

Classifications

unalloyed

EN ISO 636-A:	AWS A5.18:		
W 42 5 W3Si1	ER70S-6		

Characteristics and field of use

Universally applicable copper coated welding rod with a largely spatter-free material transfer. The welding rod is suitable for joint welding in the construction of boilers, containers and building structures.
 BÖHLER EMK 6 is also suitable for use in acid gas (HIC test according to NACE TM-02-84). Values for the SSC test are also available.

Marks (rods only)

front:  W3Si1
 back: ER70S-6

Base materials

Steels up to a yield strength of 420 MPa (60 ksi)
 S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S420N, S275M-S420M, S275NLS420NL,
 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
 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 composition of welding rod (Wt-%)

C	Si	Mn			
0.8	0.9	1.45			

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:	-40°C:
untreated	450	560	28	180	80
stress relieved*	400	510	28	180	110

* 600°C/2 h – shielding gas 100% Argon

Operating data

	Polarity = -	Shielding gas: Argon
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Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (09717.), LTSS, SEPROZ, CE

Classifications

unalloyed

EN ISO 636-A:

AWS A5.18:

W 46 5 W2Si

ER70S-3

Characteristics and field of use

Copper coated welding rod for welding unalloyed and low-alloy steels. The TIG rod is suitable for thin-walled plates and thin-walled tubes as well as for root welds. The relatively low Si content makes the welding rod particularly suitable for welding joints that will later be enamelled or galvanised. The TIG rods are particularly recommended for root welds (approved down to -50°C).

BÖHLER EML 5 is also suitable for use in acid gas (HIC test according to NACE TM-02-84).

Marks (rods only)

front:  W3Si1
back: ER70S-3

Base materials

Steels up to a yield strength of 460 MPa (67 ksi)

S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S460N, S275M-S460M, S275NL-S460NL, S275ML-S460ML, P235GH-P355GH, P275NL1-P460NL1, P275NL2-P460NL2, P215NL, P265NL, P355N, P460N, P285NH-P460NH, 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 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 572 Gr. 42, 50, 55, 60, 65; 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 composition of welding rod (Wt-%)

C	Si	Mn		
0.01	0.6	1.2		

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	0.2%					
	MPa	MPa	%	+20°C:	-20°C:	-50°C:
untreated	520	620	26	220	200	90
stress relieved*	480	580	28	200	210	

* 600°C/2 h – shielding gas 100% Argon

Operating data



Polarity = -

Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (1096.), DB (42.014.02), Statoil, CE

Union I 52

TIG rod

Classifications

unalloyed

EN ISO 636-A:

AWS A5.18:

W 42 5 W3Si1

ER70S-6

Characteristics and field of use

GTAW solid rod and wire for the welding with argon. Typical fields of use: boiler, tank and pipeline constructions and apparatus engineering.

Marks (rods only)



Base materials

Unalloyed structural steels acc. to EN 10025: S185, S235JR, S235JRG1, S235JRG2, S275JR, S235J0, S275J0, S355J0. Boiler steels P235GH, P265GH, P295GH, P355GH.
 Fine grained structural steels up to S420N.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 composition of welding rod (Wt-%)

C	Si	Mn		
0.08	0.85	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	
				+20°C	-50°C:
Shielding gas	MPa	MPa	%		
I1	440	560	25	130	50

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I 1-3

Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (1656.), DB (42.132.11), DNV

Classifications


low-alloyed

EN ISO 21952-A:	EN ISO 636-A:	AWS A5.28:
W MoSi	W 46 3 W2Mo (for rod)	ER70S-A1 (ER80S-G)

Characteristics and field of use

TIG welding rod, copper coated for welding in boiler making, pressure vessel and pipeline construction, crane building and steel construction. High-quality, very tough and crack-resistant weld metal, resistant to ageing. Suitable for the temperature range from -30°C to 500°C (550°C). Very good welding and flow behaviour.

Marks (rods only)

front:  WMoSi
back: 1.5424

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 composition of welding rod (Wt-%)


C	Si	Mn	Mo	
0.1	0.6	1.1	0.5	

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	0.2%			in J CVN	
Shielding gas	MPa	MPa	%	+20°C:	-30°C:
untreated	530	650	26	200	80
annealed*	480	570	27	230	

*annealed, 620°C/1 h/furnace down to 300°C/air – shielding gas Argon

Operating data

	Polarity = -	Shielding gas: 100% Argon
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Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (0020.), KTA 1408.1 (8066.), DB (42.014.09), BV (UP), DNV (I YMS), CRS (3), CE, NAKS

Similar alloy filler metals

GMAW solid wire:	DMO-IG	SAW combination:	EMS 2 Mo/BB 24, EMS 2 Mo/BB 306, EMS 2 Mo/BB 400
SMAW electrode:	FOX DMO Kb FOX DMO Ti		EMS 2 Mo/BB 418 TT
Flux cored wire:	DMO Ti-FD		EMS 2 Mo/BB 421 TT

Classifications

low-alloyed

EN ISO 21952-A:

AWS A5.28:

W CrMo1Si

ER80S-B2 (mod.)

Characteristics and field of use

TIG welding rods, copper coated for welding in boiler, pressure vessel and pipeline construction, also for welding work with quenched and tempered and case-hardening steels. Preferred for 13CrMo4-5. Approved for long-term use at operating temperatures of up to +570°C. Suitable for step cooling applications (Bruscato ≤ 15 ppm). The weld metal exhibits high quality, good toughness and crack resistance; it is resistant to caustic cracking, can be nitrided and is suitable for quenching and tempering. The creep strength is in the same range as the 13CrMo4-5 material. Very good welding and flow behaviour.

Marks (rods only)

front:  W CrMo1 Si
back: 1.7339

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo	P	As	Sb	Sn
0.1	0.6	1.0	1.2	0.5	≤0.015	≤0.010	≤0.005	≤0.006

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:
annealed *	440	570	25	250
annealed 1**	510	620	22	200

*680°C/2 h/furnace down to 300°C/air – shielding gas Argon; ** 620°C/1 h/furnace down to 320°C/air – shielding gas Argon

Operating data


Polarity = -

 Shielding gas:
100% Argon

Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (1096.), DB (42.014.02), Statoil, CE

Similar alloy filler metals

GMAW solid wire:	DMO-IG	Flux cored wire:	DMO Ti-FD
SMAW electrode:	FOX DMO Kb FOX DMO Ti	SAW combination:	EMS 2 CrMo/BB 24 EMS 2 CrMo/BB 24 SC EMS 2 CrMo/BB 418 TT
Gas welding rod:	DCMS		

Union I Mo

TIG rod

Classifications

low-alloyed

EN ISO 21952-A:

EN ISO 636-A:

AWS A5.28:

W MoSi

W 46 3 W2Mo

ER80S-G(A1)

Characteristics and field of use

Medium alloyed welding rod/wire for the welding with argon. Suited for low alloy and creep resistant steels in pipe and tank construction.

Marks (rods only)



W MoSi / ER80S-G (A1)

Base materials

P235GH, P265GH, P295GH, 16 Mo 3, 17 MnMoV 64, 15 NiCuMoNb 5, 20 MnMo 45, 20 MnMoNi 55, Fine grained structural steels up to S460N, Pipe steels acc. to EN 10216 T2: P235GH, P265GH ASTM A335 Gr. P1; A161-94 Gr. T1 A, A182M Gr. F1; A204M Gr. A, B, C; A250M Gr. T1; A217 Gr. WC1

Typical composition of welding rod (Wt-%)

C	Si	Mn	Mo	
0.1	0.6	1.15	0.5	

Mechanical properties of all-weld metal

Shielding gas	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN	
	MPa	MPa	%	+20°C	-30°C:
I1	480	570	23	110	47

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I 1-3

Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (1250.), DB (42.132.43)

Union I CrMo

TIG rod

Classifications

low-alloyed

EN ISO 21952-A:

AWS A5.28:

W CrMo1Si

ER80S-G

Characteristics and field of use

Welding rod/wire for the welding with argon. Suitable for manufacturing creep resistant steels in boiler, tank, pipeline and nuclear reactor construction.

Marks (rods only)



W CrMo1Si / W IV

Base materials

1.7335 – 13CrMo4-5, ASTM A193 Gr. B7; 1.7357 – G17CrMo5-5, A217 Gr. WC6; A335 Gr. P11 and P12

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo
0.1	0.6	1.0	1.1	0.5

Mechanical properties of all-weld metal

	Yield strength 0.2%	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN
Shielding Gas	MPa	MPa	%	+20°C
A1	450	560	22	90

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I 1-3

Dimensions (mm)

0.8	2.0	2.5	3.0
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Approvals and certificates

TÜV (0906.), DB (42.132.44)

BÖHLER CM 2-IG

TIG rod

Classifications

low-alloyed

EN ISO 21952-A:

AWS A5.28:

W CrMo2Si

ER90S-B3 (mod.)

Characteristics and field of use

TIG welding rod, copper coated for welding in boiler, pressure vessel and pipeline construction, and for the petrochemical industry, e.g. cracking plants. Preferred for 10CrMo9-10, and also suitable for similar-alloy quenched and tempered and case-hardening steels. Approved for long-term use at operating temperatures of up to +600°C. The weld metal exhibits high quality, good toughness and crack resistance, as well as a creep strength very much in the same range as 10CrMo9-10. Very good welding and flow behaviour.

Marks (rods only)

front:  W CrMo2 Si
back: 1.7384

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 composition of welding rod (Wt-%)


C	Si	Mn	Cr	Mo	P	As	Sb	Sn
0.08	0.6	0.9	2.5	1.0	≤0.010	≤0.010	≤0.005	≤0.006

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:
annealed *	470	600	23	190

(*) annealed, 720°C/2 h/furnace down to 300°C/air – shielding gas Argon

Operating data

	Polarity = -	Shielding gas: 100% Argon
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Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (1564.), SEPROZ, CE, NAKS (Ø2.4 mm; Ø3.0 mm)

Similar alloy filler metals

GMAW solid wire:	CM 2-IG	Flux cored wire:	CM 2 Ti-FD
SMAW electrode:	FOX CM 2 Kb SC FOX CM 2 Kb	SAW combination:	CM 2-UP/BB 24 CM 2 SC-UP/BB 24 SCEMS 2 CM 2-UP/BB 418 TT

Union I CrMo 910

TIG rod

Classifications

low-alloyed

EN ISO 21952-A:

AWS A5.28:

W CrMo2Si

ER90S-G

Characteristics and field of use

Medium alloyed welding rod/wire for the welding with argon. Suitable for manufacturing creep resistant steels in boiler, tank, pipeline and nuclear reactor construction.

