

We Make Together...
WELDING CONSUMABLES



Raajratna
electrodes pvt. ltd.

An ISO 9001:2015 Certified Company & Government Recognized One Star Export House

Company PROFILE

Raajratna Electrodes Pvt. Ltd., is one of the largest manufacturer & exporter of welding consumables in the country. It is an ISO 9001:2015 certified company and it also wears the badge of a Government Accredited One Star Export House a title conferred on companies that meet national and international standards of quality and excellence.

It is a part of well-known "Raajratna Group" involved in Stainless Steel Wires, Fasteners and Tubes having their state-of-the-art manufacturing units on Ahmedabad - Mehsana Highway.

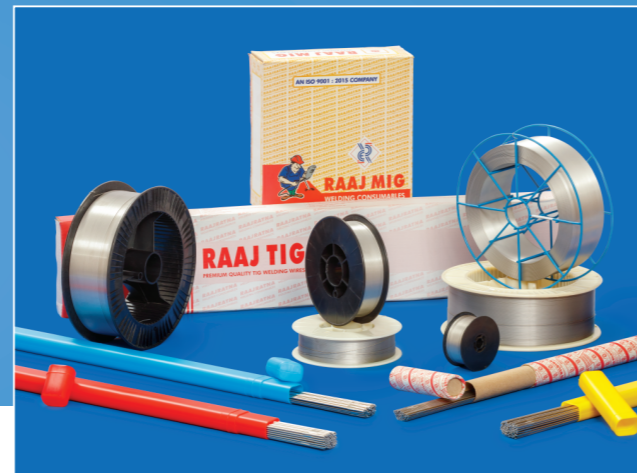
Our production team is highly skilled and we always aim to give zero defect products to our customers. Our quality assurance and R&D team always strives for continuous improvement in our products keeping in view customer's requirement.



Raajratna Electrodes offers complete range of Welding Consumables viz.

- **MANUAL METAL ARC WELDING ELECTRODE (MMAW)**
- **COPPER COATED WELDING WIRE (TIG / MIG / SAW)**
- **STAINLESS STEEL WELDING WIRE (TIG / MIG / SAW)**
- **SUBMERGED ARC WELDING WIRE & FLUX**
- **FLUX CORED ARC WELDING WIRE (FCAW)**

Welding Consumables manufactured by the company are meeting international quality standards i.e. AWS, DIN, BS, JIS etc. We adopt latest and innovative technology and our products are approved by International and National agencies like ABS, BAX COUNSEL, BHEL, BIS, BV, DNV-GL, D&B, ESSAR, GWSSB, IBR, IRS, LR, L & T, NTPC LTD., NPCIL & RDSO.



Star Performer Trophy
for the Excellence in Engineering Exports
Awarded by EEP-INDIA

Raajratna's Global Presence

- | | | | | | | |
|------------|------------|-------------|-----------|--------------|--------------|------------------|
| Australia | Chile | Fiji Island | Kenya | Nigeria | Singapore | Turkmenistan |
| Bahrain | Colombia | Ghana | Kuwait | Oman | Slovenia | UAE |
| Bangladesh | Costa Rica | Guatemala | Malawi | Phillipines | South Africa | Uganda |
| Belgium | Egypt | Haiti | Mauritius | Qatar | South Korea | USA |
| Brazil | Ethiopia | Iran | Mongolia | Romania | Sri Lanka | Venezuela |
| Canada | Ecuador | Italy | Myanmar | Saudi Arabia | Thailand | and many more... |

Welding Electrodes

Raajratna Brand	Classification AWS / EN ISO / IS	Current Polarity	Welding Position	Typical Weld Metal Chemical Properties (Element %)											Typical Weld Metal Mechanical Properties				Applications	Approval/ Hardness/ Others	
				C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb	Other	YS (N/mm ²)	UTS (N/mm ²)	Elongation (%)	CVN Impact at°C Joules			
SPECIAL PIPE WELDING ELECTRODES																					
RATNA 6010	A 5.1 E 6010 2560-A E 42 3 C 25	DC(+)	F,V,OH,H	0.120	0.60	0.22	0.008	0.015	-	-	-	-	-	-	450	550	26	-30	55	Suitable for general structure, root pass and multilayers pipe line applications.	-
RATNA 6011	A 5.1 E 6011 2560-A E 42 3 C 15	DC(+)/AC	F,V,OH,H	0.110	0.65	0.25	0.007	0.015	-	-	-	-	-	-	440	550	26	-30	60	Designed for welding of pipelines jobs, storage tanks, shipbuilding etc.	-
RATNA 7010-P1	A 5.5 E 7010-P1 2560-A E 46 3 C 25	DC(+)	F,V,OH,H	0.150	1.00	0.35	0.009	0.015	0.15	0.50	0.20	-	-	-	500	590	24	-30	50	Welding of high yield pipeline steels, out of position welding storage tanks, drill platforms, shipbuildings etc.	-
RATNA 8010-G	A 5.5 E 8010-G 2560-A E 50 3 C 25	DC(+)	F,V,OH,H	0.140	1.10	0.35	0.007	0.014	-	0.55	0.10	-	-	-	550	650	24	-30	60	Welding of high strength pipeline steels, root, filling and capping runs in API 5LX70 grade line pipe.	-
RATNA 8018-P2	A 5.1 E 8018-P2 2560-A E 46 4 B 45 H5	DC(+)	F,V,OH,H	0.070	1.35	0.55	0.010	0.020	0.10	0.75	0.30	-	-	-	510	640	25	-30	100	Welding of high strength API 5L pipe steels made of X65 & X70.	-
RATNA LH-80	A 5.5 E 8045-P2 2560-A E 50 4 B 45 H5	DC(+)	F,V,OH,H	0.065	1.45	0.50	0.010	0.020	0.10	0.80	0.35	-	-	-	530	650	24	-30	90	Welding fill and cap pass up to X70 grade pipe. Hot tapping and pipe repairing.	H2: 2.50ml/100gm weld metal
LOW AND MEDIUM TENSILE STEEL ELECTRODES																					
RATNA FS12	A 5.1 E 6012 2560-A E 35 A R 1 2	DC(-)/AC	F,V,OH,H	0.080	0.35	0.25	0.012	0.022	-	-	-	-	-	-	380	460	24	+20	52	Suitable for steel furnitures, light sheet metal works, general fabrications.	-
RATNA 6013	A 5.1 E 6013 IS 814 ER 4222	DC(-)/AC	F,V,OH,H	0.065	0.41	0.24	0.011	0.021	-	-	-	-	-	-	425	490	26	0	62	Rutile type light coated all position electrode for light structural steel, machinery, general fabrication work.	BIS, DNV-GL, IRS
RATNA 6013X	A 5.1 E 6013 IS 814 ER 4222X & 2560-A E 38 0 R 1 1	DC(-)/AC	F,V,OH,H	0.060	0.43	0.24	0.011	0.020	-	-	-	-	-	-	430	498	27	0	70	Medium heavy coated rutile type all position electrodes suitable for storage tanks, rail coaches, low pressure vessels and boiler applications.	BIS, BV, IRS, IBR, BAX COUNSEL, ABS, BHEL, NTPC
RATNA 6013XX	A 5.1 E 6013 IS 814 ER 4222X	DC(-)/AC	F,V,OH,H	0.060	0.45	0.22	0.010	0.020	-	-	-	-	-	-	435	502	28	0	70	Heavy coated all position rutile base electrodes suitable for boilers, heavy section, ship hull construction and repair, storage tanks, rail coaches.	BIS
RATNA 6022	A 5.1 E 6022 2560-A E 35 0 R 1 4	DC(-)/AC	F,V,Filling	0.065	0.55	0.40	0.012	0.025	-	-	-	-	-	-	380	460	22	0	40	Spot welding floor decking to beams. Single pass of groove welds on sheet metal.	-
RATNA 7014	A 5.1 E 7014 2560-A E 42 0 R 1 2	DC(-)/AC	F,V,OH,H	0.090	0.90	0.50	0.010	0.020	-	-	-	-	-	-	460	550	22	0	80	Welding of structural steel for buildings, heavy sections, ship construction and bridges.	-
RATNA 7016	A 5.1 E 7016 2560-A E 42 3 B 1 2	DC(+)/AC	F,V,OH,H	0.062	1.30	0.55	0.011	0.016	-	-	-	-	-	-	460	565	26	-30	70	Suitable for overlaying buffer layer, low & medium carbon steels, heavy steel plates, cast steels and steels of poor weldability.	-
RATNA 7016W	A 5.1 E 7016 2560-A E 42 3 B 1 2	DC(+)/AC	F,V,OH,H	0.065	1.35	0.60	0.012	0.018	-	-	-	-	-	-	480	560	25	-30	80	Suitable for welding unknown steel grade. Steel component with high carbon and high sulphur, cast iron repairs.	-
RATNA 7018	A 5.1 E 7018 2560-A E 42 3 B 3 2	DC(+)/AC	F,V,OH,H	0.055	1.15	0.45	0.008	0.015	-	-	-	-	-	-	450	550	29	-30	65	Welding in blast furnace, heavy structures subjected to dynamic loading and impact, railcar, industrial & mining machinery, bridges, boiler job, atomic reactor and pipe work. Metal recovery around 115%. Suitable for boilers, pressure vessels, penstocks & earth moving equipments.	BIS, BV, IRS, IBR, BAX COUNSEL, LR, ABS, DNV-GL, NTPC, NPCIL, BHEL, RDSO
RATNA 7018 H4R	A 5.1 E 7018 H4R 2560-A E 42 3 B 3 2 H5	DC(+)/AC	F,V,OH,H	0.060	1.00	0.70	0.010	0.020	-	-	-	-	-	-	440	540	28	-30	80	All maintenance applications including welding of all types of carbon-manganese steels, high tensile, heavy structures.	H2 : 2.50ml/100gm weld metal
RATNA 7024	A 5.1 E 7024 2560-A E 42 A R 1 4	DC(-)/AC	F, H, Filling	0.090	1.05	0.50	0.010	0.020	-	-	-	-	-	-	450	570	22	+20	100	Suitable for heavy sections machinery parts, cranes and bridges, columns, shipbuilding, pressure vessels etc.	-
RATNA SUPER	A 5.1 E 6013 IS 814 ER 4211	DC(-)/AC	F,V,OH,H	0.070	0.40	0.26	0.011	0.022	-	-	-	-	-	-	415	480	24	0	50	Suitable for mild steel structure, plant machinery and general applications.	BIS
RATNA SUPER S	A 5.1 E 6013 IS 814 ER 4211X	DC(-)/AC	F,V,OH,H	0.065	0.40	0.25	0.010	0.022	-	-	-	-	-	-	418	488	26	0	60	Suitable for mild steel structure, ship construction, storage tanks etc.	RDSO
LOW ALLOY ELECTRODE FOR LOW TEMPERATURE SERVICE																					
RATNA 7018 SPL	A 5.1 E 7018-1 2560-A E 42 4 B 3 2	DC(+)/AC	F,V,OH,H	0.060	1.39	0.33	0.008	0.015	-	-	-	-	-	-	470	580	28	-45	70	Suitable for high pressure vessels, steels sensitive to hydrogen embrittlement and severe stress prone to crack. Off-shore drilling rigs and platforms, power plant job.	NPCIL, BV, BAXCOUNSEL
RATNA 7018 Ni	A 5.5 E 7018-G 2560-A E 42 5 1Ni B 3 2	DC(+)/AC	F,V,OH,H	0.055	0.90	0.35	0.010	0.020	-	0.60	-	-	-	-	450	570	26	-50	60	Application include restrained joints, heavy steel section & welding medium and high tensile steels, ammonia storage tanks.	-
RATNA 8018 Ni SPL	A 5.5 E 8018-G 2560-A E 46 6 Mn1Ni B 3 2	DC(+)/AC	F,V,OH,H	0.060	1.60	0.40	0.010	0.020	-	0.62	-	-	-	-	540	630	24	-60	50	Suitable for welding quenched & tempered steels, pressure vessels, penstocks, fine grained steels. Industrial equipment subjected to sub-zero temperature.	-
RATNA 8018-C1	A 5.5 E 8018-C1 2560-A E 46 6 2Ni B 3 2	DC(+)/AC	F,V,OH,H	0.055	0.85	0.35	0.010	0.020	-	2.50	-	-	-	-	520	630	22	-60	60	For LNG storage tanks, liquefied gases, cryogenic vessels, to weld 2.25% Ni steels used for low temperature.	-
RATNA 8018-C2	A 5.5 E 8018-C2 2560-A E 46 6 3Ni B 3 2	DC(+)/AC	F,V,OH,H	0.060	1.10	0.40	0.010	0.020	-	3.50	-	-	-	-	500	600	24	-75	47	Suitable for oil refinery, cryogenic vessels, to weld 3.25% Ni steels used for low temperature service in petrochemical industries.	-
RATNA 8018-C3	A 5.5 E 8018-C3 2560-A E 46 4 1Ni B 3 2	DC(+)/AC	F,V,OH,H	0.060	0.90	0.40	0.010	0.020	0.10	1.00	0.20	-	-	-	490	595	26	-40	70	Typical applications include storage tanks for liquefied gases, distillers in coke oven batteries and in petrochemical industries.	-

