Covered electrodes, high alloyed

Brand Standard AWS Standard EN ISO	Chemical Composition (%) Typical Values	Mechanical Properties Typical Values	Ø x L (mm)	Approvals	Characteristics and Applications
SUPERALOY - 1A AWS A5.4: E308 -16	C: 0.05 Si: 0.40 Mn: 0.80 S: 0.015 P: 0.035 Cr: 18.5 Mo: 0.15 Ni: 8.20	UTS: 570 MPa El: 38%	2.50 x 350 3.15 x 350/450 4.00 x 450 5.00 x 450	-	Low carbon 19/9 type stainless steel rutile coated electrode with properties like oxidation and corrosion resistance and resistance to solidification cracking. The deposit has excellent strength and is of radiographic quality. The electrode gives smooth finish, spatter free arc and self lifting slag. Suitable for joining AISI 301,302, 304 and 308 steels and equipments used in petrochemical, chemical and fertilizer industries etc.
SUPERALOY - 38 AWS A5.4: E308L-16	C: 0.03 Si: 0.85 Mn: 0.60 P: 0.030 S: 0.015 Cr: 18.60 Mo: 0.10 Ni: 8.10	UTS: 570 MPa El: 38%	2.50 x 350 3.15 x 350 4.00 x 450 5.00 x 450	-	Low carbon 19/9 rutile coated stainless steel electrode. Best suitable electrodes for furniture manufacturing. The electrode gives smooth arc, fine bead apperance and shiny finish. Suitable for joining AISI 301, 302, 304L and 308L and welding of utensiles, dairy machieries, equipments used in petrochemicals, chemical and fertilizer industries etc. This electrode has excellent re-striking at low OCV and low current in AC and DC
BOHLER FOX N EAS 2-16 AWS A5.4: E308L-16 EN ISO 3581 A: E 19 9 L R	C: 0.020 Si: 0.70 Mn: 0.60 P: 0.030 S: 0.020 Cr: 19.0 Ni: 10.0 FN: 3 - 8 (WRC-92)	UTS: 600 MPa El: 40%	2.50 x 350 3.15 x 350 4.00 x 350 5.00 x 350	IBR, ABS	Low carbon, austenitic stainless steel 19/9 Cr-Ni type stick electrode with rutile coating. Designed to produce first class weld deposits with reliable CVN toughness values giving 100% radiography quality welds with very good root pass and positional welding characteristics. Excellent welding properties with DC power and high resistance to hot cracking in the weld metal with good resistance to intergranular corrosion.
SUPERALOY - 2A AWS A5.4: E316 -16	C: 0.06 Si: 0.40 Mn: 0.90 P: 0.045 S: 0.020 Cr: 18.25 Mo: 2.20 Ni: 11.50 FN: 3 - 8 (WRC-92)	UTS: 560 MPa El: 35%	2.50 x 350 3.15 x 350 4.00 x 450 5.00 x 450	-	An 18 Cr /12 Ni /2.3 Mo stainless steel electrode with resistance to corrosion, cracking and heat. The weld metal has excellent creep resistant strength, welds are to chemical corrosions. The bead is finely rippled. Suitable to weld 18/8/Mo steels such as 316 type, fabrication of stainless steel tanks used in textiles, chemical, pulp and paper industries. Corrosion resistance application such as tanks fabrication for storage of phosphoric acid, acetic acid and suplhuric acids etc.
BOHLER FOX N EAS 4M - 16 AWS A5.4: E316L-16 EN ISO 3581-A: E 19 12 3 L R	C: 0.020 Si: 0.70 Mn: 0.60 S: 0.020 P: 0.030 Ni: 12.60 Cr: 18.70 Mo: 2.30 FN: 3 - 8 (WRC-92)	UTS: 575 MPa El: 35%	2.50 x 350 3.15 x 350 4.00 x 350 5.00 x 350	IBR, ABS	A Low Carbon, Cr-Ni-Mo stainless steel electrode with rutile coating for welding of ASTM 316 & 316L stainless steel. Weld metal features a good resistance against intergranular corrosion. Passes the test as per ASTM A262 IGC Practice E. Designed to produce first class weld deposits with reliable CVN toughness values and 100% radiography quality welds with very good root pass and positional welding characteristics with self releasing slag. Good gap bridging ability, easy weld pool and slag control as well as easy slag removal even in narrow preparations resulting in clean bead surfaces and minimum post weld cleaning.

