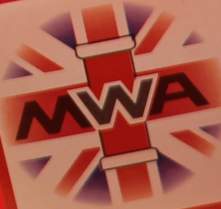




**MWA
Product Guide
2nd Edition**




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MANUFACTURER OF WELDING ELECTRODES



WARNING  **SAFETY NOTICE**
Welding fumes may be harmful. Use proper ventilation and wear eye protection. Do not inhale fumes.
Welding should be done by trained operators only. Do not touch the electrode until it has cooled.
The electrode may become very hot. Do not touch the electrode until it has cooled.
Do not touch the electrode until it has cooled.
Do not touch the electrode until it has cooled.

MAC CAST E407



WELCOME...

Welcome to the NEW MWA product guide. Here at MWA, we want to make it as easy as possible for you to sell our products. That is why our product guide is designed not only for you to find what you need, but also for you to help your customers achieve the results they want, using the best quality electrodes from the UK!

CONTACT OUR ELECTRODE SPECIALIST

You can contact our experienced electrode specialist below, who will be able to answer any questions you may have!

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SOCIAL MEDIA



@WeldfastMWA



**THE ONLY UK MANUFACTURER OF
MAINTENANCE & REPAIR ELECTRODES**

THE STORY

MWA have been manufacturing welding electrodes in the United Kingdom since 1974. With MWA Electrode distributors around the world, MWA continue to provide welding solutions to every type of industry.

The MWA range of welding electrodes symbolise high quality and are distributed throughout the world. With over 200 products available all problems and applications can be met.

MWA can also offer private branded electrodes. A wide range of packaging solutions are available to suit, including unprinted electrodes, AWS printed electrodes and even unique product name printed electrodes can be purchased. Labelling can be as simple or as detailed as you require. We design and print all our labels in house to customers needs.

MWA offer full technical support, with advice from metallurgists and welding engineers, ensuring all problems can be resolved.

Our qualified metallurgists enable us to formulate all types of electrodes, and using our own, on site, spectrometer we are able to analyse and certify all welding electrodes. We have recently re-developed our Nickel Alloy range for welding Inconels, Monels, Hastelloys & Nimonics within the nuclear, chemical, and petrochemical industries.

MWA are continuously developing into various industries such as:

- Forging
- Chemical
- Oil
- Foundry
- Steel
- Quarry
- Automotive



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SPECIAL STEELS

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MAC TRODE E64 W

High quality austenitic stainless steel rutile coated electrode, depositing 23% Cr, 12% Ni, 2% W weld metal to resist corrosion, heat and friction.

Tungsten in the weld metal produces high strength, scale and general wear resistance at temperatures up to 1100°C. For joining and overlaying various steels especially heat resistant steels, HR Crown 1 type – primarily furnace applications and particularly suitable for repairs to mandrels used in hot forming of tubular components.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni	P	S	Si	W
0.065	23	1.65	12	0.010	0.015	0.50	2.00

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	680 N/mm ²
Elongation	30-35%
Hardness	220 Brinell

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm
70-110	110-140	140-180

Related Specification:

AWS E309 Special

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E66

Superior specially designed high strength austenitic type electrode of duplex structure. Can be used for overlaying and joining dissimilar steels to one another, high and low carbon steels, spring steels, tool and die steels, cast steels, ferritic to austenitic steels and steels of unknown composition.

High resistance to cracking coupled with good wear, heat, impact and corrosion resistance. Therefore this electrode has uses in practically every type of industry resulting in one of the most universally used electrodes for problem and unknown steels.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.095	29.8	0.99	0.92	10.1	0.026	0.015	0.75

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	840 N/mm ²
Elongation	25%
Hardness	220 Brinell

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
25-35	30-45	50-70	90-110	120-140	150-190	200-250

Related Specification:

AWS E312-17

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E66 S

High strength rutile coated synthetic electrode for joining and overlaying dissimilar steels. Economical high recovery electrode produces a 29/9 type stainless steel weld deposit. Positive smooth arc, easy slag removal and builds up rapidly. Can be used in all positions. Ideal for buttering layers or overlaying steels to combat heat, friction and impact, where economy is of the utmost importance. Covers large areas quickly. Will join stainless to carbon steels and steels of unknown quantity.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni	P	S	Si
0.08	29.15	0.80	9.5	0.01	0.009	0.7

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	695 N/mm ²
Elongation	25-30%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
80-120	120-175	160-210	200-275

Related Specification:

AWS E312-16-HR

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E66 V

Superior high strength austenitic type electrode of duplex structure for joining and overlaying all steels. This variation of Mac Trode E66 is designed specifically to overcome difficult deslagging problems on high manganese tool steels and for inclined vertical down welding and root runs on certain thick sections. Has high resistance to cracking. Wear, heat, impact and corrosion resistant. Used for overlaying and joining dissimilar steels to one another, high and low carbon steels spring steels, tool and die steels, cast steels, ferritic to austenitic steels and steels of unknown composition.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.095	29.8	0.99	0.92	10.1	0.26	0.015	0.75

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	840 N/mm ²
Elongation	25-30%

Sizes Available & Recommended

2.5mm	3.2mm	4.0mm	5.0mm
80-120	120-175	160-210	200-275

Related Specification:

AWS E312-16

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E606

Specially designed high strength austenitic type electrode of duplex structure. All purpose low amperage electrode. Easy to use with smooth arc, low spatter and even bead formulation. Can be used for overlaying and joining dissimilar steels to one another, high and low carbon steels, spring steels, tool and die steels, cast steels, and steels of unknown composition. High resistance to cracking coupled with good wear, heat, impact and corrosion resistance.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.11	29.5	1.06	0.87	9.65	0.02	0.01	0.95

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	840 N/mm ²
Elongation	25%
Hardness	220 Brinell

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
25-35	30-45	50-70	90-110	120-140	150-190	200-250

Related Specification:

AWS E312-17

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E616

Superior specially designed high strength austenitic type electrode of duplex structure. All purpose low amperage electrode. Easy to use with smooth arc, low spatter and even bead formation. Can be used for overlaying and joining dissimilar steels to one another, high and low carbon steels, spring steels, tool and die steels, cast steels, ferritic to austenitic steels and steels of unknown composition. High resistance to cracking coupled with good wear, heat, impact and corrosion resistance.

Therefore this electrode has uses in practically every type of industry resulting in one of the most universally used electrodes for problem and unknown steels.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.095	29.8	0.99	0.92	10.1	0.028	0.015	0.75

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	840 N/mm ²
Elongation	25%
Hardness	220 Brinell

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
25-35	30-45	50-70	90-110	120-140	150-190	200-250

Related Specification:

AWS E312-17

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E630

Tough high strength, fully austenitic electrode, designed to resist heat and impact. Fully machinable. Weld deposit will work harden under impact and retain properties at high temperatures. Easy to use in all positions producing sound welds, good build-up characteristics and good slag detachability. For joining or overlaying mild and alloy steels, spring steels, heat resisting steels, ideal for the repair of drop forging dies. Suitable for use as a buffer layer prior to hardsurfacing of manganese steel, and may be used for welding manganese steel rails or similar applications involving friction, impact or corrosion.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni	P	S	Si
0.1	20.0	5.4	10.0	0.02	0.016	0.55

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	650 N/mm ²
Elongation	40%
Hardness	220 Brinell
Hardness (Work Hardened)	350 Brinell

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
60-95	70-120	110-140	130-160	120-200

Related Specification:
AWS A5.4 E307-16 | Type 20.10.4 Mn

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC TRODE E630 S

Tough high strength, synthetic austenitic electrode designed to resist heat and impact. Fully machinable, with a recovery rate of 170%. Easy to use in all positions producing sound welds, good build-up characteristics and good slag detachability. Weld deposit will work harden under impact and retain properties at high temperatures. For joining and overlaying mild and alloy steels, spring steels and heat resisting steels. Suitable for use as a buffer layer prior to hard surfacing of manganese steel and may be used for welding manganese steel rails or similar applications involving friction, impact or corrosion.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni	P	S	Si
0.1	22.0	4.15	10.0	0.02	0.016	0.55

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	620 N/mm ²
Elongation	40%
Hardness	220 Brinell
Hardness (Work Hardened)	300 Brinell

Sizes Available & Recommended

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
60-95	95-120	120-140	140-160	160-200

Related Specification:
AWS A5.4 E307-26 RMP

Current:
AC/DC DC(+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC TRODE E631

The electrode has a basic lime rutile flux coating and is so alloyed to deposit a martensitic precipitation hardening Cr-Ni-Mo-Cu weld metal. Excellent weldability combined with good slag detachability. The smaller diameters, e.g. 2.50 & 3.20mm can be used in all positions. Designed to weld Firth Vickers 520 and alloy 450 (USA). The corrosion resistance of the weld is similar to 304 stainless but its yield strength is 3 times greater. The weld is slightly under alloyed compared to FV 520 to compensate for the faster cooling rates of the weld metal to castings but responds in an identical manner to PWHT as FV 520.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Nb	Ni	P	S	Si
0.4	13.9	1.5	0.6	1.5	0.3	5.00	0.02	0.02	0.4

Typical All Weld Metal Mechanical Properties

As Welded		
Ultimate Tensile Strength	1230 N/mm ²	
0.2% Proof Stress	1110N/mm ²	
Elongation	12%	
Reduction of Area	30%	
Hardness	410 HV	
PWHT	850°C - 2hr	450°C - 4hr

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-100	100-130	150-190	200-240

Related Specification:

N/A

Current:

DC (±) AC (OCV 80 amps)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC TRODE E6130

High recovery rutile type electrode for welding, surfacing and building up manganese steel components. Weld deposits have excellent impact resistance and rapid work hardening properties. For applications where a hard surface, resistant to wear under heavy impact and battering is required. For weld reclamation of crushers, railway frogs and crossings and for reclamation of defective manganese steel castings. For welding manganese steels to each other or to mild and low alloy steels. Cool between runs on thick sections to prevent surface fissuring.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni
0.8	5.0	13.0	3.0

Typical Hardness Values

As Welded	230-245 Brinell - 20 Rockwell C
Work Hardened	480-550 Brinell - 50 Rockwell C

Deposited Weld Metal Structure

To achieve required properties and analyses at least 3 layers of weld metal must be deposited, when welding on mild and low alloy steels. Keep work piece as cool as possible to achieve maximum weld soundness. Water quench if necessary.

Sizes Available & Recommended

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
80-110	110-140	150-180	180-210	210-240

Related Specification:

AWS E Fe Mn-A

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6410

High quality low hydrogen type electrode specially designed for welding 12% Cr martensitic steel which air hardens to produce high strength. (For increased toughness use E6410NM) . Easy to strike and restrike, smooth flowing electrode with low spatter and excellent slag detachability. Welds are of a smooth flat appearance. For joining and the repair of wrought and cast steels subject to corrosion and oxidation. If post weld heat treatment is not possible then an austenitic type stainless steel electrode should be used.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Fe	Mn	Mo	Ni	P	S	Si
0.045	12.8	0.04	BAL	0.62	0.20	0.3	0.01	0.009	0.34

Typical All Weld Metal Mechanical Properties

As Welded

Property	Value
Ultimate Tensile Strength	520 N/mm ²
Elongation	18%
0.2% Proof Stress	280 N/mm ²
Reduction of Area	52%
Impact Energy @ -20°C	50J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
70-110	80-140	100-170

Related Specification:

AWS A5.4 E410-16

Current:

AC/DC (+) (AC Min 70 OCV)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6410 HR

Basic flux coated low hydrogen electrode made on a mild steel core wire with iron powder and alloying elements added to the flux to provide a martensitic weld metal containing a nominal 12% Cr with smaller levels of Ni and Mo. Mac Trode E6410-25 electrodes are designed for welding 410 (12Cr) martensitic stainless steels such as ASTM 410, 403, cast A487 grade CA15 BS410 S21 (EN56A) 410C21 and 403 C21. Such materials and weld metal are heat resistant up to 580°C and display reasonable creep resistance up to 550°C. Metal recovery is some 120% with respect to the core wire and 3.25mm electrodes may be used for positional welding.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Ni	P	S	Si
0.04	12.0	0.04	0.7	0.30	1.4	0.020	0.001	0.4

Typical All Weld Metal Mechanical Properties

Post Weld H.T

Min

Property	Value
Ultimate Tensile Strength	620 N/mm ²
Elongation	18%
0.2% Proof Stress	450 N/mm ²
Hardness	<22 HRC
Charpy Vee Notch @ +20°C	60J
Charpy Vee Notch @ -10°C	50J

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm
70-140	95-180	140-250

Related Specification:

AWS E410-26

Current:

DC (+) or AC (Min OCV 80)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6410 NM

High quality superior low hydrogen type electrode for welding high strength martensitic corrosion resistant stainless steel. Has moisture resistant rutile flux coating with a recovery rate of approximately 130%. Easy to strike and restrike, smooth flowing electrode with low spatter and excellent slag detachability. Welds are of a smooth flat appearance. For welding high strength corrosion resistant martensitic stainless and cast steels which have superior sulphide-induced SCC hydro-cavitation properties (when compared with plain 12% Cr steels).

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Mo	Ni	P	S	Si
0.06	12.4	BAL	0.24	0.51	4.45	0.01	0.007	0.24

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	550 N/mm ²
Elongation	17%
0.2% Proof Stress	470 N/mm ²
Reduction of Area	45%
Impact Energy @ -20°C	50J

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm
70-110	80-140	100-170

Related Specification:
AWS A5.4 E410-Ni Mo-16

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6412

Manufactured using a low carbon, high purity ferritic core wire with a rutile metal powder flux containing chromium as the main alloying element. Weldability and weld metal appearance are excellent, allowing contact welding with low spatter levels and readily detachable slag. A specially designed electrode for welding wrought alloys such as ASTM A176, A276 and A446, which contain a nominal 25% Cr and possesses similar resistance to oxidation in sulphurous reducing conditions up to 1100°C. The electrode may be used to weld similar alloyed cast materials and applications including, furnace parts, oil burners and flue stack liners.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Ni	P	S	Si
0.05	28	BAL	0.4	0.1	0.012	0.01	0.6

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	560 N/mm ²
Elongation	17%
0.2% Proof Stress	400 N/mm ²
Reduction of Area	42%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-110	110-140	150-200	200-250

Related Specification:
Known as 28RMP

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 180°C before use.

