

Classifications

unalloyed rutile

EN ISO 2560-A:

AWS A5.1:

E 38 0 RC 11

E6013

Characteristics and field of use

Rutile cellulose coated stick electrode with comfortable weldability in all positions, including vertical down to some extent.

Exceptional weldability with AC, good ignition and re-ignition properties, reliable fusion penetration, flat seam. Preferred for building fitters and assembly jobs.

Base materials

Steels up to a yield strength of 380 MPa (52 Ksi)

S235JR-S355JR, S235JO-S355JO, P195TR1-P265TR1, P195GH-P265GH,

L245NB-L360NB, L245MB-L360MB, shipbuilding steels: A, B, D

ASTM A 106, Gr. A, B; A 283 Gr. A, C; A 285 Gr. A, B, C; A 501, Gr. B; A 573, Gr. 58, 65;

A 633, Gr. A, C; A 711 Gr. 1013; API 5 L Gr. B, X42, X52

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.06	0.3	0.5		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V		
				+20°C:	±0°C:	-10°C:
untreated	430	490	26	75	65	50

Operating data



Polarity = - / ~

re-drying: not necessary
Electrode identification:
FOX KE 6013 E 38 0 RC

Dimensions (mm)	Amperage A
2.0 x 250	45-80
2.5 x 250/350	60-100
3.2 x 350	90-130
4.0 x 350/450	110-170

Approvals and certificates

LR (2m), SEPROZ

Classifications

unalloyed rutile

EN ISO 2560-A:

AWS A5.1:

E 38 0 RC 11

E6013

Characteristics and field of use

Rutile cellulose coated Stick electrode with very good weldability in all positions, including vertical down.

Universal electrode, particularly for small transformers. Bendable covering. Versatile application in steel, vehicle, boiler, container and ship construction, as well as for galvanised components.

Base materials

Steels up to a yield strength of 380 MPa (52 ksi)
 S235JR-S355JR, S235JO-S355JO, P195TR1-P265TR1, P195GH-P265GH, L245NBL360NB, L245MB-L360MB, shipbuilding steels: A, B, D
 ASTM A 106, Gr. A, B; A 283 Gr. A, C; A 285 Gr. A, B, C; A 501, Gr. B; A 573, Gr. 58, 65;
 A 633, Gr. A, C; A 711 Gr. 1013; API 5 L Gr. B, X42, X52

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.06	0.4	0.5		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V		
				+20°C:	±0°C:	-10°C:
untreated	460	490	25	75	60	47

Operating data



Polarity = - / ~

Dimensions (mm)

Amperage A

2.0 x 250	45-80
2.5 x 250/350	60-100
3.2 x 350	90-130
4.0 x 350/450	110-170
5.0 x 450	170-240

Approvals and certificates

TÜV (5687.), DB (10.014.12), ABS (2), DNV (2), LR (2), LTSS, SEPROZ, CE

Phoenix Sh Gelb R

Stick electrode

Classifications

unalloyed rutile

EN ISO 2560-A:

AWS A5.1:

E 38 2 RB 12

E6013

Characteristics and field of use

Rutile basic electrode. Excellent vertical up welding characteristics; easy handling in out of position work; particularly suitable for fabricating radiographically sound circumferential pipe welds; good porosity-free root weld fusion, also in tight air gaps. Useable in pipeline, boiler and tank construction, structural steel work and shipbuilding.

Base materials

S235JRG2 - S355J2; shipbuilding steels appr.-grade 3; boiler steels P235GH, P265GH, P295GH; ASTM A36 and A53 Gr. all; A106 Gr. A, B, C; A135 Gr. A, B; A283 Gr. A, B, C, D; A366; A285 Gr. A, B, C; A500 Gr. A, B, C; A570 Gr. 30, 33, 36, 40, 45; A607 Gr. 45; A668 Gr. A, B; A907 Gr. 30, 33, 36, 40; A935 Gr. 45; A936 Gr. 50; API 5 L Gr. B, X42-X52

Typical analysis of all-weld metal (Wt-%)

C

Si

Mn

0.08

0.20

0.55

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V
	MPa	MPa	%	+20°C
untreated	380	460	22	75

Operating data



Polarity = - / ~

Dimensions (mm)

Amperage A

2.0 x 250

30- 75

2.5 x 250

40- 90

2.5 x 350

40- 90

3.2 x 350

90-130

4.0 x 350

140-190

4.0 x 450

140-190

5.0 x 450

190-250

Approvals and certificates

TÜV (01591.), DB (10.132.20), ABS, BV, GL, LR, DNV

Classifications

unalloyed rutile

EN ISO 2560-A:

AWS A5.1:

E 42 0 RC 11

E6013

Characteristics and field of use

Rutile cellulose covered electrode. General purpose; useable in all positions; excellent gap-bridging and arc-striking ability; for tack-welding and bad fit-ups. Well suited for welding rusty and primed plates (roughly 40 µm); excellent vertical down characteristics. Useable on small transformers (42 V, open circuit).

Base materials

S235JRG2 - S355J2; GS-38; GS-45; St35; St45; St35.8; boiler steels P235GH, P265GH, P295GH; shipbuilding steels corresp. to app.-grade 2; fine grained structural steels up to P355N; weldable ribbed reinforcing steel bars. ASTM A36 and A53 Gr. all; A106 Gr. A, B, C; A135 Gr. A, B; A283 Gr. A, B, C, D; A366; A285 Gr. A, B, C; A500 Gr. A, B, C; A570 Gr. 30, 33, 36, 40, 45; A607 Gr. 45; A668 Gr. A, B; A907 Gr. 30, 33, 36, 40; A935 Gr. 45; A936 Gr. 50; API 5 L Gr. B, X42-X52

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.09	0.35	0.50		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V
	MPa	MPa	%	+20°C
untreated	420	510	22	50

Operating data



Polarity = - / ~

Dimensions (mm)

Amperage A

2.0 x 250	30- 75
2.5 x 250	40- 90
2.5 x 350	40- 90
3.2 x 350	90-130
4.0 x 350	140-190
4.0 x 450	140-190
5.0 x 350	190-240
5.0 x 450	190-240

Approvals and certificates

TÜV (00425.), DB (10.132.19), ABS, BV, LR, GL (2Y), DNV

BÖHLER FOX ETI

Stick electrode

Classifications

unalloyed rutile

EN ISO 2560-A:

AWS A5.1:

E 42 0 RR 12

E6013

Characteristics and field of use

Rutile coated Stick electrode with excellent weldability in all positions with the exception of vertical down. Particularly smooth seams, self-releasing slag. Little spatter, and good weldability with AC. Exceptional re-ignition properties and easy handling. High run-out lengths can be achieved. Versatile applicability in industry and craft.

Base materials

Steels up to a yield strength of 420 MPa (60ksi) S235JR-S355JR, S235JO-S355JO, P195TR1-P265TR1, P195GH-P265GH, L245NB-L360NB, L245MB-L360MB, L415NB, L415MB, shipbuilding steels: A, B, D ASTM A 106, Gr. A, B; A 283 Gr. A, C; A 285 Gr. A, B, C; A 501, Gr. B; A 573, Gr. 58, 65, 70; A 633, Gr. A, C; A 711 Gr. 1013; API 5 L Gr. B, X42, X52, X60

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.07	0.4	0.5		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V	
	MPa	MPa	%	+20°C:	±0°C:
untreated	430	520	26	65	50

Operating data

Polarity = - / ~

Dimensions (mm)**Amperage A**

1.5 x 250	40-60
2.0 x 250	45-80
2.5 x 250/350	60-110
3.2 x 350/450	90-140
4.0 x 450	110-190
5.0 x 450	170-240

Approvals and certificates

TÜV (1097.), ABS (2), BV (2), DNV (2), GL (2), LR (2m), LTSS, SEPROZ, CE

Classifications

unalloyed rutile

EN ISO 2560-A:

AWS A5.1:

E 42 0 RR 12

E6013

Characteristics and field of use

Rutile covered electrode. Very little spatter, self releasing slag; finely rippled, smooth welds with notch-free weld metal / parent metal interface. Unproblematical welding of general-purpose structural steels; also suitable for vertical down welding in diam. up to 2.0 mm. Outstanding striking and restriking ability. For use on small transformers (42 V, open circuit).

Base materials

S235JRG2 - S355J2; St 35; St 45; St 35.8; St 45.8; boiler steels P235GH, P265GH, P295GH; ship-building steels; fine grained structural steels up to P355N- and M-grades. ASTM A36 and A53 Gr. all; A106 Gr. A, B, C; A135 Gr. A, B; A283 Gr. A, B, C, D; A366; A285 Gr. A, B, C; A500 Gr. A, B, C; A570 Gr. 30, 33, 36, 40, 45; A607 Gr. 45; A668 Gr. A, B; A907 Gr. 30, 33, 36, 40; A935 Gr. 45; A936 Gr. 50; API 5 L Gr. B, X42-X56

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.08	0.35	0.55		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V
	MPa	MPa	%	+20°C
untreated	420	510	22	60

Operating data



Polarity = - / ~

Dimensions (mm)	Amperage A
2.0 x 250	45-65
2.0 x 350	45-65
2.5 x 250	60-100
2.5 x 350	60-100
3.2 x 350	85-140
3.2 x 450	85-140
4.0 x 350	130-200
4.0 x 450	130-200
5.0 x 450	230-300
6.0 x 450	280-370

Approvals and certificates

TÜV (00350.), DB (10.132.58), ABS, BV, LR, GL, DNV

Classifications

unalloyed basic

EN ISO 2560-A:

AWS A5.1:

E 38 4 B 42 H5

E7016-1H4R

Characteristics and field of use

Basic coated Stick electrode for high-quality welded joints. Good out-of-position welding except for vertical down. Deposition efficiency about 110%. Very low hydrogen content in the weld metal (under AWS conditions HD ≤ 4 ml/100g). The weld metal is particularly tough and resistant to cracking and ageing, therefore specially suitable for rigid components with large seam cross-sections.

Base materials

Steels up to a yield strength of 380 MPa (52 ksi) S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S355N, S275M-S355M, P235GH-P355GH, P355N, P275NL1-P355NL1, P215NL, P265NL, P285NH-P355NH, P195TR1-P265TR1, P195TR2-P265TR2, P195GH-P265GH, L245NB-L360NB, L245MB-L360MB, GE200-GE240, shipbuilding steels: A, B, D, E, A 32-E 36 ASTM A 106 Gr. A, B, C; A 181 Gr. 60, 70; A 283 Gr. A, C; A 285 Gr. A, B, C; A 350 Gr. LF1, LF2; A 414 Gr. A, B, C, D, E, F, G; A 501 Gr. B; A 513 Gr. 1018; A 516 Gr. 55, 60, 65, 70; A 573 Gr. 58, 65, 70; A 588 Gr. A, B; A 633 Gr. A, C, D; A 662 Gr. A, B, C; A 678 Gr. A, B; A 711 Gr. 1013; API 5 L Gr. B, X42, X52, X56

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.07	0.4	0.9		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V		
	MPa	MPa	%	+20°C:	-20°C:	-40°C:
untreated	440	530	27	190	110	90

Operating data


Polarity = +

Dimensions (mm)
Amperage A

2.5 x 250/350

80-110

3.2 x 350/450

100-140

4.0 x 435/450

130-180

5.0 x 450

180-230

Approvals and certificates

TÜV (1098.), DB (10.014.09), ABS (3H5), BV (3HHH), DNV (3H10), GL (3H5), LR (3m H5), RMR (2), RINA (3YH5, 3H5), LTSS, SEPROZ, CE

BÖHLER FOX EV 50-A

Stick electrode

Classifications

unalloyed basic

EN ISO 2560-A:

AWS A5.1:

E 42 3 B 12 H10

E7016

Characteristics and field of use

Basic double coated electrode in all positions, except for vertical down, exceptionally good welding. Thanks to its well-aligned arc, it is particularly suitable for out-of-position welding. Very good root welding. Well-suited to AC power. Low spatter, good slag detachability, even weld pattern. Also suitable for small transformers.

Base materials

Steels up to a yield strength of 420 MPa (60 ksi) S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S420N, S275M-S420M, P235GH-P355GH, P355N, P285NH-P420NH, P195TR1-P265TR1, P195TR2-P265TR2, P195GH-P265GH, L245NB-L415NB, L245MB-L415MB, GE200-GE240 ASTM A 106 Gr. A, B, C; A 181 Gr. 60, 70; A 283 Gr. A, C; A 285 Gr. A, B, C; A 414 Gr. A, B, C, D, E, F, G; A 501 Gr. B; A 516 Gr. 55, 60, 65, 70; A 573 Gr. 58, 65, 70; A 588 Gr. A, B; A 633 Gr. A, C, D; A 662 Gr. A, B, C; A 678 Gr. A, B; A 711 Gr. 1013; API 5 L Gr. B, X42, X52, X56, X60

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.07	0.7	1.1		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5_0$)	Impact values ISO-V
	MPa	MPa	%	+20°C:
untreated	440	550	28	180

Operating data



Polarity = ± / ~

Dimensions (mm)

Amperage A

2.0 x 350	60-90
2.5 x 350/450	100-150
3.2 x 450	140-190
4.0 x 450	190-250

Approvals and certificates

TÜV (10574.), DB (10.014.17), CE

Phoenix Spezial D

Stick electrode

Classifications

unalloyed basic

EN ISO 2560-A:

AWS A5.1:

E 42 3 B 12 H10

E7016

Characteristics and field of use

Double covered basic electrode. Outstanding welding characteristics on AC and DC in all positions except the vertical down; stable arc, good radiographic soundness. Useable in handicraft and industry for field and workshop applications. Redry for 2 h at 250 - 300 °C (482 - 572 °F).

Base materials

S235JRG2 - S355J2, boiler steels P235GH, P265GH, P295GH, P355GH; fine grained structural steels up to S355N; pipe steels St 35, St 35.8, L210 - L360NB, GS-52, L290MB - L360MB; ASTM A27 and A36 Gr. all, A214, A242 Gr. 1-5, A266 Gr. 1, 2, 4, A283 Gr. A, B, C, D, A285 Gr. A, B, C, A299 Gr. A, B, A328, A366, A515 Gr. 60, 65, 70, A516 Gr. 55, A570 Gr. 30, 33, 36, 40, 45, A572 Gr. 42, 50, A606 Gr. all, A607 Gr. 45, A656 Gr. 50, 60, A668 Gr. A, B, A907 Gr. 30, 33, 36, 40, A841, A851 Gr. 1, 2, A935 Gr. 45, A936 Gr. 50; API 5 L Gr. B, X42-X56

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.06	0.65	1.05		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V	
				+20°C	-30 °C
untreated	440	550	22	80	50

Operating data



Polarity = + / ~

Dimensions (mm)

Amperage A

2.5 x 350	60-90
3.2 x 350	95-150
3.2 x 450	95-150
4.0 x 450	140-190
5.0 x 450	190-250

Approvals and certificates

TÜV (03282.), DB (10.132.42), ABS, BV, DNV, GL, LR

Classifications

unalloyed basic

EN ISO 2560-A:

AWS A5.1:

E 42 3 B 12 H10

E7016

Characteristics and field of use

The special coating technology of Comet J 50N provides a flat, regular and finely rippled bead surface, a stable arc, a good slag detachability and a notch-free wetting behaviour. The weld metal is not sensitive towards metal impurities. Thank to its double coating, this electrode is well applied for root-passes and welding out of position. Comet J 50 N can be welded in DC and AC, the weld efficiency amounts to 120%, H₂-% in the weld deposit < 8 ml/100g.

Base materials

Unalloyed steels S235JRG2 – S355J2; E295, E335, St35, St 45, St 35.8, St45.8, St50-2
 Pressure vessel construction steels P235GH, P265GH, P295GH Fine-grain steels till grade S355N
 Shipping construction steels A – E, AH - EH Cast steels C 35, GS-38, GS-45

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.06	0.7	1.1		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀ 0)	Impact values ISO-V
	MPa	MPa	%	+20°C
untreated	420	510	22	140

Operating data


Polarity = + / ~

Dimensions (mm)
Amperage A

2.5 x 350	50-100
3.2 x 450	70-130
4.0 x 450	110-170
5.0 x 450	140-220

Approvals and certificates

ABS, BV, DNV, FT, GL, LR, TÜV

BÖHLER FOX EV 50

Stick electrode

Classifications

unalloyed basic

EN ISO 2560-A:

AWS A5.1:

E 42 5 B 42 H5

E7018-1H4R

Characteristics and field of use

Basic coated Stick electrode for high-quality welded joints. Exceptional strength and toughness properties down to -50°C. Deposition efficiency about 110%. Good welding in all positions except for vertical down. Very low hydrogen content in the weld metal (under AWS conditions $HD \leq 4$ ml/100g). The electrode is suitable for joint welding in steel, boiler, container, vehicle, ship and machine construction, and as a buffer layer for build-up welds with high-carbon steels. Suitable for welding steels of low purity and high carbon content. Particularly suitable for offshore constructions. CTOD-tested at -10°C. BÖHLER FOX EV 50 is also suitable for use in acid gas (HIC test according to NACE TM-02-84). Values for the SSC test are also available.

Base materials

Steels up to a yield strength of 420 MPa (60 ksi) S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S420N, S275M-S420M, S275NL-S420NL, S275ML-S420ML, P235GH-P355GH, P275NL1-P355NL1, P275NL2-P355NL2, P215NL, P265NL, P355N, P285NH-P420NH, P195TR1-P265TR1, P195TR2-P265TR2, P195GH-P265GH, L245NB-L415NB, L245MB-L415MB, GE200-GE240, GE300, shipbuilding steels: A, B, D, E, A 32-F 36, A 40-F 40 ASTM A 106 Gr. A, B, C; A 181 Gr. 60, 70; A 283 Gr. A, C; A 285 Gr. A, B, C; A 350 Gr. LF1, LF2; A 414 Gr. A, B, C, D, E, F, G; A 501 Gr. B; A 513 Gr. 1018; A 516 Gr. 55, 60, 65, 70; A 573 Gr 58, 65, 70; A 588 Gr. A, B; A 633 Gr. A, C, D, E; A 662 Gr. A, B, C; A 707 Gr. L1, L2, L3; A 711 Gr. 1013; A 841 Gr. A, B, C; API 5 L Gr. B, X42, X52, X56, X60

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.08	0.4	1.2		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5_0$)	Impact values ISO-V		
				+20°C:	-20°C:	-50°C:
untreated	460	560	27	190	160	70

Operating data

Polarity = +

Dimensions (mm)**Amperage A**

2.0 x 250	50-70
2.5 x 250/350	80-110
3.2 x 350/450	100-140
4.0 x 350/450	130-180
5.0 x 450	180-230
6.0 x 450	240-290

Approvals and certificates

TÜV (0426.), DB (10.014.02), ABS (3H5, 4Y), BV (3YHHH), DNV (3YH10), GL (4Y40H15), LR (3, 3YH5), RMR (3YHH), RINA (4YH5 / 4H5), LTSS, SEPPOZ, CRS (3YH5), CE, NAKS

Classifications

unalloyed basic

EN ISO 2560-A:

AWS A5.1:

E 42 5 B 32 H5

E7018-1

Characteristics and field of use

Basic covered electrode. Very good welding characteristics including out of position work; 120 % weld metal recovery; H₂- content in the weld metal ≤5 ml/100 g; very pure cryogenic weld metal at temperatures as low as -50 °C (-58 °F); CTOD tested up to -10 °C (14 °F). Suitable for use in structural steel work, boiler making, tank construction, ship and bridge building and vehicle manufacture; particularly suitable for welding fine grained structural steels. Excellent weldability on offshore steels. Redry for 2 h at 250 - 350 °C (482 - 662 °F).

Base materials

S235JRG2 - S355J2, E295, E335, C 35; boiler steels P235GH, P265GH, P295GH, P355GH; fine grained structural steels up to S420N; shipbuilding steels A, B, D, E; offshore steels; pipe steels P265, P295, L290NB - L415NB, L290MB - L415MB; X 42 - X 60; cast steel GS-38, GS-45, GS-52; ageing resistant steels ASt 35 - ASt 52; ASTM A27 and A36 Gr. all, A214, A242 Gr. 1-5, A266 Gr. 1, 2, 4, A283 Gr. A, B, C, D, A285 Gr. A, B, C, A299 Gr. A, B, A328, A366, A515 Gr. 60, 65, 70, A516 Gr. 55, A570 Gr. 30, 33, 36, 40, 45, A572 Gr. 42, 50, A606 Gr. all, A607 Gr. 45, A656 Gr. 50, 60, A668 Gr. A, B, A907 Gr. 30, 33, 36, 40, A841, A851 Gr. 1, 2, A935 Gr. 45, A936 Gr. 50;

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.07	0.35	1.2		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation	Impact values	
	0.2%		(L ₀ =5 _g 0)	ISO-V	
	MPa	MPa	%	+20 °C	-50 °C:
untreated	420	510	22	120	47

Operating data



Polarity = + / ~

Dimensions (mm)

Amperage A

2.0 x 250	45-65
2.5 x 250	65-110
2.5 x 350	65-110
3.2 x 350	100-145
3.2 x 450	100-145
4.0 x 350	135-200
4.0 x 450	135-200
5.0 x 450	180-280
6.0 x 450	240-375
8.0 x 450	290-420

Approvals and certificates

TÜV (00348.), DB (10.132.17), ABS, BV, GL, LR, DNV

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.1:

E 38 3 C 2 1

E6010

Characteristics and field of use

Cellulose coated Stick electrode for vertical welding of the root (down and up), hot pass, filler and cover pass welding of large pipelines. Ideally suited for welding the root pass. Highly economical when compared with vertical up welding, also in combination with basic vertical down electrodes. BÖHLER FOX CEL is characterised by a very intensive, fine-droplet depositing, as well as good toughness properties. Insensitive to weather conditions, high resistance to the formation of shrinkage grooves. HIC and SSC resistance tested according to NACE TM 02-84 or TM 01-77.