Covered electrodes, high alloyed

Brand Standard AWS Standard EN ISO	Chemical Composition (%) Typical Values	Mechanical Properties Typical Values	Ø x L (mm)	Approvals	Characteristics and Applications
BOHLER FOX N CN 23/12 - 16 AWS A5.4: E309L-16 EN ISO 3581-A: E 23 12 L R	C: 0.020 Si: 0.80 Mn: 0.65 P: 0.030 S: 0.020 Cr: 23.0 Ni: 12.9 FN: 10 - 14 (WRC-92)	UTS: 575 MPa El: 35%	2.50 x 350 3.15 x 350 4.00 x 350 5.00 x 350	IBR, ABS	A Low Carbon, highly alloyed stainless steel stick electrodes with rutile coating. The electrode is designed for dissimilar welding between stainless and mild or low alloy steels. The electrode is well suited as a buffer layer when performing overlay welding on mild steels, providing an 18Cr 8 Ni deposit from the very first layer. High crack resistance is achieved through the increased ferrite content in the weld metal. Designed to produce first class weld deposits with 100% radiography quality welds with very good positional welding characteristics with self releasing slag. Excellent welding properties with DC power and high resistance to hot cracking in the weld metal. Scaling temperature – Approx . 850°C (air).
SUPERALOY - CW AWS A5.4: E310 -16	C: 0.12 Si: 0.40 Mn: 1.10 P: 0.025 S: 0.015 Cr: 27.0 Ni: 21.0	UTS: 620 MPa El: 35%	2.50 x 350 3.15 x 350 4.00 x 350 5.00 x 350	-	An all position electrode to deposit 25 Cr/20 Ni. The electrode is specially designed for oxidation and scaling resisatnce at elevated temprature at 1200°C with excellent weld metal finish, low spatter and easily removable slag. Suitable for AISI 310 grade steel, clad steel, high temperature furnace parts, gas turbine cumbustion chamber, harneable steel and disimilar steels.
BOHLER FOX N SAS 2-16 AWS A5.4: E347-16 EN ISO 3581-A: E 19 9 Nb R	C: 0.035 Si: 0.70 Mn: 0.60 P: 0.025 S: 0.020 Ni: 9.50 Cr: 19.70 Nb: 0.35 FN: 6 - 8 (WRC-92)	UTS: 620 MPa El: 34%	2.50 x 350 3.15 x 350 4.00 x 350 5.00 x 350	-	Stabilized, austenitic stick electrode with rutile coating. Excellent welding characteristic with easy slag removal and finely rippled bead, high resistance to hot cracking with resists intergranular corrosion up to +400°C. Excellent strength after PWHT (~ 690°C for 30 hrs.). Suitable where same type steels and ferritic 13% chrome steels are welded.
BOHLER FOX N CN 23/12 Mo - 16 AWS A5.4: E309LMo -16 EN ISO 3581-A: E 23 12 2 L R	C: 0.020 Si: 0.80 Mn: 0.70 P: 0.025 S: 0.020 Ni: 13.0 Cr: 23.0 Mo: 2.60 FN: 16 - 20 (WRC-92)	UTS: 680 MPa El: 30%	2.50 x 350 3.15 x 350 4.00 x 350 5.00 x 350	-	Low Carbon, austenitic stainless steel stick electrodes with rutile coating. The electrode is designed for dissimilar welding between stainless and mild or low alloy steels. The electrode is well suited as a buffer layer when performing overlay welding on mild steels, providing an 18Cr 8 Ni deposit from the very first layer. High crack resistance with austenite – ferrite joints and weld cladding achieved by increased FN (~ 20). Designed to produce first class weld deposits with 100% radiography quality welds with very good positional welding characteristics with self releasing slag. Excellent welding properties with DC power and high resistance to hot cracking in the weld metal.

