



WELDERS TO THE NATION SINCE 1951



**Best Performance Consistent quality**



**Classification:**

AWS A/SA 5.1 E7018-1 IS 814 EB5629H,JX

**Identification:** Name Printed**Characteristics**

A Low-hydrogen, iron-powder electrode. Weld metal exhibits excellent toughness upto minus 60°C. It gives excellent arc stability, arc smoothness and very easy slag removal. It has exceptional operating characteristics giving X-ray quality welds even for pipe welding in 5G & 6G positions.

**All Weld Metal Mechanical Properties**

Condition	UTS	YS	Elongation	CVN Impact, J			Hardness
	Mpa	Mpa	%(L=4xd)	-30° C	-46° C	-60° C	BNN
AW	520-640	450-540	24 min	80	50	30	200 max.

**Packing Data**

	5.0	4.0	3.2	2.5
Dia, mm	5.0	4.0	3.2	2.5
Length, mm	450	450	450	350
Pcs per carton, Nos	51	75	113	239
Cartons/ box	4	4	4	4
Pcs per box, Nos	204	300	452	956
Approx. wt. of 1000 Pcs, kg	96	66	44	21

**Welding Currents**

5.0	4.0	3.2	2.5
180-280	140-180	90-140	60-90

**Welding Positions:** F, H, V-up, OH**Current Conditions:** AC (70V) / DC (+)**Typical Applications**

Welding of storage tanks, pipes, pressure vessels, boilers, bridges and heavy structures subject to dynamic loading and mechanical restraint. Suitable for joining steels like ASTM SA-414/SA-414M Gr. C&D (P. No. 1) Gr.60 steels of SA-516/516M (P. No. 1), IS:2002, IS:2062 etc.

**Approvals**

ABS E7018-1	LRA Gr. 4Y40H5
DNV 4Y40H5	Toyo E7018-1

**Typical Weld Metal Chemistry, Wt %**

C – 0.04 - 0.09	Mn – 0.80 – 1.60	Si – 0.20 – 0.45
S – 0.015 Max.	P – 0.015 Max.	

Diffusible H2 Content, &lt;5 ml/ 100 gm of weld metal

**Redrying Conditions**

300°C for 1 hour (Optionally also available in vacuum packed condition, redrying not required in this packaging)

**Special Tests**

Tests Type	Remarks
CTOD at -10°C	Passed
HIC & SSCC (NACE)	Passed

## CROMOTEN 9M15

A 9%Cr -1%Mo non-synthetic type low hydrogen electrode modified with Niobium &amp; Vanadium

**Classification**

AWS A / SFA 5.5 E 9015-B9

**Characteristics**

A hydrogen-controlled electrode to deposit niobium & vanadium modified 9Cr-1.0Mo weld metal. The composition of the core wire closely matches with the weld metal chemistry. The electrode burns with smooth & stable arc, low spatter, uniform bead and easily detachable slag. The deposited weld metal is of radiographic quality and can be used at all positions. The weld metal is designed to meet strength requirements even after prolong holding at elevated temperatures and also to have good impact resistance even at sub-zero temperatures.

**All Weld Metal Mechanical Properties**

Condition	UTS	YS	Elongation	Hardness	CVN Impact, J
	MPA	MPA	L=4d	BHN	AT-18°C AT-0°C
AW	620 min	530 min	19 min	220 max	27 min 45 min

(After SR heat treatment at 760±14°C for 4 hours)

**Redrying Conditions** 300°C for 1 hr**Packing Data**

	2.5	3.2	4	5
Dia, mm	2.5	3.2	4	5
Length, mm	450	450	450	450
Wt. per carton, kg	5	5	5	5
Net Wt. per box, kg	20	20	20	20

**Current Conditions:** DC (+)**Typical Applications**

The electrode is suitable for welding similar composition creep resistant steels used for boilers, power plants, oil refineries, chemical plants, etc. Suitable for joining steels conforming to Grade T91 of SA-199/ SA-199M and SA-213/SA-213M, Grade F91 of SA- 182/ SA-182M and SA-336/SA-336M, Grade C12A of SA-217/SA-217M, Grade P91 of SA335/SA-335M, Grade FP91 of SA-369/SA-369M, Grade 91 of SA-387/SA-387M, etc.

