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: 0.45 Mn: 1.20 S: 0.015 P: 0.035 Cr: 18.70 Mo: 0.1 Ni: 9.1	UTS: 580 MPa El: 34%	2.50 x 350 3.15 x 350 4.00 x 350	-	Low carbon 19/9 type stainless steel electrode with properties like oxidation and corrosion resisatnce, resiatnace to hot cracking. Electrode gives smooth arc, less spatter and self peeling slag. Suitable for joining AISI 301, 302, 304 and 308 having 18 Cr/ 8 Ni. Welding of hospital apparatus, househols articles, 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: 3 - 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: 2.50 FN: 16 - 20 (WRC-92)	UTS: 720 MPa El: 32%	2.50 x 350 3.15 x 350 4.00 x 350 5.00 x 350	ABS	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
BOHLER FOX A 7 (Thermanit X) AWS A5.4: E307-15 (mod.) EN ISO 3581-A: E 18 8 Mn B 2 2	C: 0.09 Si: 0.7 Mn: 6.5 Cr: 18.6 Ni: 8.8	UTS: 640 MPa (≥500) YS: 460 MPa (≥350) El: 39% (≥25) CVN Impact: +20°C: 90J	2.50 x 300 3.20 x 350 4.00 x 350 5.00 x 450 6.00 x 450	TÜV, DB, DNV, CE	Basic coated, core wire alloyed austenitic electrode of E 18 8 Mn B / E307-15 type for welding and cladding in all positions except vertical down. Versatile electrode for numerous applications – welding of "hard-to-weld" steels, dissimilar welding as well as repair and maintenance. For tough buffer and intermediate layers for cladding of rails and switches, valve seats and in hydropower plants. The weld metal offers exceptionally high ductility and elongation together with outstanding crack resistance. Good resistance to embrittlement when operating at service temperatures from –100°C up to 650°C.
AVESTA 308L/MVR AWS A5.4: E308L-17 EN ISO 3581-A: E 19 9 L R 3 2	C: 0.025 Si: 0.7 Mn: 0.7 Cr: 19.7 Ni: 10.0	UTS: 570 MPa (≥510) YS: 420 MPa (≥ 320) El: 45% (≥ 25) CVN Impact: +20°C: 70J –120°C: 40J –196°C: 34J (≥ 32)	1.5 x 250 2.0 x 300 2.5 x 350 3.2 x 350 4.0 x 450 5.0 x 450	TUV, DB, DNV, CE	Rutile coated, core wire alloyed electrode of E 19 9 L R / E308L-17 type for all position welding of 1.4301, 1.4307 / 304L stainless steels. Resulting weld microstructure is austenite with 5 – 10% ferrite. Very good corrosion resistance under fairly severe conditions, e.g. in oxidizing acids and cold or dilute reducing acids. Max. service temperature 350°C.
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: 580 MPa (≥510) YS: 460 MPa (≥320) El: 40% (≥25) CVN Impact: +20°C: 65J -120°C: 50J (≥32)	1.5 x 250 2.0 x 300 2.5 x 350 3.2 x 350 4.0 x 450 5.0 x 450	TÜV, DB, DNV, CE	Rutile coated low carbon, core wire alloyed electrode of E 19 12 3 L R / E316L-17 type for welding 1.4404 and 1.4436 / 316L type stainless steels in all positions. The weld metal offers a good resistance to general corrosion, pitting and intercrystalline corrosion in chloride-containing environments e.g. for applications in dilute hot acids. Resulting weld microstructure is austenite with 5 – 10% ferrite. Max. service temperature 400°C.