Covered electrodes, high alloyed

Brand Standard AWS Standard EN ISO	Chemical Composition (%) Typical Values	Mechanical Properties Typical Values	Ø x L (mm)	Approvals	Characteristics and Applications
THERMANIT X AWS A5.4: E307-15 (mod.) EN ISO 3581-A: E 18 8 Mn B 2 2	C: 0.10 Si: 0.6 Mn: 7.0 Cr: 18.5 Ni: 8.0	UTS: 660 MPa (≥500) YS: 460 MPa (≥350) El: 35% (≥25) CVN Impact: +20°C: 90J	2.50 x 300 3.15 x 350 4.00 x 350 5.00 x 450	TÜV, VG-95132-1, CE, DB	Stainless Resistant to scaling up to 850 °C (1562°F). No adequate resistance against sulphureous combustion gases at temperatures above 500°C (932°F). For joining and surfacing applications with heat resistant Cr steels/cast steel grades and heat resistant austenitic steels / cast steel grades. Well suited to fabricating austenitc ferritic joints – max. service temperature 300°C (572 °F). For joining unalloyed/low alloy or Cr steels / cast steel grades to austenitic steels. Low heat input required in order to avoid brittle martensitic transition zones.
AVESTA 308L/MVR AWS A5.4: E308L-17 EN ISO 3581-A: E 19 9 L R 3 2	C: 0.02 Si: 0.7 Mn: 0.60 Cr: 19.5 Ni: 10.0	UTS: 570 MPa (≥510) YS: 440 MPa (≥320) El: 37% (≥30) CVN Impact: +20°C: 60J -40°C: 55J	1.60 x 250 2.00 x 300 2.50 x 350 3.25 x 350 4.00 x 450 5.00 x 450	DB, DNV, TUV	AVESTA 308L/MVR a Cr-Ni electrode for all position of ASTM 304 and 304L stainless steels. Weld metal features a good resistance against intergranular corrosion (IGC ASTM A262 Practice E). It is a rutile coated electrode with excellent all position characteristics, which can be used with AC/DC+. Resulting in flat to slightly concave bead shape. Fine rippled weld bead surface giving shinier deposit.
AVESTA 316L/SKR AWS A5.4: E316L-17 EN ISO 3581-A: E 19 12 3 L R 3 2	C: 0.02 Ni: 12.0 Si: 0.8 Mn: 0.7 Cr: 18.0 Mo: 2.8	UTS: 590 MPa YS: 460 MPa El: 36% CVN Impact: +20°C: 60J -40°C: 55J -120°C: 32J	1.6 x 250 2.0 x 300 2.5 x 350 3.25 x 350 4.0 x 450 5.00 x 450	TÜV, DB, DNV GL	Avesta 316L/SKR is a low carbon core wire alloyed Cr-Ni-Mo electrode for welding of 1.4436/ASTM 316 type stainless steels. The core wire alloyed concept ensures constant corrosion properties. Excellent resistance to general, pitting and intergranular corrosion in chloride containing environments. Intended for severe conditions, e.g. in dilute hot acids.
AVESTA 310 AWS A5.4: E310-17 EN ISO 3581-A: E 25 20 R	C: 0.11 Si: 0.7 Mn: 2.0 Cr: 26.0 Ni: 21.4	UTS: 560 MPa (≥550) YS: 420 MPa (≥350) El: 25% (≥20) CVN Impact: +20°C: 65J -196°C: 45J	2.50 x 300 3.20 x 350 4.00 x 350	-	AVESTA 310 is designed for welding of high temperature stainless steel 1.4845 / ASTM 310S and similar types. To minimise the risk of hot cracking when welding fully austenitic steels like that heat input and interpass temperature must be low and there must be as little dilution as possible from the parent metal. Primary intended for high temperature applications.
BOHLER FOX SAS 4-A AWS A5.4: E318-17 EN ISO 3581-A: E 19 12 3 Nb R 3 2	C: 0.03 Si: 0.8 Mn: 0.8 Cr: 19.0 Ni: 12.0 Mo: 2.7 Nb: +	UTS: 600 MPa (≥550) YS: 460 MPa (≥350) El: 32% (≥25) CVN Impact: +20°C: 60J -90°C: ≥32J	2.0 x 300 2.5 x 250/300/350 3.2 x 300/350 4.0 x 350 5.00 x 450	TÜV, DB, CE, NAKS	Rutile coated core wire alloyed, stabilised austenitic electrode. Mainly for Ti or Nb stabilised 1.4571 / 1.4580 / 316Ti steel grades. Designed for first class weld seems and easy handling on AC or DC. High current carrying capacity, minimum spatter formation, self releasing slag, smooth and clean weld profile, safety against formation of porosity due to moisture resistant coating. The fully alloyed core wire ensures the most reliable corrosion resistance. Resistant to intergranular corrosion up to +400°C