**Typical Weld Metal Chemistry, Wt %**

C:0.08-0.12	Mn:1.2 max	Si:0.25 max
Cr:8.5 – 9.5	Ni: 0.40- 1.0	Mo: 0.85-1.10
V: 0.20-0.30	Nb:0.02-0.10	N:0.03-0.07
Al: 0.04 max	P:0.010 max	S:0.010 max

**Welding Currents**

5.0 mm	4.0 mm	3.2 mm	2.5 mm
140-190	110-160	120-90	50-80



# TENALLOY 80HH Spl

## Classification

**AWS A/SFA 5.5** E11018-M

**Identification** Name Printed

## Characteristics

Extra low hydrogen, low-alloy, high tensile steel electrode suitable for welding fully killed fine – grained steel. The electrode works in all positions, gives very little spatter. The slag is easy to remove. Its weld bead has a smooth, uniform appearance.

## Redrying Conditions

350°C for 2 hour (Optionally also available in vacuum packed condition, redrying not required in this packaging)

### All Weld Metal Mechanical Properties

Condition	UTS	YS	Elongation	CVN Impact, J
	Mpa	Mpa	%(L=4xd)	-50°C
AW	770-870	680-760	20-24	30-70

### Packing Data

	5.0	4.0	3.2	2.5
Dia, mm				
Length, mm	450	450	450	350
Pcs per carton, Nos	51	78	113	215
Cartons/ box	4	4	4	4
Pcs per box, Nos	204	312	452	860
Approx. wt. of 1000 Pcs, kg	96	63	44	23

### Welding Currents

5.0 mm	4 mm	3.2 mm	2.5 mm
180-250	140-180	90-140	60-90

**Current Conditions:** AC, (90V) / DC (+)

## Typical Applications

Penstocks, earth moving equipments and heavy steel fabrications made from high tensile. For welding USS T-1 steel, Heat-treated fine-grained steels N-A-XTRA 70, hy80, etc. Suitable for joining steels conforming to ASTM specification

- C, D grades of SA-225/SA-225M(P.No. 10A)
- Class 2, 3 of B, C, D grades of SA-533/SA533M(P.No.3)
- Class 1 (P. No. 11A) and (P. No.11A) of B, C grades of SA-543/SA543M
- All thickness range of SA-612/SA612M (P. No.10C)
- A, B, C grades of SA-738/SA-738M

### Typical Weld Metal Chemistry, Wt %

C – 0.06 – 0.10	Mn – 1.30 – 1.70	Mo – 0.30 – 0.50
Si – 0.30 – 0.70	P – 0.012 max	Ni – 1.25 - 2.50
S – 0.012 max	Cr – 0.20-0.40	

**Welding Positions:** F, H, V-up, OH



# Duplex & Super duplex ( SMAW + TIG)

## Classification

**AWS A / SFA 5.4** E 2209-16

**IS 5206** E 22.93 L R 23

**Identification :** Name Printed

## Characteristics

An electrode depositing Austenitic-Ferrite Weld metal suitable for welding of duplex weld metal having uniform, and fine ripples. Slag removal is very easy and spatter loss is extremely low. The weld metal is of radiographic quality.

### All Weld Metal Mechanical Properties

Condition	UTS	% Elongation	Ferrite FN	PREN
	Mpa	(L=4xd)		
AW	700-780	20 min	30-35	35 min.

### Welding Currents

5	4	3.2	2.5
150-180	90-125	70-90	50-70

### Packing Data

	4.0	3.2	2.5	5.0
Dia, mm				
Length, mm	300	300	300	300
Wt. per carton, kg	2	2	2	2
Cartons/ box	5	5	5	5
Net Wt. per box, kg	10	10	10	10

**Current Conditions:** DC (+)

## Typical Applications

For welding of duplex Austenitic-Ferrite Stainless steel and cladding of duplex stainless steel weld metal on CS/LAS, used for piping in Gas and oil industry, Off-shore platforms.