Base materials

S235JR, S275JR, S235J2G3, S275J2G3, S355J2G3, P235GH, P265GH, P355T1, P235T2-P355T2, L210NB-L385NB, L290MB-L385MB, P235G1TH, P255G1TH root pass up to L555NB, L555MB API Spec. 5 L: A, B, X 42, X 46, X 52, X 56, root pass up to X 80

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.12	0.14	0.5		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V			
				+20°C:	±0°C:	-20°C:	-30°C:
untreated	450	550	26	100	90	80	50

Operating data



Polarity = +/- -
Minus Polarity for root pass only

Dimensions (mm)

Amperage A

2.5 x 250/300

50-90

3.2 x 350

80-130

4.0 x 350

120-180

5.0 x 350

160-210

Approvals and certificates

TÜV (1281.), DNV (3), Statoil, SEPROZ, CE, NAKS (Ø 3.2; 4.0 mm)

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.1:

E 38 2 C 2 1

E6010

Characteristics and field of use

Cellulose coated Stick electrode for vertical down welding in pipeline construction and in general pipe construction. Particularly suitable for root pass welding (down and up) using DC on the positive pole. BÖHLER FOX CEL+ permits good gap bridging, has good root fusion penetration due to the intensive, fine-droplet material transfer, high welding speeds and high resistance to the formation of root wormholes (piping).

Base materials

S235JR, S275JR, S235J2G3, S275J2G3, S355J2G3, P235GH, P265GH, P355T1, P235T2-P355T2, L210NB-L385NB, L290MB-L385MB, P235G1TH, P255G1TH root pass up to L555NB, L555MB API Spec. 5 L: A, B, X 42, X 46, X 52, X 56, root pass up to X 80

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.17	0.15	0.6		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5_0$)	Impact values ISO-V			
				+20°C:	±0°C:	-20°C:	-30°C:
untreated	450	520	26	105	95	65	

Operating data


Polarity = +/- -
Minus Polarity for root pass only

Dimensions (mm)
Amperage A

2.5 x 300	50-90
3.2 x 350	80-130
4.0 x 350	120-180

Phoenix Cel 70

Stick electrode

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.1:

E 42 C 2 5

E6010

Characteristics and field of use

Cellulose covered electrode for vertical down circumferential welds in pipeline constructions. Excellent weldability in root pass welding (DC \pm); also in the vertical up position. CTOD, HIC and HSCC tested. Do not redry!

Base materials

API5L: Grade A, B, X 42, X 46, X 52, root pass welding up to X 80; EN 10208-2: L290MB-, 360MB- and root pass welding up to L485MB- and NB-qualities; EN 10113-3: S275ML, S355ML, S275NL, S355NL

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.14	0.18	0.55		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V		
	MPa	MPa	%	+20°C	-20°C:	-40°C
untreated	420	510	22	80	50	28

Operating data



Polarity = +/- -
Minus Polarity for root pass only

Dimensions (mm)

Amperage A

2.5 x 300	50-80
3.2 x 350	80-130
4.0 x 350	120-180
5.0 x 350	160-220

Approvals and certificates

TÜV (00247.), DB (10.132.44), ABS, LR, GL, DNV, VNIIST

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.5:

E 42 2 C 2 5

E7010-P1

Characteristics and field of use

Cellulose covered electrode for vertical down circumferential welds in pipeline constructions. Excellent weldability in root, hot, fill and cap pass welding. Easy slag removal. Particularly suitable for root pass welding (DC ±); also in the vertical up position. CTOD, HIC and HSCC tested. Do not redry!

Base materials

API5L: Grade B, X 42 - X 60 and root pass up to X 70; EN 10208-2: L290MB-, L360MB- and root pass L485MB- and NB-qualities; EN 10113-3: S275ML, S355ML, S275NL, S355NL

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.15	0.20	0.60		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V		
				MPa	MPa	%
untreated	420	530	22	80	55	28

Operating data



Polarity = +/- -
Minus Polarity for root pass only

Dimensions (mm)

Amperage A

3.2 x 350	80-130
4.0 x 350	120-180
5.0 x 350	160-220

Approvals and certificates

TÜV (03199.), LR

BÖHLER FOX CEL 75

Stick electrode

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.5:

E 42 3 C 2 5

E7010-P1

Characteristics and field of use

Higher-strength, cellulose coated Stick electrode for vertical down welding on large pipelines. Highly economical compared to vertical up welding. Particularly suitable for hot pass, filler and cover pass welding on higher-strength pipe steels. BÖHLER FOX CEL 75 is characterised by a very intensive, fine-droplet depositing, as well as good toughness properties. Insensitive to weather conditions. HIC and SSC resistance tested according to NACE TM 02-84 or TM 01-77.

Base materials

S235JR, S275JR, S235J2G3, S275J2G3, S355J2G3, P235GH, P265GH, L210-L415NB, L290MB-L415MB, P355T1, P235T2-P355T2, P235G1TH, P255G1TH
 root pass up to L480MB
 API Spec. 5 L: Grade A, B, X42, X 46, X 52, X 56, X 60, root pass up to X 70

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.14	0.14	0.7		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation	Impact values				
	0.2%		(L ₀ =5 ₀)	ISO-V				
	MPa	MPa	%	+20°C	±0°C	-20°C	-30°C	-40°C
untreated	480	550	23	100	95	65	55	45

Operating data

Polarity = + / -
 Minus Polarity for root pass only

Dimensions (mm)**Amperage A**

3.2 x 350	80-130
4.0 x 350	120-180
5.0 x 350	160-210

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.5:

E 42 3 Mo C 2 5

E7010-A1

Characteristics and field of use

Higher-strength, cellulose coated Stick electrode for vertical down welding on large pipelines. Highly economical compared to vertical up welding. Particularly suitable for hot pass, filler and cover pass welding on higher-strength pipe steels. BÖHLER FOX CEL Mo is characterised by a very intensive, fine-droplet depositing, as well as good toughness properties. Insensitive to weather conditions, high resistance to the formation of shrinkage grooves. HIC and SSC resistance tested according to NACE TM 02-84 or TM 01-77.

Base materials

S235JR, S275JR, S235J2G3, S275J2G3, S355J2G3, P235GH, P265GH, L210-L415NB, L290MB – L415MB, P355T1, P235T2-P355T2, P235G1TH, P255G1TH root pass up to L555MB API Spec. 5 L: Grade A, B, X 42, X 46, X 52, X 56, X 60, root pass up to X 80

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Mo
0.1	0.14	0.4	0.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V				
				20°C	±0°C	-20°C	-30°C	-40°C
untreated	480	550	23	100	95	85	50	42

Operating data


Polarity = + / -
Minus Polarity for root pass only

Dimensions (mm)
Amperage A

3.2 x 350	80-130
4.0 x 350	120-180
5.0 x 350	140-210

Approvals and certificates

TÜV (11181.), CE

Phoenix Cel 80

Stick electrode

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.5:

E 46 3 C 2 5

E8010-P1

Characteristics and field of use

Cellulose covered electrode for vertical down circumferential welds; for field welding of higher strength pipeline steels; excellent weldability in root, hot, fill and cap pass welding. Easy slag removal. Particularly suitable for root pass welding (DC \pm), also in the vertical up position. Good bend and radio-graphic test results. High ductility of the welded joint and great safety against root pass cracking. Do not redry!

Base materials

API5L: X 42, X 46, X 52, X 56, X 60, X 65, X 70 and root pass up to X 80 EN 10208-2: L290MB-, L485MB- and root pass up to L555MB- and NB-qualities; EN 10113-3: S355ML, S420ML, S460ML

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	
0.16	0.20	0.85	0.20	

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5_0$)	Impact values ISO-V		
	MPa	MPa	%	+20°C	-20°C	-30°C
untreated	460	550	19	70	60	47

Operating data



Polarity = +/- -
Minus Polarity for root pass only

Dimensions (mm)

Amperage A

3.2 x 350	80-130
4.0 x 350	140-190
5.0 x 350	160-220

Approvals and certificates

TÜV (00536.), ABS, LR

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.5:

E 46 4 1Ni C 2 5

E8010-P1

Characteristics and field of use

Higher-strength, cellulose coated Stick electrode for vertical down welding on large pipelines. Highly economical compared to vertical up welding. Particularly suitable for hot pass, filler and cover pass welding on higher-strength pipe steels. FOX CEL 85 is one of the most widely used cellulose electrodes, and meets the highest quality demands in large pipeline construction. It is characterised by a very intensive, fine-droplet depositing, as well as good toughness properties. Insensitive to weather conditions, high resistance to the formation of shrinkage grooves. HIC and SSC resistance tested according to NACE TM 02-84 or TM 01-77.

Base materials

L415NB-L450NB, L415MB-L450MB API Spec. 5 L: X 56, X 60, X 65

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni
0.14	0.15	0.75	0.7

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V			
	MPa	MPa	%	+20°C:	±0°C:	-20°C:	-40°C:
untreated	490	570	23	110	105	100	70

Operating data



Polarity = +

Dimensions (mm)

Amperage A

3.2 x 350	80-130
4.0 x 350	120-180
5.0 x 350	160-210

Approvals and certificates

TÜV (1361.), ABS (E8010-P1), SEPROZ, CE

BÖHLER FOX CEL 90

Stick electrode

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.5:

E 50 3 1Ni C 2 5

E9010-P1

Characteristics and field of use

Higher-strength, cellulose coated Stick electrode for vertical down welding on large pipelines. Highly economical compared to vertical up welding. Particularly suitable for hot pass, filler and cover pass welding on higher-strength pipe steels. BÖHLER FOX CEL 90 meets the toughest quality demands in large pipeline construction, and is characterised by a very intensive, fine-droplet depositing, as well as toughness properties. Insensitive to weather conditions.

Base materials

API5L: X 42, X 46, X 52, X 56, X 60, X 65, X 70 and root pass up to X 80 EN 10208-2: L290MB-, L485MB- and root pass up to L555MB- and NB-qualities; EN 10113-3: S355ML, S420ML, S460ML

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	
0.17	0.15	0.9	0.8	

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V				
	MPa	MPa	%	20°C	±0°C	-20°C	-30°C	-40°C
untreated	580	650	21	100	90	75	65	40

Operating data

Polarity = +
Minus Polarity for root pass only

Dimensions (mm)**Amperage A**

4.0 x 350

120-180

5.0 x 350

160-210

Approvals and certificates

TÜV (1324.), Statoil, SEPROZ, CE

Phoenix Cel 90

Stick electrode

Classifications

unalloyed cellulosic

EN ISO 2560-A:

AWS A5.5:

E 50 3 1 Ni C 2 5

E9010-G

Characteristics and field of use

Cellulose covered electrode for circumferential welds; developed for field welding of higher strength pipeline steels in the vertical down position. Excellent weldability in root, hot, fill and cap pass welding. Easy slag removal. Good bend and radiographic test results. High ductility of the welded joint. Do not redry!

Base materials

API5L: X 60, X 65, X 70, (X 80) EN 10208-2: L415MB-, L450MB-, L485MB-, (L555MB-) and B-qualities; Phoenix Cel 90 is overmatching the X 60 and X 65 steels

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	
0.18	0.20	0.85	0.75	

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V		
	MPa	MPa	%	+20°C	-20°C:	-30°C
untreated	530	630	18	70	55	47

Operating data



Polarity = +/- -

Dimensions (mm)

Amperage A

3.2 x 350	80-140
4.0 x 350	140-190
5.0 x 350	160-220

Approvals and certificates

TÜV (00105.)

Classifications

low-alloy basic vertical up

EN ISO 2560-A:

AWS A5.1:

E 42 4 B 1 2 H5

E7016-1H4R

Characteristics and field of use

BÖHLER FOX EV PIPE is a basic coated Stick electrode particularly noted for its excellent welding performance in the vertical up welding of pipe root passes on the negative pole, as well as filler and cover pass welding on the positive pole. At wall thicknesses of 8 mm and above, the 3.2 mm electrode diameter can be used for the root weld. The shorter melting times that can be achieved, and the greater run-out lengths of each electrode, bring significant cost savings in comparison with the type AWS E7018 Stick electrodes usually used for this purpose. The electrode is also well suited to use with AC, and can therefore also be used for AC welding in building and plant construction. The electrode features outstanding low-temperature impact energy and a low hydrogen content of max. 5 ml/100g in the weld metal.

Base materials

EN P235GH, P265GH, P295GH, P235T1, P275T1, P235G2TH, P255G1TH, S255N-S420N1), S255NL1 up to S420NL1, L290NB up to L360NB, L290MB up to L415MB, L450MB2) up to L555MB2) API Spec. 5L: A, B, X 42, X46, X52, X56, X60, X65-X802) ASTM A53 Grade A-B, A106 Grade A-C, A179, A192, A210 Grade A-1 1) stress relieved up to S380N / S380NL1 2) only for root pass

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn		
0.06	0.6	0.9		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V			
	MPa	MPa	%	+20°C:	-20°C:	-40°C:	-45°C:
untreated	470	560	29	170	100	60	55

Operating data


Polarity = + / - / ~

Dimensions (mm)
Amperage A

2.0 x 300	30-60
2.5 x 300	40-90
3.2 x 350	60-130
4.0 x 350	110-180

Approvals and certificates

TÜV (7620.), DB (10.014.77), LTSS, SEPROZ, CE, NAKS (Ø 2.5 - 4.0 mm), GAZPROM (Ø 2.5 - 4.0 mm)

Classifications low-alloy basic vertical down

EN ISO 2560-A:	AWS A5.5:	
E 46 5 1Ni B 4 5	E8018-G	

Characteristics and field of use

Basic coated vertical down electrode for high quality welded joints on large pipelines and in building structures. Suitable for welding filler and cover passes in pipeline construction. Weld metal, particularly crack-resistant, with high toughness down to -50°C. Very low hydrogen content in the weld metal. The deposition rate is 80-100% higher than vertical up welding. Through its good welding properties this Stick electrode permits easy processing even under difficult welding conditions. The special preparation of the striking ends gives maximum protection from start porosity. HIC and SSC resistance tested according to NACE TM 02-84 or TM 01-77.

Base materials

S235J2G3-S355J2G3, L290NB-L450NB, L290MB-L450MB, P235GH-P295GH API Spec. 5 L: A, B, X 42, X46, X 52, X 56, X 60, X 65


Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	
0.05	0.4	1.1	0.9	

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation	Impact values				
	0.2%		(L0=5 ₀ 0)	ISO-V				
	MPa	MPa	%	20°C	±0°C	-20°C	-40°C	-50°C
untreated	510	560	27	170	150	120	85	65

Operating data



Polarity = +

Dimensions (mm)	Amperage A
3.2 x 350	110-160
4.0 x 350	180-210
4.5 x 350	200-240

Approvals and certificates

TÜV (03531.), SEPROZ, CE

Classifications low-alloy basic vertical down

 EN ISO 18275-A: AWS A5.5:

 E 55 5 Z2Ni B 4 5 E9018-G
Characteristics and field of use

Basic coated vertical down electrode for high quality welded joints on large pipelines and in building structures. Suitable for welding filler and cover passes in pipeline construction. Weld metal, particularly crack-resistant, with high toughness. Through its good welding properties this Stick electrode permits easy processing even under difficult welding conditions. The special preparation of the striking ends gives maximum protection from start porosity. Very low hydrogen content in the weld metal. The deposition rate is 80-100% higher than vertical up welding.

Base materials

L485MB, L555MB API Spec. 5 L: X70, X80

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	
0.05	0.3	1.2	2.2	

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V				
				20°C	±0°C	-20°C	-40°C	-50°C
untreated	600	650	27	170	145	130	110	80

Operating data


Polarity = +

Dimensions (mm)	Amperage A
3.2 x 350	110-160
4.0 x 350	180-210
4.5 x 350	200-240

Approvals and certificates

TÜV (03402.), Statoil, SEPROZ, CE, GAZPROM (Ø 3.2; 4.0; 4.5 mm)

Classifications low-alloy basic vertical down

EN ISO 18275-A:	AWS A5.5:	
E 62 5 Z2Ni B 4 5	E10018-G	

Characteristics and field of use

Basic coated vertical down electrode for high quality welded joints on large pipelines and in building structures. Suitable for welding filler and cover passes in pipeline construction. Weld metal, particularly crack-resistant, with high toughness. Through its good welding properties this Stick electrode permits easy processing even under difficult welding conditions. The special preparation of the striking ends gives maximum protection from start porosity. Very low hydrogen content in the weld metal. The deposition rate is 80-100% higher than vertical up welding.

Base materials

L555MB API Spec. 5 L: X80

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	
0.07	0.4	1.2	2.3	

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V			
	MPa	MPa	%	+20°C:	±0°C:	-20°C:	-50°C:
untreated	670	730	24	150	125	120	70

Operating data

	Polarity = +
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Dimensions (mm)	Amperage A
4.0 x 350	180-210
4.5 x 350	200-240

Approvals and certificates

TÜV (06333.), SEPROZ, CE

Classifications

low-alloy high strength

EN ISO 2560-A:

AWS A5.5:

E 46 6 1Ni B 4 2 H5

E8018-C3H4R

Characteristics and field of use

Ni-alloy, basic coated Stick electrode with exceptional quality figures, in particular with high toughness and crack resistance for higher-strength fine-grained structural steels. Approved for armour plates. Suitable for the temperature range from -60°C to +350°C. Very good impact energy in aged condition. Deposition efficiency about 115%. Easily handled in all positions except for vertical down. Very low hydrogen content in the weld metal (under AWS conditions $HD \leq 4$ ml/100g).

Base materials

general structural steels, pipe and boiler steels, cryogenic fine-grained structural steels and special qualities. S275N-S460N, S275NL-S460NL, S275M-S460M, S275ML-S460ML, P355N, P355NH, P460N, P460NH, P275NL1-P460NL1, P275NL2-P460NL2, L360NB, L415NB, L360MB-L450MB, L360QB-L450QB ASTM A 203 Gr. D, E; A 350 Gr. LF1, LF2, LF3; A 420 Gr. WPL3, WPL6; A 516 Gr. 60, 65, 70; A 572 Gr. 42, 50, 55, 60, 65; A 633 Gr. A, D, E; A 662 Gr. A, B, C; A 707 Gr. L1, L2, L3; A 738 Gr. A; A 841 A, B, C; API 5 L X52, X60, X65, X52Q, X60Q, X65Q

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	
0.07	0.4	1.15	0.9	

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5_0$)	Impact values ISO-V	
	MPa	MPa	%	+20°C:	-60 °C:
untreated	510	610	27	180	110

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 350	80-100
3.2 x 350	110-140
4.0 x 450	140-180
5.0 x 450	190-230

Approvals and certificates

TÜV (1524.), DNV (3 YHH), RMR (3 YHH), Statoil, LTSS, SEPROZ, CRS (3YH5), CE, VG 95132

Classifications

low-alloy high strength

EN ISO 2560-A:

AWS A5.5:

E 50 4 Mo B 4 2

E7015-G

Characteristics and field of use

Basic covered electrode for welding high strength and creep resistant joints. High temperature resistant up to 500 °C (932 °F) and creep resistant up to 550 °C (1022 °F); high strength and cracking resistance; very low H₂-content ≤5 ml/100 g. For welding creep resistant joints in boilers, tanks and pipeline constructions, especially suited for boiler steel 16 Mo 3. Redry for 2 h at 300 - 350 °C (572 - 662 °F).

Base materials

boiler steels P235GH, P265GH, P295GH, P355GH, 16 Mo 3, 15 NiCuMoNb 5, 17 MnMoV 64, 13 MnNiMo 54, 20 MnMoNi 45; FK-steels S355N - S460N, P355NH - P460NH, P355NL1 - P460NL1; pipe steels L360NB - L415NB, L360MB - L485MB

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni
0.08	0.30	1.20	0.45

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀ 0)	Impact values ISO-V	
	MPa	MPa	%	+20 °C	-40 °C:
untreated	490	570	20	120	47

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 350	70-100
3.2 x 350	110-140
4.0 x 350	130-190
5.0 x 450	160-230
6.0 x 450	220-310

Approvals and certificates

TÜV (01829.), DB (10.132.14 and 20.132.15), ABS, GL, DNV

Phoenix SH Schwarz 3 K Ni

Stick electrode

Classifications

low-alloy high strength

EN ISO 2560-A:

AWS A5.5:

E 50 4 1NiMo B 4 2 H5

E9018-G

Characteristics and field of use

Basic covered NiMo alloyed electrode with a weld metal of special metallurgical purity for nuclear reactor construction. Quality controlled according to KTA 1408.2; very low H₂-content ≤5 ml/100 g; NDT-tested. Used preferably for the welding of steels in the construction of nuclear reactors, boiler and pressure vessels; for fine grained structural steels up to S500Q. Redry for 2 h at 300 - 350 °C (572 - 662 °F).

Base materials

20 MnMoNi 55, 22 NiMoCr 37, ASTM A 508 Cl 2, ASTM A 533 Cl 1 Gr. B, 15 NiCuMoNb 5 S 1 (WB 36), GS-18 NiMoCr 37, 11 NiMoV 53 (Welmonil 43), 12 MnNiMo 55 (Welmonil 35), S420N - S500Q, P460NH; ASTM A302 Gr. A-D; A517 Gr. A, B, C, E, F, H, J, K, M, P; A225 Gr. C; A572 Gr. 65

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	P	S	Mo	Ni	Cu
0.06	0.30	1.25	<=0.01	<=0.01	0.40	0.95	<=0.08

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V	
	MPa	MPa	%	+20°C	-40 °C:
untreated	540	620	20	140	50

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 350

70-100

3.2 x 350

100-150

4.0 x 350

140-200

5.0 x 450

170-250

Approvals and certificates

TÜV (00512.+08100.)