Covered electrodes, high alloyed

Brand Standard AWS Standard EN ISO	Chemical Composition (%) Typical Values	Mechanical Properties Typical Values	Ø x L (mm)	Approvals	Characteristics and Applications
BOHLER FOX EAS 4 M AWS A5.4: E316L-15 EN ISO 3581-A: E 19 12 3 L B 2 2	C: 0.03 Si: 0.4 Mn: 1.2 Cr: 18.8 Ni: 11.8 Mo: 2.7	UTS: 580 MPa (≥510) YS: 440 MPa (≥320) El: 38% (≥25) CVN Impact: +20°C: 90J -120°C: ≥32J -196°C: ≥27J	2.5 x 300 3.2 x 350 4.0 x 350 5.00 x 450	TÜV, DNV GL, CE	Basic electrode, core wire alloyed stainless steel electrode. Suitable in all industries using similar or high carbon steels or ferritic 13% Cr steels. Reliable toughness values down to –196°C. 100% X-ray safety together with very good root pass and positional welding characteristics. Resistant to intergranular corrosion up to +400°C. Good gap bridging ability, easy weld pool and slag control. Easy slag removal even in narrow preparations result in clean bead surfaces with minimum post weld cleaning.
BOHLER FOX EAS 2 AWS A5.4: E308L-15 EN ISO 3581-A: E 19 9 L B 2 2	C: 0.03 Si: 0.4 Mn: 1.3 Cr: 19.8 Ni: 9.6 FN: 4 – 10	UTS: 570 MPa (≥520) YS: 420 MPa (≥320) El: 38% (≥30) CVN Impact: +20°C: 100J -196°C: 40J (≥34)	2.5 x 300 3.2 x 350 4.0 x 350 5.00 x 450	TÜV, DB, Statoil, CE	Basic coated, core wire alloyed stainless steel electrode. Suitable in all industries using similar or high carbon steels or ferritic 13% Cr-steels. Very good root pass and positional welding characteristics, good gap bridging ability, easy weld pool and slag control as well as easy slag removal even in narrow preparations resulting in clean bead surfaces and minimum post weld cleaning. An excellent electrode for welding on site. Resistant to intergranular corrosion up to +350°C. Packed into hermetically sealed tins. This type of consumables is also available as a special low ferrite version.
BOHLER FOX CN 13/4 AWS A5.4: E410NiMo-15 EN ISO 3581-A: E 13 4 B 6 2	C: 0.035 Si: 0.3 Mn: 0.5 Cr: 12.2 Ni: 4.5 Mo: 0.5	Heat treatment: 600°C / 2h UTS: 910 MPa (≥ 760) YS: 680 MPa (≥ 500) El: 17% (≥ 15) CVN Impact: +20°C: 66J -20°C: 55J -60°C: 50J	2.5 x 350 3.2 x 450 4.0 x 450 5.0 x 450	TÜV, CE	Basic electrode, low hydrogen, suited for similar soft martensitic and martensitic -ferritic rolled, forged, and cast steels. Mainly used in the construction of hydro turbines, compressors. Resistant to corrosion from water, steam, and sea water atmosphere. Thanks to an optimum balance of alloying components the weld deposit yields very good ductility and toughness & cracking resistance despite of its high strength. Excellent operating characteristics, easy slag removal smooth bead appearance and low hydrogen weld metal (HD ≤ 5 ml/100 g). Metal recovery approx. 130%. Positional weldability is offered up to ø 3.2 mm electrodes.