MAC TRODE E6430

MMA type welding electrode manufactured on a pure low carbon core wire with a recovery rate of 130% with respect to the core wire. This electrode has a moisture resistant coating giving very low weld metal hydrogen levels. It has good scaling resistance in air up to 820°C and low corrosion rate in sulphur bearing gases e.g. in H₂/H₂S mixtures some 5 to 10 times better than 12% Cr steels at 300°C-500°C. Mac Trode E6430 is immune to hydrogen attack at high temperatures and will resist stress corrosion cracking in boiling chloride, nitrate and alkali solutions. Used in the cast and wrought form in industries such as chemical, petrochemical and steam generating industries. It is also suitable for welding Cr Si Al steels with up to 18% Cr, used for furnace parts and exhaust ducting.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Ni	P	S	Si
0.08	17.0	0.05	0.40	0.5	0.10	0.015	0.010	0.30

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	520 N/mm ²
Elongation	24%
0.2% Proof Stress	360 N/mm ²
Reduction of Area	50%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
70-110	80-140	100-180

Related Specification:

AWS A5.5 E430-16

Current:

DC (+) (OCV 70 amps) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6502

Low hydrogen manual metal arc electrode using a silicon free, low nitrogen C Mn core wire with a moisture resistant, chemically basic flux with a controlled iron powder addition. All positional electrode with good slag control. Easy to strike electrode which produces porosity free weld deposits. Exhibits good crack resistance and excellent resistance to oxidation at temperatures up to 650°C. For assembly welding of creep resistant steels with 5% Cr, 0.5% Mo and closely related grades. Used for pipe welds in the petrochemical industry.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	P	S	Si
0.06	5.0	0.7	0.55	0.01	0.01	0.3

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	470 N/mm ²
Elongation	32%
0.2% Proof Stress	230 N/mm ²

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-90	90-130	130-180	160-220

Related Specification:

AWS A5.5 E502-15 (Generic) | AWS A5.5 E8018-B6

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6505

A low hydrogen manual metal arc electrode using a silicon free, low nitrogen C Mn core wire with a moisture resistant chemically basic flux with a controlled iron powder addition. All positional electrode with good slag control. Exhibits good crack resistance. Mac Trode E6505 is designed specifically for welding a range of 9% Cr Mo forged and cast steels, for use in the fabrication and repair of pressure vessels.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Mo	Ni	P	S	Si
0.06	9.56	BAL	0.73	1.15	2.14	0.01	0.015	0.55

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	520 N/mm ²
Elongation	32%
0.2% Proof Stress	480 N/mm ²
Reduction of Area	75%
Impact Energy @ -10°C	35J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-90	90-130	130-180	160-220

Related Specification:
AWS E505-15 (Generic) | AWS E8018-B8

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6630

Low hydrogen manual metal arc electrode using a silicon free, low carbon, high purity, C:Mn core wire with a concentrically extruded, moisture resistant rutile flux, with a recovery rate of approximately 130% with respect to core wire. Easy to strike electrode which produces porosity free weld deposits.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Fe	Mn	Ni	P	S	Si
0.076	15.20	2.10	BAL	0.70	4.10	0.010	0.010	0.40

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	520 N/mm ²
Elongation	36%
0.2% Proof Stress	280 N/mm ²
Reduction of Area	52%
Impact Energy @ -20°C	50J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
70-110	80-140	100-180

Related Specification:
AWS A5.5 E630-16

Current:
DC (+) (OCV 70 amps) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE RAIL ROD

High recovery (115%) Low Hydrogen electrode for the welding of rails. Due to the excellent resistance to compressive loading, this electrode is ideal for the welding of rail steels. Low and medium Carbon rail steels. Minimal slag formation permits a slag over slag technique. Ideally Pre-Heat to 200-250C and maintain an inter pass temperature of around 400C.

Related Specification:

N/A

Current:

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

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.1	2.3	1.2	0.3	0.2	0.01	0.008	0.5

Typical All Weld Metal Mechanical Properties**As Welded**

Ultimate Tensile Strength	900 N/mm ²
Elongation	17%
0.2% Proof Stress	700 N/mm ²
Hardness (HV)	280

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm	6.0mm
100-160	140-190	200-280	230-370

MAC STAIN E100	26
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MAC STAIN E100

High quality rutile type niobium stabilised stainless steel electrode for welding 19/12/3 chrome, nickel, molybdenum stainless steels, subject to heat and to resist certain acids and corrosive liquids. Suitable for applications where good resistance to general corrosion and pitting is required. Due to niobium stabilisation the weld deposit has good resistance to intergranular corrosion, and is suitable for applications involving high temperatures up to 600°C. Extensive applications are found in chemical and drug processing plants, food, petroleum, and allied industries.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Nb	Mo	Ni	Si
0.06	18.5	1.1	0.7	3.1	12.5	0.65

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	680 N/mm ²
Elongation	30-35%
Yield Stress	370 N/mm ²

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm
25-35	30-45	45-70	70-110	110-140	140-180

Related Specification:
AWS E318 -17 | 19.12.3.R.

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E100 ELC

High quality rutile low carbon stainless steel electrode depositing weld metal of the 19% Cr, 12% Ni, 3% Mo type for corrosion resistance. Suitable for use in all positions except vertical down, high acid resistance. Extra low carbon. Wide usage in textile, pulp and paper, rayon and chemical industries. May be used for overlaying carbon and low alloy steels to provide corrosion and acid resistance. Suitable for general service at temperatures up to 500°C and for acid resistance up to 350°C. The electrode is suitable for welding steels of AISI 316L, 316 and 317 types. Weld Metal Micro-Structure: Austenite with 5–11% ferrite.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	Si
0.03	18.4	1.1	2.8	12.4	0.64

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	620 N/mm ²
Elongation	30-45%
0.2% Proof Stress	370 N/mm ²
Reduction of Area	40-45%
Hardness	150-160 Brinell
Charpy Vee Notch @ 20°C	85J
Charpy Vee Notch @ -196°C	48J

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm
25-35	30-45	45-70	70-110	110-140	140-180

Related Specification:
AWS E316L – 17 | 19.12.3.L.R.

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC STAIN E100 H

A manual metal arc electrode manufactured on an austenitic core with a fully chemically extruded basic flux. The electrodes are suited for all positional welding and have great resistance to porosity, even for site welding. Mac Stain E100H is intended for welding 316 stainless steels, used for elevated strength and oxidation resistance for typical applications arising in the power generator industry. Such steels and electrodes have a controlled carbon content of 0.04 to 0.08%

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	Si
0.06	18.0	1.3	2.5	12.0	0.4

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	580 N/mm ²
Elongation	36%
0.2% Proof Stress	460 N/mm ²
Reduction of Area	52%
Hardness	150-160 Brinell

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm
25-35	30-45	45-70	70-110	110-140	140-180

Related Specification:

AWS A5 E316H-15

Current:

DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC STAIN E100 UREA

A nil ferrite, non magnetic fully austenitic E316L alloy used in the marine and offshore industry. Also withstands attack by nitric acid. Basic coating gives ability for positional welding giving high strength and corrosion resistance at cryogenic temperatures.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	N	Ni	P	S	Si
0.04	18.5	3.5	3.0	0.15	16.0	0.02	0.015	0.64

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	580 N/mm ²
Elongation	36%
0.2% Proof Stress	420 N/mm ²
Impact Energy @ -196°C	50J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-90	80-120	100-150	150-200

Related Specification:

Known as E 18:15:3 LB

Current:

DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC STAIN E101

High quality rutile type, niobium stabilised stainless steel electrode for welding and overlaying 19% Cr, 9% Ni austenitic stainless steels subject to temperatures up to 600°C. Ideal for use on pressure vessels, food and process plant, domestic stainless steel equipment etc.

Steels for which the electrode is recommended are as follows:

AISI Type 321 (EN58 B and C) titanium stabilised

AISI Type 347 (EN58 F and G) niobium stabilised

AISI Type 302 (EN58 A) unstabilised

AISI Type 304 (EN58 E) unstabilised

Weld Metal Micro-Structure: Austenite with 3-10% ferrite.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni	Nb	P	S	Si
0.03	19.9	1.2	9.4	0.8	0.023	0.017	0.6

Typical All Weld Metal Mechanical Properties**As Welded**

Ultimate Tensile Strength	650 N/mm ²
Elongation	30-35%
Reduction of Area	40-50%
Hardness	160-180 Brinell

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
25-35	30-45	45-70	70-110	110-140	140-180	180-210

Related Specification:

AWS E347-17

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E101 CF

Manufactured on a matching alloyed core wire with a high rutile based flux coating. The electrode has a stable but soft arc and fluid slag ensures short arc welding characteristics used for all positional pipework welding which ensures weld metal integrity and smooth weld beads. It is not recommended for contact welding as slag is fluid and the soft arc does not lend itself to long arc lengths. The electrode is designed for welding controlled carbon 18% Cr 10% Ni stainless steels, particularly pipework operating between 400-815°C, such applications arise in the petrochemical industries.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.063	19.5	1.3	0.08	9.94	0.023	0.009	0.37

Typical All Weld Metal Mechanical Properties**As Welded**

Ultimate Tensile Strength	610 N/mm ²
Elongation	45%
0.2% Proof Stress	435 N/mm ²
Reduction of Area	48%
Hardness	190 HV
Charpy Vee Notch @ 20°C	80J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-90	70-120	100-160	130-210

Related Specification:

AWS A5.4 E308H-16

Current:

DC (+/-) AC (OCV 70) MIN

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E101 ELC

High quality rutile type stainless steel electrode for welding low carbon 19% Cr, 9% Ni stainless steel. The extra low carbon content provides improved corrosion resistance and notch toughness at low temperatures. Wide usage in the pressure vessel, process plant, dairy and food industries, also suitable for cryogenic applications where high notch toughness at sub-zero temperatures is required. Although the electrode is primarily for welding steels of the AISI 304L and 308L types, it may also be used for welding the higher carbon types 304 and 308. In applications where the operating temperature does not exceed 400°C the electrode may also be used for welding type 347 steels.

Weld Metal Micro-Structure: Austenite with 3-10% ferrite.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni	Si
0.03	18.5	1.1	10.1	0.62

Typical All Weld Metal Mechanical Properties**As Welded**

Ultimate Tensile Strength	585 N/mm ²
Elongation	30-45%
0.2% Proof Stress	340 N/mm ²
Reduction of Area	40-55%
Hardness	140-170 Brinell
Charpy Vee Notch @ 20°C	80J
Charpy Vee Notch @ -196°C	48J

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm
25-35	30-45	45-70	70-110	110-140	140-180

Related Specification:

AWS E308L-17

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E101 H

A rutile flux coated 347 stainless steel all positional electrode with a controlled carbon content 0.04-0.08% and controlled ferrite level of 3-7%, manufactured on a low carbon 308L stainless steel core wire. Designed for welding 347H and 321H stainless steels, subjected to elevated temperatures. This electrode is all positional with smaller diameters ideally suitable to root runs on pipework.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Nb	Ni	P	S	Si
0.07	18.9	1.4	0.7	10.5	0.021	0.011	0.5

Typical All Weld Metal Mechanical Properties**As Welded**

Ultimate Tensile Strength	660 N/mm ²
Elongation	30-40%
0.2% Proof Stress	490 N/mm ²
Reduction of Area	54%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-90	70-120	100-160	130-210

Related Specification:

AWS A5.4 E347H-16

Current:

DC (+) (OCV 70 amps)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E101 Mo

High quality lime rutile low silica stainless steel welding electrode for welding 19% Cr, 9% Ni 3% Mo stainless steels. The electrode has good strike and restrike characteristics and is suitable in all positions. Designed for welding hardenable high strength ferritics such as armour plate and ferritic materials in Q and T condition containing 0.4°C and alloyed with Ni Cr Mo & V steels for which the electrode is recommended for welding ferritics.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.11	19.6	1.0	2.69	9.0	0.026	0.024	0.48

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	780 N/mm ²
Elongation	> 45%
0.2% Proof Stress	> 540 N/mm ²
Reduction of Area	> 40%
Impact Energy @ 0°C	45J

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
25-35	30-45	45-70	70-110	110-140	140-180	180-210

Related Specification:

AWS A5.4 E308 Mo-17

Current:

DC (+/-) AC (OCV 70) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E102

Fully austenitic stainless steel electrode with a rutile coating designed to weld 25/20 chromium, nickel heat-resisting steels. Specially designed for welding austenitic heat resistant stainless steels such as AISI Type 310 and Firth Vickers Immaculate 5. The weld deposit provides good heat resistance up to 1400°C in air, up to approx. 650°C in oxidising sulphurous atmospheres. The electrodes are also suitable for welding stainless to carbon or low alloy steels, and recommended for foundry heat treatment trays and bins, foundry thermocouple units and many furnace elements.

Weld Metal Micro-Structure: Fully austenitic.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni	Si
0.08	25.6	2.39	20.64	0.68

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	695 N/mm ²
Elongation	35-40%
Hardness	210 Brinell

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
50-70	70-110	110-140

Related Specification:

AWS E310-17

Current:

AC/DC. DC electrode positive (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E102 EHC

Manufactured on a high purity, fully alloyed core wire with a chemically basic flux coating. The purity of the weld deposit is further enhanced by incorporating with the flux ultra fine metal alloys in the same ratio as they are present in the core wire, this ensures low levels of residuals; tin (Sn<0.01) and lead (Pb<0.01). Recovery is approximately 120% in respect to core wire. This electrode is designed to weld similar alloyed castings that are covered by the following specifications; BS 3100 and BS 1504 grade 310C40, BS 4534 grade 6, ASTM A297 HK, A351 and A608 HK 40. DIN 1.4848 and 1.4847. Proprietary alloys include Paramount H20, Thermoalloy 47 and Cronite HR6.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Ni	Si
0.40	26	0.01	1.8	0.1	21	0.4

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	760 N/mm ²
Elongation	21%
0.2% Proof Stress	570 N/mm ²
Reduction of Area	26%
Hardness	225-235 Brinell
Charpy Vee Notch @ 20°C	70J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-95	75-125	100-160	135-215

Related Specification:
AWS A5.5 E310H-15

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E103 CF

High quality rutile type stainless steel electrode for welding steels of a similar composition. The deposited weld metal has a controlled carbon content of about 0.08% and a low ferrite level, therefore increasing the high temperature strength and stability of the weld microstructure in service conditions above 400°C. Normally used in furnace and flue gas systems.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Ni	P	S	Si
0.08	22.8	0.1	1.5	0.1	12.9	0.02	0.01	0.3

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	600 N/mm ²
Elongation	40%
0.2% Proof Stress	480 N/mm ²
Reduction of Area	50%
Hardness	210 HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-80	70-110	90-150

Related Specification:
AWS E309H-16

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E103 L

General purpose stainless steel electrode of 23/12 type designed for joining dissimilar stainless steels, of the most common types, to one another. Primarily designed for fabrication applications where tolerance to dilution is exploited in joining 410, 304, 321, 316 to mild and low alloy steels for brackets, stiffeners etc. Also employed as a buffer layer on mild steels and used on clad plate applications extensively. Similar cast and wrought steels can also be welded if the service conditions are below 400°C

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Ni	P	S	Si
0.03	23.2	0.76	12.7	0.016	0.008	0.55

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	600 N/mm ²
Elongation	35%
Hardness	210 Brinell

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
40-60	40-60	50-60	70-100	110-140	140-180	180-220

Related Specification:

AWS E309L-17

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E103 Mo

General purpose stainless steel electrode of 23/12/3 type designed for joining dissimilar stainless steels, of the most common types, to one another. Primarily designed for maintenance applications where various types of stainless steels intermediate in composition between 18/8 and 23/12 chrome nickel, are used and where the need for one electrode, to accommodate all applications on a general basis, is required. Most of the common types of stainless steel can be welded with this electrode, without the loss of properties.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.035	23.0	1.4	2.5	13.0	0.03	0.03	0.6

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	620 N/mm ²
Elongation	35%
Hardness	210 Brinell

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-60	70-100	110-140	150-190

Related Specification:

AWS E309L Mo -17

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E104

High recovery alloyed rutile flux coated electrode that deposits a duplex stainless steel weld deposit. The moisture resistant coating ensures freedom from porosity. Welds with a stable arc and may be used slag over slag. The quick freezing slag allows greater control over the molten weld metal. This electrode may be used on thick sections of problem steels but specifically designed for welding galvanised steel. Such welds are free from porosity and of excellent appearance and positive resistance to atmospheric corrosion similar to the base material itself.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.03	23.0	0.60	2.8	12.0	0.010	0.010	0.80

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	660 N/mm ²
Elongation	40%
0.2% Proof Stress	475 N/mm ²
Reduction of Area	55%
Impact Energy @ 20°C	60J

Sizes Available and Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm
40-60	45-70	70-115	90-150	130-210

Related Specification:
AWS E309Mo-26 (Nearest)

Current:
AC/DC (+/-)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E105

Manufactured using a high purity ferritic core wire with an alloyed flux whose slag and de-oxidation system ensures full alloying with no trace segregation of any one element. Ideal electrode for contact welding and mitred fillets joints and deposits smooth even weld appearance for extra efficiency and deposits a weld metal recovery rate of 180%. The electrode is designed to weld ASTM 317 and similar austenitic alloys in which the high Mo content provides extra resistance to pitting in high chloride environments. This electrode may be used in cast or wrought form eg. BS 317S16 – 317S12 – 317C16 – 317C12 – ASTM 317 and CG 8M. May also be used for mixed welds between 317 – 316 – 304 – 321 – 347 etc.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.06	19.0	0.7	3.5	13.0	0.018	0.021	0.5

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	630 N/mm ²
Elongation	35%
0.2% Proof Stress	450 N/mm ²
Reduction of Area	41%
Impact Energy @ 20°C	110J

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm
90-120	110-140	140-200

Related Specification:
AWS E317-17

Current:
DC +/- AC (OCV 80 min)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E107

An extruded flux coated Manual Metal Arc electrode manufactured on an alloyed core wire giving a nominal 22Cr. 10Ni deposit micro alloyed with rare earth minerals. Special rutile – alumina – silicate fluxes formulation that ensures ease of welding with easy arc strike and re-striking and smooth weld seams and readily detachable slag. Designed for applications and alloys that need good resistance to oxidation up to 1100°C. e.g. furnace parts – flues – exhausts combustion nozzles. Materials to be welded include: ASTM/UNS S30815 Avesta 253 (Proprietary) EN 10095 – 1.4835 and 1.4893 plus 1.4891.