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: 0.31	UTS: 620 MPa (≥550) YS: 460 MPa (≥350) El: 35% (≥25) CVN Impact: +20°C: 60J -90°C: 50J (≥32)	2.0 x 300 2.5 x 350 3.2 x 350 4.0 x 350 5.0 x 450	TÜV, DB, CE	Rutile coated, cored wire alloyed stabilized electrode of E 19 12 3 Nb R / E318-17 type. Mainly for welding titanium and niobium-stabilized 1.4571 / 316Ti and 1.4580 / 316Cb austenitic stainless steel grades. Designed for first class weld seams and easy handling on AC or DC. High current carrying capacity with minimum spatter formation. Self-releasing slag, smooth and clean weld profile. Safety against formation of porosity due to moisture resistant coating. The corrosion resistance corresponds to that of 316Ti with good resistance to general and pitting corrosion. Max. service temperature 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: 590 MPa (≥510) YS: 450 MPa (≥320) El: 42% (≥25) CVN Impact: +20°C: 130J -120°C: 62J -196°C: 38J (≥32)	2.5 x 300 3.2 x 350 4.0 x 350 5.0 x 450	TÜV, DNV CE	Basic electrode, core wire alloyed electrode of E 19 12 3 L B / E316L-15 type. Primarily used for 1.4404 and 1.4435 / 316L austenitic steel grades. Reliable toughness values down to –196°C. Good gap bridging ability and excellent X-ray safety. Good welding characteristics in all positions except vertical-down with easy weld pool and slag control. Easy slag removal even in narrow joint preparations result in clean bead surfaces with minimum post weld cleaning. Max. service temperature 400°C.
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: 575 MPa (≥520) YS: 420 MPa (≥320) El: 40% (≥30) CVN Impact: +20°C: 110J -196°C: 46J (≥34)	2.5 x 300 3.2 x 350 4.0 x 350 5.0 x 450	TÜV, DB, CE	Basic coated, cored wire alloyed electrode of E 19 9 L B / E308L-15 type. Primarily used for 1.4306 / 304L and 304LN steel grades. Designed to produce first class weld deposits with reliable CVN impact toughness values down to –196°C. Good gap bridging ability, very good root pass and excellent X-ray safety. Good welding characteristics in all positions except vertical-down with easy weld pool and slag control. Easy slag removal even in narrow preparations result in clean bead surfaces with minimum post-weld cleaning. Ideal electrode for welding on site. Max. service temperature 350°C. Also available as a special low ferrite version, BÖHLER FOX EAS 2 (LF).
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 coated, low-hydrogen electrode of E 13 4 B / E410NiMo-15 type for welding soft-martensitic and martensitic-ferritic rolled, forged, and cast steels. Mainly used in the construction of hydro turbines and compressors. Corrosion resistance similar to matching 13Cr(Ni)- steels. Thanks to an optimum balance of alloying components, the weld deposit yields very good ductility, toughness and cracking resistance despite the high strength. Excellent operating characteristics with easy slag removal, smooth bead appearance and low hydrogen content in the weld metal (HD < 5 ml/100 g). The Ø 2.5 and 3.2 mm electrodes can be used for welding in all positions apart from vertical down. Higher recovery rate and better re-striking properties than BÖHLER FOX CN 13/4 SUPRA.

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: 5.1 Mo: 0.4 Cu: 3.2 Nb: 0.2	Heat treatment : Solution annealed, 1040°C / 0.5h / Air / 620°C / 4 h / Air UTS: 880 MPa YS: 550 MPa El: 18% CVN Impact: +20°C: 69 - 75J -50°C: 55J	2.5 x 300 3.2 x 350 4.0 x 350 5.0 x 450	CE	Basic coated electrode of E Z 17 4 Cu B / E630-15 (mod.) type with high strength for welding of similar precipitation hardening rolled, forged and cast CrNiCu-steels. Popular for components in the paper industry, rotors of compressors, fan blades, press plates in the plastic processing industry and in the aerospace industry. The electrode shows very good arc stability and weld puddle control as well as slag detachability and seam cleanness. Hydrogen content in weld deposit < 5 ml/100 g. Suitable for welding in all positions except vertical down. With the use of proper PWHT (solution annealing + precipitation hardening), impact values down to –50°C are achievable.
AVESTA 904L AWS A5.4: E385-17 EN ISO 3581-A: E 20 25 5 Cu N L R 3 2	C: 0.02 Si: 0.7 Mn: 1.2 Cr: 20.5 Ni: 25 Mo: 4.5 Cu: 1.5	UTS: 620 MPa (≥510) YS: 430 MPa (≥320) El: 35% (≥25) CVN Impact: +20°C: 70J -60°C: 60J -196°C: 45J (≥32)	2.5 x 350 3.2 x 350 4.0 x 400 5.0 x 400	TÜV, DB, CE	Rutile coated fully austenitic electrode of E 20 25 5 Cu N L R / E385-17 type designed for welding 1.4539 / 904L type steels. It can also be used for welding 1.4404 / 316L components where a ferrite free weld is required, e.g. in cryogenic or non-magnetic applications. The weld metal has very good impact toughness at low temperatures. Very good resistance to general corrosion in non-oxidizing environments such as sulfuric acid and phosphoric acid and to pitting and crevice corrosion in chloride containing solutions. Meets the corrosion test requirements as per ASTM G48 Methods A, B and E (40°C). Scaling temperature approximately 1000°C in air.