Marks (rods only)

W CrMo2 Si / 1.7384

Base materials

1.7380 – 10 CrMo 910, ASTM A355 Gr- P22; 1.7379 – G17CrMo9-10, A217 Gr. WC9

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo
0.047	0.6	1.0	2.55	1.0

Mechanical properties of all-weld metal

	<i>Yield strength</i> 0.2%	<i>Tensile strength</i>	<i>Elongation</i> ($L_0=5d_0$)	<i>Impact values</i> in J CVN
Shielding gas	MPa	MPa	%	+20°C
I1	470	590	20	80

Operating data

Polarity = -

Shielding gas (EN ISO 14175):
I 1-3**Dimensions (mm)**

2.0	2.5	3.0	
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Approvals and certificates

TÜV (0908.), DB (42.132.41)

Classifications

low-alloyed

EN 12536:

AWS A5.2:

O IV

R60-G

Characteristics and field of use

Copper coated, Mo-alloyed gas welding rod, preferred for pipe welding with strict inspection requirements. Viscous weld pool. Approved for long-term use at operating temperatures of up to +500°C.

Marks (rods only)

front:  O IV 2.0
back: R60-G

Base materials

Unalloyed and creep resistant structural steels with yield strengths up to 295 MPa. 16Mo3, S235JR, S275JR, S275N, S275M, P195GH-P295GH, P195TR1-P265TR1, P195TR2-P265TR2, GE200-GE240 ASTM A 29 Gr. 1013, 1016; A 106 Gr. C; A; A 182 Gr. F1; A 283 Gr. B, C; A 501 Gr. B; A 510 Gr. 1013; A 512 Gr. 1021, 1026; A 513 Gr. 1021, 1026; A 633 Gr. C; A 709 Gr. 36, 50; A 711 Gr. 1013

Typical composition of welding rod (Wt-%)

C	Si	Mn		
0.01	0.6	1.2		

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:
untreated	330	470	24	60

Operating data



Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (0146.), DB (70.014.03), SEPPOZ, CE

BÖHLER Ni 1-IG

TIG rod

Classifications

low-alloyed

EN ISO 636-A:	EN ISO 636-A:	AWS A5.28:
W3Ni1	W 46 5 W3Ni1	ER80S-Ni1 (mod.)

Characteristics and field of use

Ni-alloy TIG welding rod for high-quality welding in the offshore field and applications with high requirements for low-temperature toughness down to -50°C.

Marks (rods only)

front:  W3Ni1
base: ER80S-Ni 1 (mod.)

Base materials

Cryogenic, high-strength steels up to a yield strength of 460 MPa 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 composition of welding rod (Wt-%)

C	Si	Mn	Ni	
0.07	0.7	1.4	0.9	

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:	-50°C:
untreated	500	600	25	150	(≥ 47)

Operating data

	Polarity = -	Shielding gas: 100% Argon
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Dimensions (mm)

2.0	2.4		
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Approvals and certificates

TÜV (12808.), CE

BÖHLER 2.5 Ni-IG

TIG rod

Classifications

low-alloyed

EN ISO 636-A:

AWS A5.28:

W 46 8 W2Ni2

ER80S-Ni2

Characteristics and field of use

Ni-alloy TIG welding rod, copper coated for welding cryogenic fine-grained structural steels and nickel steels. The TIG method is particularly suitable for thin sheet and root runs.
Cryogenic down to -80°C.

Marks (rods only)

front:  W2Ni2 2.4
back: ER80S-Ni 2

Base materials

Steels up to a yield strength of 460 MPa (67 ksi)
S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S460N, S275M-S460M, S275NL-S460NL, S275ML-S460ML, P235GH-P355GH, P275NL1-P460NL1, P275NL2-P460NL2, P215NL, P265NL, P355N, P460N, P285NH-P460NH, 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 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 572 Gr. 42, 50, 55, 60, 65; 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 composition of welding rod (Wt-%)

C	Si	Mn	Ni
0.08	0.6	1.0	2.4

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:	-80°C:
untreated	510	600	26	280	80	(≥ 47)

Operating data

	Polarity = -	Shielding gas: 100% Argon
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Dimensions (mm)

2.0	2.4	3.0
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Approvals and certificates

TÜV (01081.), BV (SA 3 YM; UP), GL (6Y46), Statoil, SEPROZ, CE

Similar alloy filler metals

GMAW solid wire:	2.5 Ni-IG	SAW combination:	Ni 2-UP/BB 24
SMAW electrode:	FOX 2.5 Ni		Ni 2-UP/BB 421 TT

TIG rod

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Chapter 2.2 - TIG rod (high-alloyed)

Product name	EN ISO		AWS		P
BÖHLER C 9 MV-IG	EN ISO 21952-A	W CrMo91	AWS A5.28	ER905-B9	179
Thermanit MTS 3	EN ISO 21952-A	W CrMo91	AWS A5.28	ER905-B9	180
Union I P24	EN ISO 21952-A	WZ CrMo2VTI/Nb	AWS A5.28	ER905-G	181
Thermanit MTS 616	EN ISO 21952-A	WZ CrMoWVNb 9 0.5 1.5	AWS A5.28	ER905-G [ER905-B9(mod.)]	182
BÖHLER A 7 CN-IG	EN ISO 14343-A	W 18 8 Mn	AWS A5.9	ER307 (mod.)	183
Thermanit X	EN ISO 14343-A	W 18 8 Mn	AWS A5.9	ER307 (mod.)	184
Thermanit ATS 4	EN ISO 14343-A	W 19 9 H	AWS A5.9	ER19-10H	185
Avesta 308L/MVR	EN ISO 14343-A	W 19 9 L	AWS A5.9	ER308L	186
Avesta 308L-Si/MVR-Si	EN ISO 14343-A	W 19 9 L Si	AWS A5.9	ER308LSi	187
Thermanit JE-308L	EN ISO 14343-A	W 19 9 L	AWS A5.9	ER308L	188
Thermanit JE-308L Si	EN ISO 14343-A	W 19 9 L Si	AWS A5.9	ER308LSi	189
BÖHLER CN 23/12-IG	EN ISO 14343-A	W 23 12 L	AWS A5.9	ER309L	190
Thermanit 25/14 E-309L	EN ISO 14343-A	W 23 12 L	AWS A5.9	ER309L	191
Avesta 309L-Si	EN ISO 14343-A	W 23 12 L Si	AWS A5.9	ER309LSi	192
Thermanit D	EN ISO 14343-A	W 22 12 H	AWS A5.9	ER309 (mod.)	193
BÖHLER FF-IG	EN ISO 14343-A	W 22 12 H	AWS A5.9	ER309 (mod.)	194
Avesta 316L/SKR	EN ISO 14343-A	W 19 12 3 L	AWS A5.9	ER316L	195
Avesta 316L-Si/SKR-Si	EN ISO 14343-A	W 19 12 3 L Si	AWS A5.9	ER316LSi	196
BÖHLER EAS 4 M-IG	EN ISO 14343-A	W 19 12 3 L	AWS A5.9	ER316L	197
Thermanit GE-316L	EN ISO 14343-A	W 19 12 3 L	AWS A5.9	ER316L	198
Thermanit GE-316L Si	EN ISO 14343-A	W 19 12 3 L Si	AWS A5.9	ER316LSi	199
BÖHLER SAS 4-IG	EN ISO 14343-A	W 19 12 3 Nb	AWS A5.9	ER318	200
Thermanit A	EN ISO 14343-A	W 19 12 3 Nb	AWS A5.9	ER318	201
Avesta 318-Si/SKNb-Si	EN ISO 14343-A	W 19 12 3 Nb Si	AWS A5.9	ER318(mod.)	202
BÖHLER SAS 2-IG	EN ISO 14343-A	W 19 9 Nb	AWS A5.9	ER347	203
Thermanit H-347	EN ISO 14343-A	W 19 9 Nb	AWS A5.9	ER347	204
BÖHLER CN 13/4-IG	EN ISO 14343-A	W 13 4	AWS A5.9	ER410NiMo (mod.)	205
Avesta 2205	EN ISO 14343-A	W 22 9 3 N L	AWS A5.9	ER2209	206
BÖHLER CN 22/9 N-IG	EN ISO 14343-A	W 22 9 3 N L	AWS A5.9	ER2209	207
Thermanit 22/09	EN ISO 14343-A	W 22 9 3 N L	AWS A5.9	ER2209	208
Avesta LDX 2101	EN ISO 14343-A	W 23 7 N L	-	-	209
Avesta P5	EN ISO 14343-A	W 23 12 2 L	AWS A5.9	ER309LMo(mod.)	210
Avesta 2507/P100	EN ISO 14343-A	W 25 9 4 N L	AWS A5.9	ER2594	211
BÖHLER CN 25/9 CuT-IG	EN ISO 14343-A	W 25 9 4 N L	AWS A5.9	ER2594	212
Thermanit 25/09 CuT	EN ISO 14343-A	W 25 9 4 N L	AWS A5.9	ER2594	213
Thermanit L	EN ISO 14343-A	W 25 4	-	-	214
BÖHLER FA-IG	EN ISO 14343-A	W 25 4	-	-	215
BÖHLER FFB-IG	EN ISO 14343-A	W 25 20 Mn	AWS A5.9	ER310 (mod.)	216
UTP A 2133 Mn	EN ISO 14343-A	WZ 21 33 Mn Nb	-	-	217
UTP A 2535 Nb	EN ISO 14343-A	WZ 25 35 Zr	-	-	218
UTP A 3545 Nb	EN ISO 14343-A	WZ 35 45 Nb	-	-	219
Thermanit 35/45 Nb	EN ISO 18274	S Ni Z (NiCr36Fe15Nb0.8)	-	-	220
Avesta P12	EN ISO 18274	S Ni 6625 (NiCr22Mo9Nb)	AWS A5.14	ERNiCrMo-3	221
BÖHLER NIBAS 625-IG	EN ISO 18274	S Ni 6625 (NiCr22Mo9Nb)	AWS A5.14	ERNiCrMo-3	222
Thermanit 625	EN ISO 18274	S Ni 6625 (NiCr22Mo9Nb)	AWS A5.14	ERNiCrMo-3	223
UTP A 6222 Mo	EN ISO 18274	S Ni 6625 (NiCr22Mo9Nb)	AWS A5.14	ERNiCrMo-3	224
BÖHLER NIBAS 70/20-IG	EN ISO 18274	S Ni 6082 (NiCr20Mn3Nb)	AWS A5.14	ERNiCr-3	225
Thermanit Micro 82	EN ISO 18274	S Ni 6082 (NiCr20Mn3Nb)	AWS A5.14	ERNiCr-3	226
UTP A 068 HH	EN ISO 18274	S Ni 6082 (NiCr20Mn3Nb)	AWS A5.14	ERNiCr-3	227
Thermanit 617	EN ISO 18274	S Ni 6617 (NiCr22Co12Mo9)	AWS A5.14	ERNiCrCoMo-1	228
UTP A 6170 Co	EN ISO 18274	S Ni 6617 (NiCr22Co12Mo9)	AWS A5.14	ERNiCrCoMo-1	229
UTP A 776	EN ISO 18274	S Ni 6276 (NiCr15Mo16Fe6W4)	AWS A5.14	ERNiCrMo-4	230
Thermanit Nimo C 24	EN ISO 18274	S Ni 6059 (NiCr23Mo16)	AWS A5.14	ERNiCrMo-13	231
UTP A 759	EN ISO 18274	S Ni 6059 (NiCr23Mo16)	AWS A5.14	ERNiCrMo-13	232
UTP A 80 M	EN ISO 18274	S Ni 4060 (NiCu30Mn3Ti)	AWS A5.14	ERNiCu-7	233

BÖHLER C 9 MV-IG

TIG rod

Classifications

high-alloyed

EN ISO 21952-A:

AWS A5.28:

W CrMo91

ER90S-B9

Characteristics and field of use

TIG welding rod for highly creep resistant, quenched and tempered 9-12% chrome steels, particularly for T91/P91 steels in turbine and boiler construction and in the chemical industry. Approved for long-term use at operating temperatures of up to +650°C.