Typical All Weld Metal Chemical Analysis (%)

C	Ce	Cr	Mn	N	Ni	P	S	Si
0.06	0.003	22.0	0.70	0.05	10.0	0.025	0.011	1.60

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	710 N/mm ²
Elongation	40%
0.2% Proof Stress	560 N/mm ²
Reduction of Area	50%

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm
90-120	110-140	140-200

Related Specification:
Avesta 253 MA Type
Current:
DC +/- AC (OCV 80 min)
Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E108

A specially designed composition where Molybdenum % is reduced to form a hybrid alloy between 308H and 316H, operates in temperatures up to 800C. Gives a very high resistance to thermal embrittlement. Creep ductility is enhanced at temperatures above 650C. Used mainly in power generation and chemical process industries on applications such as, steam turbines, catalytic crackers, transfer piping and furnace accessories.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Ni	P	S	Si
0.05	16.0	0.3	1.25	1.25	8.25	0.015	0.01	0.45

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	620 MPa
Elongation	38%
0.2% Proof Stress	400 MPa
Reduction of Area	45%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-80	80-100	90-140	130-200

Related Specification:
AWS E 16.8.2-17 Type
Current:
DC (+ve) AC (OCV 55v min)
Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 200°C before use.

MAC STAIN E120

Designed on a highly alloyed core wire with a high purity lime rutile flux coating that deposits high chromium duplex weld metal with excellent resistance to corrosion and erosion. After water quenching from 1100°C the microstructure is 30 to 40 % delta ferrite – balance austenite. Mac Stain E120 is designed to weld alloys in cast condition which are then solution heat treated at 1100°C and then air or water quenched. These alloys include AISI 329, DIN 1.4460 and 1.4582 and proprietary alloys such as Firth Vickers FMN, Weir Materials Zeron 25, Sandvik 10RE51 and 3RE60.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	N2	Ni	P	S	Si
0.02	25.0	1.1	3.5	0.18	7.0	0.019	0.02	0.4

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	800 N/mm ²
Elongation	38%
Reduction of Area	45%
Impact Energy @ -50°C	35J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
45-70	70-110	110-140	140-180

Related Specification:

AWS E2553-16

Current:

AC/DC (AC OCV 70 min)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E120 Cu

Designed on a highly alloyed core wire with a high purity lime/rutile flux coating that deposits high chromium duplex weld metal with excellent resistance to corrosion and erosion. Designed to weld alloys in cast condition such as ASTM A351, A744, CD4MCu, UNS 93370, ASTM A240, BS3146 ANE 21. Proprietary alloys include Uranus 55 and Ferralium. After welding, the weldment is water or air quenched from 1100°C and this solution heat treatment ensures both weld and casting have similar microstructures e.g. austenite with 30 to 40 % delta ferrite.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	N2	Ni	P	S	Si
0.03	26.0	2.0	1.2	3.5	0.16	7.5	0.02	0.02	0.4

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	960 N/mm ²
Elongation	22%
0.2% Proof Stress	750 N/mm ²
Reduction of Area	48%
Impact Energy @ -50°C	50J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
45-70	70-110	110-140	140-180

Related Specification:

AWS E2553-Cu-16

Current:

AC/DC (AC OCV 70 min)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E122

Designed on a highly alloyed core wire with a high purity lime/ rutile flux coating that deposits high chromium duplex weld metal with excellent resistance to corrosion and erosion. The weld metal microstructure contains 30 to 50 % delta ferrite – balance austenite. This electrode has a very stable arc, low spatter, easy strike and restrike, good slag detachability and porosity free smooth welds. Mac Stain E122 is designed to weld the following alloys when no subsequent solution heat treatment is applied to the weldment. ASTM A182 Grade F51, UNS 53 1803, DIN 1.4462, BSC Hyresist 22/5, Sandvik SAF 2205, Avesta 2205, Valourec VS22.
Additional Data : PRE N = %Cr + 3.3 x %Mo + 16 x %N2 = 38

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	N2	Ni	P	S	Si
0.02	25.0	1.0	3.5	0.18	9.0	0.011	0.01	0.4

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	760 N/mm ²
Elongation	24%
0.2% Proof Stress	630 N/mm ²
Impact Energy @ -50°C	85J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
45-70	70-110	110-140	140-180

Related Specification:

AWS E2209-16

Current:

AC/DC (AC OCV 70 min)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E122 B

Designed on a highly alloyed core wire with a high purity chemically basic flux to facilitate all positional welding including on site welding. The weld metal as deposited has a duplex microstructure of the deposited weld contains 30 to 50 % delta ferrite – balance austenite which provides excellent resistance to corrosion and erosion. Mac Stain E122B is designed to weld the following alloys when no subsequent solution heat treatment is applied to the weldment, ASTM A182 Grade F51, UNS 53 1803, DIN 1.4462, BSC Hyresist 22/5, Sandvik SAF 2205, Avesta 2205, Valourec VS22.
Additional Data : PRE N = %Cr + 3.3 x %Mo + 16 x %N2 = 38

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	N2	Ni	P	S	Si
0.02	25.0	1.0	3.5	0.18	9.0	0.011	0.01	0.4

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	760 N/mm ²
Elongation	24%
0.2% Proof Stress	630 N/mm ²
Reduction of Area	44%
Impact Energy @ -50°C	85J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
45-70	70-110	110-140	140-180

Related Specification:

AWS E2209-15

Current:

AC/DC (AC OCV 70 amps)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E124

Designed on a highly alloyed core wire with a high purity lime/ rutilite flux coating that deposits high chromium duplex weld metal with excellent resistance to corrosion and erosion. The microstructure of the as deposited weld contains 30 to 50 % delta ferrite – balance austenite. Mac Stain E124 is designed to weld the following alloys when no subsequent solution heat treatment is applied to the weldment. UNS S32760 (wrought) and UNS J99380 (cast) and Weir Materials Zeron 100 (proprietary brand). Weir metals main areas of application for these materials is when a good combination of high strength and resistance to seawater corrosion is needed.

Additional Data : $PRE N = \%Cr + 3.3 \times \%Mo + 16 \times \%N2 = 40$

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	N2	Ni	P	S	Si	W
0.02	25.0	0.8	0.6	3.5	0.22	9.5	0.020	0.015	0.4	0.70

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	910 N/mm ²
Elongation	25%
0.2% Proof Stress	690 N/mm ²
Reduction of Area	45%
Impact Energy @ -50°C	46J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
45-70	70-110	110-140	140-180

Related Specification:

Type 2595-16.Cu.WR.

Current:

AC/DC (AC OCV 80 min)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.

MAC STAIN E125 B

Designed on an alloyed core wire with a special basic flux which deposits a super duplex weld metal system to give optimum all-positional welding. The electrode is designed for all positional welding of super duplex alloys subject to service in the as welded condition. The weld has a matching microstructure to the base alloy by virtue of an increased nickel content eg; microstructure of weld and base metal austenite with 40 to 60 Ferrite. The materials and applications it is suitable for are 25% chrome super duplex alloys conforming to ASTM A182 F53, UNS S32760, BS EN 1088-2, X2 Cr Ni

Mo, N25-7-4

Casting's : UNS J93404 ASTM A890 Grade 5A/6A

Proprietary Alloys : Weir pumps – Zeron 100 XKS – Sandvik – Avesta – SAF 2507. Particularly recommended for fixed positional pipework in the ASME 5G/6G position.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	N	Ni	P	S	Si
0.03	25.0	0.10	1.0	3.9	0.28	9.5	0.020	0.015	0.5

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	910 N/mm ²
Elongation	28%
0.2% Proof Stress	710 N/mm ²
Reduction of Area	45%
Impact Energy @ -50°C	>50J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-75	70-95	100-160	130-190

Related Specification:

AWS E2594L-15

Current:

DC+ (OCV 80 min)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.



NICKEL ALLOYS

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MAC NICRO E200

Manual Metal Arc electrode with a chemically basic flux coating. A superior electrode for joining and overlaying nickel and nickel alloys such as Inco 200 and 201; or nickel and nickel alloys to carbon steels especially where carbon migration is susceptible during high temperature service conditions. For operations such as evaporators, condensers, treatment of certain dry gases, chlorinating plants and for service involved in the treatment of organochlorine products. This electrode will cover a wide range of applications but is particularly suitable for site welding when TIG welding can not be used.

Typical All Weld Metal Chemical Analysis (%)

Al	C	Cr	Cu	Fe	Mn	Ni	P	S	Si	Ti
0.28	0.023	0.11	0.09	0.52	0.74	93.3	0.01	0.001	0.66	4.19

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	510 N/mm ²
Elongation	23%
0.2% Proof Stress	300 N/mm ²
Reduction of Area	32%
Impact Energy @ -40°C	140J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
50-70	90-110	120-140

Related Specification:

AWS A5.11 E Ni - 1

Current:

DC (+) only

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC NICRO E201

Manual Metal Arc welding electrode using a solid predominantly alloyed core wire with a concentrically extruded flux coating. Easy to use electrode with a porosity free weld deposit. A superior electrode for welding nickel alloys similar to Incoloy 800 and Incoloy DS, and for joining these to stainless and creep resisting Cr Mo steels.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Fe	Mn	Nb	Ni	P	S	Si
0.05	16.30	0.05	7.83	2.90	1.83	67.70	0.01	0.009	0.48

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	680 N/mm ²
Elongation	35%
0.2% Proof Stress	510 N/mm ²
Reduction of Area	50%
Impact Energy @ -196°C	80J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-80	80-120	100-150

Related Specification:

AWS A5.11 E Ni Cr Fe - 1

Current:

AC (OCV 70 amps Min) DC (+/-)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICRO E202

Manual Metal Arc welding electrode using a solid predominantly alloyed core wire with a concentrically extruded flux coating. A superior electrode for welding nickel alloys similar to Incoloy 800, Incoloy DS, Brightray and similar to stainless steels and Cr Mo creep steels. For welding 3% - 5% and 9% nickel steels for semi and full cryogenic applications and for welding high temperature cast alloys such as HK40.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Fe	Mn	Mo	Nb	Ni	P	S	Si
0.03	16.50	0.06	7.84	2.50	0.72	2.19	67.0	0.01	0.009	0.53

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	710 N/mm ²
Elongation	44%
0.2% Proof Stress	430 N/mm ²
Reduction of Area	45%
Impact Energy @ -196°C	100-200J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
50-70	90-110	120-140

Related Specification:

AWS A5.11 E Ni Cr Fe 2

Current:

AC (OCV 70 amps min) DC (±)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180° C before use.

MAC NICRO E203

Superior electrode for joining and overlaying almost any nickel chrome alloy for service in both cryogenic and high temperature conditions, with the emphasis on the cryogenic side. For welding Inconel 600 and 601 type alloys, Incoloy 800 and 800H, involved in temperatures up to 540°C and for dissimilar applications such as Incoloy 600 and 800HT to carbon or stainless steels; nickel 200 or monel 400 and nimonic 75. Also suitable for welding 3%, 5% nickel semi cryogenic steels and 9% nickel steels for full cryogenic conditions: Used extensively in the nuclear, chemical and petrochemical industries.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Nb	Ni	P	S	Si	Ti
0.02	15	7.00	7.50	1.50	68	0.009	0.005	0.62	0.11

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	660 N/mm ²
Elongation	40%
0.2% Proof Stress	390 N/mm ²
Reduction of Area	45%
Impact Energy @ -196°C	150J
Hardness (As Deposited)	190 HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-90	80-120	100-150	130-200

Related Specification:

AWS A5.11 E Ni Cr Fe 3

Current:

DC (+/-) AC min 70 OCV

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICO E203 B

Designed on a highly alloyed core wire with a high purity chemically basic flux to facilitate all positional welding including on site applications. A versatile electrode with superior welding characteristics for welding almost any nickel chrome alloy for service in both cryogenic and high temperature conditions, with the emphasis on the cryogenic side. For joining and overlaying Inconel 600 and 601 type alloys, Incoloy 800 and 800H, involved in temperatures up to 540°C and for dissimilar applications such as Incoloy 600 and 800H to carbon or stainless steels, nickel 200 or monel 400 and nimonic 75. Also suitable for welding 3%, 5% nickel semi cryogenic steels and 9% nickel steels for full cryogenic conditions: Used extensively in the nuclear, chemical and petrochemical industries.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Nb	Ni	P	S	Si	Ti
0.02	15	7.0	7.50	1.50	65	0.009	0.005	0.62	0.11

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	650 N/mm ²
Elongation	40%
0.2% Proof Stress	390 N/mm ²
Reduction of Area	45%
Impact Energy @ -196°C	150J
Hardness (as Deposited)	190 HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
50-70	90-110	120-140

Related Specification:
 AWS A5.11 E Ni Cr Fe 3 (Basic) All Positional
Current:
 AC (Min. 70 OCV) DC +/-
Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICO E207

Manufactured using a high purity nickel based copper alloyed core wire with a chemically basic flux coating, containing extra deoxidants to eliminate from the weld metal gases such as nitrogen. Designed to be used with conventional welding techniques, the strong arc encourages full penetration while the basic slag and deoxidisation system ensures the metallurgical integrity of the deposited weld metal. For welding wrought and cast alloys of similar composition such as:- BS NA13 & NA1. ASTM/UNS N°4400, N°4405 & M35-1 DIN 2.4360, 2.4361, 2.4365. Proprietary alloys include:- INCO MONEL 400, MONEL R405, VDM NICORROS & NICORROS 5. Used to special advantage on site fabrication work when joint geometry and/or weather conditions make the use of inert gas welding processes impractical.

Typical All Weld Metal Chemical Analysis (%)

C	Cu	Fe	Mn	Ni	P	S	Si	Ti + Al
0.002	26	0.60	3.50	67	0.009	0.002	0.50	0.72

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	510 N/mm ²
Elongation	41%
0.2% Proof Stress	260 N/mm ²
Reduction of Area	55%
Impact Energy @ -50°C	110J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-80	70-120	90-150	120-190

Related Specification:
 AWS A5.11. E Ni Cu 7 | Monel 400 Type
Current:
 DC (+) Only
Storage:

Electrodes should be stored in dry conditions. Should the electrodes become damp, re-dry for one hour at 150°C before use.