**Welding Positions** F, H, V-up, OH

**Redrying Conditions** 300°C for 1 hr

### Typical Weld Metal Chemistry, Wt %

C - 0.04 max.	Ni – 8.5-10.5	Mo – 2.5-3.5
Mn -1.2-2.0	Si – 0.9 max.	Cr – 21.5-23.5
S – 0.03 Max	N – 0.1- .20	P – 0.03 Max.



# BETANOX 4462

# BETANOX 2595-15

**Classification:** AWS A/SFA 5.4 E 2595-15

**Identification :** Name Printed

## Characteristics

A basic coated electrode depositing austenitic ferritic weld metal suitable for welding of super duplex stainless steels. Nitrogen and Nickel contents in the weld metal are controlled to produce a balance duplex structure to ensure good toughness and freedom from weld cracking in highly restrained joints. Presence of Tungsten in weld metal retards the formation of inter-metallic compounds in the HAZ and thereby increases resistance to hot cracking. Radiographic quality weld metal is deposited with uniform fine ripples; Slag removal is easy and spatter loss is low.

### All Weld Metal Mechanical Properties

Condition	UTS	EI (L=4d):	Ferrite Number	PREN
AW	760 N/mm <sup>2</sup> min	15 % min	40 - 60	40 min
Weld metal meets pitting corrosion resistance at 25°C & 30°C as per ASTM G48				

### Packing Data

Dia, mm	2.5	3.2	4	5
Length, mm	350	350	350	350
Wt. per carton, kg	2	2	2	2
Wt. per box, kg	10	10	10	10

### Welding Currents

2.5 mm	3.2 mm	4 mm	5 mm
50-80	70-110	90-140	130-180

**Current Conditions:** DC (+)

## Typical Applications

Welding of super duplex stainless steels such as UNS S32550, S32750, S 32760 (wrought) and UNS J93370, J93380, J93404, CD4MCuN (cast). It can also be used to weld standard duplex stainless steel such as UNS S31803 and UNS S 32205 and for the welding of carbon and low alloy steels to duplex steels as well.

## Redrying Conditions

300°C for 1 hr

### Typical Weld Metal Chemistry, Wt %

C: 0.04 max	Mn: 2.50 max	Si: 1.20max
Cr: 24.0-27.0	Ni : 8.0 – 10.5	Mo: 2.5 - 4.5
N <sub>2</sub> : 0.20 - .030	Cu : 0.40 – 1.5	S: 0.025 max
P: 0.030max	W: 0.40 – 1.0	



## Non Ferrous

**Classification:**

AWS A/SFA 5.11 E NiCrMo-5

**Identification :** Name Printed

## Characteristics

A basic coated specially designed electrode for high grade welding of high Mo Nickel base alloys (e.g. Inconel 625, 800) as well as Cr-Ni-Mo steels with high Mo content. It gives 150% weld metal recovery. Works smoothly with negligible spatter. Reduces carbon diffusion at high temperature.

### All Weld Metal Mechanical Properties

Condition	UTS	EI (L=4d)
AW	690-790 N/mm <sup>2</sup>	30% - 40%

### Welding Currents

3.2 mm	4 mm	5 mm
90 – 120	140-180	180-240

### Packing Data

Dia, mm	3.2	4	5
Length, mm	350	350	350
Wt. per carton, kg	5	5	5
Wt. per box, kg	20	50	50

**Current Conditions:** AC/DC (+)

## Typical Applications

For surfacing steel clad with a nickel-chromium –molybdenum alloy. Suitable for welding/ surfacing of tong jaws of the slab handling cranes.