Welding Electrodes

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				C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb	Other	YS (N/mm ²)	UTS (N/mm ²)	Elongation (%)	CVN Impact at°C Joules		
ELECTRODE FOR HIGH TENSILE AND QUENCHED & TEMPERED STEEL																				
RATNA 7018 M	A 5.5 E 7018-A1 3580-E Mo B 3 2	DC(+)/AC	F,V,OH,H	0.065	0.80	0.55	0.010	0.020	-	-	0.56	-	-	-	480	565	25	+20 150	Suitable for high pressure vessels & piping. C-Mo steels used for elevated temperature services.	-
RATNA HT	A 5.5 E 9018-G 18275-A E 55 5 1.5NiMo B 3 2	DC(+)/AC	F,V,OH,H	0.060	1.40	0.45	0.010	0.020	-	1.35	0.40	-	-	-	600	710	22	-50 50	Suitable for welding high tensile & refined grain steels, power house construction and for welding Q & T / HSLA steel.	-
RATNA HT 65 SPL	A 5.5 E 9018M 18275-A E 55 5 ZB 3 2	DC(+)/AC	F,V,OH,H	0.060	1.00	0.45	0.010	0.018	-	1.55	0.20	-	-	-	580	710	26	-50 54	Welding of chemical plants and machinery parts, equipment such as penstocks to be subjected to -50°C.	-
RATNA HT 65 D1	A 5.5 E 9018-D1 18275-A E 55 5 MnMo B 3 2	DC(+)/AC	F,V,OH,H	0.055	1.60	0.40	0.008	0.017	-	0.45	0.35	-	-	-	630	720	22	-50 50	Suitable for welding HSLA steels, "CONCOR" wagon type application of the railways, penstocks, storage tanks.	PWHT: 620°C/1Hrs
RATNA HT 75	A 5.5 E 10016-G 18275-A E 62 5 Mn1Ni B 1 2	DC(+)/AC	F,V,OH,H	0.060	1.55	0.35	0.010	0.020	-	0.60	0.25	-	-	-	700	810	20	-50 54	Welding quenched & tempered steels, earthmoving equipment, off-shore constructions, bridges and submarines.	-
RATNA HT 75 D2	A 5.5 E 10018-D2 18275-A E 55 5 Mn1NiMo B 3 2	DC (+)/AC	F,V,OH,H	0.065	1.45	0.50	0.010	0.020	0.10	0.80	0.35	-	-	-	570	650	24	-50 90	Suitable for welding Q & T Steel, off-shore constructions & machinery, penstocks, pressure vessels, bridges & sub-marines.	-
RATNA HT SPL	A 5.5 E 11018M 18275-A E 62 5 Mn2NiMo B 3 2	DC(+)/AC	F,V,OH,H	0.055	1.70	0.40	0.009	0.020	0.20	2.00	0.35	-	-	-	710	845	20	-50 54	Welding of high tensile steels (800 N/mm ²) such as USS-1 & WEL-TEN 80 and steels conforming to ASTM A517. Suitable for site conditions with high relative humidity & higher joint restraints. Extra low hydrogen class.	-
RATNA HT 80	A 5.5 E 12018M 18275-A E 69 5 Mn2NiCrMo B 3 2	DC(+)/AC	F,V,OH,H	0.080	1.45	0.45	0.010	0.020	0.35	2.40	0.35	-	-	-	760	915	20	-50 50	The electrode is intended for welding of steels such as HY 80, N-A-XTRA70, USS T1 grades etc.	-
ELECTRODE FOR CREEP RESISTANT STEEL																				
RATNA CR 1	A 5.5 E 8018-B2 3580-A E CrMo1 B 3 2 H5	DC(+)/AC	F,V,OH,H	0.070	0.80	0.55	0.010	0.020	1.20	-	0.45	-	-	-	550	660	24	-	Suitable to weld creep resistant steels like 1% Cr-0.5%Mo pipelines and plates used in oil refinery, power plants, steam boilers for service temperatures up to 550°C.	PWHT: 690°C/1Hrs
RATNA CR 2	A 5.5 E 9018-B3 3580-A E CrMo2 B 3 2 H5	DC(+)/AC	F,V,OH,H	0.080	0.70	0.50	0.010	0.020	2.25	-	1.00	-	-	-	635	740	22	-	Suitable for weld creep resistant steel like with 2.25% Cr and 1% Mo used in oil refinery, power plants, steam boilers, chemical units. Weld metal is oxidation resistant up to 575°C.	PWHT: 690°C/1Hrs
RATNA CR 5	A 5.5 E 8018-B6 3580-A E CrMo5 B 3 2 H5	DC(+)/AC	F,V,OH,H	0.070	0.77	0.47	0.010	0.020	5.50	-	0.50	-	-	-	515	620	25	-	Welding in petrochemical industries, chemical industries, power house applications.	PWHT: 740°C/1Hrs
RATNA CR 9	A 5.5 E 8018-B8 3580-A E CrMo9 B 3 2 H5	DC(+)/AC	F,V,OH,H	0.077	0.80	0.45	0.010	0.020	8.75	0.15	1.10	-	-	-	525	630	22	-	For welding 7-10% Cr - 1% Mo steels, castings, petrochemicals industries, oil refinery. Weld metal has excellent creep strength up to 600°C, oxidising resistant up to 700°C.	PWHT: 740°C/1Hrs
RATNA CR 9 SPL	A 5.5 E 9018-B9 3580-A E CrMo91 B 3 2 H5	DC(+)/AC	F,V,OH,H	0.095	0.65	0.25	0.007	0.008	9.75	0.40	1.02	0.18	Nb:0.033 V:0.20	Al:0.01 N:0.055	740	630	22	+20 60	Welding of A213-T91 Tube, A335-P91 pipe, and A387 Gr. 91 Plate. Also used in power generation, petro chemicals, steam piping and turbines.	PWHT: 760°C/2Hrs
HARDFACING ELECTRODES																				
RATNA HF 1	DIN 8555 E1-UM-250 14700 E Fe1	DC(-)/AC	F,V,OH,H	0.22	0.55	0.60	-	-	2.00	-	-	-	-	-	-	-	-	-	Suitable to use for hammers, gear shaft couplings, axles, crane crushers, machine parts, rollers, sugarcane crushers, pulleys.	Hardness 250-350 BHN
RATNA HF 2	DIN 855-E1UM-400 14700 E Fe3	DC(-)/AC	F,V,OH,H	0.25	0.60	0.60	-	-	2.70	-	-	-	-	-	-	-	-	-	Suitable to use on couplings, gears, cogwheels, shafts, plough shears, pinions, etc. It is superior for field welding.	Hardness 350-450 BHN
RATNA HF 3	DIN 855-E1UM-6 14700 E Fe8	DC(-)/AC	F,V,OH,H	0.65	0.65	0.55	-	-	7.50	-	-	-	-	-	-	-	-	-	Mine rails, plough shares, crusher hammers, drilling bits, conveyor buckets, crane wheels, oil expeller etc.	Hardness 550-650 BHN
RATNA HF 5	DIN 8555-E1UM-60GR 14700 E Fe6	DC(+)/AC	F,V,OH,H	2.50	1.00	2.50	-	-	3.00	-	-	-	-	-	-	-	-	-	Suitable for resurfacing on mixer blades worms of oil expellers, screw conveyors, shears, bucket tips and excavators teeth.	Hardness 550-650 BHN
RATNA HF-II LH	DIN 8555-E1UM-400S 14700 E Fe1	DC(+)/AC	F,V,OH,H	0.20	0.55	0.60	-	-	3.25	-	-	-	-	-	-	-	-	-	Suitable to weld on rail ends and crossing, brake shoes, cogwheels, conveyor parts, cold punching dies, pulleys and steel casting etc.	Hardness 350-400 BHN
RATNA HF LH	DIN 855-E1UM-60S 14700 E Fe8	DC(+)/AC	F,V,OH,H	0.60	0.45	0.60	-	-	7.50	-	0.40	-	-	V:0.40	-	-	-	-	Suitable to work on high carbon and high sulphur steels without cracks, crane wheels, rock drill crane cutting knives, impellers, oil expeller, conveyor buckets, etc.	Hardness 550-650 BHN
RATNA HF MN	DIN 8555-E7UM-250KP 14700 E Fe9	DC(+)/AC	F,V,OH,H	0.90	12.50	0.65	-	-	-	-	-	-	-	-	-	-	-	-	Suitable for stone crushing jaws, Mn steel rails, austenitic Mn steel castings, hammers, cement grinder rings, rail crossovers, etc.	AW:200-240 BHN WH:500 BHN
STAINLESS STEEL ELECTRODES																				
RATNA 308	A 5.4 E 308-16 3581-A E 19 9 R 3 2	DC(+)/AC	F,V,OH,H	0.040	1.20	0.50	0.010	0.020	19.50	9.40	-	-	-	-	-	595	39	-	Suitable for joining AISI 301, 302, 304 and 308 steel having 18Cr/8Ni and similar composition.	RDSO
RATNA 308L	A 5.4 E 308L-16 3581-A E 19 9 L R 3 2	DC(+)/AC	F,V,OH,H	0.025	1.25	0.47	0.008	0.018	19.75	9.52	-	-	-	-	-	600	40	-	Suitable for joining AISI 301L, 302L, 304L and 308L steel having 18Cr/8Ni with low carbon content.	RDSO, NPCIL, LR
RATNA 308H	A 5.4 E 308H-16 3581-A E 19 9 H R 3 2	DC(+)/AC	F,V,OH,H	0.060	1.28	0.50	0.009	0.020	19.70	9.50	-	-	-	-	-	620	42	-	Suitable for joining AISI 304H, 308H material used in high temperature applications and fabrication jobs.	-
RATNA 309	A 5.4 E 309-16 3581-A E 23 12 R 3 2	DC(+)/AC	F,V,OH,H	0.037	1.35	0.45	0.008	0.017	23.85	12.45	-	-	-	-	-	605	40	-	Suitable for welding 22%Cr-12%Ni stainless steel grades of AISI 309, dissimilar steel, stainless steel to carbon steel and low alloy steels.	RDSO
RATNA 309L	A 5.4 E 309L-16 3581-A E 23 12 L R 3 2	DC(+)/AC	F,V,OH,H	0.023	1.30	0.48	0.009	0.018	23.70	12.35	-	-	-	-	-	590	41	-	Suitable for welding 22%Cr-12%Ni stainless steel grades of AISI 309L, welding similar and dissimilar steels and for joining clad steel.	-