Classifications

low-alloy high strength

EN ISO 18275-A:

AWS A5.5:

E 55 6 1NiMo B 4 2 H5

E8018-GH4R

Characteristics and field of use

Basic coated Stick electrode of high toughness and crack-resistance for high-strength fine-grained structural steels. Cryogenic down to -60°C , and resistant to ageing. Approved for armour plates. Easily handled in all positions except for vertical down. Very low hydrogen content in the weld metal (under AWS conditions $\text{HD} \leq 4 \text{ ml/100g}$).

Base materials

general structural steels, pipe and boiler steels, cryogenic fine-grained structural steels and special qualities. S460N, S460M, S460NL, S460ML, S460Q-S550Q, S460QL-S550QL, 460QL1-S550QL1, P460N, P460NH, P460NL1, P460NL2, L415NB, L415MB-L555MB, L415QB-L555QB, alform 500 M, 550 M, aldur 500 Q, 500 QL, 500 QL1, aldur 550 Q, 550 QL, 550 QL1, GE300, 20MnMoNi4-5, 15NiCuMoNb5-6-4 ASTM A 572 Gr. 65; A 633 Gr. E; A 738 Gr. A; A 852; API 5 L X60, X65, X70, X80, X60Q, X65Q, X70Q, X80Q

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	Mo
0.06	0.3	1.2	0.8	0.35

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V	
	MPa	MPa	%	+20 °C:	-60 °C:
untreated	600	650	25	180	80

Operating data


Polarity = +

Dimensions (mm)
Amperage A

2.5 x 350	80-100
3.2 x 350	100-140
4.0 x 450	140-180
5.0 x 450	190-230

Approvals and certificates

TÜV (1802.), SEPROZ, CE, NAKS (Ø 3.2-4.0 mm), VG 95132

Phoenix SH Ni 2 K 100

Stick electrode

Classifications

low-alloy high strength

EN ISO 18275-A:

AWS A5.5:

E 69 5 Mn2NiCrMo B 4 2 H5

E11018-G

Characteristics and field of use

Basic covered NiCrMo alloyed electrode. Low H₂-content ≤5 ml/100 g (HD) in the weld metal; very low moisture pickup during long term storage. For high strength fine grained structural steels, for cast steel qualities; weld metal insensitive to cold cracking. Redry for 2 h at 300 - 350 °C (572 - 662 °F).

Base materials

Quenched and tempered fine grained structural steels up to 720 MPa yield point. High strength fine grained structural steels S620QL - S690QL, S620QL1, S690QU, HY 100, Suprafort 700, N-AXTRA 56, 63, 70

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni
0.06	0.20	1.60	0.38	0.40	1.85

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V	
	MPa	MPa	%	+20°C	-50 °C:
untreated	700	750	18	120	47

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 350	70-100
3.2 x 350	90-140
4.0 x 450	140-190
5.0 x 450	180-250

Approvals and certificates

TÜV (00548.), DB (10.132.35), GL, WIWEB (for HY100 + Suprafort700), BV

Classifications

low-alloy high strength

EN ISO 18275-A:

AWS A5.5:

E 69 6 Mn2NiCrMo B 4 2 H5

E11018-GH4R

Characteristics and field of use

Basic coated Stick electrode of high toughness and crack-resistance for high-strength fine-grained structural steels. Cryogenic down to -60°C , and resistant to ageing. Easily handled in all positions except for vertical down. Very low hydrogen content in the weld metal (under AWS conditions HD ≤ 4 ml/100g).

Base materials

quenched and tempered fine-grained structural steels up to 690 MPa yield strength S620Q, S620QL, S690Q, S690QL, S620QL1-S690QL1, alform plate 620 M, 700 M, aldur 620 Q, 620 QL, 620 QL1, aldur 700 Q, 700 QL, 700 QL1 ASTM A 514 Gr. F, H, Q; A 709 Gr. 100 Type B, E, F, H, Q; A 709 Gr. HPS 100W

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.05	0.4	1.7	0.4	2.1	0.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V	
	MPa	MPa	%	+20 °C:	-40 °C:
untreated	780	840	20	110	60

Operating data


Polarity = +

Dimensions (mm)
Amperage A

2.5 x 350	70-100
3.2 x 350	100-140
4.0 x 450	140-180
5.0 x 450	190-230

Approvals and certificates

TÜV (4313.), DB (10.014.22), SEPROZ, CE

Classifications

low-alloy creep resistant

EN ISO 3580-A:

AWS A5.5:

E Mo B 4 2 H5

E7018-A1H4R

Characteristics and field of use

Basic coated Stick electrode for high quality welded joints on creep resistant boiler and pipe steels, preferred for 16Mo3. Approved for long-term use in operating temperature ranges up to 550°C. Particularly high toughness and crack resistance. Very low hydrogen content (under AWS conditions $HD \leq 4 \text{ ml/100g}$). Deposition efficiency about 115%.

Base materials

creep-resistant steels and cast steels of the same type, steels resistant to ageing and to caustic cracking 16Mo3, 20MnMoNi4-5, 15NiCuMoNb5, S235JR-S355JR, S235JO-S355JO, S450JO, S235J2-S355J2, S275N-S460N, S275M-S460M, P235GH-P355GH, P355N, P285NH-P460NH, P195TR1-P265TR1, P195TR2-P265TR2, P195GH-P265GH, L245NB-L415NB, L450QB, L245MB-L450MB, GE200-GE300 ASTM A 29 Gr. 1013, 1016; A 106 Gr. C; A, B; A 182 Gr. F1; A 234 Gr. WP1; A 283 Gr. B, C, D; A 335 Gr. P1; A 501 Gr. B; A 533 Gr. B, C; A 510 Gr. 1013; A 512 Gr. 1021, 1026; A 513 Gr. 1021, 1026; A 516 Gr. 70; A 633 Gr. C; A 678 Gr. B; A 709 Gr. 36, 50; A 711 Gr. 1013; API 5 L B, X42, X52, X60, X65

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Mo
0.08	0.35	0.8	0.45

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V	
	MPa	MPa	%	+20°C:	-50 °C:
untreated	510	590	24	170	60

Operating data


Polarity = +

Dimensions (mm)
Amperage A

2.5 x 250/350	80-110
3.2 x 350	100-140
4.0 x 350/450	130-180
5.0 x 450	190-230

Approvals and certificates

TÜV (0019.), KTA 1408.1 (8053.), DB (10.014.14), ABS (E 7018-A1), DNV (NV 0.3Mo), GL (15 Mo 3), RS (-), Statoil, LTSS, SEPROZ, CRS (3YH10), CE, NAKS

Similar alloy filler metals

Stick electrode:	FOX DMO Ti	Gas welding rod:	DMO
TIG rod:	DMO-IG	Wire/flux combination:	EMS 2 Mo with BB 24 BB 306, BB 400, BB 418 TT BB 421 TT
Solid wire electrode:	DMO-IG		
Flux cored wire:	DMO Ti-FD		

Classifications

low-alloy creep resistant

EN ISO 3580-A:

AWS A5.5:

E Mo B 4 2 H5

E7018-A1

Characteristics and field of use

Basic covered electrode. Very good welding characteristics in out of position work; easy slag removal; cold toughness at temperatures as low as $-40\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$). High temperature resistant up to $500\text{ }^{\circ}\text{C}$ ($932\text{ }^{\circ}\text{F}$) and creep resistant up to $550\text{ }^{\circ}\text{C}$ ($1022\text{ }^{\circ}\text{F}$). Particularly suitable for circumferential welds in conduit pipes as well as boiler, pressure vessel, header and nuclear reactor fabrication. Redry for 2 h at $250 - 350\text{ }^{\circ}\text{C}$ ($482 - 662\text{ }^{\circ}\text{F}$).

Base materials

Boiler steels P235GH, P265GH, P295GH, 16 Mo 3, 20 MnMo 45, 16 Mo 5, 15 NiCuMoNb 5, 17 Mn-MoV 64; fine grained structural steels S355N - S460N, P355NH - P460NH, P355NL1 - P460NL1; pipe steels L360NB - L415NB, L360MB - L485MB, X 52 - X 70; ASTM A 355 Gr. P1; A161-94 Gr. T1; A217 Gr. WC1; A182M Gr. F1; A204M Gr. A, B, C; A250M Gr. T1

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Mo
0.06	0.35	0.8	0.45

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5_g0$)	Impact values ISO-V	
	MPa	MPa	%	+20 °C	-40 °C:
untreated	480	560	20	120	47

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 250	70-110
3.2 x 350	100-140
4.0 x 350	140-190
4.0 x 450	140-190
5.0 x 450	180-250

Approvals and certificates

TÜV (00902.), DB (10.132.31), ABS, LR, DNV

BÖHLER FOX DCMS Kb

Stick electrode

Classifications

low-alloy creep resistant

EN ISO 3580-A:

AWS A5.5:

E CrMo1 B 4 2 H5

E8018-B2H4R

Characteristics and field of use

Basic coated Stick electrode, core wire alloyed, for high quality welded seams in boiler and pipe steels, similar steel qualities, similar alloy quenched and tempered steels, untreated case hardening and nitriding steels. Preferred for 13CrMo4-5. Approved for long-term use in operating temperature ranges up to +570°C. Suitable for step cooling applications (Bruscati 15 ppm). High toughness and crack resistance, weld metal can be quenched and tempered. Very low hydrogen content (under AWS conditions $HD \leq 4 \text{ ml}/100\text{g}$). Deposition efficiency about 115 %. Preheating, interpass temperature and subsequent Heat Treatment according to the requirements of the base material in use (for 13CrMo4-5 at 200-250°C, temper after welding at 660-700°C, at least ½ h / furnace down to 300°C / air).

Base materials

same alloy creep resistant steels and cast steel, case-hardening and nitriding steels with comparable composition, heat treatable steels with comparable composition, steels resistant to caustic cracking 1.7335 13CrMo4-5, 1.7262 15CrMo5, 1.7728 16CrMoV4, 1.7218 25CrMo4, 1.7225 42CrMo4, 1.7258 24CrMo5, 1.7354 G22CrMo5-4, 1.7357 G17CrMo5-5 ASTM A 182 Gr. F12; A 193 Gr. B7; A 213 Gr. T12; A 217 Gr. WC6; A 234 Gr. WP11; A335 Gr. P11, P12; A 336 Gr. F11, F12; A 426 Gr. CP12

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	P	As	Sb	Sn
0.08	0.25	0.8	1.1	0.5	<=0.010	<=0.005	<=0.005	<=0.005

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V
	MPa	MPa	%	+40 °C:
t*	480	580	23	160

* 680 °C/2h / furnace down to 300 °C / air

Operating data

Polarity = +

Dimensions (mm)	Amperage A	Dimensions (mm)	Amperage A
2.5 x 250/350	80-110	4.0 x 350/450	130-180
3.2 x 350	100-140	5.0 x 450	180-220

Approvals and certificates

TÜV (0728.), DB (10.014.32), ABS (E 8018-B2), DNV (NV 1Cr 0.5Mo), GL (13 CrMo 44), LTSS, SEPROZ, CE, NAKS (Ø3.2 mm; Ø4.0 mm)

Similar alloy filler metals

Stick electrode:	FOX DCMS Ti	TIG rod:	DCMS-IG
Solid wire electrode:	DCMS-IG	Flux cored wire:	DCMS Ti-FD
Gas welding rod:	DCMS	Wire/flux combination:	EMS 2 CrMo with BB 24, BB 24 SC, BB 418 TT

Phoenix Chromo 1

Stick electrode

Classifications low-alloy creep resistant

EN ISO 3580-A: AWS A5.5:

E CrMo1 B 4 2 H5 E8018-B2

Characteristics and field of use

Basic covered CrMo alloyed electrode. Cryogenic, crack-free, suitable for quenching and tempering; resistant to caustic cracking; creep resistant in short time range up to 500 °C (932 °F) and in long time range up to 570 °C (1058 °F). Electrode for heavy-duty steam boiler and superheater tube fabrication; for quenched and tempered steels. Redry for 2 h at 300 up to 350 °C (572 up to 662 °F).

Base materials

13 CrMo 4-5, GS-22 CrMo 54, 42 CrMo 4

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	P	As	Sb	Sn
0.06	0.25	0.85	1.20	0.50	<=0.012	<=0.010	<=0.005	<=0.005

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V		
	MPa	MPa	%	+20 °C	-20 °C:	-40 °C:
SR	460	550	22	120	100	60

Operating data



Polarity = +

Dimensions (mm)	Amperage A
2.5 x 350	80-110
3.2 x 350	110-145
4.0 x 350	130-190
5.0 x 450	160-230

Approvals and certificates

TÜV (6535.), Controlas (1073)

Phoenix SH Chromo 2 KS

Stick electrode

Classifications

low-alloy creep resistant

EN ISO 3580-A:

AWS A5.5:

E CrMo2 B 4 2 H5

E9015-B3

Characteristics and field of use

Basic covered CrMo alloyed electrode. Extra low content of trace elements; step-cooling tested; not sensitive to long term embrittlement. Manufacture of chemical apparatus, hydrocrackers; for welding work on heavy-duty boilers, superheaters, superheater lines; for welding of CrMo and CrMoV alloyed steels for the petrochemical industry. Redry for 2 h at 300 - 350 °C (572 - 662 °F).

Base materials

10 CrMo 9-10, 12 CrMo 9-10, 10 CrSiMoV 7, 15 CrMoV 5-10; ASTM A335 Gr. P22, A217 Gr. WC9

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Mo	Cr	P	As	Sb	Sn	S
0.07	0.25	0.70	0.90	2.2	<=0.012	<=0.010	<=0.005	<=0.005	<=0.010

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V		
	MPa	MPa	%	+20°C	-30 °C:	-40 °C:
SR	440	550	22	130	90	80

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 350	70-100
3.2 x 350	100-145
3.2 x 450	100-145
4.0 x 350	140-190
4.0 x 450	140-190
5.0 x 450	160-240

Approvals and certificates

TÜV (01823.)

Phoenix SH Kupfer 3 KC

Stick electrode

Classifications low-alloy creep resistant

EN ISO 3580-A:	AWS A5.5:	
E ZCrMoV1 B 4 2 H5	E9015-G	

Characteristics and field of use

Basic covered CrMoV alloyed electrode. Good welding characteristics; uniform weld pattern; easy slag removal. Useable on low alloy creep resistant cast steel of the same composition. Redry for 2 h at 300 - 350 °C (572 - 662 °F).

Base materials

GS-17 CrMoV 511, GS-17 CrMo 55; creep resistant and similar cast steel; 1.7706 – G17CrMoV5-10

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	V
0.13	0.40	1.0	1.4	1.05	0.25

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V
	MPa	MPa	%	+20 °C
SR	520	630	18	40

Operating data



Polarity = +

Dimensions (mm)	Amperage A
3.2 x 450	90-140
4.0 x 450	140-190
5.0 x 450	180-240

Approvals and certificates

TÜV (03187.)

BÖHLER FOX CM 2 Kb

Stick electrode

Classifications

low-alloy creep resistant

EN ISO 3580-A:

AWS A5.5:

E CrMo2 B 4 2 H5

E9018-B3H4R

Characteristics and field of use

Basic coated stick electrodes, core wire alloyed, for components subject to high temperature stress in boiler, apparatus and pipeline construction, as well as in the petrochemical industry e.g. in cracking plants. Preferred for 10CrMo9 10. Approved for long-term use at operating temperatures of up to 600°C. For step cooling applications, a product range, specially developed for the purpose, is available. Crack-resistant, tough weld metal, high creep strength. Good welding properties in all positions other than vertical down. Weld metal can be nitrated, quenched and tempered. Deposition efficiency approx. 115%, low hydrogen content (under AWS conditions $HD \leq 4 \text{ ml/100 g}$).

Base materials

same type as creep-resistant steels and cast steels, similar alloy quenched and tempered steels up to 980 MPa strength, similar alloy case-hardening and nitriding steels 1.7380 10CrMo9-10, 1.7276 10CrMo11, 1.7281 16CrMo9-3, 1.7383 11CrMo9-10, 1.7379 G17CrMo9-10, 1.7382 G19CrMo9-10 ASTM A 182 Gr. F22; A 213 Gr. T22; A 234 Gr. WP22; 335 Gr. P22; A 336 Gr. F22; A 426 Gr. CP22

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	P	As	Sb	Sn
0.08	0.3	0.6	2.2	1.0	<=0.010	<=0.005	<=0.005	<=0.006

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V
	MPa	MPa	%	+20°C:
t*	510	600	20	120

*tempered, 730 °C/2h / furnace down to 300 °C / air

Operating data

Polarity = +

Dimensions (mm)**Amperage A**

2.5 x 250	80-110
3.2 x 350	100-140
4.0 x 350/450	130-180
5.0 x 450	180-230

Approvals and certificates

TÜV-D (0722.), DB (10.014.30), ABS (E 9018-B3), DNV (NV 2.25Cr 1Mo), GL (10 CrMo 9 10), SEPROZ, CE, NAKS (Ø3.2; Ø4.0 mm)

Similar alloy filler metals

Stick electrode:	FOX CM 2 Kb SC	Flux cored wire:	CM 2 Ti-FD
Wire/flux combination:	CM 2-UP/BB 24	Solid wire electrode:	CM 2-IG
	CM 2-UP/BB 418 TT	TIG rod:	CM 2-IG

Classifications

low-alloy creep resistant

EN ISO 3580-A:

AWS A5.5:

E CrMo5 B 4 2 H5

E8018-B6H4R

Characteristics and field of use

Basic coated Stick electrode, core wire alloyed, for creep resistant and high pressure hydrogen resistant steels in boiler construction and the petrochemical industry. Preferred for X12CrMo5. Approved for long-term use in an operating temperature range of up to +650°C. High crack resistance due to low hydrogen content (under AWS conditions HD ≤ 4 ml/100g). Good welding in all positions except for vertical down. Weld metal can be quenched and tempered, deposition efficiency about 115%.

Base materials

same type as creep-resistant steels and cast steels, similar alloy quenched and tempered steels up to 1180 MPa 1.7362 X12CrMo5 ASTM A 182 Gr. F5; A 193 Gr. B5; A 213 Gr. T5; A217 Gr. C5; A 234 Gr. WP5; A 314 Gr. 501; A335 Gr. P5 and P5c; A 369 Gr. FB 5; A 387 Gr. 5; A 426 Gr. CP5

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo
0.08	0.3	0.8	5.0	0.6

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V
	MPa	MPa	%	+20°C:
t*	520	620	21	90

*tempered, 730 °C/2h / furnace down to 300 °C / air

Operating data

	Polarity = +
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Dimensions (mm)	Amperage A
2.5 x 250	70-90
3.2 x 350	110-130
4.0 x 350	140-170

Approvals and certificates

TÜV (0725.), LTSS, SEPROZ, CE

Similar alloy filler metals

TIG rod:	CM 5-IG	Solid wire electrode:	CM 5-IG
Wire/flux combination:	CM 5-UP/BB 24		

BÖHLER FOX 2.5 Ni

Stick electrode

Classifications

low-alloy cryogenic

EN ISO 2560-A:

AWS A5.5:

E 46 8 2Ni B 4 2 H5

E8018-C1H4R

Characteristics and field of use

Ni-alloy, basic coated Stick electrode for unalloyed and Ni-alloy fine-grained structural steels. Tough, crack-resistant weld metal. The weld metal is cryogenic down to -80°C. Ideal weldability in all positions except for vertical down. Very low hydrogen content (under AWS conditions HD ≤ 4 ml/100g).