Marks (rods only)

front:  WCrMo91
back: ER 90S-B9

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 composition of welding rod (Wt-%)


C	Si	Mn	Cr	Ni	Mo	V	Nb
0.1	0.3	0.5	9.0	0.5	0.9	0.2	0.06

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:	
annealed *	640	760	19	150	

(*) annealed, 760°C/2 h/furnace down to 300°C/air – shielding gas Argon

Operating data

	Polarity = -	Shielding gas: 100% Argon
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Dimensions (mm)

2.0 2.4

Approvals and certificates

TÜV (07106.), CE, NAKS (Ø2.4 mm; Ø3.0 mm)

Similar alloy filler metals

GMAW solid wire:	C 9 MV-IG	Flux cored wire:	C 9 MV Ti-FD
SMAW electrode:	FOX C 9 MV	SAW combination:	C 9 MV-UP/BB 910
Metal cored wire:	C 9 MV-MC		

Thermanit MTS 3

TIG rod

Classifications

high-alloyed

EN ISO 21952-A:

AWS A5.28:

W CrMo91

ER90S-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.

Marks (rods only)



W CrMo91 / ER90S-B9

Base materials

1.4903 – X10CrMoVNb9-1; ASTM A199 Gr. T91; A355 Gr. P91(T91); A213/213M Gr. T91

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo	V	Nb
0.1	0.3	0.5	9.0	0.7	1.0	0.2	0.06

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:
760 °C / 2 h	530	620	19	150

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (6166.)

Union I P24

TIG rod

Classifications

high-alloyed

EN ISO 21952-A:

AWS A5.28:

WZ CrMo2VTi/Nb

ER90S-G

Characteristics and field of use

Medium alloyed welding rod / wire for the welding with Argon. Suitable for creep resistant tubes and pipes in power stations, especially 7CrMoVTi B10-10 (T24/P24)

Marks (rods only)

T / P24 / ER90S-G

Base materials

1.7378 – 7 CrMoVTiB 10-10; (P24/T24)

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo	V	Ti/Nb
0.05	0.3	0.5	2.2	1.0	0.22	0.04

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:
AW	600	700	15	47
740 °C / 2 h	500	620	20	100

Operating data

Polarity = -

Shielding gas (EN ISO 14175):
I 1-3**Dimensions (mm)**

Spools	0.8	D100, B300		
	1.0	B300		
	1.2	B300		
Rods	1.6	2.0	2.4	3.2

Approvals and certificates

TÜV (10157.)

Thermanit MTS 616

TIG rod

Classifications

high-alloyed

EN ISO 21952-A:

AWS A5.28:

WZ CrMoWVNb 9 0.5 1.5

ER90S-G [ER90S-B9(mod.)]

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.

Marks (rods only)



Base materials

ASTM A 355 Gr. P92, NF 616, ASTM A 355 Gr. P92 (T92); A213 Gr. 92, 1.4901 X10CrWMoVNb9-2

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo	Ni	W	V	Nb	N
0.1	0.25	0.5	8.5	0.4	0.5	1.6	0.2	0.06	0.04

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:
760°C/≥2 h	560	720	15	41

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

Spools	0.8	D200		
Rods	1.6	2.0	2.4	3.2

Approvals and certificates

TÜV (9290.)

BÖHLER A 7 CN-IG

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 18 8 Mn

ER307 (mod.)

Characteristics and field of use

TIG welding rod 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, wear-resistant and corrosion-resistant surfacings on rail and points components, valve seats and cavitation protection armour in hydro-electric machines. 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 recommended for operating temperatures above +650°C. Very good welding and flow behaviour.

Marks (rods only)

front:  W 18 8 Mn
back: 1.4370

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-alloy 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 composition of welding rod

C	Si	Mn	Cr	Ni
0.07	0.8	6.8	19.2	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	38	120	≥ 32

Operating data

 Polarity = -

Shielding gas:
Argon

Dimensions (mm)

1.6	2.0	2.4
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Approvals and certificates

TÜV (00023.), DNV (X), GL (4370), DB (43.014.28), CE, NAKS, VG 95132

Similar alloy filler metals

SMAW electrode:	FOX A 7 / FOX A 7 CN* FOX A 7-A	Flux cored wire:	A 7-MC, A 7-FD, A 7 PW-FD
GMAW solid wire:	A 7-IG / A 7 CN-IG*	SAW combination:	A 7 CN-UP/BB 203

Thermanit X

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 18 8 Mn

ER307 (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 for 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.

Marks (rods only)

front:  W 18 8 Mn
back: 1.4370

Base materials

TÜV-certified parent metal

1.4583 – X10CrNiMoNb18-12 and included parent metals combined with ferritic steels up to boiler plate P295GH. 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 high alloyed 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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.08	0.8	7.0	19.0	9.0

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	620	35	100

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
11

Dimensions (mm)

1.0	1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (1234.), DB (43.132.26), DNV

Thermanit ATS 4

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 19 9 H

ER19-10H

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.

Marks (rods only)



W 19 9 H / ER19-10 H

Base materials

TÜV-certified parent metal 1.4948 – X6CrNi18-11 1.4878 – X12CrNiTi18-9
1.4850 – X6CrNiNb18-10 AISI 304H, 321H, 347H

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.05	0.4	1.8	18.8	9.3

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:
AW	400	600	30	100

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (1616.)

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 19 9 L

ER308L

Characteristics and field of use

Avesta 308L/MVR is designed for welding 1.4301/ASTM 304 type stainless steels. It can also be used for welding steels that are stabilized with titanium or niobium, such as 1.4541/ASTM 321 and 1.4550/ASTM 347 in cases where the construction will be operating at temperatures below 400°C. For higher temperatures a niobium stabilised consumable such as Avesta 347-Si/MVNb-Si is required. Avesta 308L/MVR is also available with high silicon content (308L-Si/MVR-Si). The higher silicon content will improve fluidity and minimise the spatter, giving a nicer weld bead appearance.

Corrosion resistance:

Very good under fairly severe conditions, e.g. in oxidising acids and cold or dilute reducing acids.

Base materials

For welding steels such as

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.02	0.4	1.7	20.0	10.0

Ferrite 8 FN; WRC -92, 10FN;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:	-196°C:
untreated	460	620	33	130	120	70

Operating data



Shielding gas:

Ar (99.95%) or Ar with an addition of 20 – 30% helium (He) or 1 – 5% hydrogen (H₂). The addition of helium (He) and hydrogen (H₂) will increase the energy of the arc. Gas flow rate 4 – 8 l/min.

Dimensions (mm)

1.2	1.6	2.0	2.4	3.2
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Avesta 308L-Si/MVR-Si

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 19 9 L Si

ER308LSi

Characteristics and field of use

Avesta 308L-Si/MVR-Si is designed for welding 1.4301/ASTM 304 type stainless steels. It can also be used for welding steels that are stabilised with titanium or niobium, such as 1.4541/ASTM 321 and 1.4550/ASTM 347 in cases where the construction will be operating at temperatures below 400°C. For higher temperatures a niobium stabilized consumable such as Avesta 347-Si/MVNB-Si is required.

Base materials

For welding steels such as

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.02	0.85	1.8	20.0	10.5

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	470	640	34	140	80

Operating data

Shielding gas:

Ar (99.95%) or Ar with an addition of 20 - 30% helium (He) or 1 - 5% hydrogen (H_2). The addition of helium (He) and hydrogen (H_2) will increase the energy of the arc. Gas flow rate 4 - 8l/min.

Dimensions (mm)

1.0	1.2	1.6	2.0	2.4	3.2	4.0
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Thermanit JE-308L

TIG rod

Classifications

high-alloyed


EN ISO 14343-A: AWS A5.9:

W 19 9 L ER308L

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. High toughness at subzero temperatures as low as -196 °C (-321 °F). For joining and surfacing applications with matching and similar – stabilized and non-stabilized – austenitic CrNi(N) and CrNiMo(N) steels/cast steel grades. For joining and surfacing work on cryogenic matching/similar austenitic CrNi(N) steels/cast steel grades.

Marks (rods only)

 W 19 9L / ER308L

Base materials

TÜV-certified parent metal 1.4301 – X5CrNi18-10 1.4311 – X2CrNi18-10 1.4550 – X6CrNiNb18-10 AISI 304, 304L, 304LN, 302, 321, 347; ASTM A157 Gr. C9, A320 Gr. B8G or D

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.02	0.5	1.7	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:	-196°C:
untreated	400	570	35	100	35

Operating data



Polarity = –

Shielding gas (EN ISO 14175):
I1, I3

Dimensions (mm)

1.0	1.2	1.6	2.0	2.4	3.2	4.0
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Approvals and certificates

TÜV (9451.), DB (43.132.19), CWB (ER 308L), DNV

Thermanit JE-308L Si

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 19 9 L Si

ER308LSi

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. Cold toughness at subzero temperatures as low as -196 °C (-321 °F). For joining and surfacing applications with matching and similar – stabilized and non-stabilized – austenitic CrNi(N) and CrNiMo(N) steels/cast steel grades. For joining and surfacing work on cryogenic matching/similar austenitic CrNi(N) steels/cast steel grades.