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				C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb	Other	YS (N/mm ²)	UTS (N/mm ²)	Elongation (%)	CVN Impact at°C Joules			
STAINLESS STEEL ELECTRODES																					
RATNA 309Nb	A 5.4 E 309Nb-16 3581-A E 23 12 Nb R 3 2	DC(+)/AC	F,V,OH,H	0.035	1.27	0.50	0.010	0.020	23.50	12.40	-	-	0.85	-	-	595	39	-	Designed to use where niobium stabilised weld metal is required in overlays or inlays on C-Mn or low alloy steel.	-	
RATNA 309LMo	A 5.4 E 309LMo-16 3581-A E 23 12 2 L R 3 2	DC(+)/AC	F,V,OH,H	0.022	1.25	0.45	0.008	0.020	23.80	12.55	2.40	-	-	-	-	575	37	-	Low carbon content with 25Cr-12Ni-2.5Mo weld deposit has excellent resistance to oxidation and scaling up to 1050°C. Welding of 316 type clad or dissimilar steel.	-	
RATNA 309Mo	A 5.4 E 309Mo-16 3581-A E 23 12 2 R 3 2	DC(+)/AC	F,V,OH,H	0.040	1.30	0.47	0.009	0.018	23.60	12.50	2.35	-	-	-	-	610	38	-	Suitable for repair welding in dissimilar joints and steels difficult to weld. Also used for buffer layers, clad steels and hardenable steels.	-	
RATNA 310	A 5.4 E 310-16 3581-A E 25 20 R 3 2	DC(+)/AC	F,V,OH,H	0.095	2.00	0.57	0.010	0.017	26.50	20.45	-	-	-	-	-	630	35	-	Welding of 25%Cr-20%Ni steels, dissimilar metals, clad steel. Suitable for high temperature furnace, gas turbine chambers etc.	-	
RATNA 316	A 5.4 E 316-16 3581-A E 19 12 3 R 3 2	DC(+)/AC	F,V,OH,H	0.060	1.20	0.50	0.010	0.018	18.80	11.50	2.50	-	-	-	-	610	39	-	Suitable to weld 18%Cr-12%Ni-2%Mo steels such as 316/317 type where corrosion resistance applications required.	-	
RATNA 316L	A 5.4 E 316L-16 3581-A E 19 12 3 L R 3 2	DC(+)/AC	F,V,OH,H	0.025	1.25	0.47	0.010	0.020	19.00	11.44	2.55	-	-	-	-	595	40	-	Welding of AISI 316L and 317L grades of stainless steels. Suitable for chemical plants, pharmaceutical and fertilizer industries.	NPCIL, LR	
RATNA 316LF	A 5.4 E 316L-16 (Nr) 3581-A 19 12 3 L R 3 2	DC(+)/AC	F,V,OH,H	0.023	1.45	0.45	0.008	0.020	18.25	14.25	2.50	-	-	-	-	570	39	-	Welding of AISI 316 and 316L steels where ferrite content in weld deposit is restricted to less than 2% and cladding of 316L UREA grade steels.	FN:2 max.	
RATNA 36Nb	A 5.4 E 318-16 3581-A E 19 12 3 Nb R 3 2	DC(+)/AC	F,V,OH,H	0.035	1.20	0.50	0.010	0.020	18.50	11.30	2.50	-	0.55	-	-	600	30	-	Niobium in the weld metal provides increased resistance to intergranular carbide precipitation. Suitable for acid plants, textile, paper & pulp industries.	-	
RATNA 317L	A 5.4 E 317L-16 3581-A E 19 13 4 L R 3 2	DC(+)/AC	F,V,OH,H	0.024	1.30	0.55	0.008	0.017	19.00	13.00	3.50	-	-	-	-	580	35	-	Welding of AISI 317L/316L type SS plates, provide resistance against inorganic acids such as sulphuric, phosphoric acid.	-	
RATNA 347	A 5.4 E 347-16 3581-A E 19 9 Nb R 3 2	DC(+)/AC	F,V,OH,H	0.040	1.32	0.48	0.009	0.018	19.50	9.50	-	-	0.60	-	-	585	40	-	Welding of stainless steel to AISI 304, 304L, 321, 347 and their equivalents used in fertilizer, petrochemical and pharmaceutical industries.	-	
RATNA 13 CR	A 5.4 E 410-15 3581-A E 13 B 4 2	DC(+)	F,V,OH,H	0.045	0.35	0.55	0.007	0.016	13.00	-	-	-	-	-	-	600	24	-	Suitable for turbine construction, joining chrome steel, welding of similar corrosion resistant chrome steels, steel casting, pump parts.	PWHT: 760°C/1Hrs	
RATNA 17 CR	A 5.4 E 430-15 3581-A E 17 B 4 2	DC(+)	F,V,OH,H	0.040	0.50	0.50	0.010	0.020	16.00	-	-	-	-	-	-	620	23	-	Suitable for welding AISI 430 & 431 stainless steels and steels with higher or lower chromium content.	PWHT: 790°C/2Hrs	
RATNA 18/8/5	A 5.4 E 307-16 (Nr) 3581-A E 18 8 Mn R 3 2	DC(+)/AC	F,V,OH,H	0.040	5.80	0.55	0.009	0.017	18.50	9.10	-	-	-	-	-	635	38	-	For joining and surfacing applications, buffer layers on variety of steels, joining ferrite to austenitic steels, armour plates, austenitic manganese steels.	RDSO	
RATNA 13/4/0.5	A 5.4 E 410NiMo-16 3581-A E 13 4 B 4 2	DC(+)/AC	F,V,OH,H	0.023	0.45	0.50	0.007	0.015	11.85	4.30	0.55	-	-	-	-	910	18	-	Surfacing of high pressure valves, turbine blades and runners, pulp and paper plant equipments similar corrosion resisting chromium steel erosion, pitting and impact value.	PWHT: 620°C/1Hrs	
RATNA 312	A 5.4 E 312-16 3581-A E 29 9 R 3 2	DC(+)/AC	F,V,OH,H	0.090	1.50	0.45	0.008	0.020	29.00	10.00	-	-	-	-	-	800	24	-	Welding difficult-to-weld e.g. high hardenable tool, die & sparing steel, 13% Mn steels, free cutting steels, high temperature steels, dissimilar joints between stainless steel and high carbon steels.	200-240 BHN	
CAST IRON ELECTRODES																					
CAST STEEL	A 5.15 Est. 1071 E C Fe-1 3	DC(+)/AC	F,H-F	1.90	1.00	1.45	-	-	-	-	-	-	-	-	-	-	-	-	Suitable for welding of cast iron applications and weld metal is not readily machinable.	500 BHN	
CAST FN	A 5.15 ENiFe-Cl 1071 E C NiFe-Cl 3	DC(+)/AC	F,H-F	0.60	0.45	0.90	0.007	-	-	55.40	-	-	-	-	-	-	-	-	Suitable to repair all types of cast iron components, broken casting, joining cast iron to steel and ferrous & non-ferrous materials.	165-218 BHN	
CAST Ni	A 5.15 ENi-Cl 1071 E C Ni-Cl 3	DC(+)/AC	F,H-F	0.70	0.15	0.75	0.008	-	-	Rem.	-	-	-	-	-	-	-	-	Especially suitable where maximum machinability of highly diluted weld metal is required or where stresses are not very severe.	135-218 BHN	
CAST MONEL	A 5.15 ENiCu-B 1071 E C NiCu-B 3	DC(+)/AC	F,H-F	0.40	0.85	0.45	0.007	-	-	Rem.	-	30.50	-	Fe:3-6	-	-	-	-	Electrode for cold welding and repairing of grey and malleable cast iron and repairing casting defects. Ideal for repairing castings, repairing broken parts of castings.	-	
CAST BRONZE	A 5.6 E CuSn-C DIN 1733 EL-CuSn 7	DC(+)/AC	F,H-F	-	-	-	-	0.200	-	-	-	Rem.	-	Sn:7.80	-	-	-	-	For welding of Cu-Sn bronzes and Cu-Zn bronzes. Repairing wrought bronzes (CuSn), for surfacing on bronzes, steels and cast iron.	-	
CUTTING AND GOUGING ELECTRODES																					
CUTROD	-	DC(-)/AC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cutting and piercing carbon steels and cast steels, stainless steels, low and high alloy steels.	-	
GOUGE ROD	-	DC(-)/AC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Suitable for cleaning and removal of unwanted materials, weld joints preparation, removal of cracks in welded joints.	-	
NICKEL AND NICKEL BASED ALLOYS																					
RATNA B Ni 65	A 5.11 E NiCrFe-2 14172 E Ni 6133 (NiCr16Fe12NbMo)	DC(+)	F,V,OH,H	0.020	1.35	0.25	0.010	0.015	15.50	78.50	1.25	0.01	0.70	Fe:2.0	-	580	35	-	Suitable to weld Inconel 600, Incoloy 800, Incoloy DS, dissimilar steels. Cryogenic vessels & pipe work of 3-9% Ni steels for temperatures down to -196°C. Suitable for dissimilar welding CS to Ni based alloys.	-	
RATNA B Ni 70	A 5.11 E NiCrFe-3 14172 E Ni 6182 (NiCr15Fe6Mn)	DC(+)	F,V,OH,H	0.020	7.00	0.35	0.007	0.012	16.00	73.50	-	0.01	1.27	Fe:1.75 Ti:0.050	-	640	34	-	Suitable for nickel and nickel based alloy, Inconel 600, Nimonic 75, Monel 400. Low temperatures applications, 5% & 9% Ni steels used for cryogenic vessels & pipe work. Suitable for joining dissimilar materials to Ni-Cr-Fe alloys.	-	