Base materials

cryogenic structural and Ni-alloy steels, special cryogenic shipbuilding steels. 10Ni14, 12Ni14, 13MnNi6-3, 15NiMn6, S275N-S460N, S275NL-S460NL, S275M-S460M, S275ML-S460ML, P275NL1-P460NL1, P275NL2-P460NL2 ASTM A 203 Gr. D, E; A 333 Gr. 3; A334 Gr. 3; A 350 Gr. LF1, LF2, LF3; A 420 Gr. WPL3, WPL6; A 516 Gr. 60, 65; AA 529 Gr. 50; A 572 Gr. 42, 65; A 633 Gr. A, D, E; A 662 Gr. A, B, C; A 707 Gr. L1, L2, L3; A 738 Gr. A; A 841 A, B, C

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni
0.04	0.3	0.8	2.4

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V	
				+20°C:	-80°C:
untreated	490	570	30	180	110

Operating data

Polarity = +

Dimensions (mm)	Amperage A
2.5 x 350	70-100
3.2 x 350	110-140
4.0 x 450	140-180
5.0 x 450	190-230

Approvals and certificates

TÜV (00147.), DB (10.014.16), ABS (Ni 2.1/2.6), BV (5Y40), WIWEB, DNV (5 YH10), GL (8Y46), LR (5Y40mH15), RINA (5YH5, 3H5), Statoil, SEPROZ, CE

Similar alloy filler metals

TIG rod:	2.5 Ni-IG	Solid wire electrode:	2.5 Ni-IG
Wire/flux combination:	Ni 2-UP/BB24 Ni 2-UP/BB 421 TT		

Chapter 1.2 - Stick electrodes (high-alloyed)

Product name	EN ISO	AWS	P
BÖHLER FOX P 92	EN ISO 3580-A	E ZCrMoWVNb 9 0.5 2 B 4 2 H5	AWS A5.5 E9015-B9 (mod.) 92
BÖHLER FOX S 9 MV	EN ISO 3580-A	E CrMo91 B 4 2 H5	AWS A5.5 E9015-B9 93
Thermanit MTS 616	EN ISO 3580-A	E ZCrMoWVNb 9 0.5 2 B 4 2 H5	AWS A5.28 E9015-G 94
Thermanit Chromo 9 V	EN ISO 3580-A	E CrMo9 1 B 4 2 H5	AWS A5.5 E9015-B9 95
Thermanit MTS 3	EN ISO 3580-A	E CrMo9 1 B 4 2 H5	AWS A5.28 E9015-B9 96
BÖHLER FOX CM 9 Kb	EN ISO 3580-A	E CrMo9 B 4 2 H5	AWS A5.5 E8018-B8 97
BÖHLER FOX 20 M/VW	EN ISO 3580-A	E CrMoWV 12 B 4 2 H5	- 98
Avesta 308/308H AC/DC	EN ISO 3581-A	E 19 9 R	AWS A5.4 E308H-17 99
BÖHLER FOX E 308 H	EN ISO 3581-A	E 19 9 H R 4 2	AWS A5.4 E308H-16 100
Thermanit ATS 4	EN ISO 3581-A	E 19 9 H B 2 2	AWS A5.4 E308H-15 101
BÖHLER FOX EAS 2	EN ISO 3581-A	E 19 9 L B 2 2	AWS A5.4 E308L-15 102
Avesta 308L/MVR	EN ISO 3581-A	E 19 9 L R	AWS A5.4 E308L-17 103
BÖHLER FOX EAS 2-A	EN ISO 3581-A	E 19 9 L R 3 2	AWS A5.4 E308L-17 104
Thermanit JEW 308L-17	EN ISO 3581-A	E 19 9 L R 3 2	AWS A5.4 E308L-17 105
Avesta 309L	EN ISO 3581-A	E 23 12 L R	AWS A5.4 E309L-17 106
BÖHLER FOX CN 23/12-A	EN ISO 3581-A	E 23 12 L R 3 2	AWS A5.4 E309L-17 107
BÖHLER FOX EAS 4 M	EN ISO 3581-A	E 19 12 3 L B 2 2	AWS A5.4 E316L-15 108
Avesta 316L/SKR Cryo	EN ISO 3581-A	E 19 12 3 L R	AWS A5.4 E316L-16 109
Avesta 316L/SKR	EN ISO 3581-A	E 19 12 3 L R	AWS A5.4 E316L-17 110
Avesta 316L/SKR-4D	EN ISO 3581-A	E 19 12 3 L R	AWS A5.4 E316L-17 111
BÖHLER FOX EAS 4 M-A	EN ISO 3581-A	E 19 12 3 L R 3 2	AWS A5.4 E316L-17 112
Thermanit GEW 316L-17	EN ISO 3581-A	E 19 12 3 L R 3 2	AWS A5.4 E316L-17 113
BÖHLER FOX SAS 4	EN ISO 3581-A	E 19 12 3 Nb B 2 2	AWS A5.4 E318-15 114
BÖHLER FOX SAS 4-A	EN ISO 3581-A	E 19 12 3 Nb R 3 2	AWS A5.4 E318-17 115
Thermanit AW	EN ISO 3581-A	E 19 12 3 Nb R 3 2	AWS A5.4 E318-17 116
Avesta 347/MVnb	EN ISO 3581-A	E 19 9 Nb R	AWS A5.4 E347-17 117
BÖHLER FOX SAS 2	EN ISO 3581-A	E 19 9 Nb B 2 2	AWS A5.4 E347-15 118
BÖHLER FOX SAS 2-A	EN ISO 3581-A	E 19 9 Nb R 3 2	AWS A5.4 E347-17 119
BÖHLER FOX CN 13/4	EN ISO 3581-A	E 13 4 B 6 2	AWS A5.4 E410NiMo-15 120
BÖHLER FOX X 7	EN ISO 3581-A	E 18 8 Mn B 2 2	AWS A5.4 E307-15 (mod.) 121
Thermanit X	EN ISO 3581-A	E 18 8 Mn B 2 2	AWS A5.4 E307-15 (mod.) 122
BÖHLER FOX A 7-A	EN ISO 3581-A	E 218 9 MnMo R 3 2	AWS A5.4 E307-16 (mod.) 123
Thermanit XW	EN ISO 3581-A	E 18 8 Mn R 1 2	AWS A5.4 E307-16 (mod.) 124
BÖHLER FOX CN 19/9 M	EN ISO 3581-A	E 20 10 3 R 3 2	AWS A5.4 E308Mo-17 (mod.) 125
Avesta 904L	EN ISO 3581-A	E 20 25 5 Cu N L R	AWS A5.4 E385-17 126
BÖHLER FOX CN 20/25 M-A	EN ISO 3581-A	E 20 25 5 Cu N L R 3 2	AWS A5.4 E385-17 (mod.) 127
Avesta 253 MA	EN ISO 3581-A	E 21 10 R	- 128
UTP 2133 Mn	EN ISO 3581-A	EZ 2133 B 42	- 129
Avesta 2205 basic	EN ISO 3581-A	E 22 9 3 N L B	AWS A5.4 E2209-15 130
Avesta 2205	EN ISO 3581-A	E 22 9 3 N L R	AWS A5.4 E2209-17 131
Avesta 2205-PW AC/DC	EN ISO 3581-A	E 22 9 3 N L R	AWS A5.4 E2209-17 132
BÖHLER FOX CN 22/9 N	EN ISO 3581-A	E 22 9 3 N L R 3 2	AWS A5.4 E2209-17 133
Avesta 2304	EN ISO 3581-A	E 23 7 N L R	- 134
Avesta LDX 2101	EN ISO 3581-A	E 23 7 N L R	- 135
Avesta P5	EN ISO 3581-A	E 23 12 2 L R	AWS A5.4 E309MoL-17 136
BÖHLER FOX CN 23/12 Mo-A	EN ISO 3581-A	E 23 12 2 L R 3 2	AWS A5.4 E309LMo-17 137
BÖHLER FOX FFB	EN ISO 3581-A	E 25 20 B 2 2	AWS A5.4 E310-15 (mod.) 138
BÖHLER FOX FFB-A	EN ISO 3581-A	E 25 20 R 3 2	AWS A5.4 E310-16 139
Avesta 310	EN ISO 3581-A	E 25 20 R	AWS A5.4 E310-17 140
Avesta 2507/P100 rutile	EN ISO 3581-A	E 25 9 4 N L R	AWS A5.4 E2594-16 141
Thermanit 25/09 CuT	EN ISO 3581-A	E 25 9 4 N L B 2 2	AWS A5.4 E2553-15 (mod.) 142
Thermanit 25/22 H	EN ISO 3581-A	E 225 22 L B 2 2	- 143
Avesta P7 AC/DC	EN ISO 3581-A	E 29 9 R	- 144
UTP 65 D	EN ISO 3581-A	E 29 9 R 12	- 145
Thermanit 30/10 W	EN ISO 3581-A	E 29 9 R 12	AWS A5.4 E312-16 mod. 146
BÖHLER FOX CN 29/9-A	EN ISO 3581-A	E 29 9 R 12	AWS A5.4 E312-17 147
UTP 65	EN ISO 3581-A	EZ 29 9 R 32	- 148
UTP 2535 Nb	EN ISO 3581-A	EZ 25 35 Nb B62	- 149
BÖHLER FOX NIBAS 625	EN ISO 14172	E Ni 6625 (NiCr22Mo9Nb)	AWS A5.11 ENiCrMo-3 150
Thermanit 625	EN ISO 14172	E Ni 6625 (NiCr22Mo9Nb)	AWS A5.11 ENiCrMo-3 151
UTP 6222 Mo	EN ISO 14172	E Ni 6625 (NiCr22Mo9Nb)	AWS A5.11 ENiCrMo-3 152
BÖHLER FOX NIBAS 70/20	EN ISO 14172	E Ni 6082 (NiCr20Mn3Nb)	AWS A5.11 ENiCrFe-3 (mod.) 153
Thermanit Nicro 82	EN ISO 14172	E Ni 6082 (NiCr20Mn3Nb)	AWS A5.11 ENiCrFe-3 (mod.) 154
UTP 068 HH	EN ISO 14172	E Ni 6082 (NiCr20Mn3Nb)	AWS A5.11 ENiCrFe-3 (mod.) 155
UTP 6170 Co	EN ISO 14172	E Ni 6117 (NiCr22Co12Mo)	AWS A5.11 ENiCrCoMo-1 (mod.) 156
Thermanit Nicro 182	EN ISO 14172	E Ni 6182 (NiCr15Fe6Mn)	AWS A5.11 ENiCrFe-3 157
UTP 759 Kb	EN ISO 14172	E Ni 6059 (NiCr23Mo16)	AWS A5.11 ENiCrMo-13 158
Thermanit Nimco C 24	EN ISO 14172	E Ni 6059 (NiCr23Mo16)	AWS A5.11 ENiCrMo-13 159
UTP 7015	EN ISO 14172	E Ni 6182 (NiCr15Fe6Mn)	AWS A5.11 ENiCrFe-3 160
UTP 7015 Mo	EN ISO 14172	E Ni 6093 (NiCr15Fe8NbMo)	AWS A5.11 ENiCrFe-2 161
UTP 7013 Mo	EN ISO 14172	E Ni 6620 (NiCr14Mo7Fe)	AWS A5.11 ENiCrMo-6 162
UTP 80 M	EN ISO 14172	E Ni 4060 (NiCu30Mn3Ti)	AWS A5.11 ENiCu-7 163
Avesta P12-R basic	EN ISO 14172	E Ni Cr 22 Mo 9	AWS A5.11 ENi Cr Mo-12 164

BÖHLER FOX P 92

Stick electrode

Classifications

high-alloyed

EN ISO 3580-A:

AWS A5.5:

E ZCrMoWVNb 9 0.5 2 B 4 2 H5

E9015-B9 (mod.)

Characteristics and field of use

BÖHLER FOX P 92 is a basic coated Stick electrode that was specially developed for welding the creep resistant steel 1.4901 (NF 616, P 92). It is characterised by a stable arc, good ignition and re-ignition properties, low spatter formation and easily removable slag. Approved for long-term use at operating temperatures of up to +650°C.

Base materials

same type as highly creep resistant steels 1.4901 X10CrWMoVNb9-2, NF 616 ASTM A 213 Gr. T92; A 335 Gr. P92

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	W	V	N	Nb
0.1	0.3	0.7	8.6	0.55	0.7	0.06	0.2	0.04	0.04

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V
	MPa	MPa	%	+20°C:
t*	600	740	20	55

*tempered, 760°C/2h, furnace down to 300°C, air

Operating data

Polarity = +

Dimensions (mm)**Amperage A**

2.5 x 300 80-110

3.2 x 350 90-140

4.0 x 350 130-180

Approvals and certificates

TÜV (9291.), SEPROZ, CE

Similar alloy filler metals

TIG rod:

P 92-IG

Flux cored wire:

P 92 Ti-FD

Wire/flux combination:

P 92-UP/BB 910

BÖHLER FOX C 9 MV

Stick electrode

Classifications

high-alloyed

EN ISO 3580-A:

AWS A5.5:

E CrMo91 B 4 2 H5

E9015-B9

Characteristics and field of use

Basic coated Stick electrode, core wire alloyed, for highly creep resistant, quenched and tempered 9-12% chrome steels, particularly for T91 and P91 steels. Approved for long-term use in an operating temperature range of up to +650°C. The Stick electrode provides good welding in all positions other than vertical down, and features good ignition properties.

Base materials

same type as highly creep resistant steels 1.4903 X10CrMoVNb9-1, GX12CrMoVNbN9-1 ASTM A 335 Gr. P91, A 336 Gr. F91, A 369 Gr. FP91, A 387 Gr. 91, A 213 Gr. T91

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Nb	V	N
0.1	0.2	0.6	8.5	0.5	1.0	0.06	0.2	0.04

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation	Impact values
	0.2%		(L ₀ =5 ₀)	ISO-V
	MPa	MPa	%	+20°C:
t*	580	710	19	75

*tempered, 760 °C/2h / furnace down to 300 °C / air

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 250

60-80

3.2 x 350

90-120

4.0 x 350

110-150

5.0 x 450

150-210

Approvals and certificates

TÜV (6762.), SEPROZ, CE

Similar alloy filler metals

TIG rod:	C 9 MV-IG	Wire/flux combination:	C 9 MV-UP/BB 910
Solid wire electrode:	C 9 MV-IG	Flux cored wire:	C 9 MV Ti-FD C 9 MV-MC

Thermanit MTS 616

Stick electrode

Classifications

high-alloyed

EN ISO 3580-A:

AWS A5.28:

E ZCrMoWVNb 9 0.5 1.5 2 B 4 2 H5

E9015-G

Characteristics and field of use

High temperature resistant. Suited for joining and surfacing applications with matching high temperature resistant parent metal P92 according to ASTM A 335.

Base materials

ASTM A 355 Gr. P92, NF 616; 1.4901 – X10CrWMoVNb9-2

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	V	W	Nb	N
0.11	0.2	0.6	8.8	0.5	0.7	0.2	1.6	0.05	0.05

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V
	MPa	MPa	%	+20°C
t*	560	720	15	41

*tempered 760°C/>=2h

Operating data

Polarity = +

Dimensions (mm)**Amperage A**

2.5 x 300	80-110
3.2 x 350	90-140
4.0 x 350	130-180

Approvals and certificates

TÜV (9291.), SEPROZ, CE

Thermanit Chromo 9 V

Stick electrode

Classifications

high-alloyed

EN ISO 3580-A:

AWS A5.5:

E CrMo 91 B 4 2 H5

E9015-B9

Characteristics and field of use

Basic covered CrMoVNb alloyed electrode. Good welding characteristics in out of position work; high temperature resistant weld metal. For quenched and tempered 9 % chromium steels, in particular P 91 / T 91 according to ASTM. Redry for 2 h at 300 - 350 °C (572 - 662 °F).

Base materials

For quenched and tempered 9 % chromium steels, in particular P91 / T91 according to ASTM. X10CrMoVNb91 (1.4903), A 213-T91, A 335-P91, A 387 Gr. 91 (plates), A 182 F91 (forgings).

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	V	Nb	N
0.09	0.2	0.6	9.0	1.1	0.8	0.2	0.05	0.04

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V
	MPa	MPa	%	+20°C
t*	550	680	17	47

*t 760°C/2h

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 250	70-100
3.2 x 350	100-145
4.0 x 350	140-190
5.0 x 450	160-240

Approvals and certificates

TÜV (6173.), Controlas (1353)

Thermanit MTS 3

Stick electrode

Classifications

high-alloyed

EN ISO 3580-A

AWS A5.28:

E CrMo 91 B 4 2 H5

E9015-B9

Characteristics and field of use

High temperature resistant, resistant to scaling up to 600 °C (1112 °F). Suited for joining and surfacing applications with quenched and tempered 9% Cr steels, particularly for matching high temperature resistant parent metal T91/P91 according to ASTM.

Base materials

1.4903 – X10CrMoVNb9-1; ASTM A 199 Gr. T91, A213/213M Gr. T91, A355 Gr. P91 (T91)

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	V	Nb	N
0.09	0.3	0.5	9.0	0.9	0.7	0.2	0.05	0.04

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V
	MPa	MPa	%	+20°C
t*	550	680	17	47

*tempered 760°C/2h

Operating data



Polarity = +

Dimensions (mm)

0.8	1.0	1.2	1.6
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Approvals and certificates

TÜV (6166.), Controlas

Classifications

high-alloyed

EN ISO 3580-A:

AWS A5.5:

E CrMo9 B 4 2 H5

E8018-B8

Characteristics and field of use

Basic coated Stick electrode, core wire alloyed, for creep resistant and high pressure hydrogen resistant boiler and pipe steels, particularly in the petrochemical industry. Preferred for X11CrMo9-1 (P9). Approved for long-term use in an operating temperature range of up to +600°C. Weld metal can be quenched and tempered, deposition efficiency about 115%.

Base materials

same type as highly creep resistant steels 1.7386 X11CrMo9-1, 1.7388 X7CrMo9-1 ASTM A 182 Gr. F9; A 213 Gr. T9; A 217 Gr. C12; A 234 Gr. WP9; A 335 Gr. P9; A 336 Gr. F9; A 369 Gr. FB9; A 387 Gr. 9 and 9CR; A 426 Gr. CP9; A 989 Gr. K90941

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo
0.08	0.25	0.65	9.0	1.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V
	MPa	MPa	%	+20°C:
t*	610	730	20	70

t* tempered, 760 °C / 1 h / furnace down to 300 °C / air

Operating data


Polarity = +

Dimensions (mm)
Amperage A

2.5 x 250

70-90

3.2 x 350

100-130

4.0 x 350

130-160

Approvals and certificates

TÜV (2183.), SEPROZ, CE

Similar alloy filler metals
TIG rod:

CM 9-IG

BÖHLER FOX 20 MVW

Stick electrode

Classifications

high-alloyed

EN ISO 3580-A:

E CrMoWV 12 B 4 2 H5

Characteristics and field of use

Basic coated, core wire alloyed electrode for highly creep resistant, quenched and tempered 12% Cr steels in turbine and boiler construction and in the chemical industry. Preferred for X20Cr-MoV11-1. Approved for long-term use at operating temperatures of up to +650°C. High creep strength and very good toughness under long-term stress. Strict composition tolerances ensure high-quality weld metal. Low hydrogen content (under AWS conditions HD ≤ 4 ml/100 g). Good welding in all positions except for vertical down. Weld metal can be quenched and tempered. Deposition efficiency about 115%.

Base materials

same and similar types to highly creep-resistant steels 1.4922 X20CrMoV11-1 (T550 Extra), 1.4935 X20CrMoWV12-1, 1.4923 X22CrMoV12-1, 1.4926 X21CrMoV12-1, 1.4913 X19CrMoNbVN 11-1 (T560 Extra), 1.4931 GX23CrMoV12-1

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	V	W
0.18	0.3	0.7	11.0	0.55	0.9	0.25	0.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V
	MPa	MPa	%	+20°C:
t*	580	780	18	45

*tempered, 760 °C / 4 h / furnace down to 300 °C / air

Operating data

Polarity = +

Dimensions (mm)	Amperage A
2.5 x 250	60-80
3.2 x 350	90-120
4.0 x 350	110-140
5.0 x 450	150-180

Approvals and certificates

TÜV (01082.), KTA 1408.1 (8088.), DB (10.014.31), LTSS, SEPROZ, CE

Similar alloy filler metals

TIG rod:	20 MVW-IG	Wire/flux combination:	20 MVW-UP/BB 24
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Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 9 R

E308H-17

Characteristics and field of use

Avesta 308/308H AC/DC is a high carbon Cr-Ni electrode primarily intended for welding 1.4948/ASTM 304H type stainless steels exposed to temperatures above 400°C.

Base materials

For welding steels such as

Outokumpu	EN	ASTM	BS	NF	SS
4948	1.4948	304H	305S51	Z6 CN 18-09	2333
4301	1.4301	304	304S31	Z7 CN 18-09	2333
4541	1.4541	321	321S31	Z6 CNT 18-10	2337
-	1.4550	347	347S31	Z6 CNNb 18-10	2338

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.06	0.7	1.1	20.0	10.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-40°C:
untreated	450	605	37	55	50

Operating data



Polarity = + / ~

Dimensions (mm)

Amperage A

2.5 x 300	50-80
3.25 x 350	80-120
4.0 x 350	130-160
5.0 x 350	160-220

BÖHLER FOX E 308 H

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 9 H R 4 2

E308H-16

Characteristics and field of use

Rutile-basic coated Stick electrode for highly creep resistant austenitic CrNi steels, for operating temperatures up to +700°C. BÖHLER FOX E 308 H was specially formulated for the 304 H base material. Resistant to hot cracking and little tendency to embrittlement through controlled ferrite content (3-8 FN), scale-resistant. Very good welding in all positions except for vertical down.

Base materials

same type as highly creep resistant steels 1.4948 X6CrNi18-10, 1.4878 X8CrNiTi18-10, 1.4940 X7CrNiTi18-10, 1.4910 X3CrNiMoBN17-13-3 AISI 304H, 321H, 347H

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.05	0.6	0.8	19.8	10.2

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 ₀)	Impact values ISO-V
	MPa	MPa	%	+20°C:
untreated	420	580	40	75

Operating data

Polarity = + / ~

Dimensions (mm)**Amperage A**

2.5 x 300	45-75
3.2 x 350	70-110
4.0 x 350	110-145

Approvals and certificates

TÜV (11178.), CE, SEPROZ

Similar alloy filler metals

Stick electrode:	FOX CN 18/11	Flux cored wire:	E 308 H-FD
Wire/flux combination:	CN 18/11-UP/BB 202	TIG rod:	ER 308 H-IG E 308 H PW-FD CN 18/11-IG
Solid wire electrode:	CN 18/11-IG		

Thermanit ATS 4

Stick electrode

Classifications

high-alloyed

EN 3581-A:

AWS A5.4:

E 19 9 H B 2 2

E308H-15

Characteristics and field of use

High temperature resistant up to 700 °C (1292 °F); resistant to scaling up to 800 °C (1472 °F). For surfacing and joining applications on matching/similar high temperature resistant steels/cast steel grades.

Base materials

TÜV certified parent metals 1.4948 – X6CrNi18-11 1.4878 – X12CrNiTi18-9 1.4550 – X6CrNiNb18-10 AISI 304, 304H, 321H, 347H

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.05	0.3	1.6	18.5	9.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5 _g 0)	Impact values ISO-V
	MPa	MPa	%	+20 °C
untreated	350	550	35	70

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 300	55- 80
3.2 x 350	80-105
4.0 x 350	90-135
5.0 x 450	150-190

Approvals and certificates

TÜV (01526.)

BÖHLER FOX EAS 2

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 9 L B 2 2

E308L-15

Characteristics and field of use

Low carbon, core wire alloyed austenitic stick electrode with basic coating. For application in all branches of industry where same-type steels, including higher-carbon steels and ferritic 13% chrome steels are welded. Developed for first-class welded joints with very good root and position welding. Good gap bridging and easy control of the weld pool and of the slag. Easy slag removal even in tight seams. The clean surface of the seam guarantees short reworking times. Exceptionally suitable for thick-walled, stressed constructions and for assembly welding. Resists intergranular corrosion up to +350°C. This product is also available as a LF (low ferrite) type.

