deposits.

Recovery is about 150% with respect to core wire, 65% with respect to whole electrode.

Specifications

AWS A5.4	E307-26
BS EN 1600	E 18 9 Mn Mo R 52
DIN 8556	similar to E 18 8 Mn MPR 26

ASME IX Qualification

QW432 F-No 5

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo	Cu
min	0.04	3.3	--	--	--	18.0	9.0	0.5	--
max	0.14	4.75	0.9	0.025	0.035	21.5	10.7	1.5	0.75
typ	0.1	4.0	0.6	0.010	0.015	19	9.5	0.8	0.1

All-weld mechanical properties

As welded			min	typical	PWHT 600°C/2h
Tensile strength		MPa	590	660	--
0.2% Proof stress		MPa	350	475	--
Elongation on 4d		%	30	40	--
Elongation on 5d		%	25	36	--
Reduction of area		%	--	45	--
Impact energy	+ 20°C	J	--	85	--
Impact energy	- 50°C	J	--	70	47
Hardness		HV	--	210 *	--

* Increases to about 400-450HV on work hardening.

Operating parameters

DC +ve or AC (OCV: 70V min)

ø mm	2.5	3.2	4.0	5.0
min A	70	90	130	160
max A	115	155	210	260

Packaging data

ø mm	2.5	3.2	4.0	5.0
length mm	350	380	380	450
kg/carton	12.0	13.5	13.2	15.0
pieces/carton	429	234	153	102

19.9.6Mn

All-positional rutile coated MMA electrode

Product description

Rutile electrode made on nearly matching austenitic steel core wire. Moisture resistant coating ensures sound porosity free deposits.

Recovery is about 110% with respect to core wire, 65% with respect to whole electrode.

Specifications

AWS A5.4	similar to E307-16
BS EN 1600	E 18 8 Mn R 3 2
DIN 8556	E 18 8 Mn R 26

ASME IX Qualification

QW432 F-No -

Composition (weld metal wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo
min	--	4.5	--	--	--	17.0	7.0	--
max	0.20	7.0	0.80	0.025	0.035	20.0	10.0	0.75
typ	0.12	5.8	0.5	0.01	0.02	18	9	0.4

All-weld mechanical properties

As welded			typical
Tensile strength		MPa	680
0.2% Proof stress		MPa	480
Elongation on 4d		%	35
Reduction of area		%	40
Impact energy	+ 20°C	J	80
Hardness		HV	210 *

* Increases to about 400-450HV on work hardening.

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	12.0	14.1	15.0
pieces/carton	621	372	261

19.9.6Mn

Solid wire for MIG

Product description

Solid wire for MIG.

Specifications

AWS A5.9	Similar to ER307 (AWS ranges: 3.3-4.75%Mn, 19.5-22.0%Cr and 0.5-1.5%Mo)
BS EN ISO 14343-A	G 18 8 Mn
BS 2901: Pt2	307S98
DIN 8556	SG-X 15 CrNiMn 18 8 (1.4370)

ASME IX Qualification

QW432 F-No --

Composition (wire wt %)

	C	Mn	Si	S	P	Cr	Ni	Mo	Cu
min	0.04	5.5	0.65	--	--	17.0	7.5	--	--
max	0.14	7.5	1.0	0.025	0.03	20.0	9.5	0.3	0.3
typ	0.08	6	0.8	0.01	0.015	19	8.5	0.2	0.1

All-weld mechanical properties

Typical values as welded			MIG: Ar + 5%CO_2
Tensile strength		MPa	605
0.2% Proof stress		MPa	414
Elongation on 4d		%	42
Elongation on 5d		%	40
Reduction of area		%	52
Impact energy	+ 20°C	J	105
Impact energy	- 50°C	J	65
Hardness cap/mid		HV	185/210

Typical operating parameters

	MIG
Shielding	Ar+5%CO_2 *
Current	DC+
Diameter	1.2mm
Parameters	220A, 26V

* Other proprietary shielding gases also suitable eg. Ar+2%O_2, Ar-He mixtures etc

Packaging data

ø mm	MIG
1.0	15kg spool
1.2	15kg spool

Fume data

MIG fume composition (wt %):

Fe	Mn	Ni	Cr^3	Mo	Cu	OES (mg/m^3)
30	26	3.5	12	< 0.5	< 1	3.8