Welding Electrodes

Raajratna Brand	Classification AWS / EN ISO / IS	Current Polarity	Welding Position	Typical Weld Metal Chemical Properties (Element %)											Typical Weld Metal Mechanical Properties				Applications	Approval/ Hardness/ Others
				C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb	Other	YS (N/mm ²)	UTS (N/mm ²)	Elongation (%)	CVN Impact at°C Joules		
NICKEL AND NICKEL BASED ALLOYS																				
RATNA B Ni 80	A 5.11 E NiCrMo-3 14172 E Ni 6625 (NiCr22Mo9Nb)	DC(+)	F,V,OH,H	0.020	0.35	0.30	0.007	0.010	22.00	63.00	9.00	0.01	3.40	Fe:1.50	-	800	32	-	Cryogenic vessels & pipe work of 9% Ni steel (Q&T grade) for temperatures down to -196°C. Welding of Inconel 625, Inconel 601, Incoloy 800H, 825 & similar grades. Weld is heat resistant and maintains strength at 1000°C.	-
RATNA B Ni 90	A 5.11 E NiCrMo-6 14172 E Ni 6620 (NiCr14Mo7Fe)	DC(+)	F,V,OH,H	0.020	2.50	0.35	0.010	0.010	16.50	66.90	8.50	0.01	1.50	Fe:2.00 W:1.30	-	790	34	-	Weld metal has excellent cryogenic properties & suitable for UNS K81340 and K71340.	-
RATNA Ni Cu 7	A 5.11 E NiCu-7 14172 E Ni 4060 (NiCu30Mn 3 Ti)	DC(+)	F,V,OH,H	0.015	0.65	0.10	0.007	0.008	-	66.50	-	Rem.	Al: 0.025 Ti:0.045	Fe:2.0	-	550	35	-	Suitable to weld monel metals to itself, monel to carbon steel or stainless steel, welding on clad side or monel clad steel for service against sea water & alkalis.	-
SPECIAL STAINLESS STEEL ELECTRODES																				
RATNA 330	A 5.4 E 330-16 3581-A E 18 36 B 4 2	DC(+)/AC	F,V,OH,H	0.20	1.50	0.55	0.008	0.015	15.50	33.50	-	-	-	-	-	560	30	-	Weld metal contains high Ni, it has good acid and heat resistability. It can be used for welding of cast iron and wrought alloys products.	-
RATNA 630	A 5.4 E 630-16	DC(+)/AC	F,V,OH,H	0.025	0.60	0.55	0.008	0.020	16.50	4.75	-	3.85	0.22	-	-	1120	15	-	Suitable for joining ASTM A-564 hardenable steels such as 17-4 and 17-7. Used for hydraulic equipment components, impellers, pump shafts.	PWHT:1050°C/1Hrs
RATNA 2093L	A 5.4 E 2209-16 3581-A E 22 9 3 N L R 3 2	DC(+)/AC	F,V,OH,H	0.025	1.25	0.50	0.008	0.020	23.00	10.00	2.95	-	-	N:0.10	-	780	30	-	Suitable to weld duplex SS such as (Type 2205). Resistance to stress corrosion, cracking and pitting. Used in offshore, oil and gas, petrochemical.	-
RATNA 25/20 SPL	A 5.4 E 310-16(Nr) 3581-A E 25 20 R 3 2	DC(+)/AC	F,V,OH,H	0.095	3.80	0.57	0.010	0.017	25.50	20.25	-	-	-	-	-	630	35	-	Suitable for weld AISI 310 type steel clad side of clad steels, high temperature furnace part, dissimilar steels and freedom from micro fissuring.	-
RATNA 20/25/5Cu	A 5.4 E 385-16 3581-A E 20 25 5 Cu N L R 1 2	DC(+)/AC	F,V,OH,H	0.025	1.50	0.60	0.008	0.015	20.25	25.50	4.55	1.75	-	-	-	570	35	-	Ideally suited for welding carpenter 20, HV 9, HV 9A, Uranus B-6, UHB 904L, sandvik 2Rk65 and other similar materials.	-
RATNA 2553	A 5.4 E 2553-16	DC(+)/AC	F,V,OH,H	0.035	1.10	0.50	0.010	0.018	25.50	7.90	3.30	1.90	-	N:0.15	-	820	20	-	Suitable for pumps, valves, offshore oil & gas industries, pulp, paper, textile industries, chemical and petrochemical plants.	-
RATNA 2593	A 5.4 E 2593-16	DC(+)/AC	F,V,OH,H	0.025	1.00	0.55	0.010	0.018	25.00	9.80	3.35	2.25	-	N:0.18	-	800	21	-	Weld metal deposited by E2593 electrodes combines increased tensile strength with improved resistance to stress corrosion, cracking and pitting.	-
RATNA 2594	A 5.4 E 2594-16 3581-A E 25 9 4 N L R 4 2	DC(+)	F,V,OH,H	0.030	1.85	0.47	0.008	0.017	25.60	9.30	4.00	-	-	N:0.22	-	875	20	-	Welding of super duplex stainless steels, similar compositions, carbon and low alloy steels to duplex stainless steels such as type 2205.	-
RATNA 2595	A 5.4 E 2595-16 3581-A E 25 9 4 N L R 4 2	DC(+)	F,V,OH,H	0.030	1.75	0.45	0.008	0.018	25.00	9.25	3.20	0.85	-	W:0.55 N:0.23	-	800	22	-	Suitable for joining standard grade duplex stainless steels such as UNS 32205 & S31803.	-
RATNA 320	A 5.4 E 320-16	DC(+)/AC	F,V,OH,H	0.035	1.45	0.55	0.010	0.020	20.00	33.00	2.50	3.30	0.55	-	-	600	35	-	Suitable for a wide range of chemicals including sulfuric and their salts. Used for castings and wrought alloys.	-