Base materials

1.4306 X2CrNi19-11, 1.4301 X5CrNi18-10, 1.4311 X2CrNi18-10, 1.4312 GX10CrNi18-8, 1.4541 X6CrNiTi18-10, 1.4546 X5CrNiNb18-10, 1.4550 X6CrNiNb18-10 AISI 304, 304L, 304LN, 302, 321, 347, ASTM A157 Gr. C9, A320 Gr. B8C or D

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.03	0.4	1.3	19.8	9.6

FN 4-10

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
				+20°C:	-196°C:
untreated	420	590	38	110	50

Operating data

Polarity = +

Dimensions (mm)**Amperage A**

2.5 x 300	50-80
3.2 x 350	80-110
4.0 x 350	110-140

Approvals and certificates

TÜV (0152.), DB (30.014.10), Statoil, SEPROZ, CE

Similar alloy filler metals

GMAW solid wire:	FOX EAS 2-A FOX EAS 2-VD FOX EAS 2 (LF)	Flux cored wire:	EAS 2-MC EAS 2-FD EAS 2 PW-FD EAS 2 PW-FD (LF)
TIG rod:	EAS 2-IG	Solid wire electrode:	EAS 2-IG (Si)
Wire/flux combination:	EAS 2-UP/BB 202		

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 9 L R

E308L-17

Characteristics and field of use

Avesta 308L/MVR is a Cr-Ni electrode for all position welding of 1.4301/ASTM 304 type stainless steels. Corrosion resistance: Very good under fairly severe conditions, e.g. in oxidising acids and cold or dilute reducing acids.

Base materials

Outokumpu	EN	ASTM	BS	NF	SS
4301	1.4301	304	304S31	Z7 CN 18-09	2333
4307	1.4307	304L	304S11	Z3 CN 18-10	2352
4311	1.4311	304LN	304S61	Z3 CN 18-10 Az	2371
4541	1.4541	321	321S31	Z6 CNT 18-10	2337

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.02	0.8	0.6	19.5	10.0

Ferrite 8 FN; WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength 1.0%	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	MPa	MPa	%	+20°C:	-40°C:	-196°C:
untreated	440	570	37	60	40	27

Operating data



Polarity =+ / ~

Dimensions (mm)

Amperage A

2.0 x 300	30-55
2.5 x 350	45-70
3.25 x 350	60-110
4.0 x 450	90-150
5.0 x 450	140-200

BÖHLER FOX EAS 2-A

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 9 LR 3 2

E308L-17

Characteristics and field of use

Low carbon, core wire alloyed, austenitic stick electrode with rutile coating. For application in all branches of industry where same-type steels, including higher-carbon steels and ferritic 13% chrome steels are welded. Special fine welding properties, excellent welding with AC power and a high resistance to hot cracking in the weld metal are features of this product. The exceptional position welding capacity and the self-releasing slag are of significant economic importance. Resists intergranular corrosion up to +350°C.

Base materials

1.4306 X2CrNi19-11, 1.4301 X5CrNi18-10, 1.4311 X2CrNiN18-10, 1.4312 G-X10CrNi18-8, 1.4541 X6CrNiTi18-10, 1.4546 X5CrNiNb18-10, 1.4550 X6CrNiNb18-10 AISI 304, 304L, 304LN, 302, 321, 347, ASTM A157 Gr. C9, A320 Gr. B8C or D

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.03	0.8	0.8	19.8	10.2

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	MPa	MPa	%	+20°C:	-120°C:	-196°C:
untreated	430	560	40	70	≥ 32	≥ 32

Operating data

Polarity = + / ~

Dimensions (mm)**Amperage A**

1.5 x 250	25-40
2.0 x 300	40-60
2.5 x 250/350	50-90
3.2 x 350	80-110
4.0 x 350	110-160
5.0 x 450	140-200

Approvals and certificates

TÜV (1095), DB (30.014.15), ABS (E 308L-17), GL (4306), Statoil, VUZ, SEPROZ, CE, CWB, NAKS (Ø3.2 mm; Ø4.0 mm)

Similar alloy filler metals

GMAW solid wire:	FOX EAS 2 FOX EAS 2-VD	Flux cored wire:	EAS 2-MC EAS 2-FD EAS 2 PW-FD EAS 2 PW-FD (LF)
Solid wire electrode:	EAS 2-IG (Si)		
Wire/flux combination:	EAS 2-UP/BB 202	TIG rod:	EAS 2-IG

Thermanit JEW 308L-17

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:	AWS A5.4:	
E 19 9 L R 3 2	E308L-17	

Characteristics and field of use

Stainless; resistant to intercrystalline corrosion and wet corrosion up to 350 °C (662 °F). Corrosion resistant similar to matching low carbon and stabilized austenitic 18/8 CrNi(N) steels/cast steel grades. Good resistance to nitric acid. For joining and surfacing applications with matching and similar – stabilized and non stabilized – CrNi(N) steels/cast steel grades. Cold toughness at subzero temperatures as low as –105 °C (–157 °F).

Base materials

1.4311 – X2CrNi18-10, 1.4550– X6CrNiNb18-10; AISI 304, 304L, 304LN, 302, 321, 347; ASTM A157 Gr. C9; A320 Gr. B8C or D

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
<0.04	<0.9	0.8	19.5	9.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-105°C:
untreated	320	550	35	65	40

Operating data

Polarity = + / ~

Dimensions (mm)	Amperage A
2.0 x 300	40-60
2.5 x 350	50-90
3.2 x 350	80-120
4.0 x 350	110-160
5.0 x 450	140-200

Approvals and certificates

TÜV (00558.), DB (30.132.07), CWB

Avesta 309L

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 23 12 L R

E309L-17

Characteristics and field of use

Avesta 309L is a high-alloyed low carbon electrode designed for welding dissimilar joints between stainless and mild or low-alloy steels. The electrode is well suited as a buffer layer when overlay welding on mild steels, providing an 18 Cr 8 Ni deposit from the very first layer. Avesta 309L can also be used for welding some high temperature steels, such as 1.4833/ASTM 309S.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
High-alloyed low carbon electrode for surfacing unalloyed steel, joint welding molybdenum-alloyed stainless steel to unalloyed steel and for welding clad material.					

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.02	0.8	0.8	23.0	13.3

FN 12; WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-40°C:
untreated	450	570	35	50	45

Operating data

Polarity = + / ~

Dimensions (mm)	Amperage A
2.0	35-60
2.5	50-80
3.25	80-120
4.0	100-160
5.0	160-220

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 23 12 LR 3 2

E309L-17

Characteristics and field of use

Core wire alloyed, low-carbon, austenitic stick electrode with rutile coating. High crack resistance with hard-to-weld materials, austenite-ferrite joints and weld claddings is achieved through the increased ferrite content (FN ~17) in the weld metal. Particularly good fine welding properties and excellent AC weldability characterise this product. For operating temperatures between -60°C and +300°C, for the first layer of weld claddings up to +400°C.

Base materials

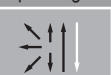
Joints of and between high-strength, unalloyed and alloyed quenched and tempered steels, stainless, ferritic Cr and austenitic Cr-Ni steels, austenitic manganese steels and weld claddings: for the first layer of chemically resistant weld claddings on the ferritic-pearlitic steels used for boiler and pressure vessel construction up to fine-grained structural steel S500N, and for the creep resistant fine-grained structural steels 22NiMoCr4-7, 20MnMoNi5-5 and GS-18NiMoCr 3 7

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.02	0.7	0.8	23.2	12.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-60°C:
untreated	460	570	40	55	≥ 32

Operating data


Polarity = + / ~

Dimensions (mm)
Amperage A

2.5 x 350	60-80
3.2 x 350	80-110
4.0 x 350/450	110-140
5.0 x 450	140-180

Approvals and certificates

TÜV (1771.), DB (30.014.08), ABS (E 309L-17), BV (UP), DNV (NV 309 L), GL (4332), LR (DXV and O, CMnSS), SEPROZ, CE, CWB, NAKS (Ø3.2 mm; Ø4.0 mm)

Similar alloy filler metals

Stick electrode:	FOX CN 23/12 Mo-A	Wire/flux combination:	CN 23/12-UP/BB 202
TIG rod:	CN 23/12-IG	Flux cored wire:	CN 23/12-MC CN 23/12-FD CN 23/12 PW-FD CN 23/12 Mo-FD CN 23/12 Mo PW-FD
Solid wire electrode:	CN 23/12-IG		

BÖHLER FOX EAS 4 M

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 L B 2 2

E316L-15

Characteristics and field of use

Low carbon, core wire alloyed austenitic stick electrode with basic coating. For application in all branches of industry where same-type steels, including higher-carbon steels and ferritic 13% chrome steels are welded. The weld metal has high toughness. It is therefore preferred for welding thick cross sections. Very good position welding. Cryogenic down to -196°C. Resists intergranular corrosion up to +400°C.

Base materials

1.4401 X5CrNiMo17-12-2, 1.4404 X2CrNiMo17-12-2, 1.4435 X2CrNiMo18-14-3, 1.4436 X3CrNiMo17-13-3, 1.4571 X6CrNiMoTi17-12-2, 1.4580 X6CrNiMoNb17-12-2, 1.4583 X10CrNiMoNb18-12, 1.4409 GX2CrNiMo19-11-2 UNS S31603, S31653; AISI 316L, 316Ti, 316Cb

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.03	0.4	1.2	18.8	11.8	2.7

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
				+20°C:	-120°C:	-196°C:
untreated	460	600	38	90	≥ 32	≥ 27

Operating data

Polarity = +

Dimensions (mm)**Amperage A**

2.5 x 300	50-80
3.2 x 350	80-110
4.0 x 350	110-140

Approvals and certificates

TÜV (0772.), DNV (316), Statoil, SEPPOZ, CE

Similar alloy filler metals

Stick electrode:	FOX EAS 4 M-A FOX EAS 4 M-VD FOX EAS 4 M-TS FOX EAS 4 M (LF)	Flux cored wire:	EAS 4 M-MC EAS 4 M-FD EAS 4 PW-FD EAS 4 PW-FD (LF)
TIG rod:	EAS 4 M-IG	Wire/flux combination:	EAS 4 M-UP/BB 202
Solid wire electrode:	EAS 4 M-IG (Si)		

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 L R

E316L-16

Characteristics and field of use

Avesta 316L/SKR Cryo is a Cr-Ni-Mo electrode for all position welding of austenitic stainless steels such as 1.4436/ASTM 316. The carefully controlled chemical composition gives a weld metal with a ferrite content in the range of 3 – 8 FN (WRC-92) and very good toughness down to -196°C.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
4436	1.4436	316	316S33	Z7 CND 18-12-03	2343
4432	1.4432	316L	316S13	Z3 CND 17-12-03	2353
4429	1.4429	S31653	316S63	Z3 CND 17-12 Az	2375
4571	1.4571	316Ti	320S31	Z6 CNDT 17-12	2350

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.4	1.2	17.2	12.3	2.6

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	-196°C:
untreated	450	570	35	42

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5	50-80
3.25	70-120
4.0	100-160

Avesta 316L/SKR

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 LR

E316L-17

Characteristics and field of use

Avesta 316L/SKR is an all position Cr-Ni-Mo electrode for welding ASTM 316 and 316L stainless steels.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
4436	1.4436	316	316S33	Z7 CND 18-12-03	2343
4432	1.4432	316L	316S13	Z3 CND 17-12-03	2353
4429	1.4429	S31653	316S63	Z3 CND 17-12 Az	2375
4571	1.4571	316Ti	320S31	Z6 CNDT 17-12	2350

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.8	0.7	18.0	12.0	2.8

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	MPa	MPa	%	+20°C:	-40°C:	-196°C:
untreated	460	590	36	60	55	27

Operating data

Polarity = + / ~

Dimensions (mm)	Amperage A
1.6	25-50
2.0	30-60
2.5	45-80
3.25	70-120
4.0	90-160
5.0	150-220

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 LR

E316L-17

Characteristics and field of use

Avesta 316L/SKR-4D is a thin-coated, rutileacid type electrode specially developed for welding thin-walled pipes and sheets in 1.4436/ASTM 316 type steel, mainly in the chemical process and papermaking industries. It is highly suitable for welding in restrained positions and under difficult site conditions, where it offers considerably higher productivity than manual TIG-welding. It is also recommended for root runs and multi-pass welds in general fabrication of ASTM 316-type stainless steels in all material thicknesses. Pipe welding can be performed in several different ways. One possibility is to start welding in the overhead position (1), followed by vertical-down on both sides from the 12 o'clock position (2 and 3). Another possibility is to start at the 7 o'clock position and weld vertical up to the 11 o'clock position on both sides. This requires an inverter power source with a remote control. To bridge large root gaps DC- is often preferred.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
4436	1.4436	316	316S33	Z7 CND 18-12-03	2343
4432	1.4432	316L	316S13	Z3 CND 17-12-03	2353
4429	1.4429	S31653	316S63	Z3 CND 17-12 Az	2375
4571	1.4571	316Ti	320S31	Z6 CNDT 17-12	2350


Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.8	0.7	18.2	12.2	2.6

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-20°C:
untreated	480	590	34	60	55

Operating data

	Polarity = + / ~
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Dimensions (mm)	Amperage A
1.6	15-40
2.0	25-55
2.5	30-85
3.25	45-110

BÖHLER FOX EAS 4 M-A

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 LR 3 2

E316L-17

Characteristics and field of use

Low carbon, core wire alloyed, austenitic stick electrode with rutile coating. For application in all branches of industry where same-type steels, including higher-carbon steels and ferritic 13% chrome steels are welded. Special fine welding properties, excellent welding with AC power and a high resistance to hot cracking in the weld metal are features of this product. Resists intergranular corrosion up to +400°C.

Base materials

1.4401 X5CrNiMo17-12-2, 1.4404 X2CrNiMo17-12-2, 1.4435 X2CrNiMo18-14-3, 1.4436 X3CrNiMo17-13-3, 1.4571 X6CrNiMoTi17-12-2, 1.4580 X6CrNiMoNb17-12-2, 1.4583 X10CrNiMoNb18-12, 1.4409 GX2CrNiMo19-11-2 NS S31603, S31653; AISI 316L, 316Ti, 316Cb

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.03	0.8	0.8	18.8	11.5	2.7

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-120°C:
untreated	460	600	36	90	≥ 32

Operating data

Polarity = + / ~

Dimensions (mm)**Amperage A**

1.5 x 250	25-40
2.0 x 300	40-60
2.5 x 250/350	50-90
3.2 x 350	80-120
4.0 x 350/450	110-160
5.0 x 450	140-200

Approvals and certificates

TÜV (0773), DB (30.014.14), ABS (E 316L-17), DNV (316L), GL (4571), LR (316Lm), Statoil, VUZ, SEPROZ, CE, CWB, NAKS (Ø3.2 mm; Ø4.0 mm)

Similar alloy filler metals

Stick electrode:	FOX EAS 4 M FOX EAS 4 M-VD FOX EAS 4 M-TS FOX EAS 4 M (LF)	Flux cored wire:	EAS 4 M-MC EAS 4 M-FD EAS 4 PW-FD EAS 4 PW-FD (LF)
TIG rod:	EAS 4 M-IG	Wire/flux combination:	EAS 4 M-UP/BB 202
Solid wire electrode:	EAS 4 M-IG (Si)		

Thermanit GEW 316L-17

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 L R 3 2

E316L-17

Characteristics and field of use

Stainless; resistant to intercrystalline corrosion and wet corrosion up to 400 °C (752 °). Corrosion resistant similar to matching low carbon and stabilized austenitic 18/8 CrNiMo steels/cast steel grades. For joining and surfacing applications with matching/similar – non stabilized and stabilized – austenitic CrNi(N) and CrNiMo(N) steels/cast steel grades.

Base materials

TÜV certified parent metals 1.4583 – X10CrNiMoNb18-12 1.4429 – X2CrNiMoN17-13-3 S31653; AISI 316L, 316Ti, 316Cb

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni
<0.04	<0.9	0.8	19.0	2.8	12.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-105°C:
untreated	350	550	35	60	40

Operating data

Polarity = + / ~

Dimensions (mm)**Amperage A**

2.0 x 300	40-60
2.5 x 350	50-90
3.2 x 350	80-120
4.0 x 350	110-160
5.0 x 450	140-200

Approvals and certificates

TÜV (00484.), DB (30.132.14), GL, LRS, CWB

BÖHLER FOX SAS 4

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 Nb B 2 2

E318-15

Characteristics and field of use

Stabilised, core wire alloyed austenitic stick electrode with basic coating. For application in all branches of industry where same-type steels and ferritic 13% chrome steels are welded. The weld metal has high toughness. It is therefore preferred for welding thick cross sections. Very good position welding. Resists intergranular corrosion up to +400°C.

Base materials

1.4571 X6CrNiMoTi17-12-2, 1.4580 X6CrNiMoNb17-12-2, 1.4401 X5CrNiMo17-12-2, 1.4581 GX5CrNiMoNb19-11-2, 1.4437 GX6CrNiMo18-12, 1.4583 X10CrNiMoNb18-12, 1.4436 X3CrNiMo17-13-3 AISI 316L, 316Ti, 316Cb

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Nb
0.03	0.4	1.3	18.8	11.8	2.7	+

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-90°C:
untreated	490	660	31	120	≥ 32

Operating data

Polarity = +

Dimensions (mm)	Amperage A
2.5 x 300	50-80
3.2 x 350	80-110
4.0 x 350	110-140

Approvals and certificates

TÜV (0774.), DB (30.014.05), ABS (Cr17/20, Ni10/13), GL (4571), SEPROZ, CE

Similar alloy filler metals

Stick electrode:	FOX SAS 4-A	Flux cored wire:	SAS 4 -FD SAS 4 PW-FD
Solid wire electrode:	SAS 4-IG (Si)	Wire/flux combination:	SAS 4-UP/BB 202
TIG rod:	SAS 4-IG		

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 Nb R 3 2

E318-17

Characteristics and field of use

Stabilised, core wire alloyed, austenitic stick electrode with rutile coating. For application in all branches of industry where same-type steels and ferritic 13% chrome steels are welded. Special fine welding properties, excellent welding with AC power and a high resistance to hot cracking in the weld metal are features of this product. Resists intergranular corrosion up to +400°C.

Base materials

1.4571 X6CrNiMoTi17-12-2, 1.4580 X6CrNiMoNb17-12-2, 1.4401 X5CrNiMo17-12-2, 1.4581 GX5CrNiMoNb19-11-2, 1.4437 GX6CrNiMo18-12, 1.4583 X10CrNiMoNb18-12, 1.4436 X3CrNiMo17-13-3 AISI 316L, 316Ti, 316Cb

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Nb
0.03	0.8	0.8	19.0	12	2.7	+

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-90°C:
untreated	490	640	32	60	≥ 32

Operating data


Polarity = + / ~

Dimensions (mm)
Amperage A

2.0 x 300	40-60
2.5 x 250/350	50-90
3.2 x 350	80-120
4.0 x 350	110-160
5.0 x 450	140-200

Approvals and certificates

TÜV (0777.), DB (30.014.07), LTSS, SEPROZ, CE, NAKS (Ø 2.5; 3.2; 4.0 mm)

Similar alloy filler metals

Stick electrode:	FOX SAS 4	Flux cored wire:	SAS 4 -FD SAS 4 PW-FD
TIG rod:	SAS 4-IG	Wire/flux combination:	SAS 4-UP/BB 202
Solid wire electrode:	SAS 4-IG (Si)		

Thermanit AW

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 12 3 Nb R 3 2

E318-17

Characteristics and field of use

Stainless; resistant to intercrystalline corrosion and wet corrosion up to 400 °C (752 °F). Corrosion resistant similar to matching stabilized CrNiMo steels. For joining and surfacing work with matching and similar stabilized and non stabilized austenitic CrNi(N)- and CrNiMo(N) steels and cast steel grades.

Base materials

1.4583 – X10CrNiMoNb18-12; AISI 316L, 316Ti, 316Cb

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Nb
<0.03	<0.9	0.8	19.0	2.8	12.0	>10xC

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C
untreated	400	550	30	60

Operating data



Polarity = + / ~

Dimensions (mm)	Amperage A
2.0 x 300	40-60
2.5 x 350	50-90
3.2 x 350	80-120
4.0 x 350	110-160
5.0 x 450	140-200

Approvals and certificates

TÜV (00607.), DB (30.132.09)

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 9 Nb R

E347-17

Characteristics and field of use

Avesta 347/MVNb is a Nb-stabilised Cr-Ni electrode for welding steels that are stabilised with titanium or niobium, such as 1.4541/ASTM 321. A stabilised weldment has improved high temperature properties, e.g. creep resistance, compared to low-carbon non-stabilised grades. Avesta 347/MVNb can also be used for the second layer (first layer 309 type) when cladding mild steel.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
4541	1.4541	321	321S31	Z6 CNT 18-10	2337
-	1.4550	347	347S31	Z6 CNNb 18-10	2338

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Nb
0.02	0.8	0.8	19.5	10.3	>=10xC

FN 7 - WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-40°C:
untreated	470	620	35	60	45

Operating data



Polarity = + / ~

Dimensions (mm)

Amperage A

2.0	35-60
2.5	45-70
3.25	55-120
4.0	90-150
5.0	150-200

BÖHLER FOX SAS 2

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 9 Nb B 2 2

E347-15

Characteristics and field of use

Stabilised, core wire alloyed austenitic stick electrode with basic coating. For application in all branches of industry where same-type steels and ferritic 13% chrome steels are welded. The weld metal has high toughness. It is therefore preferred for welding thick cross sections. Very good position welding. Cryogenic down to -196°C. Resists intergranular corrosion up to +400°C.