## Redrying Conditions:

300°C for 1 hr

### Typical Weld Metal Chemistry, Wt %

C: 0.03-0.08	Mn: 0.40 -1.0	Fe:4.0-7.0
Si: 0.20-0.90	S: 0.030 max	P: 0.030 max
Cr :14.5- 16.5	Mo: 15.0-18.0	Cu:0.30 max
Ni : 60.0-78.0	Co:2.5-3.5	W: 3.0 - 4.5



# NICALLOY Mo 5

# NICALLOY Mo 6

A Ni-Cr-Mo electrode for cryogenic applications

## Classification:

**AWS/SFA 5.11** ENiCrMo6  
**Identification :** Name Printed

## Characteristics

A basic coated electrode for high grade welding of high molybdenum nickel base alloys as well as Cr Ni Mo steels with high molybdenum content. The electrode is recommended for low temperature and cryogenic steels like 9% Ni steels. The weld metal is highly resistant to hot cracking, stress corrosion cracking, and thermal shock. Carbon diffusion at high temperature during the heat treatment of dissimilar joints is largely reduced. The weld metal meets highest quality requirements. The electrode shows good performance on both AC and DC.

### All Weld Metal Mechanical Properties

Condition	UTS	Elongation	Charpy V notch impact strength at -196°C	Lateral Expansion at -196°C
AW	620 MPa min	35% min	50 J min	0.50mm min.

### Welding Currents

4.0 mm	3.20mm	2.5mm
120-160	80-120	50 - 95

### Packing Data

Dia, mm	4.0	3.20	2.5
Length, mm	350	350	350
Wt. per carton, kg	5.25	5.25	5.25
Wt. per box, kg	21	21	21

**Current Conditions:** AC (70V)/ DC (+)

## Typical Applications

- ASTM SA553 Class 1, SA353 Class 1
- For welding of 9% Nickel steel for cryogenic applications, especially LNG storage systems. Welding on stainless / heat resistant cryogenic steels and alloys and for welding nickel base alloy to steel.

### Typical Weld Metal Chemistry, Wt %

C : 0.10 max	Mn: 2.0-4.0	Si : 1.0 max
S : 0.015 max	P : 0.015 max	Cr : 12.0-17.0
Mo : 5.0-9.0	Ni : 55 min	Fe : 4.0-8.0
Cb + Ta : 0.5-2.0	Cu : 0.50 max	W : 1.0-2.0



# NICALLOY Mo 12

## Classification:

**AWS A/SFA 5.11** E NiCrMo-12

## Characteristics

A basic coated specially designed electrode for high grade welding of high Mo Nickel base alloys (e.g. Inconel 625, 800) as well as Cr-Ni-Mo steels with high Mo content. Recommended for high temperature and creep resisting steels. The weld metal is highly resistant to hot cracking, stress corrosion cracking and thermal shock. Works smoothly with negligible spatter. Reduces carbon diffusion at high temperature.

### All Weld Metal Mechanical Properties

Condition	UTS	Elong (%) (L=4d)	CVN impacts at -196°C	Lateral Expansion
AW	650-750 N/mm <sup>2</sup>	35%min	35 - 60J	30 - 50mils

### Welding Currents

4.0 mm	3.2 mm	2.5 mm
130-170	110-140	70-100

### Packing Data

Dia, mm	4.0	3.2	2.5
Length, mm	350	350	350
Wt. per carton, kg	5	5	5
Wt. per box, kg	10	10	10

**Current Conditions:** DC (+)

## Typical Applications

For welding of Cr-Ni-Mo austenitic steel to duplex stainless steels and 9% Ni steel for cryogenic applications, forging dies for service applications from -200 °C to 1000°C. Joining of A 240, A 107, A 182, A 249, A 276, A 312, A 358, A473 etc.

**Redrying Conditions:**

300°C for 1 hr

### Typical Weld Metal Chemistry, Wt %

C: 0.03 max	Mn: 1.0 -2.20	Fe : 5.0 max
Si : 0.25-0.65	S : 0.02max	P : 0.025max
Cr 20.5-22.5	Mo: 8.8-10.0	Cu: 0.05max
Ni: Balance		



# ZEDALLOY CoCr - A

## Classification:

AWS A/SFA 5.13 E CoCr-A

## Characteristics

Specially designed electrode with cobalt based alloy (stellite) to retain hardness in the range of 35-40HRC even at high temperature (33HRC approximately at 600°C). Weld metal is machinable. A buffer layer of Betanox-D is recommended on hard base materials. The electrodes have excellent arc stability, low spatter loss and very good re-striking with easy slag detachability. Weld beads are smooth, uniform and of excellent appearance.