Marks (rods only)

front:  W 19 9L Si
back: ER309LSi

Base materials

TÜV-certified parent metal

1.4301 – X5CrNi18-10 1.4311 – X2CrNiN18-10; 1.4550 – X6CrNiNb18-10 AISI 304, 304L, 304LN, 302, 321, 347; ASTM A157 Gr. C9, A320 Gr. B8C or D.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.02	0.9	1.7	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:	-196 °C
untreated	350	570	35	75	35

Operating data



Polarity = +

Shielding gas (EN ISO 14175):
M11, M12, M13

Dimensions (mm)

0.8	1.0	1.2	1.6
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Approvals and certificates

TÜV (0555.), DB (43.132.08), CWB (ER 308L-Si), DNV

Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 23 12 L	ER309L		

Characteristics and field of use

TIG welding rod with increased ferrite content (FN ~16) in the weld metal. High crack resistance with hard-to-weld materials, austenite-ferrite joints and weld claddings. Dilution is to be kept as low as possible. Usable for operating temperatures between -120°C and +300°C.

Marks (rods only)

front:  W 23 12 L
back: ER 309 L

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-18NiMoCr3 7.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
≤0.02	0.5	1.7	23.5	13.2

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:
untreated	440	580	34	150

Operating data


Polarity = -

 Shielding gas:
100% Argon

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (4699), GL (4332), SEPROZ, DB (43.014.29), CE

Similar alloy filler metals

SMAW electrode:	FOX CN 23/12-A FOX CN 23/12 Mo-A	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
GMAW solid wire:	CN 23/12-IG		

Thermanit 25/14 E-309L

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 23 12 L

ER309L

Characteristics and field of use

Stainless; wet corrosion up to 350 °C (662 °F). Well suited for depositing intermediate layers when welding clad materials. Favourably high Cr- and Ni-contents, low C content. For joining unalloyed/low-alloy steels/cast steel grades or stainless heat resistant Cr-steels/cast steel grades to austenitic steels/cast steel grades. For depositing intermediate layers when welding the side of plates clad with low-carbon – non-stabilized and stabilized – austenitic CrNi(MoN) austenitic metals.

Marks (rods only)

W 23 12 L / ER309L

Base materials

TÜV-certified parent metal. Combinations between 1.4583 – X10CrNiMoNb18-12 and ferritic steels up to S355N. Joints of and between high-tensile, unalloyed and alloyed quenched and tempered steels, stainless, ferritic Cr and austenitic Cr-Ni steels, high manganese steels as well as claddings: for the first layer of chemical resistant weld claddings on ferriticpearlitic steels up to fine grained structural steels S500N, in steam boiler and pressure boiler construction, as well as creep resistant fine grained structural steels 11NiMoCr4-7 acc. to leaflet "SEW-Werkstoffblatt" No. 365, 366, 20MnMoNi5-5 and G18NiMoCr3-7.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.02	0.5	1.7	24.0	13.0

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	580	30	80

Operating data

Polarity = –

Shielding gas (EN ISO 14175):
I1**Dimensions (mm)**

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (2661.), CWB (ER 309L-Si), GL (4332)

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 23 12 L Si

ER309LSi

Characteristics and field of use

Avesta 309L-Si is a high-alloy 23 Cr 13 Ni wire primarily intended for surfacing of lowalloy steels and dissimilar welding between mild steels and stainless steels, offering a ductile and crack resistant weldment. The chemical composition, when surfacing, is equivalent to that of ASTM 304 from the first run. One or two layers of 309L are usually combined with a final layer of 308L, 316L or 347.

Corrosion resistance:

Superior to type 308L. When used for overlay welding on mild steel a corrosion resistance equivalent to that of 1.4301/ASTM 304 is obtained already in the first layer.

Base materials

For welding steels such as

Outokumpu

EN

ASTM

BS

NF

SS

Avesta 309L is primarily used when surfacing unalloyed or low-alloy steels and when joining non-molybdenum-alloyed stainless and carbon steels.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.015	0.80	1.8	23.5	13.5

Ferrite 9 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:
untreated	470	610	28	140

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Ar (99.95%) or Ar with an addition of 20 – 30% helium (He) or 1 – 5% hydrogen (H₂). The addition of helium (He) will increase the energy of the arc. Gas flow rate 4 – 8 l/min.

Dimensions (mm)

1.2	1.6	2.0	2.4	3.2
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Thermit D

TIG rod

Classifications


high-alloyed

EN ISO 14343-A:	AWS A5.9:	
W 22 12 H	ER309 (mod.)	

Characteristics and field of use

Resistant to scaling up to 950 °C (1742 °F). For joining and surfacing applications with matching/similar heat resistant steels/cast steel grades.

Marks (rods only)

 W 22 12 H / 1.4829

Base materials

1.4828 – X15CrNiSi20-12 AISI 305; ASTM A297HF


Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.11	1.2	1.2	22.0	11.0

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	420	600	30	85

Operating data

	Polarity = -	Shielding gas (EN ISO 14175): I1
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Dimensions (mm)

1.6	2.0	2.4	3.2		
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Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 22 12 H

ER309 (mod.)

Characteristics and field of use

TIG welding rod for same-type, heat resistant rolled, forged and cast steels, as well as for heat resistant ferritic Cr-Si-Al steels, such as in annealing shops, hardening shops, steam boiler construction, the petrochemical industry and the ceramic industry. Austenitic weld metal containing about 8% ferrite. Preferred for exposure to oxidising gases. Joints on Cr-Si-Al steels that are exposed to gases containing sulphur must be carried out using BÖHLER FOX FA or BÖHLER FA-IG as a final layer. Resistant to scaling up to +1000°C.

Marks (rods only)

front:  W 22 12 H
back: 1.4829

Base materials

austenitic

1.4828 X15CrNiSi20-12, 1.4826 GX40CrNiSi22-10, 1.4833 X12CrNi23-13

ferritic-pearlitic

 1.4713 X10CrAlSi7, 1.4724 X10CrAlSi13, 1.4742 X10CrAlSi18, 1.4710 GX30CrSi7,
1.4740 GX40CrSi17 AISI 305, ASTM A297HF

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.1	1.1	1.6	22.5	11.5

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	500	630	32	115

Operating data


Polarity = -

 Shielding gas:
100% Argon

Dimensions (mm)

1.6	2.0	2.4
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Approvals and certificates

TÜV (20), SEPROZ

Similar alloy filler metals

SMAW electrode:	FOX FF FOX FF-A	GMAW solid wire:	FF-IG
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Avesta 316L/SKR

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:	
W 19 12 3 L	ER316L	

Characteristics and field of use

Avesta 316L/SKR is designed for welding 1.4436/ASTM 316 type stainless steels. It is also suitable for welding steels that are stabilised with titanium or niobium, such as 1.4571/ASTM 316Ti, for service temperatures not exceeding 400°C. For higher temperatures, a niobium stabilised consumable such as Avesta 318-Si/SKNb-Si should be used. Avesta Welding also supplies a 316L type wire with high silicon content (316L-Si/SKR-Si). The higher silicon content (0.85%) improves the fluidity of the melt pool with a minimum of spatter and is therefore recommended if the demands on surface quality are high.

Marks (rods only)

 W 19 12 3 L/ E316L

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 composition of welding rod (Wt-%)


C	Si	Mn	Cr	Ni	Mo
0.02	0.40	1.7	18.5	12.2	2.6

Ferrite 7 FN; WRC-92

Mechanical properties of all-weld metal

Heat Treatment	Yield strength	Tensile strength	Elongation ($L_0=5d_0$)	Impact values in J CVN		
	0.2%			MPa	%	+20°C:
untreated	460	610	33	140	130	70

Operating data

	Polarity = -	Shielding gas: Ar (99.95%) or Ar with an addition of 20 – 30% helium (He) or 1 – 5% hydrogen (H ₂). The addition of helium (He) and hydrogen (H ₂) will increase the energy of the arc. Gas flow rate 4 – 8 l/min.
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Dimensions (mm)

1.0	1.2	1.6	2.0	2.4	3.2
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TIG rod

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Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 19 12 3 L Si

ER316LSi

Characteristics and field of use

Avesta 316L-Si/SKR-Si is designed for welding austenitic stainless steel type 17 Cr 12 Ni 2.5 Mo or similar. The filler metal is also suitable for welding titanium and niobium stabilised steels such as ASTM 316Ti in cases where the construction is used at temperatures not exceeding 400°C. For higher temperatures a niobium stabilised consumable such as Avesta 318-Si/SKNb-Si is required.

Corrosion resistance:

Excellent resistance to general, pitting and intergranular corrosion in chloride containing environments. Intended for severe service conditions, e.g. in dilute hot acids.

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.85	1.7	18.5	12.0	2.6

Ferrite 6 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:
untreated	450	600	31	140

Operating data



Polarity = -

Shielding gas:

Ar (99.95%) or Ar with an addition of 20 – 30% helium (He) or 1 – 5% hydrogen (H₂). The addition of helium (He) and hydrogen (H₂) will increase the energy of the arc. Gas flow rate 4 – 8 l/min.

Dimensions (mm)

1.0	1.2	1.6	2.0	2.4	3.2	4.0
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BÖHLER EAS 4 M-IG

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 19 12 3 L	ER316L		

Characteristics and field of use

TIG welding rod. For application in all branches of industry in which same-type steels, including higher-carbon steels, and ferritic 13% chrome steels are welded, e.g. the construction of chemical apparatus and containers, the chemical, pharmaceutical and cellulose, rayon and textile industries, and many more. Very good welding and flow behaviour. Resists intergranular corrosion up to an operating temperature of +400°C. Cryogenic down to -196°C.