Base materials

1.4550 X6CrNiNb18-10, 1.4541 X6CrNiTi18-10, 1.4552 GX5CrNiNb19-11, 1.4301 X5CrNi18-10, 1.4312 GX10CrNi18-8, 1.4546 X5CrNiNb18-10, 1.4311 X2CrNi18-10, 1.4306 X2CrNi19-11
AISI 347, 321.302, 304, 304L, 304LN, ASTM A296 Gr. CF 8 C, A157 Gr. C9, A320 Gr. B8C or D

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Nb
0.03	0.4	1.3	19.8	10.2	+

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196°C:
untreated	470	640	36	110	≥ 32

Operating data

Polarity = +

Dimensions (mm)**Amperage A**

2.5 x 300

50-80

3.2 x 350

80-110

4.0 x 350

110-140

Approvals and certificates

TÜV (1282.), DB (30.014.04), ABS (Cr18/21, Ni8/11, TaNb.1.1), GL (4550), LTSS, SEPROZ, CE

Similar alloy filler metals

Stick electrode:	FOX SAS 2-A	Flux cored wire:	SAS 2-FD SAS 2 PW-FD
Solid wire electrode:	SAS 2-IG (Si)	Wire/flux combination:	SAS 2-UP/BB 202
TIG rod:	SAS 2-IG		

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 19 9 Nb R 3 2

E347-17

Characteristics and field of use

Stabilised, core wire alloyed, austenitic stick electrode with rutile coating. For application in all branches of industry where same-type steels and ferritic 13% chrome steels are welded. Special fine welding properties, excellent welding with AC power and a high resistance to hot cracking in the weld metal are features of this product. Resists intergranular corrosion up to +400°C.

Base materials

1.4550 X6CrNiNb18-10, 1.4541 X6CrNiTi18-10, 1.4552 GX5CrNiNb19-11, 1.4301 X5CrNi18-10, 1.4312 GX10CrNi18-8, 1.4546 X5CrNiNb18-10, 1.4311 X2CrNiN18-10, 1.4306 X2CrNi19-11
 AISI 347, 321.302, 304, 304L, 304LN, ASTM A296 Gr. CF 8 C, A157 Gr. C9, A320 Gr. B8C or D

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Nb
0.03	0.8	0.8	19.5	10.0	+

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-120°C:
untreated	470	620	35	70	≥ 32

Operating data


Polarity = + / ~

Dimensions (mm)	Amperage A
2.0 x 300	40-60
2.5 x 250/350	50-90
3.2 x 350	80-120
4.0 x 350	110-160
5.0 x 450	140-200

Approvals and certificates

TÜV (1105.), DB (30.014.06), ABS (347-17), GL (4550), LTSS, VUZ, SEPROZ, CE, NAKS (Ø2.5; Ø3.2; Ø4.0)

Similar alloy filler metals

Stick electrode:	FOX SAS 2	Flux cored wire:	SAS 2-FD SAS 2 PW-FD
Solid wire electrode:	SAS 2-IG (Si)	Wire/flux combination:	SAS 2-UP/BB 202
TIG rod:	SAS 2-IG		

BÖHLER FOX CN 13/4

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 13 4 B 6 2

E410NiMo-15

Characteristics and field of use

Basic coated stick electrode for same-type corrosion-resistant, martensitic and martensitic-ferritic rolled, forged and cast steels. Used in the construction of water turbines and compressors, and in the construction of steam power stations. Resistant to water, steam and seawater atmospheres. Thanks to optimisation of the alloy composition, the weld metal, in spite of its high tensile strength, achieves exceptional extension and toughness figures, as well as a high resistance to cracking. The weld metal is also characterised by an extremely low hydrogen content ($HD \leq 5 \text{ ml/100 g}$). Exceptional slag detachability and seam cleanliness. Deposition efficiency about 130%.

Base materials

1.4317 GX4CrNi13-4, 1.4313 X3CrNiMo13-4, 1.4407 GX5CrNiMo13-4, 1.4414 GX4CrNiMo13-4
ACI Gr. CA 6 NM, S41500

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.035	0.3	0.5	12.2	4.5	0.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	MPa	MPa	%	+20°C:	-20°C:	-60°C:
untreated	890	1090	12	32		
t*	680	910	17	66	55	50

*tempered, 600 °C/2 h/air

Operating data

Polarity = +

Dimensions (mm)	Amperage A
2.5 x 350	60-90
3.2 x 450	90-130
4.0 x 450	120-170
5.0 x 450	160-220

Approvals and certificates

TÜV (3232.), LTSS, SEPROZ, CE

Similar alloy filler metals

Stick electrode:	FOX CN 13/4	TIG rod:	CN 13/4-IG
SUPRA Wire/flux combination:	CN 13/4-UP/BB 203	Flux cored wire:	CN 13/4-MC
Solid wire electrode:	CN 13/4-IG CN 13/4-MC (F)		

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 18 8 Mn B 2 2

E307-15 (mod.)

Characteristics and field of use

Core wire alloyed electrode with basic coating for joints between dissimilar steels, steels that are hard to weld and 14% Mn steels. Well suited for tough intermediate layers in case of hardfacing. Properties of the weld metal: suitable for strain-hardening, very good cavitation resistance, crack resistant, resistant to thermal shock, resistant to scaling up to +850°C, little or no tendency to sigma-phase embrittlement above 500°C, cryogenic down to -110°C. Heat treatment is possible. Consultation with the manufacturer is required for operating temperatures above +650°C. Exceptional toughness of the weld metal even at high dilution levels. Good position weldability. It is approved for welding armour plates.

Base materials

high-strength, unalloyed and alloyed structural, quenched and tempered and armour steels among themselves or among each other; unalloyed and alloyed boiler or structural steels with high-alloyed Cr and Cr-Ni steels; heat-resistant steels up to +850°C; austenitic manganese steels together and with other steels; cryogenic plate and pipe steels together with cryogenic austenitic materials.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.09	0.7	6.5	18.6	8.8

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-110°C:
untreated	460	650	35	90	≥ 32

Operating data


Polarity = +

Dimensions (mm)
Amperage A

2.5 x 300	55-75
3.2 x 350	80-100
4.0 x 350	100-130
5.0 x 450	140-170
6.0 x 450	160-200

Approvals and certificates

TÜV (06786.), DNV (E 18 8 MnB), GL (4370), LTSS, SEPPOZ, VG 95132, CE, (FOX A 7 CN: TÜV (00022.))

Similar alloy filler metals

Stick electrode:	FOX A 7-A	TIG rod:	A 7 CN-IG
Solid wire electrode:	A 7-IG / A 7 CN-IG*	Flux cored wire:	A 7-FD
Wire/flux combination:	A 7CN-UP/BB 203		A 7 PW-FD A 7-MC

Thermanit X

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 18 8 Mn B 2 2

E307-15 (mod.)

Characteristics and field of use

Stainless. Resistant to scaling up to 850 °C (1562 °F). No adequate resistance against sulphurous 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 austenitic-ferritic joints – max. application 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. Not suitable for the welding of buffer layer, clad sheet metal or cladding applications.

Base materials

TÜV certified parent metal 1.4583 – X10CrNiMoNb18-12 as well as included parent metals combined with ferritic steels up to fine grained structural steels grade StE460 (P 460 N); high tensile, unalloyed and alloyed structural, quenched and tempered, and armour steels, same parent metal or in combination; unalloyed and alloyed boiler or structural steels with highalloyed Cr and CrNi steels; heat resistant steels up to 850 °C (1562 °F); austenitic high manganese steel with matching and other steels. Cryogenic sheet metals and pipe steels in combination with austenitic parent metals.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	N
0.10	0.6	7.0	18.5	8.0	0.12

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation	Impact values in J CVN
	0.2%		($L_0=5d_0$)	
	MPa	MPa	%	+20°C
untreated	350	600	40	100

Operating data

Polarity = +

Dimensions (mm)	Amperage A
2.5 x 300	55-75
3.2 x 350	70-110
4.0 x 350	85-130
5.0 x 450	140-170

Approvals and certificates

TÜV (05650.), DB (30.132.01)

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E Z18 9 MnMo R 3 2

E307-16 (mod.)

Characteristics and field of use

Core wire alloyed electrode with rutile-basic coating for joints between dissimilar steels, steels that are hard to weld and 14% Mn steels. Well suited for tough intermediate layers in case of hardfacing. Properties of the weld metal: suitable for strain-hardening, very good cavitation resistance, crack resistant, resistant to thermal shock, resistant to scaling up to +850°C, little tendency to sigma-phase embrittlement above 500°C. Heat treatment is possible. Consultation with the manufacturer is recommended for operating temperatures above +650°C. Exceptional toughness of the weld metal even at high dilution levels with hard-to-weld steels or when subject to thermal shock. Cryogenic down to -100°C. Stable arc even with AC power.

Base materials

high-strength, unalloyed and alloyed structural, quenched and tempered and armour steels among themselves or among each other; unalloyed and alloyed boiler or structural steels with high-alloyed Cr and Cr-Ni steels; heat-resistant steels up to +850°C; austenitic manganese steels together and with other steels; cryogenic plate and pipe steels together with cryogenic austenitic materials.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.10	1.5	4.0	19.5	8.5	0.7

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-100°C:
untreated	520	720	35	75	≥ 32

Operating data


Polarity = + / ~

Dimensions (mm)

Dimensions (mm)	Amperage A
2.5 x 350	60-80
3.2 x 350	80-110
4.0 x 350	110-140
5.0 x 450	140-170

Approvals and certificates

TÜV (09101.), SEPROZ, NAKS, CE

Similar alloy filler metals

Stick electrode:	FOX A 7 / FOX A 7 CN*	Solid wire electrode:	A 7-IG / A 7 CN-IG*
TIG rod:	A 7 CN-IG	Flux cored wire:	A 7-MC A 7-FD A 7 PW-FD
Wire/flux combination:	A 7 CN-UP/BB 203		

* Product name in Germany

Thermanit XW

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 18 8 Mn R 1 2

E307-16 (mod.)

Characteristics and field of use

Stainless. Resistant to scaling up to 850 °C (1562 °F). No adequate resistance against sulphurous 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 austenitic-ferritic joints – max. application 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. Not suitable for the welding of buffer layer, clad sheet metal or cladding applications.

Base materials

1.4583 – X10CrNiMoNb18-12 as well as included parent metals combined with ferritic steels up to fine grained structural steels grade StE 355 (P355N); high tensile, unalloyed and alloyed structural, quenched and tempered, and armour steels, same parent metal or in combination; unalloyed and alloyed boiler or structural steels with highalloyed Cr and CrNi steels; heat resistant steels up to 850 °C (1562 °F); austenitic high manganese steel with matching and other steels. Cryogenic sheet metals and pipe steels in combination with austenitic parent metals.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	N
0.10	0.6	7.0	18.5	8.0	0.08

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation	Impact values in J CVN
	0.2%		($L_0=5d_0$)	
	MPa	MPa	%	+20°C
untreated	350	600	40	70

Operating data

Polarity = + / ~

Dimensions (mm)	Amperage A
2.0 x 300	45-60
2.5 x 300	55-70
3.2 x 350	65-105
4.0 x 350	110-140
5.0 x 450	150-200

Approvals and certificates

TÜV (01235.), DB (30.132.08) GL, LR

BÖHLER FOX CN 19/9 M

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 20 10 3 R 3 2

E308Mo-17 (mod.)

Characteristics and field of use

Core wire alloyed, rutile coated stick electrode with basic components for ferrite-austenite joints and intermediate layers in weld cladding. Operating temperature between -80°C and +300°C. Very good welding in all positions except for vertical down. Good fine welding properties and extremely good AC weldability.

Base materials

high-strength, unalloyed and alloyed structural, quenched and tempered and armour steels among themselves or among each other; unalloyed and alloyed boiler or structural steels with high-alloyed Cr and Cr-Ni steels; austenitic manganese steels together and with other steels.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.04	0.7	0.8	20.2	10.3	3.2

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_t$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-80°C:
untreated	520	700	28	70	≥ 32

Operating data

Polarity = + / ~

Dimensions (mm)**Amperage A**

2.5 x 250	50-85
3.2 x 350	75-115
4.0 x 350	110-160
5.0 x 450	160-200

Approvals and certificates

TÜV (1086.), DB (30.014.03), ABS (Cr18/20, Ni8/10Mo), GL (4331), LR (V4-P12), SEPROZ, CE

Similar alloy filler metals

TIG rod:	CN 19/9 M-IG	Solid wire electrode:	CN 19/9 M-IG
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Avesta 904L

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 20 25 5 Cu N L R

E385-17

Characteristics and field of use

Avesta 904L is a high-alloyed 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. To minimise the risk of hot cracking when welding fully austenitic steels, heat input and interpass temperature must be low and there must be as little dilution as possible from the parent metal.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
904L	1.4539	904L	904S13	Z2 NCDU 25-20	2562

Also for welding similar steels of the 20-25 CrNiMoCu-type.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Cu
0.02	0.7	1.2	20.5	25.0	4.5	1.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	MPa	MPa	%	+20°C:	-40°C:	-196°C:
untreated	400	600	34	70	60	50

Operating data

Polarity = + / ~

Dimensions (mm)	Amperage A
2.5	35-75
3.25	55-110
4.0	100-150
5.0	140-190

Classifications

high-alloyed

EN ISO 3581-A:	AWS A5.4:	
E 20 25 5 Cu N L R 3 2	E385-17 (mod.)	

Characteristics and field of use

Core wire alloyed, rutile coated stick electrode of type 904 L with above-average Mo content and very high pitting resistance equivalent (PREN ≥ 45) of the weld metal (according to %Cr+3.3x%-Mo+30x%N). Particularly used in the production of sulphuric and phosphoric acids in the cellulose industry, in flue gas desulphurisation plants and also in the fertiliser industry, petrochemical industry, fatty acid processing, the manufacture of acetic and formic acid, seawater desalination, in pickling plants and for heat exchangers that are operated with sea or brackish water. The weld metal is fully austenitic, and has distinct resistance to pitting and crevice corrosion in media containing chlorides, high resistance to sulphuric, phosphoric, acetic and formic acid, as well as to sea water and brackish water. As a result of the low C content of the weld metal, the risk of intergranular corrosion is also avoided, whereas the high Ni content, in comparison with conventional 18/8 CrNi weld metal types, provides very good resistance to stress corrosion cracking. As a result of the high over-alloying with Mo as compared to 1.4539 or UNS N08904 it is possible to compensate for the demonstrably high segregation rate of CrNi weld metals with a high Mo content. BÖHLER FOX CN 20/25 M-A has outstanding welding properties, and is easily handled in every position except for vertical down. The electrode exhibits good slag detachability, along with clean, finely rippled weld seams.

Base materials

same-type high-Mo content Cr-Ni steels 1.4539 X1NiCrMoCu25-20-5, 1.4439 X2CrNiMoN17-13-5, 1.4537 X1CrNiMoCuN25-25-5 UNS N08904, S31726

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Cu	N	PRE _N
<=0.03	0.7	1.7	20.3	25.0	6.2	1.5	0.17	>=45

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196°C:
untreated	410	640	34	70	≥ 32

Operating data


Polarity = + / ~

Dimensions (mm)	Amperage A
2.5 x 300	50-80
3.2 x 350	80-110
4.0 x 350	100-135

Approvals and certificates

TÜV (6634.), SEPROZ, CE

Similar alloy filler metals

Stick electrode:	FOX CN 20/25 M	TIG rod:	CN 20/25 M-IG
Solid wire electrode:	CN 20/25 M-IG (Si)		

Avesta 253 MA

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

E 21 10 R

Characteristics and field of use

Avesta 253 MA is primarily designed for welding the high temperature stainless steel Outokumpu 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 is balanced to give a crack resistant weld metal. The steel often forms a rather thick oxide in welding or hot rolling and oxidized plates and welds must be brushed or ground clean before welding.

Base materials

For welding steels such as	EN	ASTM	BS	NF	SS
Outokumpu	EN	ASTM	BS	NF	SS
253 MA®	1.4835	S30815	-	-	2368
153 MA™	1.4818	S30415	-	-	2372

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	N
0.08	1.5	0.7	22.0	10.5	0.18

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C:
untreated	535	725	37	60

Operating data



Polarity = + / ~

Dimensions (mm)	Amperage A
2.0	45-65
2.5	60-80
3.25	70-110
4.0	100-140
5.0	150-200

UTP 2133 Mn

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

EZ 2133 B 42

Characteristics and field of use

UTP 2133 Mn is suitable for joining and surfacing of heat-resistant steels and cast steels of the same or of similar nature. It is used for operating temperatures up to 1050° C in carburized low-sulphur combustion gas, e. g. in petrochemical plants.

Base materials

1.4876 X10 NiCrAlTi 32 20 UNS N 088001.4859 G- X10 NiCrNb 32 20 1.4958 X 5 NiCrAlTi 31 20 UNS N 08810 1.4959 X 8 NiCrAlTi 31 21 UNS N 08811

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Fe
0.14	0.5	4.5	21.0	33.0	1.3	balance

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C
untreated	> 410	> 600	> 25	> 70

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 300	50-75
3.2 x 350	70-110
4.0 x 400	90-140

Approvals and certificates

TÜV (07713.)

Avesta 2205 basic

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS 5.4:

E 22 9 3 N L B

E2209-15

Characteristics and field of use

Avesta 2205 basic provides better impact properties and somewhat better position welding properties compared to the 3D type. It is primarily designed for welding duplex steels of the 2205 type. The weldability of duplex steels is excellent, but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
2205	1.4462	S32205	318S13	Z3 CND 22-05 Az	2377

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N
0.03	0.5	1.2	23.5	8.9	3.0	0.16

Ferrite 45 FN WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-40°C:
untreated	645	840	26	90	75

Operating data

Polarity = + / ~

Dimensions (mm)

Dimensions (mm)	Amperage A
2.5	45-75
3.25	70-110
4.0	100-140

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 22 9 3 N L R

E2209-17

Characteristics and field of use

Avesta 2205 is primarily designed for welding duplex stainless steels such as 2205. The weldability of duplex steels is excellent, but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
2205	1.4462	S32205	318S13	Z3 CND 22-05 Az	2377

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N
0.02	0.8	0.7	22.6	9.4	3.0	0.16

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-46°C:
untreated	635	810	25	50	35

Operating data



Polarity = + / ~

Dimensions (mm)

Amperage A

2.0	30-60
2.5	45-80
3.25	70-120
4.0	90-160
5.0	150-220

Avesta 2205-PW AC/DC

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 22 9 3 N L R

E2209-17

Characteristics and field of use

Avesta 2205-PW is a duplex electrode with a coating optimized for the vertical-up and overhead position welding of duplex 2205 type steel. The weldability of duplex steels is excellent, but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc. Thanks to the sharp and concentrated arc, PW electrodes are extremely suitable for maintenance and repair welding, especially when joint surfaces are not particularly clean.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
2205	1.4462	S32205	318S13	Z3 CND 22-05 Az	2377

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N
0.02	0.8	0.8	23.0	9.5	3.1	0.18

Ferrite 35 FN WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-46°C:
untreated	680	860	25	55	35

Operating data

Polarity = + / ~

*Dimensions (mm)**Amperage A*

2.5	50-80
3.25	70-110
4.0	100 - 160
5.0	160 - 220

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 22 9 3 N L R 3 2

E2209-17

Characteristics and field of use

Core wire alloyed, rutile coated stick electrode for welding ferritic-austenitic duplex steels such as 1.4462, UNS 31803. Used primarily in the fields of offshore engineering and chemical industry. In addition to increased strength and toughness, the weld metal has an exceptional resistance to stress corrosion cracking due to the high proportion of ferrite. Good pitting resistance according to ASTM G48 / method A. The 2.0 and 2.5 mm dimensions when used at the DC negative pole are particularly suitable for vertical up welding of pipes in the root and in the subsequent passes, which is necessary, for instance, in oilfield engineering. Good AC weldability. All dimensions suitable for position welding.

Base materials

same-type duplex steels as well as similar-alloy, ferritic-austenitic materials of increased strength 1.4462 X2CrNiMoN22-5-3, 1.4362 X2CrNiN23-4, 1.4462 X2CrNiMoN22-5-3 with 1.4583 X10CrNiMoNb18-12, 1.4462 X2CrNiMoN22-5-3 with P235GH/ P265GH, S255N, P295GH, S355N, 16Mo3 UNS S31803, S32205

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N	PRE _N
<=0.03	0.8	0.9	22.6	9.0	3.1	0.17	>=35

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation (L ₀ =5d ₀)	Impact values in J CVN		
	MPa	MPa	%	+20°C:	-10°C:	-20°C:
untreated	650	820	25	55	50	≥ 32

Operating data


Polarity = ± / ~

Dimensions (mm)
Amperage A

2.5 x 350	40-75
3.2 x 350	70-120
4.0 x 350	110-160
5.0 x 450	150-200

Approvals and certificates

TÜV (3636.), ABS (E 22 09-17), DNV (Duplex), GL (4462), LR (X), RINA (2209), Statoil, SEPROZ, CE

Similar alloy filler metals

Stick electrode:	FOX CN 22/9 N-B	Solid wire electrode:	CN 22/9 N-IG
TIG rod:	CN 22/9 N-IG	Flux cored wire:	CN 22/9 N-FD CN 22/9 PW-FD
Wire/flux combination:	CN 22/9 N-UP/BB 202		

Avesta 2304

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

E 23 7 N L R

Characteristics and field of use

Avesta 2304 is primarily designed for welding the duplex stainless steel Outokumpu 2304® and similar grades. Thanks to the low molybdenum content, corrosion resistance in nitric acid containing environments is very good. The weldability of duplex steels is excellent but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
2304	1.4362	S32304	-	-	2327

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N
0.02	0.8	0.8	24.8	9.0	0.2	0.12

Ferrite 40 FN WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-40°C:
untreated	640	780	23	40	30

Operating data



Polarity = + / ~

Dimensions (mm)	Amperage A
2.5	50-80
3.25	80-120
4.0	100-160

Classifications

high-alloyed

EN ISO 3581-A:

E 23 7 N L R

Characteristics and field of use

Avesta LDX 2101 is designed for welding the ferritic-austenitic (duplex) stainless steel Outokumpu LDX 2101®. LDX 2101 is a "lean duplex" steel with excellent strength and medium corrosion resistance. The steel is used in many various applications such as bridges, process equipment in desalination, pressure vessel in the pulp/paper industry and transport and storage tanks for chemicals. To ensure the right ferrite balance in the weld metal, Avesta LDX 2101 is over-alloyed with respect to nickel. The weldability of duplex steels is excellent but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
LDX 2101®	1.4162	S32101	-	-	-

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N
0.04	0.8	0.7	23.5	7.0	0.3	0.14

Ferrite 45 FN WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-40°C:
untreated	640	780	25	45	35

Operating data



Polarity = + / ~

Dimensions (mm) Amperage A

2.0	50-80
3.25	70-120
4.0	100-160

Avesta P5

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 23 12 2 L R

E309MoL-17

Characteristics and field of use

Avesta P5 is a high-alloyed low carbon electrode designed for welding dissimilar joints between stainless and mild or low-alloy steels. It can also be used for overlay welding, providing an 18 Cr 8 Ni 2 Mo deposit from the very first layer. It can also be used for welding highstrength steels.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
High-alloyed low carbon electrode for surfacing unalloyed steel, joint welding molybdenum alloyed stainless steel to unalloyed steel and for welding clad material.					