All Weld Metal Mechanical Properties				
Condition	Hardness (3 layer deposit)	Machinability	Abrasion Resistance	Impact Resistance
AW	35-40 HRC (As welded)	Good	Good	Average

Welding Currents			
3.2 mm	4.0 mm	5.0 mm	
100-140	140-180	180-220	

Packing Data			
Dia, mm	5.0	4.0	3.20
Length, mm	350	350	350
Wt. per carton, kg	5	5	5
Wt. per box, kg	20	20	20

Current Conditions: AC/DC (-)

## Typical Applications

For surfacing of valves, conveyer screws, knives, hot shearing blades, dies and cutting edges in chemical, rubber, oil, sugar industries and steel mills to get high corrosion, oxidation, heat and wear resistance.

## Redrying Conditions:

200°C for 1 hr

Typical Weld Metal Chemistry, Wt %		
C: 0.7 – 1.4	Mn: 2.0 max	Si: 2.0 max
Cr : 25.0 – 32.0	Ni : 3.0	Mo : 1.0 max
Fe : 5.0 max	W : 3.0 – 6.0	Co : Balance



## FCAW Wires

## Classification:

AWS A/SFA 5.20 E 71T-1JC

## Characteristics

A specially designed FCAW wire to produce weld metal with improved impact properties at -40°C. Excellent operating characteristics and welding can be carried out at relatively higher welding current. The arc is smooth and stable with least spatter and easy slag detachability. The wire offers an excellent combination of T1 performance with good sub-zero toughness.

All Weld Metal Mechanical Properties				
Condition	YS	UTS	EI (L=4d)	CVN Impacts at
AW	390 N/mm <sup>2</sup> min	490 N/mm <sup>2</sup> min	22 % min	-40°C 27J (min)

Packing Data		
Layer wound on D300 plastic spools		
Dia, mm	1.2	1.6
Wt. per carton, kg	15	15
Each spool is sealed in air-tight polythene bag and then packed in corrugated box.		

Shielding Gas: Co<sub>2</sub>, flow rate 12-14 lpm

Welding position: F,H,V-up and OH

Current Conditions: DC (+)

## Typical Applications

For welding of typical structural and carbon steel such as ASTM SA-36/SA-36M, A,B,C grades of SA-285/SA-285M, A,B,C and A,B,C grades of SA-414/SA-414M.

Typical Weld Metal Chemistry, Wt %		
C: 0.10 max	Si: 0.55 max	P: 0.025 max
Mn: 0.90-1.75	S: 0.025 max	Ni: 0.50 max



# AUTOMIG FC 71T-1J

Flux Cored Wire for MAG Welding

# AUTOMIG FC 71T-5

## Classification:

AWS A/SFA 5.20 E 71T-5CH4/E71T-5MH4

Flux Type : Basic

## Characteristics

A basic type folded flux-cored wire producing weld metal with sound radiographic quality and superb mechanical properties. The wire deposits are very crack resistant and tough welded joints, especially when welding steels with high carbon content. Stable arc, easy deslagging, pore-free welds.

### All Weld Metal Mechanical Properties

Condition	UTS	YS	Elongation	CVN Impact, J
	Mpa	Mpa	%(L=4xd)	-30°C
AW	490 min	390 min	22 min	50 min

Chemical & mechanical properties given above are with A 5.32 SG-C gas (100%CO<sub>2</sub>) The chemistry and mechanical properties of the weld will vary with the type of shielding gas used

### Welding Currents

3.2 mm	4.0 mm	5.0 mm
100-140	140-180	180-220

### Packing Data

Dia, mm	1.2	1.6
Plastic Spools, net wt Kg	15	15

Shielding Gas: CO<sub>2</sub>

10-15 Litres/min

Current Conditions: DC (+)

## Typical Applications

Welding of Structural and boiler quality steel with minimum UTS upto 510 Mpa, including IS 226, IS 2002, IS 2062, DIN 17115 HIV, SA-285 Gr. C, SA-414 Gr.C, D, E; SA-515 Gr.60/65, SA 516 Gr.60/65, etc.

