



MWA
Product Guide
2nd Edition



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 Nicro 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 Nicro 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 NICRO 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 NICRO 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 Nicro 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 Nicro 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 NICRO 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 NICRO 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.