Typical analysis of all-weld metal (Wt-%)


C	Si	Mn	Cr	Ni	Mo
0.02	0.8	0.8	22.5	13.5	2.5

Ferrite 20 FN WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-40°C:
untreated	490	640	30	30	27

Operating data

	Polarity = + / ~
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Dimensions (mm)	Amperage A
2.0	30-60
2.5	45-80
3.25	70-120
4.0	90-160
5.0	150-220

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 23 12 2 L R 3 2

E309LMo-17

Characteristics and field of use

Low carbon, austenitic stick electrode with rutile coating. High crack resistance with hard-toweld materials, austenite-ferrite joints and weld claddings is achieved through the increased ferrite content (FN ~20) in the weld metal. Particularly good fine welding properties and excellent AC weldability characterise this product. For operating temperatures up to +300°C, for the first layer of weld claddings up to +400°C.

Base materials

high-strength, unalloyed and alloyed structural and quenched and tempered steels among themselves or among each other, unalloyed and alloyed boiler or structural steels with highalloy Cr, CrNi and CrNiMo steels. Austenite-ferrite joints for boiler and pressure vessel construction. Particularly suitable for the first layer of corrosion-resistant Mo-alloyed weld claddings on P235G1TH, P255G1TH, S255N, P295GH, S355N - S500N and on creep resistant, quenched and tempered fine-grained structural steels according to AD HP 0, test group 3.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.7	0.8	23.0	12.5	2.7

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-20°C:
untreated	580	720	27	55	45

Operating data



Polarity = + / ~

Dimensions (mm)

Amperage A

2.0 x 300	45-60
2.5 x 250/350	60-80
3.2 x 350	80-120
4.0 x 350/450	100-160
5.0 x 450	140-220

Approvals and certificates

TÜV (1362.), ABS (E 309 Mo), LR (DXV and O, CMnSS), DNV (309 MoL), BV (309 Mo), RINA (309MO), LTSS, SEPPOZ, NAKS, CE

Similar alloy filler metals

Stick electrode:	FOX CN 23/12-A	Flux cored wire:	CN 23/12-MC
TIG rod:	CN 23/12-IG		CN 23/12-FD
Solid wire electrode:	CN 23/12-IG		CN 23/12 PW-FD
Wire/flux combination:	CN 23/12-UP/BB 202		CN 23/12 Mo-FD
			CN 23/12 Mo PW-FD

BÖHLER FOX FFB

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 25 20 B 2 2

E310-15 (mod.)

Characteristics and field of use

Core wire alloyed, basic coated stick electrode for same-type, heat-resistant rolled, forged and cast steels such as in annealing shops, hardening shops, steam boiler construction, the petrochemical industry and the ceramic industry. Joint welds on heat-resistant Cr-Si-Al steels that are exposed to gases containing sulphur must be carried out using BÖHLER FOX FA as a final layer. Due to the risk of embrittlement, the temperature range between 650-900°C should be avoided. Resistant to scaling up to +1200°C. Cryogenic down to -196°C.

Base materials

austenitic 1.4841 X15CrNiSi25-21, 1.4845 X8CrNi25-21, 1.4828 X15CrNiSi20-12, 1.4840 GX15CrNi25-20, 1.4846 X40CrNi25-21, 1.4826 GX40CrNiSi22-10 ferritic-pearlitic 1.4713 X10CrAlSi7, 1.4724 X10CrAlSi13, 1.4742 X10CrAlSi18, 1.4762 X10CrAlSi25, 1.4710 GX30CrSi7, 1.4740 GX40CrSi17 AISI 305, 310, 314, ASTM A297 HF, A297 HJ

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.12	0.6	3.2	25.0	20.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196°C:
untreated	420	600	36	100	≥ 32

Operating data

Polarity = +

Dimensions (mm)	Amperage A
2.5 x 300	50-75
3.2 x 350	80-110
4.0 x 350	110-140
5.0 x 450	140-180

Approvals and certificates

TÜV (0143.), Statoil, SEPROZ, CE

Similar alloy filler metals

Stick electrode:	FOX FFB-A	Solid wire electrode:	FFB-IG
TIG rod:	FFB-IG		

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 25 20 R 3 2

E310-16

Characteristics and field of use

Core wire alloyed, rutile coated stick electrode for same-type, heat-resistant rolled steels such as in annealing shops, hardening shops, steam boiler construction, the petrochemical industry and the ceramic industry. The final layer of joints that are exposed to reducing gases containing sulphur must be welded with BÖHLER FOX FA. The BÖHLER FOX FFB basic stick electrode is preferable for thick-walled welded constructions. Smooth seams and easy slag removal. Resistant to scaling up to +1200°C. Due to the risk of embrittlement, the temperature range between +650-900°C should be avoided.

Base materials

austenitic 1.4841 X15CrNiSi25-21, 1.4845 X8CrNi25-21, 1.4828 X15CrNiSi20-12, 1.4840 GX15CrNi25-20, 1.4846 X40CrNi25-21, 1.4826 GX40CrNiSi22-10 ferritic-pearlitic 1.4713 X10CrAlSi7, 1.4724 X10CrAlSi13, 1.4742 X10CrAlSi18, 1.4762 X10CrAlSi25, 1.4710 GX30CrSi7, 1.4740 GX40CrSi17 AISI 305, 310, 314, ASTM A297 HF, A297 HJ

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.12	0.5	2.2	26.0	21.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C:
untreated	430	620	35	75

Operating data


Polarity = + / ~

Dimensions (mm) Amperage A

2.0 x 300	40-60
2.5 x 300	50-80
3.2 x 350	80-110
4.0 x 350	110-140

Approvals and certificates

Statoil, SEPROZ, CE

Similar alloy filler metals

Stick electrode:	FOX FFB	Solid wire electrode:	FFB-IG
TIG rod:	FFB-IG		

Avesta 310

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 25 20 R

E310-17

Characteristics and field of use

Avesta 310 is a 25 Cr 20 Ni electrode for welding 1.4845/ASTM 310S and similar types of high temperature stainless steels. To minimise the risk of hot cracking when welding fully austenitic steels and nickel base alloys, heat input and interpass temperature must be low and there must be as little dilution as possible from the parent metal.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
4845	1.4845	310S	310S16	Z8 CN 25-20	2361

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.10	0.5	2.1	26.0	21.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196°C:
untreated	440	625	35	80	50

Operating data

Polarity = + / ~

Dimensions (mm)**Amperage A**

2.5	50-75
3.25	70-100
4.0	100-150

Avesta 2507/P100 rutile

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 25 9 4 N L R

E2594-16

Characteristics and field of use

Avesta 2507/P100 rutile is designed for welding super duplex steels such as 2507/1.4410. The weldability of duplex and super duplex steels is excellent, but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
2507	1.4410	S32750	-	Z3 CND 25-06 Az	2328

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N
0.03	0.5	1.3	25.2	9.5	3.6	0.23

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-46°C:
untreated	700	900	26	80	45

Operating data

Polarity = + / ~

Dimensions (mm)**Amperage A**

2.5	50-70
3.25	80-100
4.0	100-140

Thermanit 25/09 CuT

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 25 9 4 N L B 2 2

E2553-15 (mod.)

Characteristics and field of use

Stainless. Resistance to intercrystalline corrosion – wet corrosion up to 250 °C (482 °F). 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.

Base materials

1.4515 – GX3CrNiMoCuN26-6-3 1.4517 – GX3CrNiMoCuN26-6-3-3 25 % Cr-superduplex steels such as SAF 25/07, Zeron 100

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	N	Cu	W
0.03	0.5	1.2	25.0	3.7	9.0	0.2	0.7	0.6

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
				+20°C:	-50°C:
untreated	600	750	25	70	50

Operating data

Polarity = +

Dimensions (mm)	Amperage A
2.5 x 350	55-80
3.2 x 350	80-105
4.0 x 350	90-140

Classifications

high-alloyed

EN ISO 3581-A:

E Z25 22 2 L B 2 2

Characteristics and field of use

Stainless; resistant to intercrystalline corrosion – wet corrosion up to 350 °C (662 °F). Good resistance to Cl-bearing environments, pitting corrosion and nitric acid. Huey test to ASTM A262-64: 1.5 µ/48 h max., (0.25 g/m²h), selective attack 100 µ max. Particularly suited to corrosion conditions in urea synthesis plants. For joining and surfacing applications with matching/similar steels. For weld cladding on high temperature steels and for fabricating joints on claddings.

Base materials

1.4465 – X2CrNiMoN25-25 1.4466 – X2CrNiMoN25-22-2 1.4435 – X2CrNiMo18-14-3

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	N
<0.035	<0.4	5.0	24.5	2.2	22.0	0.15

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20 °C
untreated	400	600	30	80

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 300	55-80
3.2 x 350	80-105
4.0 x 350	90-135

Approvals and certificates

TÜV (04171.)

Avesta P7 AC/DC

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

E 29 9 R

Characteristics and field of use

Avesta P7 is a high-alloyed Cr-Ni electrode with approx. 40% ferrite offering high tensile strength and excellent resistance to cracking. The chemical composition corresponds to AWS A5.4 E312. Avesta P7 is primarily intended for welding dissimilar joints between stainless steel, high strength steels, tool steel, spring steel and 14% Mn-steel, as well as other difficult-to-weld combinations.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
Specially designed for difficult-to-weld steels such as Mn-steels, tool steels and high temperature grades.					

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.09	0.8	0.8	29.0	9.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C:
untreated	620	810	20	25

Operating data

Polarity = + / ~

Dimensions (mm)	Amperage A
2.5	50-80
3.25	80-120
4.0	100-160
5.0	160-220

Classifications

high-alloyed

EN ISO 3581-A:

E 29 9 R 12

Characteristics and field of use

UTP 65 D has been developed to satisfy the highest requirements for joining and surfacing. It is extremely crack-resistant when joining steels of difficult weldability, such as e. g. hard manganese steels, tool steels, spring steels, high speed steels as well as dissimilar metal joints. Due to the good corrosion and abrasion resistance and high tensile strength UTP 65 D finds its application particularly in repair and maintenance of machine and drive components, such as gears, cams, shafts, hot cuts, hot trim plates and dies. Also ideally suited as an elastic cushioning layer for very hard surfacings.

Welding characteristics and special properties of the weld metal

UTP 65 D has outstanding welding properties. Stable arc, spatterfree. The finely rippled seam has a homogeneous structure, very good slag removal, self-lifting on parts. Good weldability in awkward positions. Stainless, creep resistant and workhardening.

Welding instructions

Clean the welding zone thoroughly. Prepare X-, V- or U-groove on thickwalled workpieces with an angle of 60 - 80°. Preheat high-C-containing steels and solid workpieces to appr. 250° C. Keep stick electrode vertical and weld with a short arc, use stringer beads or slight weaving, as applicable. Re-dry stick electrodes that have got damp for 2 h / 120 – 200° C.

Base materials

hard manganese steels, tool steels, spring steels, high speed steels as well as dissimilar metal joints

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Fe
0.1	1.0	1.0	30.0	9.5	balance

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	
untreated	> 640	> 800	> 20	

Operating data



Polarity = + / ~

Dimensions (mm)

Amperage A

1.5 x 250	35-45
2.0 x 250	45-60
2.5 x 250	55-75
3.2 x 350	75-115
4.0 x 350	100-145
5.0 x 350	120-190

Thermanit 30/10 W

Stick electrode

Classifications

high-alloyed

EN 3581-A:

AWS A5.4:

E 29 9 R 12

E312-16 (mod.)

Characteristics and field of use

Stainless; wet corrosion up to 300 °C (572 °F). High resistance to hot cracking: good toughness at high yield strength. For joining and surfacing applications with matching/similar steels/cast steel grades. For fabricating tough joints on unalloyed/low alloy structural steels of higher strength, on high manganese and CrNiMn steels, between dissimilar metals e.g. between stainless or heat resistant and unalloyed/low alloy steels/cast steel grades.

Base materials

DB-approved parent metals 1.4006 – X10Cr13, 1.3401 – X120Mn12, S235 [St 37], E295 [St 50]; Useable for joint welding on limited weldable unalloyed and low alloyed steels of higher strength. Used as stress relieved buffer layer when cladding cold and warm machine tools. For joinings on high manganese steel and CrNiMn steel, as well as for combinations on steels of different chemical composition or strength.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni
0.10	1.1	0.8	29.0	9.0	0.1

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 1.0%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C
untreated	500	750	20	25

Operating data

Polarity = + / ~

Dimensions (mm)	Amperage A
2.0 x 250	45-60
2.5 x 300	50-80
3.2 x 350	60-110
4.0 x 350	90-150
5.0 x 450	150-210

Approvals and certificates

DB (30.132.11)

Classifications

high-alloyed

EN ISO 3581-A:

AWS A5.4:

E 29 9 R 3 2

E312-17

Characteristics and field of use

Core wire alloyed, austenitic-ferritic special stick electrodes with rutile coating. Suitable for hard-to-weld materials of high-strength such as pressing and trimming tools, due to the high ferrite content and high crack resistance. Joints between dissimilar steels, tough intermediate layers in case of hardfacing. Suitable for wear-resistant surfacing on couplings, toothed wheels, shafts and the like due to the high mechanical strength and strain-hardening capacity. Can also be used for tool repairs. BÖHLER FOX CN 29/9-A has exceptional position welding properties, and is particularly suitable for welding with AC power.

Base materials

Use for joint welding of unalloyed and low-alloy steels of high-strength and limited weldability. Use as buffer layer for surfacings on cold and hot working tools. Also suitable for joints on austenitic Mn steel and Cr-Ni-Mn steel, as well as for dissimilar joints on steels of different chemical composition or strength.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni
0.11	0.9	0.7	28.8	9.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C:
untreated	650	790	24	30

Operating data


Polarity = + / ~

Dimensions (mm)
Amperage A

2.0 x 350	60-80
3.2 x 350	80-110
4.0 x 350	110-140
5.0 x 450	140-180

Approvals and certificates

DB (30.014.16, 20.014.07), CE

UTP 65

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

EZ 29 9 R 32

Characteristics and field of use

UTP 65 is particularly suitable for joinings on hardly weldable steels, when highest demands on the welding seam are made. High crack resistance when joining parent metals of difficult weldability, such as austenitic and ferritic steels, high-manganese steels with alloyed and non-alloyed steels, heat-treatable and tool steels. As cushion layer on these materials it is also ideally suited. UTP 65 finds a variety of applications in the repair and maintenance of machine and drive components as well as in tool repairing.

Welding characteristics and special properties of the weld metal

UTP 65 is very easily weldable with a smooth and stable arc, homogeneous, finely rippled bead appearance and gives very good slag removal, self-lifting in parts. The austenitic-ferritic weld deposit has highest strength values and high crack resistance. Workhardening, creep resistant and stainless.

Welding instructions

Clean welding area thoroughly. Pre-heating of thick-walled ferritic parts to 150 – 250° C. Keep the arc short up to medium-long. Apply string beads with little weaving. Hold stick electrode as vertically as possible. Redry stick electrodes that have got damp for 2 h / 120 – 200° C.

Base materials

Dissimilar joints.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Fe
0.1	1.0	1.0	29.0	9.0	balance

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	
untreated	> 620	> 800	> 22	

Operating data



Polarity = + / ~

Dimensions (mm)	Amperage A
1.5 x 250	35-50
2.0 x 250	45-65
2.5 x 250	60-80
3.2 x 350	80-130
4.0 x 350	110-150
5.0 x 350	120-200

Approvals and certificates

DB (82.138.01)

UTP 2535 Nb

Stick electrode

Classifications

high-alloyed

EN ISO 3581-A:

EZ 25 35 Nb B 62

Characteristics and field of use

UTP 2535 Nb is suitable for joining and surfacing of heat resistant CrNi-cast steels (centrifugal- and mould cast parts) of the same or of similar nature.

Welding characteristics and special properties of the weld metal

It is used for operating temperatures up to 1100° C in carburized low-sulphur combustion gas, e. g. reforming ovens in petrochemical plants.

Welding instructions

Hold stick electrode vertically with a short arc and lowest heat input. String beads are welded. The interpass temperature of 150° C should not be exceeded. Re-dry stick electrodes for 2 - 3 hours at 250 - 300° C

Base materials

1.4852 G – X 40 NiCrSiNb 35 26

1.4857 G – X 40 NiCrSi 35 26

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Ti	Fe
0.4	1.0	1.5	25.0	35.0	1.2	0.1	balance

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation	Impact values
	0.2%		($L_0=5d_0$)	
	MPa	MPa	%	
untreated	> 480	> 700	> 8	

Operating data



Polarity: = +

Dimensions (mm) Amperage A

2.5 x 300	50-70
3.2 x 350	70-120
4.0 x 400	100-140
5.0 x 400	

BÖHLER FOX NIBAS 625

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6625 (NiCr22Mo9Nb)

ENiCrMo-3

Characteristics and field of use

Core wire alloyed special stick electrode with special basic coating for high quality welded joints of nickel-based alloys with a high Mo content (e.g. Alloy 625 and Alloy 825) and of CrNiMo steels with a high Mo content (e.g. 6% Mo steels). This type is also suitable for creep resistant and highly creep resistant steels, heat resistant and cryogenic materials, dissimilar joints and low-alloy, hard-to-weld steels. Suitable for pressure vessel construction for -196°C to +550°C, otherwise with scaling resistance up to +1200°C (sulphur-free atmosphere). Because of the embrittlement of the base material between 600 and 850°C, use in this temperature range should be avoided. High resistance to hot cracking, in addition to which the C-diffusion at high temperatures or during heat treatment of dissimilar joints is largely inhibited. Extremely high resistance to stress corrosion cracking and pitting (PREN 52). Resistant to thermal shock, stainless, fully austenitic. Low expansion coefficient between C-steel and austenitic CrNi(Mo) steel. Exceptional welding properties in all positions except for vertical down, good slag detachability, high resistance to porosity, notch-free weld seams, high degree of purity. The electrode and the weld metal meet the highest quality requirements.

Base materials

2.4856 NiCr 22 Mo 9 Nb, 2.4858 NiCr 21 Mo, 2.4816 NiCr 15 Fe, 1.4583 X10CrNiMoNb18-12, 1.4876 X 10 NiCrAlTi 32 20 H, 1.4876 X 10 NiCrAlTi 32 21, 1.4529 X1NiCrMoCuN25-20-7, X 2 CrNiMoCuN 20 18 6, 2.4641 NiCr 21 Mo 6 Cu Joints of the above-mentioned materials with unalloyed and low-alloy steels e.g. P265GH, P285NH, P295GH, 16Mo3, S355N, X8Ni9, ASTM A 553 Gr.1, N 08926, Alloy 600, Alloy 625, Alloy 800 (H), 9 % Ni steels

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Al	Nb	Co	Fe
0.025	0.4	0.7	22.0	bal.	9.0	<=0.4	3.3	<=0.05	0.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196°C:
untreated	530	800	40	80	45

Operating data

Polarity = +

Dimensions (mm)**Amperage A**

2.5 x 250	45-60
3.2 x 300	65-95
4.0 x 350	90-120

Approvals and certificates

TÜV (04911.), Statoil, NAKS, LTSS, SEPROZ, CE (FOX NiCr 625: TÜV (03773.))

Similar alloy filler metals

TIG rod:	NIBAS 625-IG NiCr 625-IG A*	Wire/flux combination:	NIBAS 625-UP/BB 444 NiCr 625-IG A
Solid wire electrode:	NIBAS 625-IG	Flux cored wire:	NIBAS 625 PW-FD

* Product name in Germany

Thermanit 625

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6625 (NiCr22Mo9Nb)

ENiCrMo-3

Characteristics and field of use

Stainless; high resistance to corrosive environments. Resistant to stress corrosion cracking. Resistant to scaling up to 1100 °C (2012 °F). Temperature limit: 500 °C (932 °F) max. in sulphurous atmospheres. High temperature resistant up to 1000 °C (1832 °F). Cold toughness at subzero temperatures as low as -196 °C (-321 °F). For joining and surfacing work with matching/similar corrosion resistant materials as well as on matching and similar heat resistant, high temperature steels and alloys. For joining and surfacing work with cryogenic austenitic CrNi(N) steels/cast steel grades and on cryogenic Ni steels suitable for quenching and tempering.