MAC Nicro E211

A Nickel / Chrome / Molybdenum electrode for the welding of alloys similar to Hastelloy B and for joining and overlaying where severe corrosion is encountered, such as valve seats in the chemical industry.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Fe	Mn	Mo	Nb	Ni	P	S
0.044	21	1.61	15.90	1.20	6.72	1.75	BAL	0.01	0.007

Typical All Weld Metal Mechanical Properties**As Welded**

Ultimate Tensile Strength	800 N/mm ²
Elongation	30%
0.2% Proof Stress	580 N/mm ²
Reduction of Area	35%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
50-70	90-110	120-140

Related Specification:

AWS E Ni Cr Mo 1

Current:

AC / DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150° C before use.

MAC Nicro E212

Manual Metal Arc welding electrode using a solid predominantly alloyed core wire with a concentrically extruded flux coating. Easy to strike electrode with a porosity free weld deposit. Designed for welding a range of nickel, chrome, molybdenum steels and also joining these to ferritic steels and for welding the clad side of steel joints (clad with Ni Cr Mo material).

Typical All Weld Metal Chemical Analysis (%)

C	Co	Cr	Cu	Fe	Mn	Mo	Ni	P	S	Si	W
.044	.75	21.20	.03	13.30	.63	8.3	BAL	0.01	.009	1.19	.61

Typical All Weld Metal Mechanical Properties**As Welded****Typical**

Ultimate Tensile Strength	720 N/mm ²
Elongation	25%
0.2% Proof Stress	550 N/mm ²
Impact Energy @ -100°C	100J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
50-70	90-110	120-140

Related Specification:

AWS E Ni Cr Mo 2

Current:

AC/DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use.

MAC Nicro E213

A versatile electrode with superior welding characteristics for joining and overlaying a whole range of nickel chrome alloys where cryogenic and high temperature conditions are involved; with the emphasis on the high temperature side. Exhibits excellent strength at temperatures up to 1100°C. Specifically for the welding of Inconel 601 and 625, Incoloy 800, 801 and 825. Can also be used for welding low alloy ferritic steels such as 3% and 9% nickel steels (for cryogenic applications) super austenitics, and for transitional welds between any of the aforementioned alloys. Can be used in almost any combination where alloys are chosen for their ability to withstand very severe mechanical stress, oxidation corrosion, and extreme operating temperatures.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Mo	Nb	Ni	P	S	Si
0.05	21	4.00	0.7	9.00	3.60	63	0.009	0.005	0.62

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	810 N/mm ²
Elongation	41%
0.2% Proof Stress	520 N/mm ²
Reduction of Area	40%
Impact Energy @ -196°C	100J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-70	90-110	120-140	150-210

Related Specification:

AWS E Ni Cr Mo 3

Current:

AC/DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use.

MAC Nicro E213 B

Manufactured on a predominantly alloyed core wire with a unique lime/rutile extruded flux coating designed to impart excellent weldability for this type of complex alloy in all positional welding situations. Designed for welding nickel alloys such as Inconel 601 and Inconel 800 and 801. It is also suitable for super austenitics with high molybdenum levels such as Avesta 904L and 254 S Mo. Also suited for welding 9% nickel steels subject to cryogenic services. May also be used for welds between nickel chrome molybdenum steels.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Mo	Nb	Ni	P	S	Si
0.06	21	1.00	0.6	9.0	3.50	BAL	0.011	0.010	0.60

Typical All Weld Metal Mechanical Properties

As Welded		Typical
Ultimate Tensile Strength		810 N/mm ²
Elongation		41%
0.2% Proof Stress		520 N/mm ²
Reduction of Area		40%
Impact Energy @ -196°C		100J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-80	70-110	100-150

Related Specification:

AWS A5.11 E Ni Cr Mo-3 (Basic) All Positional

Current:

DC (+/-) AC 80 amps OCV

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use.

MAC NICKRO E214

Manual Metal Arc welding electrode using a solid predominantly alloyed core wire with a concentrically extruded flux coating. Easy strike electrode with a porosity free weld deposit. A superior electrode with exceptional welding characteristics for joining and overlaying heat and corrosion resistant wrought and cast nickel chrome alloys such as Hastalloy C276 and Hastalloy C where a low carbon content, coupled with improved alloying in the weld is required.

Typical All Weld Metal Chemical Analysis (%)

C	Co	Cr	Cu	Fe	Mn	Mo	Ni	P	S	Si	V	W
.022	.05	16.20	.01	2.18	.18	15.50	BAL	.01	.006	.46	.15	3.69

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	740 N/mm ²
Elongation	25%
0.2% Proof Stress	550 N/mm ²

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
50-70	90-110	120-140

Related Specification:
 AWS A5.11. E Ni Cr Mo 4
Current:
 AC (Min. 70 OCV) DC (+/-)
Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICKRO E215

Highly alloyed versatile nickel based electrode specially formulated to withstand elevated temperatures coupled with resistance to corrosion and thermal shock. Smooth arc, low spatter loss and good slag detachability. The weld metal possesses excellent resistance to corrosion. Work hardens under impact and is fully machinable. For welding Hastalloy C, and due to excellent heat resistance and ability to work harden under impact, the electrodes are recommended for use in the drop forging industry for protection of dies. Widely used in the chemical industry where high resistance to corrosion is required, particularly for applications involving wet chlorine gas and other strongly oxidising media. The electrode also finds wide usage in the fabrication of furnace and heat treatment equipment.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Mo	Ni	P	S	Si	V	W
0.08	15	5	0.14	16.50	BAL	0.01	0.006	0.62	0.02	3.93

Typical All Weld Metal Mechanical Properties

As Welded

Ultimate Tensile Strength	750 N/mm ²
Elongation	25%
0.2% Proof Stress	500 N/mm ²
Hardness	230HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
70-110	110-130	130-160

Related Specification:
 AWS A5.11 E Ni Cr Mo 5

Current:
 AC/DC (+)
Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICKRO E215 HR

Manual Metal Arc welding electrode manufactured on a pure nickel core wire with a concentrically extruded flux with a chemically semi basic coating, containing both alloying elements and deoxidants. Metal recovery is 160% with respect to its core wire. For welding Hastalloy C, due to excellent heat resistance and the ability to work harden under impact, the electrode is recommended for use in the drop forging industry for protection of dies. Widely used in the chemical industry where high resistance to corrosion is required, particularly for applications involving wet chlorine gas and other strongly oxidising media. The electrode also finds wide usage in the fabrication of furnace and heat treatment equipment. Suitable for welding such materials as Hastalloy C and ASTM B3341 and B366 UNS N° 10002. Also suitable for welding NiCrMo alloys to stainless, welding the clad side (NiCrMo), clad steels to both austenitic and ferritic materials. Ideal for build-ups.

Typical All Weld Metal Chemical Analysis (%)

C	Co	Cr	Fe	Mn	Mo	Ni	P	S	Si	V	W
0.1	0.2	15.5	5	0.6	16	58	0.015	0.01	0.5	0.1	4

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	620 N/mm ²
0.2% Proof Stress	490 N/mm ²

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-110	110-140	150-200	200-250

Related Specification:
 AWS A5.11 E Ni Cr Mo 5 (HR)
Current:
 AC (Min. 70 OCV) DC (+/-)
Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICKRO E217

MMA electrode manufactured on a pure nickel core wire with a chemically neutral, alloy bearing, high purity, concentrically extruded flux coating. Metal recovery is 140% with respect to the weight of the core wire. Designed for welding Ni Cr Mo base materials such as ASTM B574, B575 and UNS N06455 to itself as well and steel and related cladding operations.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Mo	Ni	P	S	Si
0.009	16.20	1.80	0.9	15.58	BAL	0.020	0.015	0.15

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	750 N/mm ²
Elongation	43%
0.2% Proof Stress	470 N/mm ²
Reduction Of Area	50%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-90	80-110	130-160

Related Specification:
 AWS A5.11 E Ni Cr Mo 7
Current:
 DC (+) or AC (Min OCV 70)
Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use.

MAC NICRO E218

Extruded flux coated MMA electrode manufactured on a high purity nickel, chromium core wire. Mac Nicro E218 is designed to weld a number of proprietary alloys of the 20Cr, 25Ni, 4.5Mo, Cu types which provide excellent resistance to corrosion by both organic and inorganic acids excluding attack by concentrated nitric acid. Such steels normally used in the form of plate, pipe and tubing include Uddelholm 904L, Sandvik 2RK65, Avesta 254SLX, Uranus B6 and B6M and APV Paralloy 5NLC. Mac Nicro E218 is also suited for welding copper free versions of these steels. Most of these steels are used in the manufacture of plant manufacturing fertilisers and resistance to crevice corrosion and chloride initiated stress corrosion cracking.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	N	Nb	Ni	P	S	Si
0.03	21	1.8	2.0	4.5	0.10	0.4	25.0	0.018	0.020	0.35

Typical All Weld Metal Mechanical Properties

As Welded	
Ultimate Tensile Strength	630 N/mm ²
Elongation	40%
0.2% Proof Stress	410 N/mm ²
Reduction of Area	50%
Hardness	190 HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-90	80-110	130-160

Related Specification:

AWS A5.4.92 E385-16

Current:

DC (+) or AC (Min OCV 70)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use.

MAC NICRO E220 Nb

Manufactured using a nickel based, chrome alloyed, iron free core wire. The alloy design necessitates the use of a chemically basic flux with a high coating ratio. The electrode is best suited to downhand and HV welding, while the smaller diameter may be used positionally. Easy to strike electrode producing porosity free deposit and good slag detachability.

Suitable for welding materials as below :

INCO IN-657, IN-671, IN-560

ASTM A560 Grade 50Cr-50Ni-Cb

PARALLOY N50W

DURALOY 50/50Cb

DIN 2.4678,2.4680,2.4813

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Nb	Ni	P	S	Si
0.08	49.49	1.05	1.09	1.71	BAL	0.007	0.005	0.44

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	960 N/mm ²
Elongation	4%
0.2% Proof Stress	700 N/mm ²
Hardness	340HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
70-90	110-150	180-250

Related Specification:

50.50Nb. Type

Current:

AC/DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICRO E221

High purity nickel chromium core wire, with extruded fully basic flux with low hydrogen levels. Designed for welding nickel, chromium, cobalt, molybdenum based materials that are covered by the UNS N°617 material code. The weld composition ensures optimum strength and resistance to oxidation between 815°C – 1200°C.

Typical All Weld Metal Chemical Analysis (%)

C	Co	Cr	Fe	Mn	Mo	Ni	P	S	Si	Ti + Al
0.06	10.8	21	1.8	0.40	8.5	BAL	0.025	0.013	0.80	0.45

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	750 N/mm ²
Elongation	35%
0.2% Proof Stress	480 N/mm ²
Impact Energy @ -20°C	100J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-80	70-110	100-150

Related Specification:
AWS A5.14-89 E Ni Cr Co Mo 1

Current:
AC/DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICRO E222 Mn

Extruded Flux coated MMA electrode manufactured on a nearly matching core wire. The chemically basic flux, with a moisture resistant coating, gives a sound porosity free deposit with a recovery rate of approximately 120% with respect to the core wire. The electrode is designed to match the composition of Paralloy CR39W and Lloyds Thermalloy T57 and the deposited weld metal will be free from any micro-cracking. This alloy was developed from 800 type alloys with increased chromium and nickel contents and exhibits improved carburisation and oxidation resistance. It is used at temperatures up to 1100°C and is resistant to severe thermal shock and fatigue. Welding applications include centrifugal cast pyrolysis coils, reformer tubes, return bends and tees for the petrochemical industry.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Nb	Ni	P	Pb	S	Si
0.08	26	0.2	3.4	0.4	1.0	35	0.01	0.002	0.010	0.3

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	750 N/mm ²
Elongation	15%
0.2% Proof Stress	560 N/mm ²
Reduction of Area	15%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-90	70-120	100-150

Related Specification:
25.35.Mn. Type

Current:
AC/DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 250°C before use.

MAC NICRO E222 Nb

Manual Metal Arc electrode manufactured on a predominantly alloyed core wire with a concentrically extruded chemically basic flux coating. Easy to strike electrode producing porosity free deposit and good slag detachability.

Typical Propriety Alloys

Propriety Alloys	BS	ASTM-ASME	DIN
Inconel 800, 800H, 800HT			
Sandvik Sanicro 31	NA15	UNS08800	1.4850
VDM Nicrofer 3220, 3220H	NA15H	UNS08810	1.4876

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Nb	Ni	P	S	Si	Ti
0.40	26	1.5	0.2	1.2	35	0.015	0.01	0.50	0.05

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	740 N/mm ²
Elongation	15%
0.2% Proof Stress	550 N/mm ²
Reduction of Area	15%
Hardness	245HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-80	70-110	110-150

Related Specification:

25.35.Nb. Type

Current:

DC (+) only

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICRO E224 Mn

Extruded flux coated MMA electrode manufactured on a closely matching core wire. The chemically basic flux ensures the metallurgical integrity of the fully austenitic weld metal and low residuals of non-metallic impurities. It may be used to weld similarly alloyed base materials such as Inconel 800 and 800H where the higher than normal manganese in the weld will significantly reduce the incidence of solidification cracking on heavily restrained weldments. Proprietary alloys that may be welded include Lloyds T52, Firth Vickers Vicro 8 and Paralloy CR 32 W.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Nb	Ni	P	S	Si
0.1	21	4.5	0.2	1.2	32	0.009	0.01	0.3

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	620 N/mm ²
Elongation	35%
0.2% Proof Stress	410 N/mm ²
Reduction of Area	50%
Impact Energy @ 20°C	55J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-85	85-120	110-165

Related Specification:

21:33 Type

Current:

DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC Nicro E224 Nb

Manufactured on a predominantly alloyed core wire with a concentrically extruded chemically basic flux coating. Mainly used for welding muffles and radiant tubes, heat treatment trays and baskets, reformer furnace outlet manifolds, ethylene plant transfer lines and many aspects of the nuclear engineering industry. The electrode provides resistance to corrosion, thermal fatigues and shock at temperatures up to 1000°C. This electrode has been designed to match the composition and properties of type 800 alloys in the wrought and cast form.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Nb	Ni	P	S	Si
0.1	21	2.0	0.4	1.3	32	0.015	0.01	0.3

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	600 N/mm ²
0.2% Proof Stress	390 N/mm ²
Elongation	38%
Hardness	170-220 HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-90	70-120	100-160

Related Specification:

21.33.Nb.Type

Current:

DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC Nicro E225 Nb

Extruded flux coated MMA electrode manufactured on a nickel, chromium alloyed core wire. The chemically basic, medium alloyed flux coating provides a metal recovery of some 137% with respect to the core wire but still permits positional welding characteristics. The electrode is designed to weld cast alloys such as Paralloy H46M, Lloyds T75 MA, T80 and ET 45. The design emphasis of these materials and the matching electrode is to ensure optimum resistance to carbonisation and oxidation and temperature up to 1150°C typical hardness HV 260/280. Fully Austenitic microstructure reinforced with primary eutectic and secondary precipitated carbides.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Nb	Ni	P	S	Si	Ti
0.44	36	0.9	0.10	0.90	46	0.011	0.011	1.2	0.02

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	740 N/mm ²
0.2% Proof Stress	560 N/mm ²
Elongation	6%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-85	75-120	110-160

Related Specification:

35.45.Nb. Type

Current:

DC (+) only

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICO E227

Mac Nicro E227 is designed to weld both cast and wrought alloys such as carpenter 20Cb-3 and similar materials with increased nickel levels, this higher nickel level improves resistance to stress corrosion cracking in chloride environments and reduces corrosion rates in the presence of sulphuric acids. Mac Nicro E227 may also be used to weld leaner nickel alloys of the 20.29.3 Cu Nb classification. The risk of weld metal microfissuring is eliminated by a relatively low silicon level and a high manganese to silicon ratio plus low sulphur and phosphorus levels.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Nb	Ni	P	S	Si
0.05	20	3.5	2.1	2.5	0.65	35	0.012	0.005	0.25

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	650 N/mm ²
0.2% Proof Stress	420 N/mm ²

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-90	80-120	130-170

Related Specification:

AWS E320LR-16

Current:

DC (+) or AC (OCV 80) Min

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use.