Covered electrodes, high alloyed

Brand Standard AWS Standard EN ISO	Chemical Composition (%) Typical Values	Mechanical Properties Typical Values	Ø x L (mm)	Approvals	Characteristics and Applications
BOHLER FOX CN 17/4 PH AWS A5.4: E630-15 (mod.) EN ISO 3581-A: E Z 17 4 Cu B 4 3 H5	C: 0.03 Si: 0.3 Mn: 0.6 Cr: 16.0 Ni: 4.9 Mo: 0.4 Cu: 3.2 Nb: 0.2	Heat treatment: As welded UTS: 800 MPa YS: 440 MPa El: 4% CVN Impact: +20°C: 35 – 40J Heat treatment : Solution annealed, 1040°C / 0.5h / Air / 620°C / 4 h / Air UTS: 890 MPa YS: 650 MPa El: 18% CVN Impact: +20°C: 69 - 75J -50°C: 55J	2.5 x 300 3.2 x 350 4.0 x 350 5.00 x 450	-	Basic electrode with strength properties for joint and fabrication welding of analogous precipitation hardening Cr-Ni-Cu alloyed rolled, forged and cast steels. Popular for components in the paper industry, rotors of compressors, fan blades, press plates in the plastic processing industry and for the aerospace industry. The electrode shows very good features in regard to arc stability, weld puddle control, slag detachability and seam cleanliness. Lowest hydrogen content in the deposit is a prerequisite (HD < 5 ml/100 g). The electrode is suitable for welding in all positions except vertical down.
AVESTA 904L AWS A5.4: E385-17 EN ISO 3581-A: E 20 25 5 Cu N L R	C: 0.02 Si: 0.7 Mn: 1.2 Cr: 20.5 Ni: 25 Mo: 4.5 Cu: 1.5	UTS: 600 MPa YS: 420 MPa El: 34% CVN Impact: +20°C: 70J -60°C: 60J -196°C: 40J	2.5 x 350 3.2 x 350 4.0 x 400 5.0 x 400	TÜV, DB, CE	Avesta 904L is a high alloy fully austenitic Cr-Ni-Mo-Cu electrode designed for welding 1.4539/ASTM 904L type steels. It can also be used for welding 1.4404/ASTM 316 components where a ferrite free weld is required, e.g. in cryogenic or non-magnetic applications. The weld metal has a very good impact toughness at low temperatures. Very good resistance to general corrosion in non oxidising environments such as sulphuric acid and phosphoric acid. Very good resistance to pitting and crevice corrosion in chloride containing solutions. Meets the corrosion test requirements per ASTM G48 Methods A, B and E (40°C).
AVESTA 2205 AWS A5.4: E2209-17 EN ISO 3581-A: E 22 9 3 N L R	C: 0.02 Si: 0.8 Mn: 0.7 Cr: 22.6 Ni: 9.4 Mo: 3.0 N: 0.16	UTS: 810 MPa (≥690) YS: 620 MPa (≥450) El: 25% (≥20) CVN Impact: +20°C: 45J -40°C: 35J	2.5 x 350 3.2 x 350 4.0 x 450 5.00 x 450	TÜV, DB, Certified by CWB to CSA W48, CE	Primarily designed for welding 22Cr duplex stainless steels used in offshore, shipyards, chemical tankers, chemical/petrochemical, pulp & paper, etc. Avesta 2205 is an all position electrode of E2209-17 type. The weld metal has very good resistance to pitting and stress corrosion cracking in chloride containing environments. PREN >35. Duplex alloys have good weldability, but the welding procedure should be adapted to the base material considering fluidity, joint design, heat input, etc.
THERMANIT 22/09 AWS A5.4: E2209-15 EN ISO 3581-A: E 22 9 3 N L B 2 2	C: < 0.04 Si: 0.5 Mn: 0.9 Cr: 22.5 Ni: 9.0 Mo: 3.0 N: 0.13	UTS: 690 MPa YS: 480 MPa El: 25% CVN Impact: +20°C: 50J	2.5 x 350 3.2 x 350 4.0 x 350	TÜV, CE	Stainless; resistant to intercrystalline corrosion at max. application temperature 250°C (482°F). Good resistance to stress corrosion cracking in chlorine and hydrogen sulphide bearing environments. High Cr and Mo contents provide resistance to pitting corrosion. For joining and surfacing work with matching and similar austenitc steels/cast steel grades. Attention must be paid to embrittlement susceptibility of the parent metal.