Base materials

X10NiCrAlTi32-20 H, 1.4876 – X10NiCrAlTi32-20, 2.4856 – NiCr22Mo9Nb, 1.4539 – X2NiCrMo-Cu25-20-5, X2CrNiMoCuN20-18-6, VdTÜV-WBL. 473; Alloy 600, Alloy 625, Alloy 800, 9% Ni steels

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Nb	Fe
<0.04	<0.7	<1	21.5	9.5	bal.	3.3	<2.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196 °C:
untreated	420	760	30	75	60

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 250	45-70
3.2 x 300	65-105
4.0 x 350	85-130
5.0 x 400	130-160

Approvals and certificates

TÜV (03463.), ABS, DNV, GL

UTP 6222 Mo

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6625 (NiCr22Mo9Nb)

ENiCrMo-3

Characteristics and field of use

UTP 6222 Mo is particularly suited for joining and surfacing on nickel alloys, austenitic steels, low temperature nickel steels, austenitic-ferritic-joints and claddings of the same or similar nature, like 2.4856 (NiCr22Mo 9 Nb), 1.4876 (X30 NiCrAlTi 32 20), 1.4529 (X2 NiCrMoCu 25 20 5).

Welding characteristics and special properties of the weld metal

The weld metal is heat resistant and suitable for operating temperatures up to 1000° C. It must be noted that a slight decrease in ductility will occur if prolonged heat treatment is given within the temperature range 600 - 800° C. Scale-resisting in low-sulphur atmosphere up to 1100° C. High creep strength.

Welding instructions

Opening angle of the prepared seam approx. 70°, root gap approx. 2 mm. Weld stick electrode with slight tilt and short arc. String beads are welded. The interpass temperature of 150° C and a max. weaving with 2.5 x diameter of the stick electrode core wire should not be exceeded. Re-dry the stick electrodes 2 -3 hours at 250 -300° C before use and weld them out of a warm electrode carrier.

Base materials

X10NiCrAlTi32-20 H, 1.4876 - X10NiCrAlTi32-20, 2.4856 - NiCr-22Mo9Nb, 1.4539 - X2NiCrMo-Cu25-20-5, X2CrNiMoCuN20-18-6, VdTÜV-WBL. 473; Alloy 600, Alloy 625, Alloy 800, 9% Ni steels

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Nb	Fe
0.03	0.4	0.6	22.0	9.0	bal.	3.3	1.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196°C:
untreated	> 450	> 760	> 30	> 75	45

Operating data



Polarity: +

Dimensions (mm)	Amperage A
2.5 x 250	50-70
3.2 x 300	70-95
4.0 x 350	90-120
5.0 x 400	120-160

Approvals and certificates

TÜV (03610.), DNV, ABS, GL, BV

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6082 (NiCr20Mn3Nb)

ENiCrFe-3 (mod.)

Characteristics and field of use

Core wire alloyed special stick electrode corresponding to AWS ENiCrFe-3 with special basic coating, for high-quality welding of nickel-based alloys, creep resistant and highly creep resistant steels, heat-resistant and cryogenic materials, and also for low-alloy hard-to-weld steels and dissimilar joints. Also for ferrite-austenite joints at operating temperatures $\geq 300^{\circ}\text{C}$ or heat treatments. Suitable for pressure vessel construction for -196°C to $+650^{\circ}\text{C}$, otherwise with scaling resistance up to $+1200^{\circ}\text{C}$ (sulphur-free atmosphere). Does not tend to embrittlement, high resistance to hot cracking, in addition to which the C-diffusion at high temperatures or during heat treatment of dissimilar joints is largely inhibited. Resistant to thermal shock, stainless, fully austenitic. Low expansion coefficient between C-steel and austenitic Cr-Ni-(Mo) steel. Exceptional welding properties in all positions except for vertical down, good slag detachability, high resistance to porosity, notch-free weld seams, high degree of purity. The electrode and the weld metal meet the highest quality requirements.

Base materials

2.4816 NiCr15Fe, 2.4817 LC-NiCr15Fe Nickel and nickel alloys, low-temperature steels up to X8Ni9, high-alloyed Cr and CrNiMo steels, particularly for dissimilar joints, and their joints to alloyed, low-alloy, creep resistant and highly creep resistant steels. Also suitable for Alloy 800.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Ti	Nb	Co	Fe
0.025	0.4	5.0	19.0	bal.	1.5	+	2.2	≤ 0.08	3.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	$+20^{\circ}\text{C}$:	-196°C :
untreated	420	680	40	120	80

Operating data

	Polarity = +
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Dimensions (mm)
Amperage A

2.5 x 300	40-70
3.2 x 300	70-105
4.0 x 350	90-125
5.0 x 400	120-160

Approvals and certificates

TÜV (04697.), Statoil, LTSS, SEPROZ, CE, NAKS (FOX NiCr 70 Nb: TÜV (00889.), KTA 1408.1 (08039.))

Similar alloy filler metals

TIG rod:	NIBAS 70/20-IG NiCr 70 Nb-IG A*	Solid wire electrode:	NIBAS 70/20-IG NiCr 70 Nb-IG A*
Flux cored wire:	NIBAS 70/20-FD	Wire/flux combination:	NIBAS 70/20-UP/BB 444

Thermanit Nicro 82

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6082 (NiCr20Mn3Nb)

ENiCrFe-3 (mod.)

Characteristics and field of use

Stainless; heat resistant; high temperature resistant. Cold toughness at subzero temperatures as low as $-269\text{ }^{\circ}\text{C}$ ($-452\text{ }^{\circ}\text{F}$). Well suited for welding austenitic ferritic joints. No Cr carbide zones that become brittle in the ferrite weld deposit transition zone, even not as a result of heat treatments above $300\text{ }^{\circ}\text{C}$ ($572\text{ }^{\circ}\text{F}$). Well suited for tough joints and surfacing on heat resistant Cr and CrNi steels/cast steel grades and Ni-base alloys. Temperature limits: $500\text{ }^{\circ}\text{C}$ ($932\text{ }^{\circ}\text{F}$) in sulphurous atmospheres, $800\text{ }^{\circ}\text{C}$ max ($1472\text{ }^{\circ}\text{F}$) for fully stressed welds. Resistant to scaling up to $1000\text{ }^{\circ}\text{C}$ ($1832\text{ }^{\circ}\text{F}$).

Base materials

1.4876 – X10NiCrAlTi32-30H; 2.4816 – NiCr15Fe; X8Ni9; 10CrMo9-10;
Combinations between 1.4583 – X10CrNiMoNb18-12, 1.4539 – X2NiCrMoCu25-20 and ferritic boiler steels; Alloy 600, Alloy 600L, Alloy 800 (H)

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Fe
<0.05	<0.4	4.0	19.5	bal.	2.0	<4.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	MPa	MPa	%	+20 °C:	-196 °C:	-269 °C:
untreated	380	620	35	90	70	50

Operating data



Polarity = +

Dimensions (mm)	Amperage A
2.5 x 300	45-70
3.2 x 300	65-100
4.0 x 350	85-130
5.0 x 400	130-160

Approvals and certificates

TÜV (01775.), TÜV (KTA), GL

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6082 (NiCr20Mn3Nb)

E NiCrFe-3 (mod.)

Characteristics and field of use

UTP 068 HH is predominantly used for joining identical or similar heat resistant Ni-base alloys, heat resistant austenites, cold tough Ni-steel, and for joining heat resistant austenitic-ferritic materials, such as 2.4817 (LC NiCr15Fe), 2.4851 (NiCr23Fe), 1.4876 (X10 NiCrTiAl 32 20), 1.4941 (X8 CrNTi 18 10). Specially also used for joinings of high C content 25/35 CrNi cast steel to 1.4859 or 1.4876 for petrochemical installations with working temperatures up to 900° C. The welding deposit is hot cracking resistant and does not tend to embrittlement.

Base materials

1.4876 – X10NiCrAlTi32-30H; 2.4816 – NiCr15Fe; X8Ni9; 10CrMo9-10;
 Combinations between 1.4583 – X10CrNiMoNb18-12, 1.4539 – X2NiCrMoCu25-20 and ferritic boiler steels; Alloy 600, Alloy 600L, Alloy 800 (H)

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Nb	Fe	Ni
0.03	0.4	5	19.0	1.5	2.2	3	bal.

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196 °C:
untreated	420	680	40	120	80

Operating data


Polarity = +

Dimensions (mm)
Amperage A

2.5 x 300	50-70
3.2 x 300	70-95
4.0 x 350	90-120
5.0 x 400	120-160

Approvals and certificates

TÜV, ABS, GL, BV, DNV, C

UTP 6170 Co

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6117 (NiCr22Co12Mo)

E NiCrCoMo-1 (mod.)

Characteristics and field of use

UTP 6170 Co mod. is suitable for joining high-temperature and similar nickel-base alloys, heat resistant austenitic and cast alloys, such as 2.4663 (NiCr23Co12Mo), 2.4851 (NiCr23Fe), 1.4876 (X10 NiCrAlTi 32 21), 1.4859 (GX10 NiCrSiNb 32 20). The weld metal is resistant to hot-cracking and is used for service temperatures up to 1100° C. Scale-resistance up to 1100° C in oxidizing and carburized atmospheres, e. g. gas turbines, ethylene production plants.

Welding characteristics and special properties of the weld metal

UTP 6170 Co mod can be welded in all positions except vertical-down. It has a stable arc. The seam is finely rippled and notch-free. Easy slag removal.

Welding instructions

Hold stick electrode as vertically as possible, keep a short arc. Use string bead technique. Fill end crater carefully. Interpass temperature max. 150° C. Re-dry stick electrodes for 2–3 h / 250–300° C.

Base materials

X10NiCrAlTi32-20 (1.4876) NiCr23Fe (2.4851) GX10NiCrNb32-20 (1.4859) NiCr23Co12Mo (2.4663) UNS N06617, Alloy 617

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Co	Al	Ti	Fe
0.06	<0.8	<0.3	21.0	9.0	bal.	11.0	0.7	0.3	1.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C
untreated	> 450	> 700	> 35	100

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 300	55-75
3.2 x 300	70-100
4.0 x 350	90-120

Approvals and certificates

TÜV (04661.)

Thermanit Nicro 182

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6182 (NiCr15Fe6Mn)

ENiCrFe-3

Characteristics and field of use

Stainless; resistant to scaling up to 950 °C (1742 °F), high temperature resistant up to 800 °C (1472 °F). Cold toughness at subzero temperatures as low as -196 °C (-321 °F). Well suited for austenitic ferritic joints. No Cr carbide zones that become brittle in the ferrite weld deposit transition zone even not as a result of heat treatments above 300 °C (572 °F). Well suited for tough joints and surfacing on heat resistant Cr- and CrNi steels/cast steel grades and Ni-base alloys. Temperature limits: 500 °C (932 °F) in sulphurous atmospheres, 800 °C (1472 °F) max. for fully stressed welds.

For welding work on cryogenic steels/cast steel grades including Ni steels suitable for quenching and tempering. For joining applications on steels with a low expansion coefficient (Dilavar, Invar).

Base materials

1.4876 – X10NiCrAlTi32-20; 2.4816 – NiCr15Fe; Cryogenic 1.5 - 5 % Ni steels; X8Ni9. Combinations of 1.4583 – X10CrNiMoNb18-12 and ferritic boiler steels up to 16Mo3; Alloy 800 (H)

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Fe
<0.05	<0.5	6.5	16	bal.	2.0	<6.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation	Impact values	
	0.2%		($L_0=5d_0$)	in J CVN	
	MPa	MPa	%	+20°C:	-196°C:
untreated	350	620	35	90	70

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 300	45-70
3.2 x 300	65-100
4.0 x 350	95-130
5.0 x 400	130-160

Approvals and certificates

TÜV (02073.), TÜV (KTA), (8109)

UTP 759 Kb

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6059 (NiCr23Mo16)

E NiCrMo-13

Characteristics and field of use

UTP 759 Kb is employed primarily for welding components in environmental plants and plants for chemical processes with highly corrosive media. Joint welding of matching base materials as Material-No. 2.4605 or similar matching materials as material No 2.4602 NiCr21Mo14W. Joint welding of these materials with low-alloyed steels. Cladding on low-alloyed steels.

Welding characteristics and special properties of the weld metal

In addition to its good resistance to contaminated oxidating mineral acids, acetic acids and acetic anhydrides, hot contaminated sulphuric - and phosphoric acid, UTP 759 Kb has an excellent resistance against pitting and crevice corrosion. The special composition of the coating extensively prevents the precipitation of intermetallic phases.

UTP 759 Kb can be welded in all positions except vertical down. Stable arc, easy slag removal.

Welding instructions

Opening angle of the prepared seam approx. 70°, root gap approx. 2 mm. Weld stick electrode with slight tilt and with a short arc. String beads are welded. The interpass temperature of 150° C and a max. weaving width 2.5 x diameter of the stick electrode core wire should not be exceeded. Re-dry the stick electrodes 2 – 3 hours at 250 – 300° C before use and weld them out of a warm stick electrode carrier.

Base materials

2.4602 – NiCr21Mo14W – Alloy C-22; 2.4605 – NiCr23Mo16Al – Alloy 59; 2.4610 – NiMo16Cr16Ti – Alloy C-4; 2.4819 – NiMo16Cr15W – Alloy C-276

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Fe
<0.02	<0.2	0.5	22.5	15.5	bal.	1.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C
untreated	> 450	> 720	> 30	> 75

Operating data



Polarity = +

Dimensions (mm)	Amperage A
2.5 x 250	50-70
3.2 x 300	70-100
4.0 x 350	90-130

Approvals and certificates

TÜV (06687.)

Thermanit Nimo C 24

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6059 (NiCr23Mo16)

ENiCrMo-13

Characteristics and field of use

Stainless. High corrosion resistance in reducing and, above all, in oxidizing environments. For joining and surfacing with matching and similar alloys and cast alloys. For welding the cladded side of plates of matching and similar alloys.

Base materials

2.4602 – NiCr21Mo14W – Alloy C-22; 2.4605 – NiCr23Mo16Al – Alloy 59; 2.4610 – NiMo16Cr16Ti – Alloy C-4; 2.4819 – NiMo16Cr15W – Alloy C-276

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Fe
<0.02	0.10	<0.5	23.0	16.0	bal.	<1.5

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C
untreated	420	700	40	60

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 250

45-70

3.2 x 300

65-105

4.0 x 350

85-135

Approvals and certificates

TÜV (09272.)

UTP 7015

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6182 (NiCr15Fe6Mn)

E NiCrFe-3

Characteristics and field of use

UTP 7015 is employed for joining and surfacing of nickel-base materials. UTP 7015 is also recommended for welding different materials, such as austenitic to ferritic steels, as well as for weld claddings on unalloyed and low-alloyed steels, e. g. for reactor construction.

Welding characteristics and special properties of the weld metal

I Weldable in all positions, except vertical down. Stable arc, good slag removability. The seam is finely rippled and notch-free. The weld deposit has a fully austenitic structure and is high-temperature resistant. Not prone to embrittlement either at high or low temperatures.

Welding instructions

Opening angle of the prepared seam approx. 70°, root gap approx. 2 mm. The stick electrode is welded with a slight tilt and short arc. Use string beads welding technique. The interpass temperature of 150° C and a max. weaving width 2.5 x diameter of the stick electrode core wire should not be exceeded. Re-dry stick electrode prior welding for 2 –3 h at 250 –300° C, welding out of a hot stick electrode carrier.

Base materials

NiCr15Fe (Inconel 600) and Ni alloys of the same or similar composition; highly creep resistant austenitic steels, e.g. X8CrNiNb16-13, X8CrNiMoNb16-16, X8CrNiMoVNB16-13, and steels of the same strength group with the same or similar composition. 1.5 to 5% Ni steels, including X8Ni9, and joints between the above-mentioned steel groups with unalloyed and low-alloy steels for use at higher temperatures, e.g. P235GH, P265GH, P235GH- P355GH, S255NB, P295GH, 16Mo3; low-alloy structural and boiler construction steels, as well as X20CrMoV12-1 and X20CrMoWV12-1 with stainless, creep resistant austenitic steels; also suitable for the Incoloy 800 material

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Fe
0.025	0.4	6.0	16.0	bal.	2.2	6.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C:	-196°C:
untreated	400	670	40	120	80

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 250	50-70
3.2 x 300	70-95
4.0 x 350	90-120
5.0 x 400	120-160

Approvals and certificates

TÜV (00875.), GL, DNV, KTA (08036)

UTP 7015 Mo

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6093 (NiCr15Fe8NbMo)

E NiCrFe-2

Characteristics and field of use

UTP 7015 Mo is predominantly used for joining identical heat resistant NiCrFe-alloys, heat resistant austenites, cold tough Ni-steels, and for joining heat resistant austenitic-ferritic materials. Specially also used for joinings of high C content 25/35 CrNi cast steel to 1.4859 or 1.4876 for petrochemical installations with working temperatures up to 900° C.

Welding characteristics and special properties of the weld metal

The welding deposit of UTP 7015 Mo is hot cracking resistant, does not tend to embrittlement and is scale resistant and resistant to cavitation at high temperatures.

Welding instructions

Hold stick electrode as vertically as possible with a short arc, only a very little weaving. Fill end crater carefully. Interpass temperature max. 150° C. Re-dry stick electrodes for 2 –3 h / 250 –300° C.

Base materials

2.4816 (NiCr15 Fe), 2.4951 (NiCr 20 Ti), 1.4876 (X10 NiCrTiAl 32 20), 1.4941(X8 CrNiTi 18 10)

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Nb	Ni	Fe
0.04	0.4	3.0	16.0	1.5	2.2	bal.	6.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C
untreated	> 380	> 620	> 35	> 80

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 300	50-70
3.2 x 300	70-95
4.0 x 350	90-120
5.0 x 400	120-160

Approvals and certificates

TÜV (05259.), GL, DNV

UTP 7013 Mo

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 6620 (NiCr14Mo7Fe)

E NiCrMo-6

Characteristics and field of use

The high-nickel stick electrode UTP 7013 Mo is especially suited for welding cold-tough nickel steels, such as X8Ni9.

Welding characteristics and special properties of the weld metal

UTP 7013 Mo is destined for welding with ac. It is weldable in all positions. Stable arc, easy slag removal.

Welding instructions

The weld zone must be clean and properly degreased. Prior to welding, the stick electrodes must be dried for 2–3 hours at 250–300° C. The stick electrode is welded with a slight tilt, short arc and sufficiently high amperage adjustment. To avoid end crater cracks, the crater must be filled properly and the arc drawn away to the side.

Base materials

cold-tough nickel steels, such as X8Ni9

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Nb	W	Fe
0.05	<0.6	3.5	13.0	7.0	bal.	1.0	1.2	7.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	-196°C:
untreated	> 420	> 690	> 35	> 70

Operating data



Polarity = + / ~

Dimensions (mm)	Amperage A
2.5 x 300	50-70
3.2 x 300	80-120
4.0 x 350	110-150
5.0 x 400	120-160

Approvals and certificates

BV

UTP 80 M

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni 4060 (NiCu30Mn3Ti)

E NiCu-7

Characteristics and field of use

UTP 80 M is suitable for joining and surfacing of nickel-copper alloys and of nickel-copper-clad steels. UTP 80 M is also used for joining different materials, such as steel to copper and copper alloys, steel to nickel-copper alloys. These materials are employed in high-grade apparatus construction, primarily for the chemical and petrochemical industries. A special application field is the fabrication of seawater evaporation plants and marine equipment.

Welding characteristics and special properties of the weld metal

UTP 80 M is weldable in all positions, except vertical-down. Smooth, stable arc. The slag is easily removed, the seam surface is smooth. The weld metal withstands sea water.

Welding instructions

Thorough cleaning of the weld zone is essential to avoid porosity. V angle of seam about 70°, weld string beads if possible. Weld with dry stick electrodes only! Re-dry stick electrodes 2 - 3 hours at 200° C.

Base materials

Particularly suited for the following materials: 2.4360 NiCu30Fe, 2.4375 NiCu30Al.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Ni	Cu	Ti	Al	Fe
<0.05	0.7	3.0	bal.	29.0	0.7	0.3	1.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
	MPa	MPa	%	+20°C
untreated	> 300	> 450	> 30	> 80

Operating data



Polarity = +

Dimensions (mm)

Amperage A

2.5 x 300	55-70
3.2 x 300	75-110
4.0 x 350	90-130
5.0 x 400	135-160

Approvals and certificates

TÜV (00248.), ABS, GL

Avesta P12-R basic

Stick electrode

Classifications

nickel-based

EN ISO 14172:

AWS A5.11:

E Ni Cr 22 Mo 9

E Ni Cr Mo-12

Characteristics and field of use

Avesta P12-R basic is a nickel base electrode designer for welding 6Mo steels such as 254 SMO. It can also be used for welding nickel base alloys such as Inconel 625 and Incoloy 825. In chloride containing environments, the electrode offers particularly high resistance to pitting, crevice corrosion and stress corrosion cracking. To minimise the risk of hot cracking when welding fully austenitic steels and nickel base alloys, heat input and interpass temperature must be low and there must be as little dilution as possible from the parent metal.

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
254 SMO®	1.4547	S31254	-	-	2378

Also for welding nickel base alloys to stainless or unalloyed steels and for surfacing.

Typical analysis of all-weld metal (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Nb	Fe
0.02	0.4	0.4	21.5	bal.	9.5	2.2	3.0

Mechanical properties of all-weld metal

Heat Treatment	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	MPa	MPa	%	+20°C:	-40°C:	-196°C:
untreated	480	730	40	90	80	70

Operating data



Polarity = +

Dimensions (mm)	Amperage A
2.0	25-45
2.5	40-70
3.2	60-95
4.0	90-135