Marks (rods only)

front:  W 19 12 3 L
back: ER 316 L

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo
≤0.02	0.5	1.8	18.5	12.3	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:	
untreated	470	610	38	140	

Operating data

	Polarity = -	Shielding gas: 100% Argon
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Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (00149), DB (43.014.12), DNV (316L), GL (4429), SEPROZ, NAKS (Ø2.4; 3.0), CE

Similar alloy filler metals

SMAW electrode:	FOX EAS 4 M FOX EAS 4 M (LF) FOX EAS 4 M-A FOX EAS 4 M-VD	Flux cored wire:	EAS 4 M-MC EAS 4 M-FD EAS 4 PW-FD EAS 4 PW-FD (LF)
	GMAW solid wire:		EAS 4 M-IG (Si)

TIG rod

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Thermanit GE-316L

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:


W 19 12 3 L

ER316L

Characteristics and field of use

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

Marks (rods only)

 W 19 12 3L / ER316L

Base materials

TÜV-certified parent metal

1.4583 – X10CrNiMoNb18-12; S31653, AISI 316L, 316Ti, 316Cb

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.5	1.7	18.5	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	%	+20°C:
untreated	450	580	35	100

Operating data



Polarity = –

Shielding gas (EN ISO 14175):
11

Dimensions (mm)

1.0	1.2	1.6	2.0	2.4	3.2	4.0
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Thermanit GE-316L Si

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 19 12 3 L Si	ER316LSi		

Characteristics and field of use

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

Marks (rods only)

front:  W 19 12 3 L
back: ER 316 L

Base materials

TÜV-certified parent metal 1.4583 – X10CrNiMoNb18-12; UNS S31653; AISI 316Cb, 316L, 316Ti


Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.02	0.8	1.7	18.8	12.5	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:
untreated	380	560	35	70

Operating data

	Polarity = –	Shielding gas (EN ISO 14175): M12, M13
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Dimensions (mm)

0.8	1.0	1.2	1.6
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Approvals and certificates

TÜV (0489.), DB (43.132.10), LR (flv7R-12), CWB (ER 316L-Si), GL (4429S), DNV

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 19 12 3 Nb

ER318

Characteristics and field of use

TIG welding rod. For application in all branches of industry in which same-type steels and ferritic 13% chrome steels are welded, e.g. the construction of chemical apparatus and containers, the textile and cellulose industry, dye works, beverage production, synthetic resin plants and many more. Also suitable for media containing chlorides due to the inclusion of Mo. Very good welding and flow behaviour. Resists intergranular corrosion up to an operating temperature of +400°C.

Marks (rods only)

front:  W 19 12 3 Nb
back: ER 318

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Nb
0.035	0.45	1.7	19.5	11.4	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	520	700	35	120	(≥ 32)

Operating data

	Polarity = -	Shielding gas: 100 % Argon
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Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (00236.), KTA 1408.1 (08046.), DB (43.014.03), GL (4571), SEPROZ, NAKS (Ø2.0; 2.4; 3.0), CE

Similar alloy filler metals

SMAW electrode:	FOX SAS 4 FOX SAS 4-A	Flux cored wire:	SAS 4-FD SAS 4 PW-FD
GMAW solid wire:	SAS 4-IG (Si)		
SAW combination:	SAS 4-UP /BB 202		

Thermanit A

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 19 12 3 Nb	ER318		

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 application with matching and similar – stabilized and non-stabilized – austenitic CrNi(N) and CrNiMo(N) steels and cast steel grades.

Marks (rods only)

 W 19 12 3 Nb / ER318

Base materials

TÜV-certified parent metal 1.4583 – X10CrNiMoNb18-12; UNS S31653; AISI 316Cb, 316L, 316Ti

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Nb
0.04	0.4	1.7	19.5	11.5	2.7	≥12xC

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:
untreated	400	600	30	100

Operating data



Polarity = –

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.0	1.6	2.0	2.4	3.2	4.0	5.0
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Approvals and certificates

TÜV (9474.), DB (43.132.27)

Avesta 318-Si/SKNb-Si

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 19 12 3 Nb Si

ER318 (mod.)

Characteristics and field of use

Avesta 318-Si/SKNb-Si is designed for welding steels that are stabilised with titanium or niobium such as 1.4571/ASTM 316Ti and similar, providing improved high temperature properties, e.g. creep resistance, compared to low-carbon non-stabilised materials. 318-Si/SKNb-Si shows better properties than 316L-Si/SKR-Si at elevated temperatures and is therefore recommended for applications with service temperatures above 400°C. A stabilised weldment has improved high temperature properties, e.g. creep resistance, compared to low-carbon non-stabilised grades.

Corrosion resistance:

Corresponding to 1.4571/ASTM 316Ti, i.e. good resistance to general, pitting and intergranular corrosion.

Base materials

For welding steels such as

Outokumpu	EN	ASTM	BS	NF	SS
4571	1.4571	316Ti	320S31	Z6 CNDT 17-12	2350

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Nb
0.04	0.85	1.3	19.0	12.0	2.6	>12xC

7 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	520	690	31	110	60

Operating data



Polarity = -

Shielding gas:

Ar (99.95%) or Ar with an addition of 20 – 30% helium (He) or 1 – 5% hydrogen (H₂). The addition of helium (He) and hydrogen (H₂) will increase the energy of the arc. Gas flow rate 4 – 8 l/min.

Dimensions (mm)

1.6	2.0	2.4	3.2
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Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 19 9 Nb	ER347		

Characteristics and field of use

TIG welding rod. For application in all branches of industry in which same-type steels and ferritic 13% chrome steels are welded, e.g. the construction of chemical apparatus and containers, the textile and cellulose industry, dye works and many more. Very good welding and flow behaviour. Resists intergranular corrosion up to an operating temperature of +400°C. Cryogenic down to -196°C.

Marks (rods only)

front:  W 19 9 Nb
back: ER 347

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Nb
0.05	0.5	1.8	19.6	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:	-120°C:
untreated	490	660	35	140	(≥ 32)

Operating data



Polarity = -

Shielding gas:
100 % Argon

Dimensions (mm)

1.6	2.0	2.4	3.0
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Approvals and certificates

TÜV (00142.), GL (4550), LTSS, SEPROZ, NAKS, CE

Similar alloy filler metals

SMAW electrode:	FOX SAS 2 FOX SAS 2-A	Flux cored wire:	SAS 2-FD SAS 2 PW-FD
GMAW solid wire:	SAS 2-IG (Si)	SAW combination:	SAS 2-UP/BB 202

Thermanit H-347

TIG rod

Classifications


high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 19 9 Nb	ER347		

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 austenitic CrNi steels/cast steel grades. For joining and surfacing application with matching and similar – stabilized and non-stabilized – austenitic CrNi(N) steels and cast steel grades.

Marks (rods only)

 W 19 9 Nb / ER347

Base materials

TÜV-certified parent metal 1.4550 – X6CrNiNb18-10 and the parent metals also covered by VdTÜV-Merkblatt 1000. AISI 347, 321, 302, 304, 304L, 304LN ASTM A296 Gr. CF8, A157 Gr. C9; A320 Gr. B8C or D

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Nb
0.05	0.5	1.8	19.5	9.5	≥12xC

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	570	30	65

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.0	1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (9475.), DB (43.132.21)

Classifications


high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 13 4	ER410NiMo (mod.)		

Characteristics and field of use

TIG welding rod 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 and steam. Very good welding and flow behaviour.

Marks (rods only)

front:  W 13 4
back: -

Base materials

1.4317 GX4CrNi13-4, 1.4313 X3CrNiMo13-4, 1.4407 GX5CrNiMo13-4, 1.4414 GX4CrNiMo13-4
ACI Gr. CA6NM

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo
0.01	0.7	0.7	12.3	4.7	0.5

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:	
untreated	915	1000	15	85	

Operating data

	Polarity = -	Shielding gas: 100 % Argon
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Dimensions (mm)

2.0	2.4				
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Approvals and certificates

TÜV (04110.), SEPROZ, CE

Similar alloy filler metals

SMAW electrode:	FOX CN 13/4 FOX CN 13/4 SUPRA	Flux cored wire:	CN 13/4-MC CN 13/4-MC (F)
GMAW solid wire:	CN 13/4-IG	SAW combination:	CN 13/4-UP/BB 203

Avesta 2205

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 22 9 3 N L

ER2209

Characteristics and field of use

Avesta 2205 is primarily designed for welding the duplex grade Outokumpu 2205 and similar grades but can also be used for welding SAF 2304 type of steels.

Avesta 2205 provides a ferritic-austenitic weldment that combines many of the good properties of both ferritic and austenitic stainless steels. Welding without filler metal (TIG dressing) is not allowed since the ferrite content will increase drastically which will have a negative effect on both mechanical and corrosion properties. The weldability of duplex steels is excellent but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc.

Corrosion resistance:

Very good resistance to pitting and stress corrosion cracking in chloride containing environments. PREN>35. Meets the corrosion test requirements per ASTM G48 Methods A, B and E (22°C), ASTM G36 and NACE TM 0177 Method A.

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N
0.02	0.5	1.6	22.8	8.5	3.1	0.17

Ferrite 50 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	560	720	26	200	170

Operating data



Polarity = -

Shielding gas:

Ar (99.95%). An addition of up to 2% nitrogen (N2) and 20 – 30% helium (He) is advantageous and will have a positive effect on both mechanical and corrosion properties. The addition of helium (He) will increase the energy of the arc.
Gas flow rate 4 – 8 l/min.

Dimensions (mm)

1.2	1.6	2.0	2.4	3.2
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BÖHLER CN 22/9 N-IG

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 22 9 3 N L	ER2209		

Characteristics and field of use

TIG welding rod ideally suited to welding ferritic-austenitic duplex steels. As a result of the carefully adjusted alloy, the weld metal not only features high strength and toughness, but is also exceptionally resistant to stress corrosion cracking and to pitting (ASTM G48 / Method A). The welding consumable can be used in a temperature range from -60°C up to +250°C. To achieve the special properties of the weld metal, it is necessary to ensure controlled dilution and thorough back purging. In particularly demanding cases, small proportions of N₂ may be added to the shielding gas and/or the purging gas. The TIG rod features very good welding and flow behaviour.

Marks (rods only)

front:  W 22 9 3 NL
back: ER 2209

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N	PRE _N
≤0.015	0.4	1.7	22.5	8.8	3.2	0.15	≥35

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:	-60°C:
untreated	600	800	33	150	(≥ 32)

Operating data

	Polarity = -	Shielding gas: 100 % Argon
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Dimensions (mm)

2.0	2.4				
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Approvals and certificates

TÜV (04484.), ABS (ER2209), DNV (X (I1)), GL (4462), LR (X), Statoil, CE

Similar alloy filler metals

SMAW electrode:	FOX CN 22/9 N-B	Flux cored wire:	CN 22/9 N-FD
	FOX CN 22/9 N		CN 22/9 PW-FD
GMAW solid wire:	CN 22/9 N-IG	SAW combination:	CN 22/9 N-UP/BB202

Classifications

high-alloyed


EN ISO 14343-A: AWS A5.9:

W 22 9 3 N L ER2209

Characteristics and field of use

Duplex stainless steel; resistant to intercrystalline corrosion and wet corrosion up to 250 °C (482 °F). Good resistance to stress corrosion cracking in chlorine- and hydrogen sulphide-bearing environment. High Cr- and Mo-contents provide resistance to pitting corrosion. For joining and surfacing work with matching and similar austenitic steels/cast steel grades. Attention must be paid to embrittlement susceptibility of the parent metal.