MAC NICO E228

Extruded flux coated manual metal arc electrode that produces a precipitation hardening nickel based alloy with controlled levels of chromium, molybdenum, niobium and Iron. Materials to be welded are similarly alloyed based materials where high resistance to oxidation is needed combined with good creep strength e.g., SAE-AMS 5589 5590 5596 5597 5662 5663 5664

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Fe	Mn	Mo	Nb	Ni	P	S	Ti + Al
0.05	18.1	0.03	11	0.50	2.80	5.40	BAL	0.007	0.008	0.40

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Weld Metal Hardness (As Deposited)	380-405 HV
Weld Metal Hardness (Solution HT)	20-25 RC
Weld Metal Hardness (Aged Deposited)	36-44 RC

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-100	90-120	110-170	140-180

Related Specification:

Inconel 718 (Type)

Current:

AC (OCV 70 amps) DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICRO E231

Manual Metal Arc electrode with a modified low siliceous – medium lime rutile flux coating manufactured on a low carbon fully austenitic core wire which is slightly over alloyed with respect to chrome and nickel.

Molybdenum, copper, nitrogen and niobium are added via the flux coating. The E 20.18.6.Cu LR (high recovery) variant is made in 4.00mm only with a modified coating factor to achieve increased deposition rates, close to that achievable with a 5.00mm electrode. The electrode is designed for welding those materials which display resistance to corrosion against sulphuric, phosphoric and other inorganic and organic acids. Such fully austenitic stainless steels normally contain molybdenum and copper additions. In particular the electrode is intended for welding Avesta Polarit 254 SLX material but may also be used to weld leaner and copper free variants of this material such as 317 – 317LN and similar.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	N2	Nb	Ni	P	S	Si
0.02	23	0.60	0.9	6.2	0.10	0.30	20	0.02	0.02	0.40

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	630 N/mm ²
Elongation	37%
0.2% Proof Stress	450 N/mm ²
Reduction of Area	35%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
75-120	100-155	120-170

Related Specification:

AWS E385L-16 (Nearest)

Current:

AC/DC (+) AC min OCV 80

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC NICRO E23718

Fully austenitic heat resisting electrode with a basic rutile coating made on a high alloy core wire designed to weld 18/37 type alloys. Smooth stable arc, low spatter loss, easy releasing slag and smooth porosity free welds. The electrode is designed to match 18/37 type alloy fully austenitic high alloy resisting steels, which will retain a good mechanical strength up to temperatures of 1050°C to 1100°C. Ideal for use in the heat treatment industries and high temperature process plants such as furnace rollers – furnace fittings and headers – heat treatment trays and containers – moulds – hearth plates – retorts – radiant tubes.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.45	17.5	1.5	0.4	38	0.020	0.015	0.40

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Ultimate Tensile Strength	760 N/mm ²
Elongation	12%
0.2% Proof Stress	510 N/mm ²
Reduction of Area	15%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-80	70-120	100-160

Related Specification:

AWS E330H-16 | Inconel 37/18 (Type)

Current:

AC/DC DC electrode positive (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 180°C before use.

MAC CAST E405	80
MAC CAST E406	81
MAC CAST E407	82
MAC CAST E407 S	83
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MAC CAST E410	85



MAC CAST E405

Superior high quality fully machinable nickel electrode for joining and building up on cast irons. Builds up quickly and produces sound fully machinable deposits. Minimum base metal dilution. No undercut. For hot and cold welding of cast irons and for joining or building up on malleable iron, steels and copper or one to another. Ideal for foundry reclamation.

Typical All Weld Metal Chemical Analysis (%)

Mn	Ni
99.0	1.0

Typical All Weld Metal Mechanical Properties

As Welded

Tensile Strength	340 N/mm ²
Elongation	15%
Hardness	170 Brinell

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
30-75	70-100	100-150	120-190

Related Specification:

AWS E Ni Ci

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC CAST E406

High quality general purpose nickel electrode designed for economical joining and surfacing of cast iron. Positive arc, fast build-up, easy slag detachability and fully machinable porosity free welds. May be used for hot or cold welding of cast irons and for surfacing and building up on malleable irons. It is suitable for joining mild steel to cast iron and is ideal for maintenance repair where sound welds are required.

Typical All Weld Metal Chemical Analysis (%)

Fe	Mn	Ni
1.0	2.0	97.0

Typical All Weld Metal Mechanical Properties

As Welded

Tensile Strength	415 N/mm ²
Elongation	15%
Hardness	180 Brinell

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-80	80-100	120-170	170-200

Related Specification:

AWS E Ni Ci

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC CAST E407

High strength machinable electrode for joining and building up on cast irons. Low amperage, smooth arc, minimum spatter and high resistance to cracking. For the repair of grey, S.G., nodular or ductile irons where higher strength is required. Also suitable for joining cast iron to mild steel (in conjunction with Mac Groove), pressure vessels, etc.

Typical All Weld Metal Chemical Analysis (%)

Fe	Ni
45.0	55.0

Typical All Weld Metal Mechanical Properties**As Welded**

Tensile Strength	448 N/mm ²
Elongation	20%
Hardness	180 Brinell

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
40-70	70-110	110-150	130-170

Related Specification:
AWS A5.25.69 E Ni Fe Ci

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC CAST E407 S

Manufactured on a pure nickel core wire with an extruded basic flux containing both graphite and a high metallurgical grade of iron powder. Welds with a soft stable arc and ensures a metal recovery of 160% with respect to core wire. Designed for welding all grades of cast iron to steel. The advanced deoxidisation system ensures the maximum combination of weld strength, ductility and machinability. The design principle of the electrode prevents overheating and provides great resistance to porosity.

Typical All Weld Metal Chemical Analysis (%)

C	Fe	Mn	Ni	P	S	Si
0.90	44.0	1.10	54.0	0.009	0.010	0.60

Typical All Weld Metal Mechanical Properties**As Welded**

Tensile Strength	410 N/mm ²
0.2% Proof Stress	230 N/mm ²
Elongation	15%
Hardness	240 HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-100	100-130	140-190	180-220

Related Specification:
AWS A5.15 E Ni Fe Ci HR

Current:
AC/DC (+/-)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC CAST E409

Fully machinable nickel based electrode with specially developed non-conductive coating for welding most cast irons. Specially designed for use where awkward and confined spaces cause arcing difficulties. May be used for hot or cold welding of most types of cast iron.

Typical All Weld Metal Chemical Analysis (%)

Mn	Ni
1.0	99.0

Typical All Weld Metal Mechanical Properties

As Welded

Tensile Strength	400 N/mm ²
Elongation	15%
Hardness	180 Brinell

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-80	90-110	110-140	140-180

Related Specification:

E Ni Ci Special Non-Conductive Coating

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC CAST E410

Non-machinable electrode for cast iron repairs. Can be used on dirty and contaminated castings or any cast iron repair where machinability is unimportant. For best results castings should be preheated (maintained during welding) and slow cooled, to prevent possibility of cracking. Excellent colour match, will rust.

Typical All Weld Metal Chemical Analysis (%)

C	Ni	Si
3-3.5	1-1.5	0.6

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-80	90-110	110-140	140-180

Related Specification:

Cast Iron Special

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.



MAC GROOVE E71	88
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MAC CUT E74	89

MAC GROOVE E71

An electrode specially designed for cutting, gouging and piercing operations on all metals without the use of air or oxygen. Easy to use with little skill required. Operates at lower current and produces less fume than would normally be expected from an electrode of this type. Metal surfaces are seared by the force of the arc leaving them clean and ready for subsequent welding operations. Smooth and even grooves are easily produced. Applications include, grooving, cutting, gouging and piercing operations on all metals including those which would normally present difficulties by machining. These include hardenable steels, armour plate, hard weld overlays, cast iron and stainless steels. The electrodes are ideal for back gouging of butt welded seams and almost indispensable for the preparation of cast irons prior to welding repair.

Sizes Available and Recommended Amperages			
2.5mm	3.2mm	4.0mm	5.0mm
100-150	150-250	250-300	300-450

Related Specification:

N/A

Current:

AC/DC (+) (AC minimum 70 volts open circuit)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 110°C before use.

MAC STUD E73

Extruded flux coated MMA electrode made on high alloy Duplex microstructured high tensile non-heat treatable (hence non-softening) alloyed core wire. The electrode has the ability to maintain a continuous arc when slag over slag welding while restricting the flow of the molten metal. These physical welding characteristics make the electrode ideal for the removal of threaded bolt when the bolt head has sheared at or just below the surface.

Broken Bolt Removal Procedure: Selecting the appropriate diameter electrode, e.g. approximately 50% of the stud's diameter. Make short continuous build up welds. During the breaks in welding remove slag and check circumference of build up is within the diameter of the stud. Repeat weld procedure until build up is 5 to 8mm above component surface. File two opposite flats on weld deposit and remove broken stud (unscrew) with the use of grips.

Sizes Available and Recommended Amperages			
2.5mm	3.2mm	4.0mm	5.0mm
50-90	75-130	120-180	160-220

Related Specification:

N/A

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC CUT E74

MAC CUT E74

Flux coated Manual Metal Arc electrode for cutting all metals using standard MMA equipment. Will cut all steels including stainless – also non ferrous cast irons and nickel based alloys.

Sizes Available and Recommended Amperages			
2.5mm	3.2mm	4.0mm	5.0mm
90-140	130-190	200-280	280-350

Related Specification:

N/A

Current:

AC (OCV 70 min) or DC+

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.



HARD FACING

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MAC HARD E301

Hard facing electrode designed for applications where high resistance to impact is the main requirement. The electrode is all positional and has a metal recovery rate of 120%. Welds can be softened by heat treatment at 720-750°C, machined and subsequently re-hardened by oil or water quenching. Used for the hard facing of crusher jaws, dredger tumbler plates, punches, shears, guillotine blades, tractor idler wheels, roller and track links. Also suitable for depositing buffer layers and for building up multi-layer deposits on badly worn components.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Si
0.08	4.0	0.8	0.5

Typical All Weld Deposit Hardness

37-40	Rockwell C
350-380	Brinell
365-400	Vickers

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
80-100	90-110	110-170	180-220	260-300

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for two hours at 150°C before use.

MAC HARD E304

The electrode is designed to deposit wear resistant overlays on all ferrous metals where high resistance to impact and abrasion is required. The electrode is all positional with a metal recovery rate of 110%. The welds are non-machinable in the as welded state but can be softened by heat treatment at temperatures of 720 – 750°C. After machining the welds can be rehardened by oil or water quenching.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo
0.5	6.5	1.5	1.5

Typical All Weld Deposit Hardness

57-59	Rockwell C
570-605	Brinell
660-725	Vickers

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
80-100	90-120	120-170	160-220	260-300

Current:
AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for two hours at 180°C before use.

MAC HARD E306

Hard facing electrode designed for applications on ferrous metals involving friction and severe abrasion, also where certain heat and corrosive conditions apply. The electrode is of the rutile chromium carbide all positional type and has a metal recovery rate of 150%. Ideal for foundry sand mill blades, impellor worms, screws, etc., also bucket edges and digger teeth in conjunction with Mac Trode E630 being used as a buttering layer.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	Si
4.40	43.2	0.77	0.04	<0.01	0.30

Typical All Weld Deposit Hardness

62-65	Rockwell C
800-900	Vickers

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
80-100	90-110	110-170	160-220

Current:

AC/DC (+) (AC minimum 70 volts open circuit)

Storage:

If allowed to become damp, the electrodes should be re-dried for two hours at 150°C before use.

MAC HARD E307

Mac Hard E307 is a high chromium hard facing electrode made on a mild steel core wire. The chemically basic flux also contains other significant carbide formers than chromium, e.g. tungsten, niobium, molybdenum and vanadium. This ensures a microstructure of complex carbides capable of withstanding not only severe abrasion but also resistance to oxidation and stress at elevated temperatures. Typical applications occur in the earth moving and cement industries also in the iron and steel industries on furnace parts – fire grate bars etc.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Nb	Si	V	W
4.8	24	0.4	5.0	4.0	1.0	1.5	4.0

Typical All Weld Deposit Hardness

Hardness of the first layer will depend on base material but will be in the region HRC 59-62 RC.

Hardness achieved in 2nd and 3rd layers will be HRC 63-66 RC.

Sizes Available & Recommended Amperages

3.2mm	4.0mm	5.0mm
110-150	140-200	190-250

Current:

DC (+) or AC (OCV 80)

Storage:

If allowed to become damp, the electrodes should be re-dried for two hours at 150°C before use.

MAC HARD E308

Hard facing electrode designed specifically for applications on ferrous metals where rapid deposition is required – especially where dot formation is required with little or no deslagging involved. The electrode is designed to produce spatter type deposition in the vertical welding position but will also give conventional bead deposit in the downhand welding position. Designed purposefully for the sugar cane industry for hard facing sugar cane crushing rolls welding in the vertical position whilst the rolls are being slowly revolved. The deposit is in the form of a spray spatter and results in even dot formation of a highly abrasive resistant coating. Also ideal for many wear applications in quarrying and earth moving where severe abrasion is encountered.

Typical All Weld Metal Chemical Analysis (%)

C	Cr
4-4.5	30-35

Typical All Weld Deposit Hardness

66	Rockwell C on Cast Iron
61-62	Rockwell C on Steel

Sizes Available & Recommended Amperages

3.2mm	4.0mm	5.0mm
100-130	130-170	170-250

Current:

AC/DC (+) (AC minimum 70 volts open circuit)

Storage:

If allowed to become damp, the electrodes should be re-dried for two hours at 150°C before use.

MAC HARD E335 T

Superior highly alloyed all positional tubular flux coated electrode for hard facing where extreme abrasion is involved. Alloy content 40% minimum. Moisture resistant. Smooth easy to use electrode with high deposition rate at low amps (employing higher amps than necessary will result in greater burn off and dilution of the alloy content, and poorer wear life). Low slag formation allows multi-layer welding without need to de-slag between runs – 4kg/hr. Surface cracking in certain instances may occur, but in practice will assist in the wear performance. The surface cracking has no detriment whatsoever. The highly abrasive resistant deposits find numerous applications on quarrying and mining machinery and equipment, in brickworks and extensive applications on crushing equipment and on earth moving and agricultural machinery.

Typical All Weld Metal Chemical Analysis (%)

B	C	Cr	Mn	Mo	V
0.5	4.0	27.0	4.0	4.0	1.0

Typical All Weld Deposit Hardness

50-60 (Single Layer)	Rockwell C
59-62 (Multi Layer)	Rockwell C

Sizes Available & Recommended Amperages

6.0mm	8.0mm	11.0mm
80-130	140-190	190-260

Current:

AC/DC (+)

MAC HARD E30618

Manufactured using a high purity, low silicon core wire with a chemically basic, alloy bearing flux. Smooth arc with a low spatter, easy strike and re-strike. May be used in all positions except vertically down, strong stable arc. Fillet welds are convex, weld metal is of bright appearance. Very low levels of hydrogen. Used to best advantage for critical repairs to die blocks which allows the deposit to be machined while still resulting in a tough, impact resistant deposit of around Rockwell C 40 hardness.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	Si
0.122	1.90	1.33	1.46	3.06	0.38

Physical Properties after PWHT at 600°C max

Hardness 38-43 RC

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-140	150-190	200-250	250-300

Related Specification:

AWS E16018-G

Current:

DC (+) OR AC (80 Min OCV)

Storage:

Re-drying electrodes at 180°C for two hours.