Covered electrodes, high alloyed

Brand Standard AWS Standard EN ISO	Chemical Composition (%) Typical Values	Mechanical Properties Typical Values	Ø x L (mm)	Approvals	Characteristics and Applications
AVESTA 2507/P100 rutile AWS A5.4: E2594-16 EN ISO 3581-A: E 25 9 4 N L R 4 2	C: 0.03 Si: 0.4 Mn: 1.0 Cr: 24.8 Ni: 9.3 Mo: 3.7 N: 0.23 PREN: >40 FN: 45 (WRC-92)	UTS: 880 MPa (≥ 760) YS: 700 MPa (≥ 550) El: 26% (≥ 18) CVN Impact: +20°C: 80J -46°C: 45J	2.5 x 300 3.2 x 350 4.0 x 350	CE	Covered electrode designed for welding of superduplex steel and equivalent steel grades such as EN 1.4410 / UNS S32570 and EN 1.4501 / UNS S32760. Superduplex steels are particularly popular for desalination, pulp & paper, flue gas desulphurization and sea water systems. Developed to satisfy severe requirements, such as those in NORSOK M-601 and similar standards. Meets the corrosion test requirements for ASTM G48 Methods A, B and E (40°C) in both as welded condition and after post weld heat treatment (annealing at 1100 – 1150°C, followed by short air cooling and quenching). Over alloyed in nickel to promote austenite formation. Designed for welding in all positions. The operating temperature range is –50°C to 220°C.
THERMANIT 25/09 CuT AWS A5.4: E2595-15 EN ISO 3581-A: E 25 9 4 N L B 2 2	C: 0.03 Si: 0.5 Mn: 1.2 Cr: 25.0 Mo: 3.7 Ni: 9.0 N: 0.2 Cu: 0.7 W: 0.6	UTS: 750 MPa YS: 600 MPa El: 25% CVN Impact: +20°C: 70J -50°C: 40J	2.5 x 300 3.2 x 350 4.0 x 350	-	Basic coated, core wire alloyed stick electrode designed for welding of superduplex steel and equivalent steel grades. These steels are particularly popular for desalination, pulp & paper, flue gas desulphurization and sea water systems. Resistance to intercrystalline corrosion. Service temperature from -50 °C up to 220°C. Very good resistance to pitting corrosion and stress corrosion cracking due to the high CrMo(N) content (pitting index > 40). Well suited for offshore applications.
AVESTA 253 MA EN ISO 3581-A: E 21 10 N R	C: 0.08 Si: 1.50 Mn: 0.70 Cr: 22.00 Ni: 10.50 N: 0.18	UTS: 725 MPa YS: 535 MPa El: 37% CVN Impact: +20°C: 60J	2.0 x 300 2.5 x 350 3.2 x 350 4.0 x 400 5.0 x 400	-	Rutile coated electrode, designed for welding the high temperature stainless steel 253 MA, used for furnaces, combustion chambers and burners. Both the steel and filler metal offers excellent resistance to oxidation up to 1100°C. The chemical composition of Avesta 253 MA has a balanced ferrite content of max. 6 FN to give a crack resistant weld metal. Excellent resistance to high temperature corrosion. Not intended for applications exposed to wet corrosion.