Welding Positions: F, H, V-up and OH

### Typical Weld Metal Chemistry, Wt %

C: 0.08 max	Mn: 1.75 max	Si: 0.25 – 0.60 max
S: 0.025 max	P: 0.025 max	

Diffusible H<sub>2</sub> content <4 ml/ 100gms of weld metal

### Approvals

ABS	Gr. III, YSAH5, E71T5H4	IRS	3YSHHH
BV	SA3YMHHH	LRS	DXVuo, BF, 3S, 3YS, H5, NA
DNV	Gr. III YMS H5		



# AUTOMIG FC180R

Flux Cored Wire for MAG Welding

## Classification:

AWS A/SFA 5.29 E81T-1W

RDSO : Class IV

## Characteristics

These are specially designed to produce weld metal that matches the corrosion resistance and the coloring of ASTM weathering type structural steels. These special properties are achieved by the addition of about 0.5 percent copper to the weld metal.

### All Weld Metal Mechanical Properties

Condition	UTS	YS	EI (%)	RA	CVN (J) min.
	(MPa)	(MPa)	(L=5d)	(%)	-20°C
AW	550 min	440 min	22 min	40 min	50

### Packing Data

Layer wound on D300 plastic spools		
Dia, mm	1.2	1.6
Wt. per carton, kg	12.5/15	12.5/15
Each spool is sealed in air-tight polythene bag and then packed in corrugated box.		

Shielding Gas: For best results use Argon+CO<sub>2</sub> gas, for normal usage use CO<sub>2</sub> gas with gas flow rate 14-20lpm

Welding position: F,H,V-up and OH

Current Conditions:DC (+)

## Typical Applications

For welding of typical weathering steel such as ASTM A242, A 588, CORTEN A and B grade, TATA CRS and medium high tensile steel type D40-S used for ship-building etc..

### Typical Weld Metal Chemistry, Wt %

C: 0.12max	Mn: 0.50-1.30	Si: 0.35-0.80
S: 0.025 max	P: 0.025 max	Ni: 0.40-0.80
Cu: 0.30-0.75	Cr: 0.45-0.70	



# AUTOMIG FC 81T-1 Ni1

Flux Cored Wire for MIG / MAG Welding

## Classification:

AWS A/SFA 5.29 E 81T-1Ni1C / M

## Characteristics

These are specially designed to produce weld metal with improved impact properties. Welding can be carried out at relatively higher welding current, higher deposition rate are obtainable. The electric arc is smooth and stable with least spatters and easy slag detachability.

Current Conditions: DC (+)

## Typical Applications

For welding of A 203, class 1 or 2, A 203, grade E and HY-80, offshore fabrication, vessels and structural steel work.

Shielding Gas CO<sub>2</sub> or Argon + CO<sub>2</sub>, flow rate 12-18 lpm

Welding position F,H,V-up and OH

### Typical Weld Metal Chemistry, Wt %

C: 0.12 max	Mn: 1.50 max	Si: 0.80 max
Ni: 0.80-1.10	S: 0.025 max	P: 0.025 max
Mo: 0.35 max		

### All Weld Metal Mechanical Properties

Condition	YS	UTS	EI (L=4d)	CVN Impacts at
				-30°C 40J(min)
AW	470 N/mm <sup>2</sup> min	550-690 N/mm <sup>2</sup>	19 % min	-40°C 27J(min)

### Packing Data

Layer wound on D300 plastic spools		
Dia, mm	1.2	1.6
Wt. per carton, kg	15	15

Each spool is sealed in air-tight polythene bag and then packed in corrugated box.



## Welding Electrodes, Wires & Fluxes



WELDERS TO THE NATION SINCE 1951  
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