Marks (rods only)

 W 22 9 3 NL / ER2209

Base materials

TÜV-certified duplex stainless steels 1.4462 – X2CrNiMoN22-5-3 and others, combinations of mentioned steels and ferritic steels up to S355J, 16Mo3 and 1.4583 – X10CrNiMoNb18-12

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo	Ni	N
0.02	0.4	1.7	22.5	3.2	8.8	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	600	720	25	100

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (3343.), GL (4462), ABS, DNV, LR

Classifications

high-alloyed

EN ISO 14343-A:

W 23 7 N L

Characteristics and field of use

Avesta LDX 2101 is designed for welding the duplex stainless steel Outokumpu LDX 2101, a „lean duplex“ steel with excellent strength and medium corrosion resistance. The steel is mainly intended for applications such as civil engineering, storage tanks, containers etc. Avesta LDX 2101 is over alloyed with respect to nickel to ensure the right ferrite balance in the weld metal. Welding can be performed using short, spray or pulsed arc. Welding using pulsed arc provides good results in both horizontal and vertical-up positions. Pulsed arc and 1.20 mm wire will give the best flexibility. The weldability of duplex steels is excellent but the welding should be adapted to the base material, considering fluidity, joint design, heat input etc.

Corrosion resistance:

Good resistance to general corrosion. Better resistance to pitting, crevice corrosion and stress corrosion cracking than 1.4301/AISI 304.

Base materials

For welding steels such as

Outokumpu	EN	ASTM	BS	NF	SS
LDX 2101®	1.4162	S32101	-	-	-

Typical composition of welding rod (Wt-%)


C	Si	Mn	Cr	Ni	Mo	N
0.02	0.5	0.8	23.0	7.5	<0.5	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	600	750	34	180	180

Operating data

	Polarity = -	Shielding gas: Ar (99.95%). An addition of up to 2% nitrogen (N2) and 20 – 30% helium (He) is advantageous and will have a positive effect on both mechanical and corrosion properties. The addition of helium (He) will increase the energy of the arc. Gas flow rate 4 – 8 l/min.
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Dimensions (mm)

1.2	1.6	2.4	3.2
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Avesta P5

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

AWS A5.9:

W 23 12 2 L

(ER309LMo)*

*Cr lower and Ni higher than standard.

Characteristics and field of use

Avesta P5 is a high-alloy low carbon wire of the 309LMo type, primarily designed for surfacing low-alloy steels and for welding dissimilar joints between stainless and mild or low-alloy steels. It is also suitable for welding steels like durostat® and alform®. When used for surfacing, a composition equivalent to that of 1.4401/ASTM 316 is obtained already in the first layer.

Corrosion resistance:

Superior to type 316L. When used for overlay welding on mild steel a corrosion resistance equivalent to that of 1.4401/ASTM 316 is obtained already in the first layer.

Base materials

For welding steels such as

Outokumpu	EN	ASTM	BS	NF	SS
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Avesta P5 is primarily used when surfacing unalloyed or low-alloy steels and when joining molybdenum-alloyed stainless and carbon steels.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo		
0.02	0.35	1.5	21.5	15.0	2.7		

Ferrite 8 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	470	640	30	110	90

Operating data



Polarity = -

Shielding gas:

Ar (99.95%) or Ar with an addition of 20 – 30% helium (He) or 1 – 5% hydrogen (H₂). The addition of helium (He) will increase the energy of the arc. Gas flow rate 4 – 8 l/min.

Dimensions (mm)

1.2	1.6	2.0	2.4	3.2
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Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 25 9 4 N L	ER2594		

Characteristics and field of use

Avesta 2507/P100 is intended for welding super duplex alloys such as 2507, ASTM S32760, S32550 and S31260. It can also be used for welding duplex type 2205 if extra high corrosion resistance is required, e.g. in root runs in tubes. Welding without filler metal (TIG dressing) is not allowed since the ferrite content will increase drastically which will have a negative effect on both mechanical and corrosion properties. 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.

Corrosion resistance:

Very good resistance to pitting and stress corrosion cracking in chloride containing environments. PREN>41.5. Meets the corrosion test requirements per ASTM G48 Methods A, B and E (40°C).

Base materials

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

Typical composition of welding rod (Wt-%)


C	Si	Mn	Cr	Ni	Mo	N	
0.015	0.35	0.4	25.0	9.5	3.9	0.25	

Ferrite 50 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:	-50°C:
untreated	680	860	28	170	160

Operating data

	Polarity = -	Shielding gas: Ar (99.95%). An addition of up to 2% nitrogen (N2) and 20 – 30% helium (He) is advantageous and will have a positive effect on both mechanical and corrosion properties. The addition of helium (He) will increase the energy of the arc. Gas flow rate 4 – 8 l/min.

Dimensions (mm)

1.2	1.6	2.0	2.4	3.2
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BÖHLER CN 25/9 CuT-IG

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 25 9 4 N L	ER2594		

Characteristics and field of use

TIG welding rod for welding ferritic-austenitic superduplex materials, particularly for offshore engineering. In addition to high strength and good toughness properties, the weld metal is very resistant to pitting and to stress corrosion cracking.
For operating temperatures between -60°C and +250°C.

Marks (rods only)

front:  W 25 9 4 NL

Base materials

25% Cr-superduplex steels e.g.: 1.4501 X2CrNiMoCuWN25-7-4
UNS S 32750, S 32760 ZERON 100, SAF 25/07, FALC 100


Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo	N	Cu	W	PRE _N
0.02	0.3	0.7	25.2	9.2	3.6	0.22	0.6	0.62	≥40

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:	-50°C:	-60°C:
untreated	620	760	27	200	160	150

Operating data

	Polarity = -	Shielding gas: Argon + 2-3% N ₂ 100% Argon
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Dimensions (mm)

2.0	2.4				
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Similar alloy filler metals

Flux cored wire:	CN 25/9 PW-FD	SMAW electrode:	FOX CN 25/9 CuT
GMAW solid wire:	CN 25/9 CuT-IG		

Thermanit 25/09 CuT

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 25 9 4 NL	ER2594		

Characteristics and field of use

Super duplex stainless steel; resistant to intercrystalline corrosion (Service temperature: -50 °C up to +220 °C). Very good resistance to pitting corrosion and stress corrosion cracking due to the high CrMo(N) content (pitting index ≥ 40). Well suited for conditions in offshore application, particularly for welding of supermartensitic stainless steels (13 % Cr); extra low hydrogen in the filler material available on request.

Marks (rods only)

 W 25 9 4 NL / ER2594

Base materials

1.4515 – GX3CrNiMoCuN26-6-3 1.4517 – GX3CrNiMoCuN25-6-3-3 25 % Cr-superduplex steels such as Zeron 100, SAF 25/07, FALC 100


Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo	Ni	N	Cu	W
0.02	0.3	0.8	25.3	3.7	9.5	0.22	0.6	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	
	MPa	MPa	%	+20 °C:	-40 °C
untreated	600	750	25	80	50

Operating data

	Polarity = -	Shielding gas (EN ISO 14175): I1
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Dimensions (mm)

1.6	2.0	2.4	3.2
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Thermanit L

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

W 25 4

Characteristics and field of use

Stainless; corrosion-resistant similar to matching or similar Mo-free 25% Cr(Ni) steels/cast steel grades. Should parent metal be susceptible to embrittlement interpass temperature must not be allowed to rise above 300°C (572°F). Resistant to scaling in air and oxidizing combustion gases up to 1150°C (2102°F). Good resistance in sulphurous combustion gases at elevated temperatures. For matching and similar heat resistant steels/cast steel grades.


Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.06	0.8	0.8	26.0	5.0

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	%	
untreated	500	650	20	

Operating data

	Polarity = +	Shielding gas (EN ISO 14175): I1
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Dimensions (mm)

2.4				
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Classifications

high-alloyed

EN ISO 14343-A:

W 25 4

Characteristics and field of use

TIG welding rod for gas shielded arc welding of heat resistant same type or similar type steels. Ferritic-austenitic weld metal. Due to the low Ni content it is particularly recommended when there will be exposure to oxidising or reducing combustion gases containing sulphur. Resistant to scaling up to +1100°C.

Marks (rods only)

front:  W 25 4
back: 1.4820

Base materials

ferritic-austenitic

1.4821 X15CrNiSi25-4, 1.4823 GX40CrNiSi27-4

ferritic-pearlitic 1.4713 X10CrAlSi7, 1.4724 X10CrAlSi13, 1.4742 X10CrAlSi18, 1.4762 X10CrAlSi25, 1.4710 GX30CrSi7, 1.4740 GX40CrSi17
AISI 327, ASTM A297HC


Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.07	0.8	1.2	25.7	4.5

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	540	710	22	70

Operating data

	Polarity = -	Shielding gas: 100% Argon
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Dimensions (mm)

2.4				
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Similar alloy filler metals

SMAW electrode:	FOX FA	GMAW solid wire:	FA-IG
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Classifications

high-alloyed

EN ISO 14343-A:	AWS A5.9:		
W 25 20 Mn	ER310 (mod.)		

Characteristics and field of use

TIG welding rod 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. Fully austenitic weld metal. Preferred for exposure to gases that are oxidising, contain nitrogen or are low in oxygen. Joint welding on heat resistant Cr-Si-Al steels that are exposed to gases containing sulphur must be carried out using BÖHLER FOX FA or BÖHLER FA-IG as a final layer. Resistant to scaling up to +1200°C. Cryogenic down to -196°C. Due to the risk of embrittlement, the temperature range between +650-900°C should be avoided.

Marks (rods only)

front:  W 25 20 Mn
back: 1.4842

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 composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni
0.13	0.9	3.2	24.6	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	630	33	85	(≥ 32)

Operating data

	Polarity = -	Shielding gas: 100% Argon
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Dimensions (mm)

1.6	2.0	2.4
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Approvals and certificates

SEPROZ

Similar alloy filler metals

SAW electrode	FOX FFB FOX FFB-A	GMAW solid wire:	FFB-IG
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UTP A 2133 Mn

TIG rod

Classifications

high-alloyed

EN ISO 14343-A:

WZ 21 33 Mn Nb

Characteristics and field of use

UTP A 2133 Mn is suitable for joining and surfacing heat resistant base materials of identical and of similar nature, such as

1.4859	G X 10 NiCrNb 32 20	UNS N08800
1.4876	X 10 NiCrAlTi 32 21	UNS N08810
1.4958	X 5 NiCrAlTi 31 20	UNS N08811
1.4959	X 8 NiCrAlTi 31 21	UNS N08811

A typical application is the root welding of centrifugally cast pipes in the petrochemical industry for operation temperatures up to 1050° C in dependence with the atmosphere.