MAC TUNGSTEN E375

A tubular flux coated electrode designed to give maximum abrasion resistance, depositing tungsten carbide particles held in a tough steel matrix. Operates at low amperage with little spatter and produces smooth porosity free welds. By using a weaving technique, large areas of smooth weld overlay can be achieved. Recommended current range should not be exceeded otherwise the wear resisting properties will be destroyed. The welds are non-machinable. Recommended where severe abrasion coupled with low impact occurs. Ideal for foundry sand mill blades and slingers, pan scrapers, rock drills, pug mill knives, cement blades, conveyor screws, dredger teeth, gravel pumps and numerous other similar applications.

Carbide Hardness

72 Rockwell C 1800 VPN in Steel Matrix

Sizes Available & Recommended Amperages

6.0mm
90-145

Current:

AC/DC (+) (AC minimum 70 volts open circuit)



TOOL & DIE

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MAC TOOL E3042

Manufactured on a high purity ferritic core wire with an alloy bearing concentrically extruded basic flux. It is used for both the maintenance and manufacture of components and tools subjected to impact and abrasion at temperatures up to 550°C. Such applications include dies, hot & cold shear blades, hammers, sewage and guillotine blades.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Mo	P	S	Si
0.35	7.0	BAL	1.30	2.50	0.015	0.01	0.50

Typical All Weld Deposit Hardness

As Deposited	Rockwell C
55	

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-70	80-110	140-170	170-210

Current:
DC (+) AC (80 amps OCV)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TOOL E3044

Manufactured on a high purity ferritic core wire with an alloy bearing chemically basic concentrically extruded flux. All positional welding characteristics with excellent control of the molten welding pool. Used to special advantage for the repair of hot working dies by single or multi layer build ups, or surfacing rollers or hot shear blades. When machining tungsten carbide tools are used to obtain the best profile. Excellent resistance to impact and abrasion up to 550°C and this is combined with the ability of the deposit to be machined making it an exceptionally versatile alloy. Pre- Heat 200°C to 300°C. Slow cool after welding. Readily machinable with carbide tools

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Fe	Mn	Mo	P	S	Si
0.15	5.0	BAL	0.17	4.20	0.015	0.010	0.60

Typical All Weld Deposit Hardness

As Deposited	Rockwell C
40	

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-70	80-110	140-170	170-210

Current:
AC/DC (+)(80 amps OCV)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TOOL E3053

Manufactured on a high purity mild steel core wire with a concentrically extruded chemically basic flux that contains the alloying elements and deoxidants. The metal recovery rate is some 130% with respect to the core wire, the electrode is suited for all positional work and the slag is easily controlled and resists control when building up edges. Mac Tool E3053 is essentially a modified high speed steel alloy to enlarge it's range of welding applications on cutting tools, reamers and similar no PWHT is needed and hot hardness up to 600°C is excellent. When toughness as well as hot hardness is needed or when machining is required the alloy should be annealed and slow cooled, followed by H.T at 1200°C followed by air cooling or quenching.

Typical All Weld Metal Chemical Analysis (%)

Co	Cr	Fe	Mn	Mo	P	S	Si	Ti&Nb	W
2.8	1.9	BAL	0.5	0.55	0.01	0.009	0.4	0.8	8.0

Typical All Weld Deposit Hardness

	Typical RC
As Deposited	63
Annealed @ 800°C	25
Slow Cooled 1200°C-600°C	64

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-90	90-140	130-190	160-220

Current:
AC/DC (+) - DC electrode positive (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TOOL E3060

Manufactured using a high purity, low silicon wire with a chemically basic, alloy bearing flux. May be used in all positions except vertically down, strong stable arc, fillet welds are convex, weld metal of bright appearance. Very low levels of hydrogen. Used to best advantage for downhand welding for critical repairs to die blocks when the weld metal must combine good toughness, high strength and resistance to oxidation at high temperatures, plus resistance to thermal shock.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	Si
0.13	9.5	1.0	3.0	1.75	0.9

Typical All Weld Metal Mechanical Properties

After PWHT at 520°C

Tensile Strength	840-920 N/mm ²
0.2% Proof Stress	735-810 N/mm ²
Elongation	8-12%
Hardness	38-45 HRC

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm	6.0mm
90-140	150-190	190-220	250-300

Related Specification:

10% Chrome (Generic)

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 180°C before use.

MAC HSS E3062

Hard facing electrode, designed to deposit high quality high speed steel on mild or low alloy steels, having a metal recovery rate of 115%. Tough and highly crack resistant deposits, retaining hardness at temperatures up to 620°C. Deposits can be annealed and re-hardened by oil quenching. Highly recommended for the fabrication of blanking and piercing dies, knife blade edges, shear blades, lathe tools, boring tools, milling cutters, broaching tools, drills, hot working dies etc., ideal for the building up of edges on small components.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Si	V	W
0.52	4.79	0.42	8.33	0.27	0.84	2.59

Typical All Weld Deposit Hardness

As Deposited	59-62 Rockwell C
Annealed @ 865°C	35-37 Rockwell C
Oil Quenched at 1200°C	59-62 Rockwell C

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-80	90-120	130-150	150-220

Current:
AC/DC (+)
Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TOOL E3064

A low hydrogen, iron powder basic flux coated electrode. Designed for special hardfacing applications involving heavy impact loading combined with abrasion. This electrode is ideally suited for forging dies because of its very tough deposit. It is an H13 type product. Pre-heat and dilution may effect hardness on first two layers but not on subsequent layers. On heavy build-ups use Mac Trode E6718 as buffer layer on carbon steels and Mac Trode E630 on 13% manganese steels

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Si	V
0.45	6.50	0.70	0.60	0.50	0.80

Typical All Weld Metal Mechanical Properties

	1st Layer	2nd Layer	3rd Layer
Rockwell HRC	53-55	56-59	57-60

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm
80-140	100-180	140-240

Related Specification:
H13 Tool Steel
Current:
AC (OCV 70 amps) DC+
Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 180°C before use.

MAC TOOL E3065

A low hydrogen, iron powder basic flux coated electrode for hard facing applications involving a combination of both impact and abrasion. Easy to use, giving sound porosity free welds. Ideally suited for use in the forging industry.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Si	V	W
0.80	7.50	1.4	0.80	0.70	0.15	1.2

Typical Hardness Values (On Mild Steel Plate)

	1st Layer	2nd Layer	3rd Layer
Rockwell HRC	55-60	60-62	60-63

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm
90-150	110-190	150-250

Current:

AC (OCV 70 amps) DC+

Storage:

Electrodes should be kept in a dry store. If allowed to become damp electrodes should be re-dried for one hour at 150°C before use.

MAC TOOL E3066

A low hydrogen electrode manufactured on a high purity mild steel core wire with an extruded chemically basic coating which ensures low S-P-O and N levels and also alloys the weld with the appropriate levels of alloying elements. Weld alloying is by means of appropriate levels of C-Mn-Cr-Ni and Mo, which harden by matrix reinforcing, so combining hardness with toughness. Mac Tool E3066 is specifically designed for the repair of low alloy steel die blocks in the forging industry. The weld metal combines hardness with exceptional toughness and resistance to oxidation, plus resistance to thermal cycling. Specifically the nickel ensures toughness, the chrome resistance to oxidation, the molybdenum towards retaining hardness at high temperatures.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.15	2.2	1.2	1.1	3.9	0.010	0.008	0.4

Typical All Weld Metal Mechanical Properties

HV 420 – 430 (43 Rockwell hardness)

(SR 570°C) HV 320 – 400 (30 Rockwell hardness)

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm	6.00mm
100-120	140-180	200-260	250-320

Current:

DC (+) or AC (min OCV 70 amps)

Storage:

Electrodes should be kept in a dry store. If allowed to become damp electrodes should be re-dried for two hours at 250°C before use.

MAC TOOL E3067

Extruded flux coated MMA electrode manufactured on a high purity nickel core wire with a complex alloyed chemically neutral flux coating. Metal recovery is some 150% with respect to the core wire. The alloy may be described as a nickel based Cr Co Mo Al and Ti alloyed material that exhibits excellent (precipitation) hardening characteristics. Mac Tool E3067 deposits weld metal with excellent high temperature strength and toughness stability while retaining excellent resistance to oxidation and creep. The alloy is exceptionally valuable on hot working tools, in the drop forging industry, notably the repair of GFM hammers. As with all complex nickel based alloys, welding procedures and post weld cooling rates within the 200°C min and 400°C max interpass temperatures, should be adhered to. The weld procedure should be designed to favour a maximum fineness of dendritic structure to reduce micro fissuring and liquation cracking. The use of minimum amperages consistent with good weldability is one criteria that greatly assists this objective.

Typical All Weld Metal Chemical Analysis (%)

C	Co	Cr	Fe	Mn	Mo	Si	Ti+Al	W
0.04	8.4	18.0	6.5	0.2	7.2	1.2	3.5	1.4

Typical All Weld Metal Mechanical Properties

In the aged condition 240HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-80	80-110	140-180	160-220

Related Specification:

Udimet 520 Material

Current:

AC/DC (+)

Storage:

If allowed to become damp electrodes should be re-dried for one hour at 250°C before use

MAC TOOL E3068

Extruded flux coated MMA electrode manufactured on a ferritic core wire with a complex alloyed chemically neutral flux coating. The alloy bearing chemically basic flux ensures excellent welding characteristics and metal recovery is some 125% with respect to the core wire. As the weld is a modified stainless it has excellent resistance to oxidation up to 1000°C and good wear resistance up to 600°C even under certain corrosive conditions. As welded the hardness of 52 – 56 HRC results, if the weld has to be machined it may be so annealed at 830°C and then rehardened by air or oil cooling from 960°C to 1000°C. Although it may be used to weld medium carbon variants of AISI 410 it is intended to be used as a surfacing alloy as it attains a high hardness even under conditions of slow cooling, when welding large dies and tools, it is mainly air hardening.

Nominal Analysis (%)

C	Cr	Mo	Ni
0.2	12.50	2.50	2.20

Physical Properties

As Welded

52 – 56 HRC

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-110	100-160	140-200	190-260	240-300

Related Specification:

Typical H11 Tool Steel

Current:

DC+ or AC (OCV 80 amps)

Storage:

If allowed to become damp electrodes should be re-dried for one hour at 250°C before use

MAC TOOL E3069

Extruded flux coated MMA electrode manufactured on a high purity nickel core wire with a complex alloyed chemically neutral flux coating. Metal recovery is some 150% with respect to the core wire.

Mac Tool E3069 is a nickel based Cr Co Mo alloyed precipitation hardening alloy for welding to similarly alloyed based materials used for high temperature applications. e.g. to weld AMS 5706, 5707, 5708, 5709, 5544, 5586 or ASTM 637

Typical All Weld Metal Chemical Analysis (%)

Co	Cr	Mo	Ti+Al
14.0	20.0	4.5	4.5

Typical All Weld Metal Mechanical Properties

Air Aged Rockwell C 35-45

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
50-80	80-110	140-180	160-220

Related Specification:

Waspalloy (Type)

Current:

AC/DC (+)

Storage:

If allowed to become damp electrodes should be re-dried for one hour at 250°C before use

MAC HICA E3071

Cobalt based electrode designed on a fully alloyed core wire to combat all four elements of wear, i.e. heat, impact, corrosion and abrasion. Most suitable of cobalt range where abrasion is the most predominant of the four elements of wear. Excellent for rebuilding corners with minimum base metal dilution. Has ability to overlay extensive areas without cracking. Will retain hardness at high temperatures. Welds are non-machinable. Recommended for use in the iron and steel industries or any industry where heat, corrosion and abrasion occur concurrently.

Nominal Analysis (%)

C	Co	Cr	Fe	W
2.5	BAL	30.0	3.0	12.0

Typical All Weld Deposit Hardness

	HRC	HV
+20°C	56	600
+400°C	48	480
+800°C	26	270

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-90	90-115	100-150	170-220

Related Specification:

AWS E Co Cr-C (Cobalt Grade 1)

Current:

AC/DC (+).

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use

MAC HICA E3072

Cobalt based electrode designed on a fully alloyed core wire to combat all four elements of wear, i.e. heat, impact, corrosion and abrasion. High impact properties. Most suitable of cobalt range where impact is the most predominant of the four elements of wear. Excellent for rebuilding corners with minimum base metal dilution. Has ability to overlay extensive areas without cracking. Will retain hardness at high temperatures. The welds are machinable. Recommended for use in iron and steel industries. Suitable for use on shear blades, dies, punches and all applications where good resistance to heat, impact, corrosion and abrasion is required.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Co	Fe	W
1.0	31.0	BAL	2.0	5.5

Typical All Weld Deposit Hardness

	HRC	HV
+20°C	45	440
+400°C	32	320
+800°C	22	230

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.4mm
60-75	90-115	100-150	150-220	220-275

Related Specification:
AWS E Co Cr-A. (Cobalt Grade 6)

Current:
AC/DC (+)

Storage:

If allowed to become damp electrodes should be re-dried for one hour at 150°C before use

MAC HICA E3073

Cobalt based electrode made on a fully alloyed core wire designed to combat all four elements of wear, i.e. heat, impact, corrosion and abrasion. The electrode provides optimum impact and abrasion resistant properties while retaining hardness at elevated temperatures. Excellent for rebuilding corners with minimum base metal dilution. Has ability to overlay extensive areas without cracking. Will retain hardness at high temperatures. Welds are non-machinable. Suitable for use in industries where severe impact and abrasion occurs.

Typical All Weld Metal Chemical Analysis %

C	Co	Cr	Fe	W
1.9	BAL	30.0	3.0	8.4

Typical All Weld Deposit Hardness

	HRC	HV
+ 20°C	51	546
+ 200°C	42	418
+400°C	39	380
+600°C	37	362

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-75	90-115	100-150	170-220

Related Specification:
AWS E Co Cr-B. (Cobalt Grade 12)

Current:
AC/DC (+)

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use

MAC HICA E3074

High recovery chrome / cobalt / iron based electrode designed to combat all four elements of wear, i.e. heat, impact, corrosion and abrasion, but with the emphasis on impact properties. The addition of molybdenum refines the grain structure and produces good hot hardness. Excellent for rebuilding corners with minimum base metal dilution. Has ability to overlay extensive areas without cracking. Will retain hardness at high temperatures. The welds are machinable and will work harden under impact. Recommended for use in the iron and steel industries. Designed initially as a forging material for either repairs or sinking. Suitable for use on shear blades and dies, and all applications where good resistance to heat, impact, corrosion and abrasion is required. Due to its excellent impact properties and refined grain structure it is ideally suited to clipping tools and forging punches.

Typical All Weld Metal Chemical Analysis (%)

C	Co	Cr	Fe	Mo	Ni	Si
0.11	56.32	22.01	14.34	5.5	1.32	1.12

Typical All Weld Deposit Hardness

25-30 HRC as deposited (will work harden up to 50 HRC under impact).