Packaging & Specifications

STANDARD SIZES

Size in mm	2.00	2.40 / 2.50	3.15 / 3.20	4.00	5.00
Size in inch	5/64	3/32	1/8	5/32	3/16

• All electrodes are available in 350-450mm length • Customized size also available on request.

STANDARD PACKING

Commodity	Inner Pack (Kgs.)	Master Pack (Kgs.) Corrugated
MS Electrodes, LH & Special Type Electrodes	5.0 Corrugated	20
	4.0 Corrugated	16 & 20
	2.5 Corrugated	15
SS, Nickel & Special Electrodes	5.0 Plastic	20
	2.0 Plastic	10

• Vacuum pack is available on request • Packing in pieces also available on request • Customized packing available on request

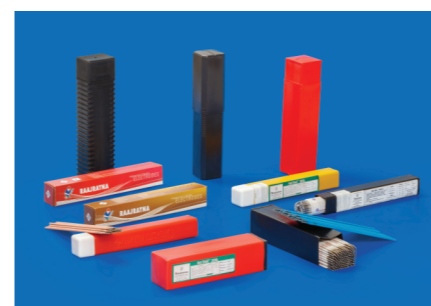
RE-DRYING

Commodity	Re-Drying Temp. °C	Holding Time	Holding Temp. °C
Rutile & Cellulosic Electrode (Can be used directly but if any sign of moisture better to re-dry)	90 - 100	0.5 Hour	RT
Basic coated & LH Type Electrode	300 - 350	1.0 Hour	100
SS & Nickel base Electrode	250 - 300	0.5 Hour	100
Cast Iron Electrode	100 - 150	0.5 Hour	60
Vacuum Pack Electrode	Use Directly	-	As Storage
SAW FLUX	300 - 350	2.0 Hour	100

• The above data are for optimum results and it is only a broad guideline.

STORAGE - GENERAL GUIDELINES

- First-in / First-out (FIFO)
- Electrodes should be kept in dry area
- Maintain the storage temperature ~15-30°C
- Relative humidity to be controlled as low as possible preferable below 50%
- Boxes of electrodes should be placed on pallet or on shelf rather than on ground
- The vacuum packed electrodes must be stored in closed packs in dry zone



Stainless Steel Welding Wire (TIG/MIG/SAW)

Raajratna Brand	Classification AWS / EN / ISO	Typical Bare Wire Chemical Properties (Element %)											Typical all-weld Mechanical Properties		Applications	Approval/Hardness/Others		
		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb	Other	UTS (N/mm ²)	Elongation (%)				
Stainless Steel Welding Wire																		
RAAJ ER 308L	A 5.9 ER 308L 14343-A 19 9 L	0.025	1.80	0.35	0.008	0.020	19.75	9.30	-	-	-	-	575	40	These grades are suitable for the MIG, TIG and submerged arc welding of the 18/8 types 302, 304 & 304L. In addition to possessing good resistance to general corrosion, low carbon grade (308L) ensures resistance against intergranular corrosion. The weld materials exhibits resistance to oxidising agents.	NPCIL, RDSO		
RAAJ ER 308L Si	A 5.9 ER 308L Si 14343-A 19 9 L Si	0.023	1.70	0.82	0.008	0.025	19.77	9.27	-	-	-	-	590	42		-		
RAAJ ER 347	A 5.9 ER 347 14343-A 19 9 Nb	0.030	1.74	0.40	0.009	0.022	19.30	9.20	-	-	0.50	-	600	41	These niobium stabilised grades are suitable for MIG, TIG and Submerged Arc welding of type 321 and the 18/8 types which are likely to be subject to temperatures of above 400°C but not more than 850°C. The higher silicon grades gives better weld flow and smoother weld beads.	-		
RAAJ ER 347 Si	A 5.9 ER 347 Si 14343-A 19 9 Nb Si	0.033	1.70	0.80	0.010	0.025	19.35	9.20	-	-	0.52	-	615	40		-		
RAAJ ER 307	A 5.9 ER 307 (Nr.) 14343-A 18 8 Mn	0.045	6.00	0.35	0.008	0.025	18.35	8.00	-	-	-	-	620	42	These Manganese alloy grades are suitable where high standards of toughness and crack resistance have to be specially met. It is suitable for MIG, TIG welding and cladding of hardenable steel, armour plate, austenitic stainless, manganese wear steels and heat resisting steel upto 850°C. 308MnSi gives better weld flow and weldability for weld beads.	-		
RAAJ ER 307 Si	A 5.9 ER 307 Si (Nr.) 14343-A 18 8 Mn Si	0.045	6.00	0.80	0.008	0.025	18.35	8.00	-	-	-	-	635	40		-		
RAAJ ER 316L	A 5.9 ER 316L 14343-A 19 12 3 L	0.021	1.80	0.37	0.009	0.020	18.60	11.27	2.15	-	-	-	580	40	These molybdenum bearing type 316 & 317 grades are suitable for the MIG, TIG and submerged arc welding of similar type 316 & 317 stainless steel. The molybdenum vastly improves resistance of pitting corrosion at higher service temperatures particularly in chloride solutions and the low carbon grades further improves resistance to intergranular corrosion.	NPCIL		
RAAJ ER 316L Si	A 5.9 ER 316L Si 14343-A 19 12 3 L Si	0.024	1.72	0.78	0.010	0.026	18.55	11.20	2.12	-	-	-	570	39		-		
RAAJ ER 317L	A 5.9 ER 317L 14343-A 18 15 L	0.022	1.65	0.40	0.008	0.023	19.00	13.20	3.20	-	-	-	630	40	-	-		
RAAJ ER 309	A 5.9 ER 309 14343-A 23 12	0.037	1.70	0.42	0.009	0.026	23.45	12.25	-	-	-	-	605	41	Suitable for MIG & TIG welding of dissimilar stainless steel and cladding stainless on low alloy & carbon steel. In 309, the higher alloy content ensures that weld metal micro structure is austenitic with approx. 10% ferrite, thus minimising the risk of cold cracking during cooling. Low carbon grade has a ferrite content 12% and is less prone to weld cracking. The high silicon gives better weld flow and smoother weld beads.	RDSO		
RAAJ ER 309L	A 5.9 ER 309L 14343-A 23 12 L	0.021	1.77	0.37	0.010	0.025	23.50	12.35	-	-	-	-	577	42		-		
RAAJ ER 309L Si	A 5.9 ER 309L Si 14343-A 23 12 L Si	0.023	1.72	0.77	0.010	0.025	23.37	12.30	-	-	-	-	592	40	-	-		
RAAJ ER 309L Mo	A 5.9 ER 309L Mo 14343-A 23 12 2 L	0.022	1.80	0.40	0.008	0.023	23.40	12.30	2.25	-	-	-	580	40	This grade is most suitable for joining and welding 18/8 Mo grades to dissimilar metals such as mild steel, steel, ferritic stainless steel or other austenitic stainless steel.	-		
RAAJ ER 310	A 5.9 ER 310 14343-A 25 20	0.090	1.45	0.42	0.009	0.026	26.45	20.35	-	-	-	-	600	40	Suitable for MIG & TIG welding of similar heat resisting types 310 & 314. Suitable for welding carbon steel to 18/8 CrNi steels and unknown materials cladding applications where heat or scale resistance are required.	-		
RAAJ ER 312	A 5.9 ER 312 14343-A 29 9	0.095	1.50	0.37	0.007	0.022	29.50	8.65	-	-	-	-	740	31	Suitable for TIG welding & MIG cladding and joining of dissimilar materials and the deposition of wear resistance and heat resistance overlays. This alloy gives a two phase weld deposit with substantial percentage.	-		
RAAJ ER 410	A 5.9 ER 410 14343-A 13	0.045	0.45	0.35	0.007	0.020	12.20	-	-	-	-	-	565	30	These grades are generally stable only for TIG welding of their equivalent 13 or 17%Cr base materials, although 430 can be used for MIG and submerged arc welding of the 430 base metals with great care. All these grades are very susceptible to weld cracking and generally the 23/12 grades are recommended for most welding applications of the 13 and 17%Cr steels.	PWHT:760°C for 1 Hrs.		
RAAJ ER 430	A 5.9 ER 430 14343-A 17	0.022	0.47	0.40	0.009	0.020	16.10	-	-	-	-	-	650	23		PWHT:790°C for 2 Hrs.		
RAAJ ER 410NiMo	A 5.9 ER 410NiMo 14343-A 13 4	0.022	0.47	0.33	0.007	0.018	11.65	4.20	0.48	-	-	-	940	18	Welding of ASTM XA6NM castings or similar materials, turbines, high pressure piping, off-shore, power plant.	PWHT:620°C for 1 Hrs.		
RAAJ ER 385	A 5.9 ER 385 14343-A 20 25 5 Cu L	0.015	1.55	0.30	0.007	0.010	20.15	25.10	4.80	1.45	-	-	590	35	This grade is used for the joining of 20Cr/25Ni/4.5Mo/1.5Cu type stainless steel which is used in the fabrication of acetic acid, sulphuric acid, terephthalic acid and tartaric acid plants.	-		
RAAJ ER 2209	A 5.9 ER 2209 14343-A 22 9 3 N L	0.020	1.60	0.40	0.007	0.020	23.00	8.50	2.90	-	-	N:0.10	860	25	The 2209 is used for welding duplex stainless steel of the 22%Cr 9%Ni3%Mo type such as UNS 31803 etc. using the TIG and MIG welding process.	-		
RAAJ ER 2594	A 5.9 ER 2594 14343-A 25 9 4 N L	0.015	0.75	0.45	0.005	0.023	25.15	9.50	3.70	-	-	N:0.23, W:0.35	840	26	Welding of super duplexes SS such as UNS S32750 & 32760 (wrought) and UNS J93380, J93404 (cast), pipe works and pressure vessels.	-		
Nickel & Nickel Alloy Bare Welding Rods																		
RAAJ Inconel 625	A 5.14 ER NiCrMo-3/18274 S Ni 6625 (NiCr22Mo9Nb)	0.020	0.10	0.10	0.005	0.005	22.30	64.50	9.00	0.01	3.60	-	790	42	Suitable for dissimilar welding using various Inconel alloys, stainless steel, low and carbon steel alloys.	-		
RAAJ Inconel 825	A 5.14 ER NiCr-3/18274 S Ni6082 (NiCr20Mn3Nb)	0.045	2.85	0.15	0.005	0.007	19.75	74.50	-	0.03	2.55	-	655	35	Welding of dissimilar grade using various Ni alloys like inconel 600, 601, incoloy 800 & 800 HT to stainless steels or carbon steels, overlaying carbon steels.	-		
Aluminum & Aluminum Alloy Bare Welding Rods																		
RAAJ ER 4043	A 5.10 ER 4043/18273-S Al4043 (AlSi5)	-	0.005	5.30	-	-	-	-	-	0.04	Fe:0.18	Al: Rem.	210	12	Suitable for welding 6xxx alloy and most casting alloys, truck bodies, pressure vessels, automotive parts general repairs and maintenance.	-		
RAAJ ER 5356	A5.10 ER 5356/18273-S Al5356 AlMg5(A)	-	0.15	0.10	-	-	0.12	-	Ti:0.12	Mg:5.00	Fe:0.25	Al: Rem.	270	15	Welding of 5xxx series alloys and suitable for boats, trailers, truck frames, ship buildings etc.	-		
Copper & Copper-Alloys Bare Welding Rods																		
RAAJ Bronze-A	A 5.7 ER CuSn-A/24373 S Cu 5180A (CuSn6P)	-	-	-	-	0.20	-	-	-	-	Sn:5.0	Cu: Rem.	260	20	Suitable for surfacing & joining of Cu alloys to steels, repair welding of cast bronzes and cladding on cast iron and steels.	-		
RAAJ Bronze-C	A5.7 ER CuSn-C/24373 Cu 5210 (Cu Sn 8P)	-	-	-	-	0.20	-	-	-	-	Sn:8.0	Cu: Rem.	260	22	Welding phosphor bronzes, high strength bronzes and brasses. Repair castings and join Cu-Sn alloys of similar composition.	-		