Welding characteristics and special properties of the weld metal

Scale resistant up to 1050°C. Good resistance to carburising atmosphere.

Welding instruction

Clean the weld area thoroughly. Low heat input. Max. interpass temperature 150°C.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Fe
0.12	0.3	4.5	21.0	33.0	1.2	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	400	600	20	70

Operating data



Polarity = -

Shielding gas:
I1

Dimensions (mm)

2.0	2.4	3.2
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Approvals and certificates

TÜV (10451.)

TIG rod

217

Classifications

high-alloyed

EN ISO 14343-A:

WZ 25 35 Zr

Characteristics and field of use

UTP A 2535 Nb is suitable for joinings and building up on identical and similar high heat resistant CrNi cast steel (centrifugal- and mould cast parts), such as

1.4852	G-X 40 NiCrSiNb 35 25
1.4857	G-X 40 NiCrSi 35 25

A typical application is the root welding of centrifugally cast pipes in the petrochemical industry for operation temperatures up to 1050° C in dependence with the atmosphere.

Welding characteristics and special properties of the weld metal

The weld deposit is applicable in a low sulphur, carbon enriching atmosphere up to 1150° C, such as reformer ovens in petrochemical installations.

Welding instruction

Clean welding area carefully. No pre heating or post weld heat treatment. Keep heat input as low as possible and interpass temperature at max. 150° C.


Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Ti	Zr	Fe
0.4	1.0	1.7	25.5	35.5	1.2	+	+	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	> 480	> 600	> 8	

Operating data

	Polarity = -	Shielding gas: 11
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Dimensions (mm)

2.0	2.4	3.2
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Classifications

high-alloyed

EN ISO 14343-A:

WZ 35 45 Zr

Characteristics and field of use

UTP A 3545 Nb is suitable for joining and surfacing on identical and similar high heat resistant cast alloys (centrifugal- and mould cast parts), such as G X-45NiCrNbSiTi 45 35.

The main application field is for tubes and cast parts of reformer and pyrolysis ovens at temperatures up to 1175° C / air.

Welding characteristics and special properties of the weld metal

The weld deposit is applicable in a low sulphur, carbon enriching atmosphere up to 1175° C and has an excellent creep strength and a good resistance against carburization and oxidation.

Welding instruction

Clean welding area carefully. No pre-heating or post weld heat treatment. Keep heat input as low as possible and interpass temperature at max. 150° C.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Ti	Zr	Fe
0.45	1.5	0.8	35.0	45.0	1.0	0.1	0.05	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	450	650	8	

Operating data



Polarity = -

Shielding gas:
I1

Dimensions (mm)

2.0	2.4	3.2
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Thermanit 35/45 Nb

TIG rod

Classifications

high-alloyed

EN ISO 18274:

S Ni Z (NiCr36Fe15Nb0.8)

Characteristics and field of use

Resistant to scaling up to 1180 °C (2156 °F). For joining and surfacing work on matching/similar heat resistant cast steel grades

Marks (rods only)

 35 45 Nb / Ni 6701 mod.

Base materials

GX45NiCrNbSiTi45-35

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Nb
0.42	1.5	1.0	35.0	45.5	0.8

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	%	
AW	450	450		

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

2.0

2.4

3.2

Avesta P12

TIG rod

Classifications

high-alloyed

EN ISO 18274:	AWS A5.14:		
S Ni 6625 (NiCr22Mo9Nb)	ERNiCrMo-3		

Characteristics and field of use

Avesta P12 is a nickel base alloy designed for welding 6Mo-steels such as Outokumpu 254 SMO. It is also suitable for welding nickel base alloys type 625 and 825 and for dissimilar welds between stainless or nickel base alloys and mild steel. 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.

Corrosion resistance:

Excellent resistance to general corrosion in various types of acids and to pitting, crevice corrosion and stress corrosion cracking in chloride containing environments.

Meets the corrosion test requirements per ASTM G48 Methods A, B and E (50°C).

Base materials

For welding steels such as					
Outokumpu	EN	ASTM	BS	NF	SS
254 SMO®	1.4547	S31254			2378
20-25-6	1.4529	N08926			

Also for welding stainless steels and nickel base alloys to low-alloy and mild steel.

Typical composition of welding rod (Wt-%)


C	Si	Mn	Cr	Ni	Mo	Nb	Fe
0.01	0.2	0.1	22.0	Bal.	9.0	3.6	< 1.0

Ferrite 0 FN

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:	-40°C:	-196°C
with Flux 805	490	740	35	130	120	110

Operating data

	Polarity = -	Shielding gas: Ar (99.95%), Gas flow rate 4 - 8l/min.
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Dimensions (mm)

1.2	1.6	2.0	2.4	3.2
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TIG rod

221

Classifications

high-alloyed

EN ISO 18274:

AWS A5.14:

S Ni 6625 (NiCr22Mo9Nb)

ERNiCrMo-3

Characteristics and field of use

TIG welding rod for high quality welded joints to nickel-based alloys with a high Mo content (e.g. Alloy 625 and Alloy 825) and also to 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. The wire and the weld metal meet the highest quality requirements.

Marks (rods only)

front:  2.4831
back: ERNiCrMo-3

Base materials

2.4856 NiCr22Mo9Nb, 2.4858 NiCr21Mo, 2.4816 NiCr15Fe, 1.4583 X10CrNiMoNb18-12, 1.4876 X10NiCrAlTi32-21, 1.4529 X1NiCrMoCuN25-20-7, X2CrNiMoCuN20-18-6, 2.4641 NiCr2 Mo6Cu. Joints of the above-mentioned materials with unalloyed and low-alloy steels such as P265GH, P285NH, P295GH, S355N, 16Mo3, X8Ni9, ASTM A 553 Gr.1, N 08926, Alloy 600, Alloy 625, Alloy 800 (H), 9% Ni steels

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Mo	Nb	Fe	Ti
≤0.02	0.1	0.1	22	bal.	9.0	3.6	≤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	540	800	38	160	130

Operating data


Polarity = -

Shielding gas:
100% Argon
Ar + He mixed gas

Dimensions (mm)

1.6

2.0

2.4

Approvals and certificates

TÜV (04324.), Statoil, SEPROZ, CE (NiCr 625-IG A: TÜV (09405.), DB (43.014.25), CE)

Thermanit 625

TIG rod

Classifications

high-alloyed

EN ISO 18274:

AWS A5.14:

S Ni 6625 (NiCr22Mo9Nb)

ERNiCrMo-3

Characteristics and field of use

Nickel based alloy; high resistance to corrosive environment. Resistant to stress corrosion cracking. Resistant to scaling up to 1100 °C (2012 °F). Temperature limit: 500°C (932°F) max. in sulphureous 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 resistant steels and alloys. For joining and surfacing work on cryogenic austenitic CrNi(N) steels/cast steel grades and on cryogenic Ni steels suitable for quenching and tempering.

Marks (rods only)

 2.4831 / ERNiCrMo-3

Base materials

TÜV-certified parent metal

1. 4547 – Alloy 254SMO – UNS S31254 – X1CrNiMoCuN20-18-7

1. 4876 – Alloy 800 – UNS N08800 – X10NiCrAlTi32-20

1. 4958 – Alloy 800 H – UNS N08810 – X5NiCrAlTi31-20

2. 4816 – Alloy 600 – UNS N06600 – NiCr15Fe

2. 4856 – Alloy 625 – UNS N06625 – NiCr22Mo9Nb

and combinations of aforementioned materials with ferritic steels up to S355J, 10CrMo9-10 and 9% Ni steels.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Nb	Fe
0.03	0.1	0.1	22.0	9.0	Bal.	3.6	<1.0

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
AW	460	740	35	120	100

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (3464.), DB (43.132.25), DNV (W 10652)

TIG rod

223

UTP A 6222 Mo

TIG rod

Classifications

high-alloyed

EN ISO 18274:

AWS A5.14:

S Ni 6625 (NiCr22Mo9Nb)

ER NiCrMo-3

Characteristics and field of use

UTP A 6222 Mo has a high nickel content and is suitable for welding high-strength and high-corrosion resistant nickel-base alloys, e.g.

X1 NiCrMoCuN25206 1.4529 UNS N08926

X1 NiCrMoCuN25205 1.4539 UNS N08904

NiCr21Mo 2.4858 UNS N08825

NiCr22Mo9Nb 2.4856 UNS N06625

It can be used for joining ferritic steel to austenitic steel as well as for surfacing on steel. It is also possible to weld 9% nickel steels using this wire due to its high yield strength. Its wide range of uses is of particular significance in aviation, in chemical industry and in applications involving seawater.

Special properties of the weld metal

The special features of the weld metal of UTP A 6222 Mo include a good creep rupture strength, corrosion resistance, resistance to stress and hot cracking. It is highly resistant and tough even at working temperatures up to 1100°C. It has an extremely good fatigue resistance due to the alloying elements Mo and Nb in the NiCr-matrix. The weld metal is highly resistant oxidation and is almost immune to stress corrosion cracking. It resists intergranular penetration without having been heat-treated.

Typical composition of welding rod (Wt-%)

C	Si	Cr	Mo	Ni	Nb	Fe
< 0.02	< 0.2	22.0	9.0	bal.	3.5	1.0

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	> 460	> 740	> 30	> 100	> 85

Operating data



Polarity = ±

Shielding gas (EN ISO 14175):

R 1

Z-ArHeHC-30/2/0.05

Dimensions (mm)

1.0

1.2

1.6

2.0

2.4

Approvals and certificates

TÜV (03460;03461), GL, DNV, ABS, LR (1.2mm MIG)

BÖHLER NIBAS 70/20-IG

TIG rod

Classifications

high-alloyed

EN ISO 18274:

AWS A5.14:

S Ni 6082 (NiCr20Mn3Nb)

ERNiCr-3

Characteristics and field of use

TIG welding rod for high-quality welded joints to nickel-based alloys, creep resistant and highly creep resistant materials, 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 $+550^{\circ}\text{C}$, 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. The wire and the weld metal meet the highest quality requirements..