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.4mm
70-90	90-115	110-150	140-190	220-275

Related Specification:

AWS E Co Cr Fe-special

Current:

AC/DC (+)

Storage:

If allowed to become damp electrodes should be re-dried for one hour at 150°C before use

MAC HICA E3075

This electrode is also known as alloy 21. The flux is a rutile type made on a fully alloyed core wire. Cobalt based electrode designed on a fully alloyed core wire to combat all four elements of wear, i.e. heat, impact, corrosion and abrasion. Most suitable of cobalt range where toughness is the most predominant of the four elements of wear. Excellent for rebuilding corners with minimum base metal dilution. Has ability to overlay extensive areas without cracking. Designed specifically for use as a forging die material. Because of its low carbon content, the electrode has excellent resistance to thermal and mechanical shock. The electrode deposits a high alloyed cobalt base weld metal with 0.3% carbon. Welds are machinable. The suggested usages are in iron and steel industries or any industry where heat, corrosion and abrasion occur concurrently, for such items as steel mill rolls, valves seat inlays, hot working dies and tools, hot shearing blades, tongs etc

The electrode main advantages are: - High temperature strength and ductile, resists thermal shock. Tough – impact resistant. Highly ductile – resists weld cracking (without any preheat). High resistance to corrosion, oxidation, sulphidation. Hardness 30 HRC as deposited, increases with work hardening. High resistance to cavitation-erosion.

Typical All Weld Metal Chemical Analysis %

C	Co	Cr	Fe	Mo	Ni
0.30	BAL	26.0	3.0	5.5	3.0

Typical All Weld Deposit Hardness

As Deposited	30 HRC
Work Hardened	50 HRC

Sizes Available and Recommended Amperages

3.2mm	4.0mm	5.0mm	6.4mm
90-115	100-150	170-220	220-275

Related Specification:

AWS E Co Cr - E. (Cobalt Grade 21)

Current:

AC/DC (+) (min 70 OCV).

Storage:

If allowed to become damp the electrodes should be re-dried for one hour at 150°C before use

MAC HICA E3076

Cobalt based electrode designed on a fully alloyed core wire. It is resistant to wear, galling and corrosion, retaining these properties at high temperatures. This electrode has exceptional fatigue resistance. Useful for tools working hot steel. Also resistant to thermal cracking, hot metal on metal wear, and surface fatigue. The welds are machinable. Recommended for use in iron and steel industries. Suitable for use on piercing points, forming tools, extrusion dies, and furnace hardware, and all applications where a combination of metal-on-metal wear, thermal fatigue and hot corrosion resistance is required.

Related Specification:

Cobalt G25

Current:

AC/DC (+) DC Positive

Storage:

If allowed to become damp electrodes should be re-dried for one hour at 150°C before use

Typical All Weld Metal Chemical Analysis (%)

C	Co	Cr	Fe	Mn	Ni	S	Si	W
0.1	BAL	20	2	1.5	0	0.02	1.12	15

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-75	90-115	100-150

Typical All Weld Deposit Hardness

Hardness **340-380 HB**



MAC BRONZE E808	122
MAC BRONZE E809	122
MAC BRONZE E810	123

MAC BRONZE E808

A versatile coated electrode which deposits a tough overlay of fully deoxidised bronze. Designed for joining and overlaying steels, cast irons, malleable iron, bronzes, brass and copper based metals. Due to the high thermal conductivity of copper alloys, pre-heating is advisable particularly if heavy sections are involved. The electrode is recommended for overlaying and building up bearing surfaces, bushes, impellor blades, valve seats, etc.

Typical All Weld Metal Chemical Analysis (%)

Cu	Mn	Sn
91.0	0.4	7.5

Typical All Weld Metal Mechanical Properties

As Welded

Tensile Strength	465 N/mm ²
0.2% Proof Stress	310 N/mm ²
Elongation	20%

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm
60-80	80-130	130-180

Related Specification:

AWS E Cu Sn-C

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 110°C before use.

MAC BRONZE E809

MAC BRONZE E809

Superior coated tough bronze electrode for joining and overlaying steels, cast irons, malleable irons, bronzes and copper based metals. Due to the high thermal conductivity of copper and copper alloys pre-heating is advisable in certain instances particularly where heavy sections are involved. Highly recommended for bearing surfaces and for wear facing against sea water corrosion.

Typical All Weld Metal Chemical Analysis (%)

Cu	Mn	Sn
84.30	0.40	14.20

Typical All Weld Metal Mechanical Properties

As Welded

Tensile Strength	386 N/mm ²
0.2% Proof Stress	278 N/mm ²
Elongation	20-25%

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm
50-75	80-120	120-175

Related Specification:

AWS E Cu Sn | 14% Tin Bronze Type

Current:

DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 110°C before use.

MAC BRONZE E810

An electrode designed for joining and overlaying aluminium bronze and for corrosion and wear resistant deposits on steel and cast irons. The weld metal deposits will produce good friction and corrosion resistance. Ideal for bearing surfaces, shafts, guides, slides, gear teeth and any wear application involving metal to metal friction.

Typical All Weld Metal Chemical Analysis (%)

Al	Cu	Fe	Mn
7.5-9.5	BAL	0.99-Max	0.5-1.8

Typical All Weld Metal Mechanical Properties

As Welded

Tensile Strength	480 N/mm ²
Hardness	160 HB
Elongation	20%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm
60-80	80-130	130-180

Related Specification:

AWS E Cu Al-A2

Current:

DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 200°C before use.

MAC ALUM E95	126
MAC ALUM E97	127

MAC ALUM E95

Aluminium 4/5% silicon type electrode suitable for the welding of commercially pure aluminium and similar alloys except those which contain magnesium or zinc as main alloying elements. Rapid deposition rate, good penetration, excellent weldability and slag control. The special chemically active mineral coating enables easy removal of surface oxides during welding, ensuring results of high quality. Welding commercially pure aluminium where a slightly higher tensile is required and for higher strength alloys of similar composition. Suitable for welding the wrought alloys H9, H20 and 30. The electrodes are unsuitable for welding alloys with high magnesium such as the 5% Mg type.

Typical All Weld Metal Chemical Analysis (%)

Al	Fe	Si
94.5	0.3	4.0

Typical All Weld Metal Mechanical Properties**As Welded**

Tensile Strength	100 N/mm ²
0.2% Proof Stress	50 N/mm ²
Elongation	20%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-90	80-110	110-150	150-180

Related Specification:

AWS E4043

Current:

DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for two hours at 110°C before use.

MAC ALUM E97

Aluminium 10/12% silicon type electrode for welding wrought and cast aluminium alloys of similar composition. Rapid deposition rate, good penetration characteristics, excellent stability, weldability and slag control. The special chemically active mineral coating enables easy removal of surface oxides during welding ensuring results of high quality. Suitable for slag over slag welding. Welding wrought alloys N4, H9, H10, H20, H30 and cast alloys LM6, LM8, LM9, LM13 and LM20. Used extensively for repair of casting defects such as surface voids where slag over slag techniques may be employed.

Typical All Weld Metal Chemical Analysis (%)

Al	Fe	Si
88.5	0.5	11.0

Typical All Weld Metal Mechanical Properties**As Welded**

Tensile Strength	180 N/mm ²
0.2% Proof Stress	80 N/mm ²
Elongation	5%

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-90	80-110	110-150	150-180

Related Specification:

AWS E4047

Current:

DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for two hours at 110°C before use.



MAC FINE STEEL	130
MAC NIL SIL	131
MAC SUPER STEEL	132
MAC SUPER STEEL VDH	133

MAC FINE STEEL

High quality all-positional mild steel electrode. Easy to use employing touch or conventional welding techniques. Designed for joining light or heavy mild steel sections, highly suitable for use in confined spaces.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	P	S	Si
0.07	0.47	0.021	0.020	0.4

Typical All Weld Metal Mechanical Properties

Ultimate Tensile Strength	540 N/mm ²
0.2% Proof Stress	530 N/mm ²
Elongation	28%
Hardness	190 Brinell

Sizes Available & Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
25-50	40-60	55-90	70-120	110-160	140-200	200-290

Related Specification:

AWS A5.1 E6013 | E43 22 R21

Current:

AC/DC (+) (AC min. 50 volts open circuit)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 110° before use.

MAC NIL SIL

Manufactured using a silicon free mild steel core wire and a highly chemically acid type (but non-corrosive) extruded flux coating. Welds with a forceful arc leaving a minimum of slag. The minimum silicon, combined with its overall purity, ensures the weld metal has excellent resistance to corrosion /erosion by molten zinc at temperatures of 450–500°C. It is suitable for welding and repairing fabricated galvanising containers constructed from high purity iron as defined by BS2858.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	P	S	Si
0.02	0.2	0.01	0.01	0.02

Typical All Weld Metal Mechanical Properties

Ultimate Tensile Strength	450 N/mm ²
0.2% Proof Stress	370 N/mm ²
Elongation	30%
Reduction of Area	60%

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
60-90	80-140	100-180	200-300

Related Specification:

AWS E6013 (Nearest)

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 110°C before use.

MAC SUPER STEEL

Superior all positional mild steel electrode for joining light and heavy gauge steel sections. May be used with conventional or touch welding techniques and are particularly suitable where welding has to be carried out in confined or awkward places. Welds are ductile and of a high radiographic quality.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	P	S	Si
0.07	0.55	0.013	0.020	0.34

Typical All Weld Metal Mechanical Properties

Ultimate Tensile Strength	530 N/mm ²
0.2% Proof Stress	510 N/mm ²
Elongation	29%
Hardness	160 Brinell

Sizes Available & Recommended Amperages

1.5mm	2.0mm	2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
25-50	40-60	55-100	90-130	130-190	190-240	220-290

Related Specification:

| E6013 |

Current:

AC/DC (+) (AC min. 50 volts open circuit)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 110° before use.

MAC SUPER STEEL VDH

All positional superior electrode for joining light and heavy gauge mild steel. Due to its characteristics, this electrode is suited to applications in confined and awkward spaces involving positional vertical down welding.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	P	S	Si
0.08	0.35	0.021	0.019	0.35

Typical All Weld Metal Mechanical Properties

Ultimate Tensile Strength	550 N/mm ²
0.2% Proof Stress	530 N/mm ²
Hardness	180 Brinell

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm
55-100	90-130	130-190

Related Specification:

AWS A5 E6013 VDH | E43 22 R3

Current:

AC/DC (+) (AC min. 50 volts open circuit)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 110° before use.



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MAC TRODE E6716

Manual Metal Arc welding electrode with a silicon free C: Mn core wire with a concentrically extruded chemically basic flux coating which has been so modified to provide good weldability on poor quality AC welding sets.

Material to be Welded: Mild and medium carbon-manganese steels up to 15mm thick with a UTS of 500N/mm² max. Typical grades:- BS1449 plate and sheet BS4360 grade 43A and 43C Lloyds A and D ship steel BS4360 grade 50B, Lloyds grade AH and DH BS3059 and BS3601 grade 320-410 AP15L A-B and X42, BS4360-50B-50C-50D, BS1501-151 430-490, BS3602-410-460.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	P	S	Si
0.08	0.80	0.020	0.020	0.65

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	580 N/mm ²
0.2% Proof Stress	500 N/mm ²
Elongation	28%
Reduction of Area	70%

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
60-100	80-130	120-170	140-200	190-250

Related Specification:
AWS A5.1 E7016 | ISO E51 44 B 24H

Current:
AC/DC AC (OCV 50) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6718

High quality superior all positional low hydrogen Manual Metal Arc welding electrode using a silicon free, low nitrogen, high purity C:Mn core wire with concentrically extruded, moisture resistant chemically basic flux with a controlled iron powder addition, to provide 120% metal recovery. Welds are of smooth appearance, ductile and of high radiographic quality.

For welding mild and medium tensile steels and for BS4360 1972 steels where low hydrogen levels and crack resistant weld metal are required.

The electrodes are particularly suitable for welding heavy sections subject to high levels of resistance and for welding problem steels with high sulphur content. Recommended for unalloyed C:Mn ferritic steels with high sub-zero toughness requirements, e.g:- Charpy values down to -60°C. CTOD values at -10°C. Used to best advantage for welding thick sections either on site or in fabrication shops. Excellent all positional weldability.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	P	S	Si
0.08	1.60	0.015	0.010	0.30

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	560 N/mm ²
0.2% Proof Stress	460 N/mm ²
Elongation of 4d	25%
Reduction of Area	70%
Impact Energy @ 0°C	110J

Sizes Available & Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-130	130-180	160-220	250-300

Related Specification:
AWS A5.1 E7018-1 | ISO 2560 E51 B110 26H

Current:
AC/DC+ (OCV 70 amps) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MILD & LOW CARBON MAGANESE STEELS

MAC TRODE E6724

MAC TRODE E6724

High quality mild steel iron powder electrode with recovery rate of 170-180% with respect to the weight of the core wire. Designed specifically for mild steel heavy fabrications where downhand ('V' preparation) welding involves large volume deposits to be laid using single or multi-pass techniques. Easy to use electrode employing either conventional or touch welding techniques.

Material to be Welded: Heavy mild steel fabrication where extended runs are involved demanding large volume of weld metal deposits in the shortest possible time. Can be used for either fillet or butt joints. Mild and medium carbon-manganese steels up to 15mm thick with a UTS of 500 N/mm² max. Typical grades:- BS1449 plate and sheet BS4360 grades 43A and 43C Lloyds A and D ship steel BS4360 grade 50B Lloyds grade AH and DH BS3059 and BS3601 grade 320-410 AP15L A-B and X42.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	P	S	Si
0.06	0.50	0.024	0.021	0.30

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	540 N/mm ²
0.2% Proof Stress	480 N/mm ²
Elongation	28%
Reduction of Area	70%
Impact Energy @ 0°C	55 Joules

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-110	120-150	160-200	200-300

Related Specification:

AWS A5.1 E7024

Current:

AC/DC DC electrode positive (+/-) AC (OCV 50) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 300°C before use.

MILD & LOW CARBON MAGANESE STEELS

MAC TRODE E6728

MAC TRODE E6728

High quality mild steel iron powdered electrode with recovery rate of approximately 150%. Designed specifically for mild steel heavy fabrications where downhand, ('V' preparation) welding involves large volume deposits to be laid using single or multipass techniques. Very easy slag detachability – self releasing. Ideal for heavy mild steel fabrications where extended runs are involved demanding large volumes of weld metal deposits in the shortest possible time. Can be used for either fillet or butt joints.

Material to be Welded: BS 1449 BS4360 GRADE 43A 43C 50B 50C & 50D LLOYDS A & D SHIP STEELS LLOYDS AH AND DH BS 1501 – 151 430 – 490.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	P	S	Si
0.08	1.10	0.009	0.011	0.45

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	560 N/mm ²
0.2% Proof Stress	460 N/mm ²
Elongation	25%
Reduction of Area	70%
Impact Energy @ -60°C	110 Joules

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
90-110	100-140	140-190	170-230	260-320

Related Specification:

AWS A5.1 E7028

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 250°C before use.



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MAC TRODE E61018 D2

Basic flux coated – low hydrogen – high strength ferritic low alloy electrode giving a metal recovery of some 120% with respect to the weight core wire. Easy to use, easy strike electrode, which deposits a porosity free weld.

Material to be Welded: Designed for all positional welding of high strength steels. Specifically those with a minimum UTS of 100 ksi. e.g.: AISI 4130, 4140, 8630, BS970 grade 709M40 the old EN19. ASTM A487 grade 4B, 4D and 6A (cast) .