Tensile Strength Conversion Table

1 kg / mm ²	= 1422.33 psi	1 kg / mm ²	= 0.635 tsi
1 kg / mm ²	= 1.422 ksi	1 kg / mm ²	= 9.81 N/mm ²

{12}

Conversion Table

1.0 Inch	= 2.54 cm	= 25.4 mm
1.0 Metre	= 1.0936 Yards	= 3.2808 Feet

{13}

Conversion Table

1.0 Metric Tonnes	= 1000 Kgs
1.0 Kilogram	= 2.2046 Lbs (Pound Mass)

Flux Cored Arc Welding Wire (FCAW)

Raajratna Brand	Classification AWS/ EN ISO / IS	Current Polarity	Welding Position	Typical Weld Metal Chemical Properties (Element %)										Typical Weld Metal Mechanical Properties				Applications	Approval/ Hardness/ Others	
				C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Other	YS (N/mm ²)	UTS (N/mm ²)	Elongation (%)	CVN Impact at°C Joules			
FLUX CORED ARC WELDING WIRE																				
RAAJCORED 70	A 5.20 E 70T-1C 17632-B T492 T1-OCA	DC(+)	F,H	0.045	1.30	0.40	0.007	0.017	-	-	-	-	-	490	600	26	-20	50	Joining of steels conforming to ASTM SA-36/SA-36M and grades of SA-283 & SA-2883M.	-
RAAJCORED 71	A 5.20 E 71T-1C/1M 17632-B T492 T1-1C/MA-H5	DC(+)	F,V,OH,H	0.052	1.37	0.53	0.008	0.015	-	-	-	-	-	515	590	27	-20	70	Weld in machinery parts, ship building, automobile industry, bridges & structural applications.	RDSO, LR
RAAJCORED 715	A 5.20 E 71T-5C/5M 17632-B T493 T5-1C/MA-H5	DC(+)	F,V,OH,H	0.050	1.47	0.45	0.008	0.014	-	-	-	-	-	500	575	26	-30	70	Welding of heavy fabrication of mild steels where superior toughness and crack resistance is required.	-
RAAJCORED 81-Ni1	A 5.29 E 81T1-Ni1 17632-B T553 T1-1C/ MA-N2 H5	DC(+)	F,V,OH,H	0.050	1.00	0.40	0.010	0.015	-	0.95	0.25	-	-	550	655	25	-30	120	Suitable for welding up to 600 N/mm ² high tensile steels, bridges, pressure vessels & for 1% Ni and similar steels.	-
RAAJCORED 81-Ni2	A 5.29 E 81T1-Ni2-C/1M 17632-B T 55 4 T1-1C/MA-N5	DC(+)	F,V,OH,H	0.045	1.20	0.50	0.007	0.017	-	2.00	-	-	-	530	620	24	-40	70	Suitable for structural application where excellent quenched & tempered steels of HY 80 type. Also suitable for welding of 560 N/mm ² high tensile steel.	-
RAAJCORED 81-A1	A 5.29 E 81T1-A1 17634-A TMoPC/M1	DC(+)	F,V,OH,H	0.048	0.90	0.44	0.007	0.014	-	-	0.55	-	-	510	625	22	+20	100	Suitable for steam pipes of boilers, high pressure tanks, oil industries, structural application.	PWHT:620°C/1Hrs
RAAJCORED 81W	A 5.29 E 81T1-W2 17632-B T 553 T1-1C/ MA-NCC1H5	DC(+)	F,V,OH,H	0.055	0.85	0.50	0.007	0.015	0.55	0.55	0.50	-	-	500	600	27	-30	60	Welding of typical weathering steel, such as ASTM A 242 and A 588 and weather proof steel for structures, buildings, vehicles and bridges.	RDSO
RAAJCORED 81-B2	A 5.29 E 81T1-B2 17634-A T CrMo1 P C/M 1	DC(+)	F,V,OH,H	0.085	0.90	0.35	0.008	0.014	1.15	-	0.50	-	-	550	620	23	+20	80	For welding 1Cr-0.5Mo low alloys steels and ASTM A 335-P2 pipe, ASTM A 387 Grade 2 Plate.	PWHT: 690°C/1Hrs
RAAJCORED 81-K2	A 5.29 E 81T1-K2 17632-B T 55 3 T1-1C/MA-N3	DC(+)	F,V,OH,H	0.050	1.00	0.40	0.007	0.012	-	1.50	-	-	-	510-	600	25	+30	70	Suitable for welding of low-temperature service steel and storage tanks, ship building, off-shore, rail, heavy equipment etc.	-
RAAJCORED 91-B3	A 5.29 E 91T1-B3 17634-A T CrMo2 P C/M 1	DC(+)	F,V,OH,H	0.080	0.90	0.45	0.008	0.014	2.15	-	1.05	-	-	590	710	22	+20	80	For welding 2.25Cr%-1.1Mo low alloys steels and ASTM A 335-P11 pipe, ASTM A 387 Grade 11 plate.	PWHT: 690°C/1Hrs
RAAJCORED 9J	A 5.20 E 71-1C/M-J 17632-B T 494 T1-1MA	DC(+)	F,V,OH,H	0.050	1.30	0.44	0.007	0.012	-	0.40	-	-	-	502	590	27	-40	55	Suitable for oil & gas lines, off-shore construction, railcar, heavy equipments.	-