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: 40J (≥32)	2.5 x 350 3.2 x 350 4.0 x 450 5.0 x 450	TÜV, DB, Certified by CWB to CSA W48, CE	Rutile coated electrode of E 22 9 3 N L R / E2209-17 type. Primarily designed for welding 22Cr duplex stainless steels such as 1.4462 / UNS 31803 used in offshore, shipyards, chemical tankers, chemical/petrochemical, pulp & paper, etc. Good weldability in all welding positions. Very good resistance to pitting and stress corrosion cracking in chloride containing environments. Good wettability and slag detachability result in smooth and clean welds.
BOHLER FOX CN 22/9 N-B AWS A5.4: E2209-15 EN ISO 3581-A: E 22 9 3 N L B 2 2	C: 0.03 Si: 0.3 Mn: 1.1 Cr: 22.6 Ni: 8.8 Mo: 3.1 N: 0.16	UTS: 830 MPa (≥ 690) YS: 630 MPa (≥450) El: 30% (≥20) CVN Impact: +20°C: 100J -50°C: 65J (≥32)	2.5 x 350 3.2 x 350 4.0 x 350 5.0 × 450	TÜV, CE	Basic coated, core wire alloyed electrode of E 22 9 3 N L B / E2209-15 type for welding of duplex stainless steels such as 1.4462 / UNS S31803 and S32205. Specially designed for the joining of thick-walled sections (e.g. > 20 mm) and rigid constructions as well as for applications where extra low service temperature requirements exist (down to -50°C). The weld metal meets the corrosion test requirements per ASTM G48 Methods A, B and E (25°C) and shows high resistance to stress corrosion cracking. The electrode provides user-friendly operating characteristics in all positions except vertical down with good slag removability and weld bead appearance. Additionally the filler metals offer high safety against formation of porosity. Ferrite measured with FeritScope FMP30 34 – 36 FN. Suitable for service temperatures from –50°C to 250°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
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: 910 MPa (≥760) YS: 720 MPa (≥550) El: 30% (≥18) CVN Impact: +20°C: 105J -50°C: 50J (≥ 32)	2.5 x 300 3.2 x 350 4.0 x 350	CE	Designed for welding of superduplex steel and equivalent steel grades such as 1.4410 / UNS S32750, 1.4507 / UNS S32550 and 1.4501 / UNS S32760, used in desalination, pulp & paper, flue gas desulfurization and seawater systems. Developed to fulfill severe requirements stated in NORSOK M-601 and similar standards. Properties of the weld metal match those of the parent metal, offering high tensile strength and toughness as well as an excellent resistance to stress corrosion cracking and localized corrosion in chloride containing environments. 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. The operating temperature range is -50°C to 220°C.
BOHLER FOX CN 25/9 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: 1.0 Cr: 25.0 Mo: 3.7 Ni: 9.5 N: 0.22 Cu: 0.7 W: 0.7	UTS: 850 MPa (≥ 760) YS: 650 MPa (≥550) El: 28% (≥18) CVN Impact: +20°C: 80J -50°C: 40J (≥32)	2.5 x 300 3.2 x 350 4.0 x 350	CE	Basic electrode of E 25 9 4 N L B / E2595-15 type, for welding of ferritic-austenitic superduplex steels. By virtue of specific alloy composition the deposit has, in addition to high tensile strength and toughness, also excellent resistance to stress corrosion cracking and pitting corrosion. The operating temperature range is -50°C up to 250°C. Well suited for the conditions in the offshore field.
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 (≥550) YS: 535 MPa (≥350) El: 35% (≥30) 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	CE	Rutile coated electrode of E 21 10 N R type. Designed for welding the high temperature stainless steel 253 MA® (1.4835 / UNS S30815), used for furnaces, combustion chambers and burners. Both the steel and filler metal offer excellent resistance to oxidation up to 1100°C. Balanced chemical composition to result in a 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.