Typical All Weld Metal Chemical Analysis (%)

C	Mn	Mo	Ni	P	S	Si
0.12	1.75	0.35	0.70	0.018	0.009	0.50

Typical All Weld Metal Mechanical Properties

As Welded	Minimum
Tensile Strength	690 N/mm ²
0.2% Proof Stress	620 N/mm ²
Elongation	18%
Charpy V Notch @ -40°C	27J
HRC (less than)	22

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
60-100	85-140	140-190	200-250	260-300

Related Specification:

AWS A5.5 E10018-D2

Current:

AC/DC DC electrode positive (+/-) AC (OCV 50) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E61018 G

Low hydrogen manual metal arc welding electrode using a silicon free, low nitrogen, high purity C:Mn core wire with a concentrically extruded, moisture resistant chemically basic flux with a controlled iron powder addition. For welding ferrite high strength low alloy (HSLA) steels e.g. quenched and tempered AISI 4130, 4140, BS970 709M40 (En19) and DIN Cr42 Mo4. For the fabrication of higher strength steels involving a requirement to meet a minimum all weld metal UTS of 690N/mm² (100 ksi) with butt weld in stress relieved condition. For offshore oil well-head process pipework and fittings, these nickel-free electrodes satisfy NACE MR-01-75 requirements intended to ensure resistance to sulphide-induced stress corrosion cracking combined with good sub-zero notch toughness.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	Mo	P	S	Si
0.060	1.53	0.26	0.010	0.010	0.45

Typical All Weld Metal Mechanical Properties

As Welded	Minimum
Tensile Strength	750 N/mm ²
0.2% Proof Stress	660 N/mm ²
Elongation	30%
Reduction of Area	65%
Impact Energy @ -50°C	35J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-130	130-180	160-220	250-300

Related Specification:

AWS A5.5 E10018-G

Current:

AC/DC

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E61118 G

Superior low hydrogen electrode, Ni Cr Mo type AWS E11018-G. If allowed to become damp these electrodes must be redried before using as moisture will cause weld metal cracking*. Smooth arc low spatter easy strike and restrike. When requirements are specified for high strength steels in specific sub zero toughness such as in the North Sea offshore and submarine fabrication work the electrode offers excellent properties.

Material to be Welded: RQT 701 HY 100 Navy Q2N OS690 cast steel.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.051	0.41	1.11	0.49	2.14	0.010	0.012	0.42

Typical All Weld Metal Mechanical Properties

As Welded	Minimum
Tensile Strength	850 N/mm ²
0.2% Proof Stress	800 N/mm ²
Elongation	22%
Reduction of Area	70%
Impact Energy @ -50°C	90J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-130	130-180	160-220	250-300

Related Specification:

AWS A5.5 E11018-G

Current:

AC/DC DC electrode positive (+/-)

Storage:

*If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E61218 G

Low hydrogen manual metal arc welding electrode using a silicon free, low nitrogen, high purity C:Mn core wire with a concentrically extruded, moisture resistant chemically basic flux with a controlled iron powder addition. Specially developed for the repair of hot working dies, where a final hardness in the region of 22–30 RC is required. The electrode has excellent running characteristics, with easy striking and good slag detachability

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.10	1.1	1.0	0.6	1.6	0.010	0.010	0.35

Typical All Weld Metal Mechanical Properties

As Welded	
Hardness	>30HRC
Stress Relieved	
Hardness	>25HRC

Sizes Available & Recommended Amperages

3.2mm	4.0mm	5.0mm	6.0mm
110-150	140-200	200-260	250-320

Related Specification:

AWS A5.5 E12018-G

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for 2 hours at 250°C before use.

MAC TRODE E61418 G

Low hydrogen manual metal arc welding electrode using a silicon free, low nitrogen, high purity C:Mn core wire with a concentrically extruded, moisture resistant chemically basic flux with a controlled iron powder addition. Specially developed for the repair of hot working dies, where a final hardness in the region of 30–35 RC is required. The electrode has excellent running characteristics, with easy striking and good slag detachability

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.1	1.5	1.5	1.1	2.3	0.010	0.010	0.35

Typical All Weld Metal Mechanical Properties

As Welded	
Hardness	>35HRC
Stress Relieved	
Hardness	>33HRC

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
60-100	85-140	140-190	200-250	260-340

Related Specification:

AWS A5.5 E14018-G

Current:

AC/DC (+)

Storage:

If allowed to become damp, the electrodes should be re-dried for 2 hours at 250°C before use.

MAC TRODE E61618 G

Manufactured using a high purity, low silicon core wire with a chemically basic, alloy bearing flux. Smooth arc with a low spatter, easy strike and re-strike. May be used in all positions except vertically down, strong stable arc. Fillet welds are convex, weld metal is of bright appearance. Very low levels of hydrogen. Used to best advantage for critical repairs to die blocks which allows the deposit to be machined while still resulting in a tough, impact resistant deposit of around Rock well C 40 hardness.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	Si
0.122	1.90	1.33	1.46	3.06	0.38

Physical Properties after PWHT at 600°C Max

Elongation	8-12%
Hardness	38-43HRC

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-140	150-190	200-250	250-300

Related Specification:

AWS A5.5 E16018-G

Current:

DC (+) OR AC (80 min OCV)

Storage:

Re-drying electrodes at 180°C will ensure very low hydrogen levels, e.g. less than 5ml H²/100g as per scale D BS 5135

MAC TRODE E6813 B2

High purity rutile flux coating with specified alloyed additions extruded onto low S-P-Si ferritic core wire. Welding Cr – Mo steels of similar alloy levels when freedom from weld imperfections such as undercut is of equal importance to metallurgical properties, e.g. root runs, fillet welds.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	P	S	Si
0.060	1.10	0.60	0.50	0.025	0.025	0.40

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	720N/mm ²
0.2% Proof Stress	640N/mm ²
Elongation	23%
Reduction of Area	75%
Impact Energy @ 10°C	120J
Hardness	230HV

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-110	100-150	140-210	200-280	250-300

Related Specification:

AWS A5.5 E8013-B2

Current:

DC electrode positive (+) AC (OCV 70)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6818 B2

A superior versatile low hydrogen electrode Ni Cr type. AWS E8018-B2 which uses a silicon free, low nitrogen, high purity C:Mn core wire with a moisture resistant chemically basic flux with a controlled iron powder addition. Recommended for resistance to hydrogen attack up to 330 °C and corrosive effects of processing high S crude oil up to 450 °C and for prolonged elevated temperature service up to 550 °C with reasonable degree of corrosion resistance in superheated stream.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	P	S	Si
0.07	1.25	0.85	0.55	0.007	0.008	0.30

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	715 N/mm ²
0.2% Proof Stress	640 N/mm ²
Elongation	24%
Reduction of Area	75%
Impact Energy @ -10°C	100J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-130	130-180	160-220	250-300

Related Specification:

AWS A5.5 E8018-B2

Current:

DC (+/-)

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

CARBON MANGANESE & LOW ALLOY STEELS

MAC TRODE E6818 C3

MAC TRODE E6818 C3

A low hydrogen, basic flux coated, low alloy electrode. Using a silicon free, low nitrogen, high purity C. Mn core wire with an extruded moisture resistant chemically basic flux with a controlled iron powder addition. For welding thick sections of ferritic steels when it is not always possible to apply post weld stress relief heat treatment. High strength levels and good toughness down to -50°C e.g. BS 4360 Grade 43E – 50E – 55L – 55EE – 55EF.

Typical All Weld Metal Chemical Analysis (%)

C	Mn	Mo	Ni	P	S	Si
0.07	1.30	0.55	0.9	0.008	0.007	0.30

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	630 N/mm ²
0.2% Proof Stress	530 N/mm ²
Elongation	27%
Reduction of Area	70%
Impact Energy @ -40°C	120J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
60-100	85-140	140-190	200-250	260-300

Related Specification:
AWS A5.5 E8018-C3

Current:
DC (+/-) AC (OCV 70) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

CARBON MANGANESE & LOW ALLOY STEELS

MAC TRODE E6818 G

MAC TRODE E6818 G

A low hydrogen, basic flux coated, low alloy electrode. Using a silicon free, low nitrogen core wire. Suitable for welding all grades of structural steels with a specified minimum yield strength of 460 N/mm². However, it is of special value when the steel/weld metal also needs guaranteed toughness properties at -50°C. Those steels include BS4360 all grades at 50F. All grades 'plates' to BS1501-225 and all grades 'forgings' to BS1501-224

Typical All Weld Metal Chemical Analysis (%)

C	Fe	Mn	Ni	P	S	Si
0.08	BAL	1.50	0.85	0.015	0.009	0.30

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	580 N/mm ²
0.2% Proof Stress	480 N/mm ²
Elongation	26%
Reduction of Area	75%
Impact Energy @-50°C	80J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-130	130-180	160-220	250-300

Related Specification:
AWS A5.5 E8018-G

Current:
DC (+/-) AC (OCV 70) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6818 W2

A low hydrogen electrode, with a high recovery of 120%, on a low carbon mild steel core wire with an extruded moisture resistant chemically basic flux which has a controlled iron powder addition. The moisture resistant coating gives a very low weld metal hydrogen level. This electrode is mainly used for weathering steels containing a similar controlled addition and offers a threefold improvement in corrosion resistance compared with plain C Mn steels. The weld metal also resists preferential corrosion in seawater, particularly in arctic waters high in oxygen and salinity and has applications for welding micro-alloyed and C Mn steels in icebreaker vessels and offshore structures. Applications also include architectural structures, bridges and exhaust gas flues.

Microstructure: In the as welded condition the microstructure is ferritic with a high proportion of acicular ferrite for optimum toughness.

Materials to be welded.

Corten A, B1 (B.Steel, US Steel) and other proprietary designations.

BS4360 Grade WR50A to WR50C

ASTM A588 Grades A, B, C, K

DIN 1.8960, 1.8961, 1.8963

Related Specification:

AWS A5.5 E8018-W2 (Generic Corten Type)

Current:

AC/DC+ (OCV 70 volts min)

Storage:

If allowed to become damp the electrodes should be re-baked.

To ensure weld metal hydrogen <5ml/100g, rebake at 300°C – 350°C for 1–2 hours. Do not exceed 420°C

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Cu	Mn	Mo	Ni	P	S	Si
0.06	0.60	0.50	1.00	0.02	0.60	0.015	0.01	0.60

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	610 N/mm ²
0.2% Proof Stress	520 N/mm ²
Elongation	25%
Reduction of Area	65%
Impact Energy @ 0°C	150J
Impact Energy @ -20°C	100J
Impact Energy @ -40°C	70J
Impact Energy @ -60°C	40J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm
70-110	80-140	100-180	140-240

MAC TRODE E6918 B3

A superior versatile low hydrogen electrode nickel chromium molybdenum type. AWS E9018-B3 which uses a silicon free, low nitrogen, high purity C:Mn core wire with a moisture resistant chemically basic flux with a controlled iron powder addition. Smooth arc low spatter, easy strike and restrike. Recommended for prolonged elevated temperatures up to 600°C associated with steam generated power plants, e.g. turbines, casting, valve bodies, boiler super heaters and pipes.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	P	S	Si
0.06	2.25	0.85	1.05	0.00	0.008	0.30

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	700 N/mm ²
0.2% Proof Stress	620 N/mm ²
Elongation	19%
Reduction of Area	65%
Impact Energy @ -10°C	80J

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-130	130-180	160-220	250-300

Related Specification:

AWS A5.5 E9018-B3

Current:

DC (+/-) AC (OCV 70) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

MAC TRODE E6918 G

This is a low hydrogen electrode using a free, low nitrogen, high purity C:Mn core wire with a concentrically extruded, moisture resistant chemically basic flux with a controlled iron powder addition. It is an easy to use electrode for welding in all positions. Good restriking ability and smooth, easy flowing welds. Pre-heat & interpass temperatures 100°C min. and up to 200°C for thick sections.

Typical All Weld Metal Chemical Analysis (%)

C	Cr	Mn	Mo	Ni	P	S	Si
0.038	0.1	1.05	0.28	0.7	0.01	0.02	0.15

Typical All Weld Metal Mechanical Properties

As Welded	Typical
Tensile Strength	700 N/mm ²
0.2% Proof Stress	620 N/mm ²
Elongation	26%
Reduction of Area	65%
Impact Energy @ -20°C	80 Joules

Sizes Available and Recommended Amperages

2.5mm	3.2mm	4.0mm	5.0mm	6.0mm
70-90	90-130	130-180	160-220	250-300

Related Specification:

AWS E9018-G

Current:

AC/DC (+) AC (OCV 70) min

Storage:

If allowed to become damp, the electrodes should be re-dried for one hour at 150°C before use.

Own Branding

MWA continue to offer own branded products to our customers at no extra cost for the electrodes. Product is available in a variety of colour boxes and pack sizes. Please ask about your options. Labelling can take two forms, firstly standard text, this comes at no extra charge. Should you prefer boxes with your own logo/ badge, then there will be a one off set up charge to cover artwork etc. This is an ideal opportunity to ringfence your business from your competitors.

Vac-Pac

New to MWA, in 2019 we started to offer some of our products in 2kg Vac-Pac sleeves. This coincided with the reformulation of some of our flux systems, together with the VP this will offer, particularly site workers etc even greater confidence in the MWA brand. Labelling on the VP will remain unaffected.

Customised Electrodes

Our development team of Chemists and Metallurgists are willing to look at manufacturing bespoke electrodes to suit your needs given feasibility of production and demand. Maybe you require an electrode previously made that is no longer available, if so please contact us.

ALUMINIUM

Product Name	Related AWS Specification	Page Number
E95	E4043	126
E97	E4047	127

BRONZES

Product Name	Related AWS Specification	Page Number
E808	E Cu Sn-C	122
E809	E Cu Sn / Type 14% Tin Bronze	122
E810	E Cu Al-A2	123

CARBON MANGANESE & LOW ALLOY STEELS

Product Name	Related AWS Specification	Page Number
E61018 D2	E10018-D2	142
E61018 G	E10018-G	143
E61118 G	E11018-G	144
E61218 G	E12018-G	145
E61418 G	E14018-G	146
E61618 G	E16018-G	147
E6813 B2	E8013-B2	148
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E6818 W2	E8018-W2	152-153
E6918 B3	E9018-B3	154
E6918 G	E9018-G	155

CAST IRONS

Product Name	Related AWS Specification	Page Number
E405	E Ni Ci	80
E406	E Ni Ci	81
E407	E Ni Fe Ci	82
E407 S	E Ni Fe Ci.HR	83
E409	E Ni Ci Special Non-Conductive Coating	84
E410	Cast Iron Special	85

CUTTING & GOUGING

Product Name	Related AWS Specification	Page Number
E71	N/A	88
E73	N/A	89
E74	N/A	89

HARD FACING

Product Name	Related AWS Specification	Page Number
E301	N/A	92
E304	N/A	93
E306	N/A	94
E307	N/A	95
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MILD & LOW ALLOY STEELS

Product Name	Related AWS Specification	Page Number
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MAC NIL SIL	E6013	131
MAC SUPER STEEL	E6013	132
MAC SUPER STEEL VDH	A5 E6013	134

MILD & LOW CARBON MANGANESE STEELS

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E6724	E7024	138
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NICKEL ALLOYS

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E201	E Ni Cr Fe-1	53
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E212	E Ni Cr Mo-2	59
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NICKEL ALLOYS (Continued)

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E101 H	E347H-16	33
E101 Mo	E308Mo-17	34
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Email: sales@mwa-international.com
Website: www.mwa-international.com

MAC CAST E407
E Ni Fe Cr

SIZE: 3.25 MM
WEIGHT: 1 KILO
BATCH: 190531


UK MANUFACTURER OF WELDING ELECTRODES

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MAC STAIN E101 ELC
AWS E308L-16

SIZE: 3.25 MM
WEIGHT: 4 KILO
BATCH: 190538

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