Submerged Arc Welding Wire & Flux

Raajratna Brand	Classification AWS/ EN ISO / IS	Current Polarity	Welding Position	Typical Bare Wire Chemical Properties (Element %)										Typical Weld Metal Mechanical Properties				Applications	Approval/ Hardness/ Others	
				C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Other	YS (N/mm ²)	UTS (N/mm ²)	Elongation (%)	CVN Impact at°C Joules			
Submerged Arc Welding Wire																				
RAAJSAW-1	A 5.17 EL 8/14171-A S1	-	-	0.065	0.47	0.025	0.010	0.015	-	-	-	-	-	-	-	-	-	-	Suitable for welding continuously mild steels and low carbon structural steels etc.	RDSO, BHEL
RAAJSAW-2	A 5.17 EM 12K/14171-A S2Si	-	-	0.095	1.01	0.190	0.010	0.015	-	-	-	-	-	-	-	-	-	-	Suitable for welding continuously weld pipes, thicker steel section, LPG cylinders etc.	RDSO
RAAJSAW-3	A 5.17 EH 14/14171-A S4	-	-	0.120	1.87	0.030	0.010	0.015	-	-	-	-	-	-	-	-	-	-	Suitable for welding medium and high tensile steels.	-
RAAJSAW-A2	A 5.23 EA 2/14171-A S2Mo	-	-	0.120	1.10	0.170	0.009	0.016	-	-	0.55	-	-	-	-	-	-	-	Suitable for welding two run technique with medium and high tensile steel.	-
RAAJSAW-12	A 5.17 EL 12/14171-A S1	-	-	0.057	0.52	0.025	0.010	0.015	-	-	-	-	-	-	-	-	-	-	Welding at mild & medium carbon structural steels, unalloyed steels in combination with SAW Flux.	-
Submerged Arc Welding Flux (Agglomerated)																				
				Typical Weld Metal Chemical Properties (Element %)																
RAAJMELT-1	A 5.17 F7A0 EL8/ 14174-A S AS 1 67 AC	AC/DC(+)	H,H-F	0.075	1.05	0.55	0.011	0.020	-	-	-	-	-	450	550	27	0	54	Used in structures, off-shore platforms, ships, machine building, automobiles, locomotives, earthmoving equipment, etc.	RDSO
RAAJMELT-2	A 5.17 F7A2 EM 12K/ 14174-A S AB 1 67 AC	AC/DC(+)	H,H-F	0.080	1.40	0.60	0.010	0.022	-	-	-	-	-	465	577	27	-20	50	The flux is suitable for use with AC & DC current with single wire, twin wire and multi wire systems. Pressure vessels, boilers, LPG cylinder, pipes etc.	RDSO
RAAJMELT-3	A 5.17 F7A2 EH 14/ 14174-A S AB 67 AC	AC/DC(+)	H,H-F	0.10	1.65	0.53	0.011	0.020	-	-	-	-	-	530	615	25	-20	50	Welding of structures, pressure vessels, boilers and other fabrications involving medium tensile, carbon and low alloys steels.	-
RAAJMELT-4	A 5.17 F7A5 EM 12K/ 14174-A S AB 78 AC	AC/DC(+)	H,H-F	0.075	1.47	0.40	0.010	0.020	-	-	-	-	-	500	570	26	-46	47	It is used for welding general structural steels, fine grain steels, boiler drums etc. Suitable for fillet welding and single or multi pass butt welding.	-
RAAJMELT-SPL	A 5.17 F7A2 EA 2/ 14174-A S BA 67 AC	AC/DC(+)	H,H-F	0.080	1.72	0.55	0.010	0.020	-	-	0.47	-	-	520	610	23	-20	47	Suitable for fillet welding and single or multi pass butt welding with low, medium and high tensile steels.	-
RAAJMELT-61	A 5.17 F7A0 EM 12K/ 14174-A S MS 67 AC	AC/DC(+)	H,H-F	0.077	1.25	0.60	0.012	0.022	-	-	-	-	-	450	580	24	0	40	Welding of general construction, structural steel, feasible for welding on a little rusty or oily plates. Suited in high speed welding especially for spiral pipe mills and beam welding.	-
RAAJMELT-81	A 5.17 F7A0 EM 12K/ 14174-A S RS 67 AC	AC/DC(+)	H,H-F	0.070	1.30	0.55	0.011	0.021	-	-	-	-	-	440	570	25	0	40	Very much suitable for high travel speed welding such as spiral welding of pipes where weld shape, easy slag removal and surface finish are necessary.	-
RAAJMELT-SS	under ER 308L	AC/DC(+)	H,H-F	0.024	1.11	0.60	0.011	0.021	19.65	9.11	-	-	-	-	570	35	-	-	Neutral basic welding flux for welding SS and heat resistant steels in combination with the wire electrodes of AWS/SFA 5.9 in respect to weld metal chemistry.	-

Copper Coated Solid Welding Wire for MIG/TIG/SAW

Raajratna Brand	Classification AWS/ EN ISO / IS	Typical Bare Wire Chemical Properties (Element %)											Typical Weld Metal Mechanical Properties				Applications	Approval/ Hardness/ Others	
		C	Mn	Si	S	P	Cr	Ni	Mo	Cu	Nb	Other	YS (N/mm ²)	UTS (N/mm ²)	Elongation (%)	CVN Impact at°C Joules			
Copper Coated Solid Welding Wire for MIG/TIG/SAW																			
RAAJMIG-1	A 5.18 ER 70S-6 14341-B G 49A 3 C/M S6	0.080	1.45	0.83	0.008	0.018	-	-	-	0.23	-	-	460	570	28	-30	70	Suitable for welding structural steel, sheet metal steel and low alloy steels for high finish, precision and better productivity.	ABS, BHEL, RDSO
RAAJMIG-S2	A 5.18 ER 70S-2 14341-B G 49A 3 C/M S2	0.050	1.02	0.49	0.007	0.015	Zr:0.045	Ti:0.075	Al:0.080	0.18	-	-	470	580	26	-30	60	Suitable for welding structural steel, pressure vessels and boilers, pipe fittings, castings, and forgings.	-
RAAJMIG-S3	A 5.18 ER 70S-3 14343-B G 49A 2 C/M S3	0.075	1.30	0.60	0.008	0.017	-	-	-	0.16	-	-	450	530	25	-20	60	A general purpose welding wire for general fabrication of mild steel, automotive structures, construction equipment.	-
RAAJMIG-80G	A 5.28 ER 80S-G 16834-B G 59A 3 M O	0.080	1.75	0.55	0.010	0.015	-	-	0.44	0.20	-	-	550	625	25	-30	65	Joining steels conforming to ASTM grade SA-36, SA-36M, SA-283 and SA-283M, pipelines & pressure vessels.	-
RAAJMIG-90G	A 5.28 ER 90S-G 16834-B G 62A 3 M O	0.10	1.92	0.55	0.008	0.012	-	-	0.55	0.15	-	-	560	700	23	-30	50	Welding structural steels with UTS up to 640 N/mm ² , construction machinery, pipelines, ships, pressure vessels.	-
RAAJMIG ER 80S-D2	A 5.28 ER 80S-D2 16834-B G 59A 3 M 4M31	0.095	1.85	0.65	0.007	0.012	-	-	0.51	0.18	-	-	520	621	26	-30	60	ER 80S-D2 contains Mo for increased strength, high temperature service pipes, pressure vessels.	-
Oxyfuel Gas Welding Rods																			
R 45	A 5.2 R 45 12536 O I	0.060	0.44	0.025	0.008	0.015	-	-	-	0.17	-	-	300	385	22	+20	50	General purpose oxyfuel gas welding rods for welding of carbon or C-Mn steels, sheets and wrought iron pipes.	-
R 60	A 5.2 R 60 12536 O II	0.090	1.02	0.20	0.007	0.015	-	-	-	0.17	-	-	390	502	24	+20	70	Oxyfuel gas welding rods for carbon or C-Mn steels where addition mechanical properties and ductility required.	-

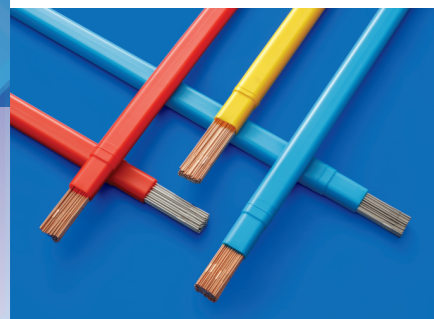
Packaging & Specifications



Copper Coated Welding Wire / Continuous Solid Wire for MIG / MAG Welding

Diameter in mm	Diameter in inch	Plastic Spools		Metal Baskets
		D-300	D-200	K-300
0.60	0.023	12.5 & 15 Kgs	5 Kgs	12.5 & 15 Kgs
0.80	0.030			
0.90	0.035			
1.00	0.040	33 Lbs / 44 Lbs	10 Lbs / 11 Lbs	33 Lbs / 44 Lbs
1.20	0.047			
1.60	0.062			

Identification : Each spool and carton is labeled with type (grade), size, quantity and batch / lot number.



Copper Coated / Stainless Steel TIG Welding Wire / Rod

Diain mm	1.20	1.60	2.00	2.40 / 2.50	3.20	4.00
Dia. in inch	3/62"	1/16"	5/64"	3/32"	1/8"	5/32"

Length : Available in 1000 mm / 39" or 36" standard length.

Identification : Each wire is embossed at one or both ends with grade & size and labeled on packages with type (grade), size, quantity & batch / lot number.

Packing : 5 Kgs / 10 Lbs wire primarily packed in plastic/corrugated tube further packed in card board box.



DRUM PAC for Copper Coated / Stainless Steel Welding Wire Advantages

- Robotic Application
- Cost Efficiency
- Un-Interrupted Feeding
- Control on Wastage
- Parts Life
- Drum Material
- Dust Free Packaging
- Safe Transportation

Wire Dia. in mm	Net Weight in Kgs.	Dimension of Drum Outer Dia. x Height in mm	Drum Type
0.80/1.00/1.20/1.60	100	510 x 465	Small Drum
1.00/1.20/1.60	250	510 x 760	Large Drum



Stainless Steel Welding Wire / Continuous Solid Wire for MIG / MAG Welding

Diameter in mm	Diameter in inch	Plastic Spools		Metal Baskets
		D-300	D-200	K-300
0.60	0.023	12.5 & 15 Kgs	5 Kgs	12.5 & 15 Kgs
0.80	0.030			
0.90	0.035			
1.00	0.040	33 Lbs / 44 Lbs	10 Lbs / 11 Lbs	33 Lbs / 44 Lbs
1.20	0.047			
1.60	0.062			

Identification : Each spool and carton is labeled with type (grade), size, quantity and batch / lot number.



Flux Cored Arc Welding Wire

Diameter in mm	Diameter in inch	Plastic Spools		Metal Baskets
		D-300	D-200	K-300
1.20	0.047	12.5 & 15 Kgs	5 Kgs	12.5 & 15 Kgs
1.40	0.055			
1.60	0.062			
		33 Lbs / 44 Lbs	10 Lbs / 11 Lbs	33 Lbs / 44 Lbs

Identification : Each spool and carton is labeled with type (grade), size, quantity and batch / lot number. Also supply drum pac in 100 Kgs. & 250 Kgs.



SAW Wire and Fluxes

Diain mm	2.00	2.40 / 2.50	3.20	4.00	5.00
Dia. in inch	5/64"	3/32"	1/8"	5/32"	3/16"

Identification : Coils are identified with label showing type (grade), size, quantity and batch / lot number.

Saw Wire Packing :

- Ring Pack** : 25 Kgs / 60 Lbs precision layer winding.
- Steel Bobbin** : 300 - 400 Kgs bulk packing.
- Ring Pack** : 500 - 750 Kgs M. S. or Corrugated Drum Packing.
- Saw Flux Packing** : Polythene lined bags of 25 Kgs. or Steel Drum of 250 Kgs.

General Welding Defects & Solutions

Quality Assurance System

REASONS	REMEDIES	ILLUSTRATION
Cracks		
Too rigid joint	Use preheating, use back strip. Use root opening alignment	
Poor joint fit-up	& check fit-up.	
Higher C, S or P of BM / WM & with higher H2 content	Use buttering technique, preheat and use low H2 electrodes.	
HOT cracking	Reduce heat input.	
High hardenability	Preheat job. Effect PWHT.	
Porosity		
Excessive short or long arc, high current & speedy welding	Adjust arc setting, required current & control travel speed.	
Moisture & contamination	Clean base metal and use recommended baking procedures	
High solidification rate	Preheat & increase heat input	
Poor Penetration		
High welding speed & inadequate current, low heat input	Proper welding parameter and heat input.	
Incorrect joint design	Check proper joint edges	
Incomplete Fusion		
Improper joint design	Check groove design & increase included angle	
Slag or oxide film	Clean weld surface before welding	
Electrode position	Maintain proper position	
Wrong arc manipulation	Improve arc manipulations	
Spatter		
Excessive arc current & arc length.	Correct the welding parameter.	
Improper shielding gas & its quality.	Use correct shielding gas and if possible use anti-spatter spray.	
Damp electrodes.	Proper maintain and store electrodes.	
Slag Inclusions		
Wrong weaving motion.	Proper weaving technique.	
Insufficient de-slagging between passes.	Remove slag, grind if necessary.	
Slag run ahead of the weld.	Increase travel speed or change angel.	

Quality Policy

We, at RAAJRATNA are committed to supply best, reliable & consistent quality of welding consumables and timely delivery with excellent technical services all the time.

This will be achieved by:

- Satisfying the needs and expectations of our customers
- Continually improving Quality Management System, imparting Training & Motivation
- Offering consistent efforts of Employees' towards quality up gradation and Product Development
- Considering Context of the Organization and aligning the Quality Management System with the strategic direction of RAAJRATNA
- Observing applicable Statutory and Regulatory requirements



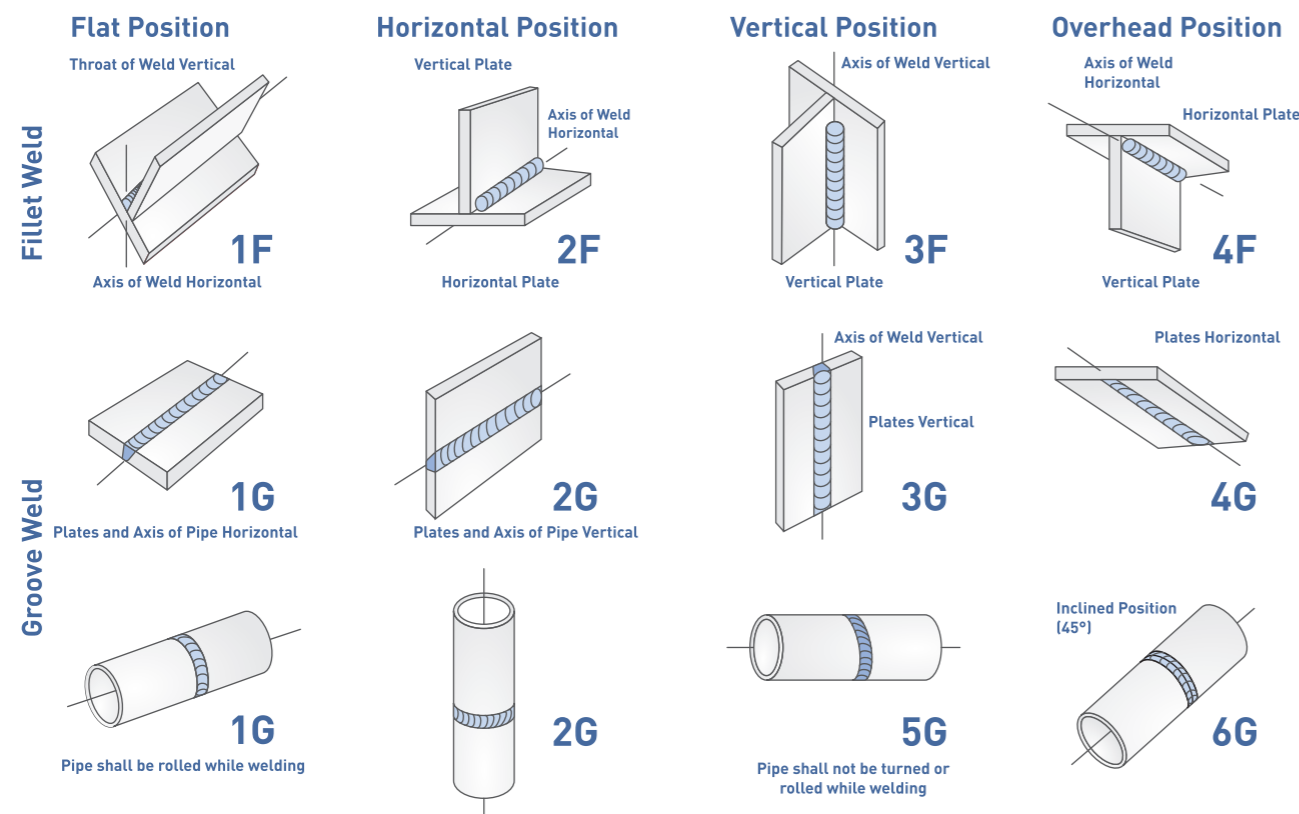
International & National Approvals



Our professional team is ready to support you...

For customized requirements, which are not mentioned in this catalogue, please do write to us. We would be too glad to serve you by exploring the possibility of developing new packing for your end use.

e-mail : (for domestic) sales@raajratnaelectrodes.com | (for international) exports@raajratnaelectrodes.com



“Raajratna” **QUALITY** So Outstanding!..
... we are proud it's Indian



Raajratna Electrodes Pvt. Ltd.

An ISO 9001:2015 Certified Company & Government Recognized One Star Export House

Manufacturer-Exporter of Welding Consumables

Regd. Office :

11, Sona Roopa, Opp. Lal Bungalow, C. G. Road, Navrangpura, Ahmedabad-380 006. Gujarat (India)

Phone : +91-79-2644 5258, 2656 1321, 2643 1543 **Fax :** +91-79-2656 8085, 2754 3085

e-mail : (for Domestic) sales@raajratnaelectrodes.com / (for International) exports@raajratnaelectrodes.com

Works :

Plot No. : 69, Village Bileshwarpura, Ahmedabad-Mehsana Highway,
Taluka : Kalol (N.G.), Dist. Gandhinagar - 382 729. Gujarat (India)

For more details please visit us on
www.raajratnaelectrodes.com