Marks (rods only)

front:  2.4806
back: ERNiCr-3

Base materials

2.4816 NiCr15Fe, 2.4817 LC-NiCr15Fe, Alloy 600, Alloy 600 L
Nickel and nickel alloys, low-temperature steels up to X8Ni9, high-alloy Cr and CrNiMo steels, particularly for dissimilar joints, and their joints to unalloyed, low-alloy, creep resistant and highly creep resistant steels. Also suitable for the Alloy 800 material.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Ti	Nb	Fe
0.02	0.1	3.1	20.5	bal.	+	2.6	≤ 1

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	680	42	190	100

Operating data

Polarity = -

Shielding gas:
100% Argon
Ar + He mixed gas

Dimensions (mm)

1.6

2.0

2.4

Approvals and certificates

TÜV (04328.), Statoil, NAKS, SEPROZ, CE (NiCr 70 Nb-IG A: TÜV (09403.), CE)

Similar alloy filler metals

SMAW electrode:	FOX NIBAS 70/20	SAW combination:	NIBAS 70/20-UP/BB 444
Flux cored wire:	NIBAS 70/20-FD NIBAS 70/20 Mn-FD	GMAW solid wire:	NIBAS 70/20-IG NiCr 70 Nb-IG A*

TIG rod

225

Thermanit Nicro 82

TIG rod

Classifications


high-alloyed

EN ISO 18274:	AWS A5.14:		
S Ni 6082 (NiCr20Mn3Nb)	ERNiCr-3		

Characteristics and field of use

Stainless; heat resistant; high temperature resistant. Cold toughness at subzero temperatures as low as -269 °C (-452 °F). Good for welding austenitic-ferritic joints. No Cr carbide zone that become brittle in the ferrite weld deposit transition zone, even as a result of heat treatments above 300 °C (572 °F). Good for fabricating tough joints and surfacing with heat resistant Cr and CrNi steels/cast steel grades and Ni-base alloys. Temperature limits: 500 °C (932 °F) in sulphurous atmospheres, 800 °C max. (1472 °F) for fully stressed welds. Resistant to scaling up to 1000 °C (1832 °F).

Marks (rods only)

 2.4806 / ERNiCr-3

Base materials

TÜV-certified parent metals

1.4876 – Alloy 800 – UNS N08800 – X10NiCrAlTi32-20

1.4877 – X5NiCrCeNb32-27

1.4958 – Alloy 800 H – UNS N08810 – X5NiCrAlTi31-20

2.4816 – Alloy 600 – UNS N06600 – NiCr15Fe

2.4817 – Alloy 600 L – UNS N06600 – LC-NiCr15Fe

2.4858 – Alloy 825 – UNS N08825 – NiCr21Mo

2.4851 – Alloy 601 – UNS N06601 – NiCr23Fe

Combinations of

1.4539 – X1NiCrMoCu25-20-5; 1.4583 – X10CrNiMoNb18-12

and ferritic boiler steels;

1.5662 – X8Ni9; 1.7380 – 10CrMo9-10

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Fe
0.02	0.1	3.0	20.0	>67.0	2.5	<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:
untreated	400	620	35	150

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (1703.), DB (43.132.11)

Classifications

high-alloyed

EN ISO 18274:

AWS A5.14:

S Ni 6082 (NiCr20Mn3Nb)

ERNiCr-3

Characteristics and field of use

UTP A 068 HH is predominantly used for joining identical or similar high heat resistant Ni-base alloys, heat resistant austenites, and for joining heat resistant austenitic-ferritic materials such as

2.4816	NiCr15Fe	UNS N06600
2.4817	LC- NiCr15Fe	UNS N10665
1.4876	X10 NiCrAlTi 32 20	UNS N08800
1.6907	X3 CrNiN 18 10	

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 is hot cracking resistant and does not tend to embrittlement.

Welding instruction

Clean weld area thoroughly. Keep heat input as low as possible and interpass temperature at approx. 150° C.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Ni	Nb	Fe
< 0.02	< 0.2	3.0	20.0	balance	2.7	0.8

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	> 380	> 640	> 35	160	80

Operating data



Polarity = -

Shielding gas:

I1
R1

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (00882.; 00883.), KTA, ABS, GL, DNV

Thermanit 617

TIG rod

Classifications

high-alloyed

EN ISO 18274:

AWS A5.14:

S Ni 6617 (NiCr22Co12Mo9)

ERNiCrCoMo-1

Characteristics and field of use

Resistant to scaling up to 1100 °C (2012 °F), high temperature resistant up to 1000 °C (1832 °F). High resistance to hot gases in oxidizing resp. carburizing atmospheres. For joining and surfacing applications with matching and similar heat resistant steels and alloys.

Marks (rods only)

 2.4627 / ERNiCrCoMo-1

Base materials

TÜV-certified parent metal

1.4859 – UNS N08810 – GX10NiCrSiNb32-20
 1.4876 – Alloy 800 – UNS N08800 – X10NiCrAlTi31-20
 1.4958 – Alloy 800 H – UNS N08810 – X5NiCrAlTi31-20
 2.4851 – Alloy – 601 – UNS N06601 – NiCr23Fe
 2.4663 – Alloy 617 – UNS N06617 – NiCr23Co12Mo

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Co	Al	Ti	Fe
0.05	0.1	0.1	21.5	9.0	Bal.	11.0	1.3	0.5	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:
AW	450	700	30	60

Operating data



Polarity = –

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (6845.)

Classifications

high-alloyed

EN ISO 18274:	AWS A5.14:		
S Ni 6617 (NiCr22Co12Mo9)	ER NiCrCoMo-1		

Characteristics and field of use

UTP A 6170 Co is particularly used for joining heat resistant and creep resistant nickel base alloys of identical and similar nature, high temperature austenitic and cast alloys, such as

1.4958 1.4959 2.4663	X5NiCrAlTi 31 20 X8NiCrAlTi 32 21 NiCr23Co12Mo	UNS N08810 UNS N08811 UNS N06617
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Welding characteristics and special properties of the weld metal

The weld metal is resistant to hot-cracking. It is used for operating temperatures up to 1100° C. Scale-resistant at temperatures up to 1100° C in oxidizing resp. carburizing atmospheres, e. g. gas turbines, ethylene production plants.

Welding instruction

Clean welding area carefully. Keep heat input as low as possible and interpass temperature at max. 150° C.


Typical composition of welding rod (Wt-%)

C	Si	Co	Cr	Mo	Ni	Ti	Al	Fe
0.06	< 0.3	11.5	22.0	8.5	bal.	0.4	1.0	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	> 750	> 30	> 120

Operating data

	Polarity = -	Shielding gas (EN ISO 14175): I1 R1
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Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (05450; 05451)

UTP A 776

TIG rod

Classifications

high-alloyed

EN ISO 18274:	AWS A5.14:		
S Ni 6276 (NiCr15Mo16Fe6W4)	ER NiCrMo-4		

Characteristics and field of use

UTP A 776 is suitable for joint welding of matching base materials, as

2.4819	NiMo16Cr15W	UNS N10276
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and surface weldings on low-alloyed steels. UTP A 776 is employed primarily for welding components in plants for chemical processes with highly corrosive media, but also for surfacing press tools, punches, etc. which operate at high temperature.

Welding characteristics and special properties of the weld metal

Excellent resistance against sulphuric acids at high chloride concentrations.

Welding instruction

To avoid intermetallic precipitations, stick electrodes should be welded with lowest possible heat input and interpass temperature.


Typical composition of welding rod (Wt-%)

C	Si	Cr	Mo	Ni	V	W	Fe
< 0.01	0.07	16.0	16.0	balance	0.2	3.5	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	> 450	> 750	> 30	> 90

Operating data

	Polarity = -	Shielding gas (EN ISO 14175): R1
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Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (05586.; 05587.)

Thermanit Nimo C 24

TIG rod

Classifications

high-alloyed

EN ISO 18274:	AWS A5.14:		
S Ni 6059 (NiCr23Mo16)	ERNiCrMo-13		

Characteristics and field of use

Nickel based alloy. 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 clad side of plates of matching and similar alloys.

Marks (rods only)

✦ 2.4607 / ERNiCrMo-13

Base materials

TÜV-certified parent metals

1.4565 – Alloy 24 – UNS S34565 – X2CrNiMnMoNbN25-18-5-4
 2.4602 – Alloy C-22 – UNS N06022 – NiCr21Mo14W
 2.4605 – Alloy 59 – UNS N06059 – NiCr23Mo16Al
 2.4610 – Alloy C-4 – UNS N06455 – NiMo16Cr16Ti
 2.4819 – Alloy C-276 – UNS N10276 – NiMo16Cr15W

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cr	Mo	Ni	Fe
0.01	<0.10	<0.5	23.0	16.0	Bal.	<1.5

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:
AW	450	700	35	120

Operating data



Polarity = --

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

1.6	2.0	2.4	3.2
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Approvals and certificates

TÜV (6462.), GL (NiCr23Mo16)

TIG rod

231

Classifications

high-alloyed

EN ISO 18274:

AWS A5.14:

S Ni 6059 (NiCr23Mo16)

ER NiCrMo-13

Characteristics and field of use

UTP A 759 is suitable for welding components in plants for chemical processes with highly corrosive media. For joining materials of the same or similar natures, e. g.

2.4602	NiCr21Mo14W	UNS N06022
2.4605	NiCr23Mo16Al	UNS N06059
2.4610	NiMo16Cr16Ti	UNS N06455
2.4819	NiMo16Cr15W	UNS N10276

and these materials with low alloyed steels such as for surfacing on low alloyed steels.

Welding characteristics and special properties of the weld metal

Good corrosion resistance against acetic acid and acetic hydride, hot contaminated sulphuric and phosphoric acids and other contaminated oxidising mineral acids. Intermetallic precipitation will be largely avoided.

Welding instruction

The welding area has to be free from impurities (oil, paint, markings). Minimize heat input. The interpass temperature should not exceed 150 °C. Linear energy input < 12 kJ/cm


Typical composition of welding rod (Wt-%)

C	Si	Cr	Mo	Ni	Fe
< 0.01	0.1	22.5	15.5	balance	< 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	> 35	> 100

Operating data

	Polarity = -	Shielding gas (EN ISO 14175): R1
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Dimensions (mm)

0.8	1.0	1.2	1.6
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Approvals and certificates

TÜV (06065.; 06068.), GL

Classifications

high-alloyed

EN ISO 18274:

AWS A5.14:

S Ni 4060 (NiCu30Mn3Ti)

ER NiCu-7

Characteristics and field of use

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

The weld metal has an excellent resistance to a large amount of corrosive medias, from pure water to non-oxidising mineral acids, alkali and salt solutions

Welding instruction

Clean the weld area thoroughly to avoid porosity. Opening groove angle about 70°. Weld stringer beads.

Typical composition of welding rod (Wt-%)

C	Si	Mn	Cu	Ni	Ti	Fe
< 0.02	0.3	3.2	29.0	balance	2.4	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:
untreated	> 300	> 450	30	> 80

Operating data



Polarity = -

Shielding gas (EN ISO 14175):
I1

Dimensions (mm)

0.8

1.0

1.2

Approvals and certificates

TÜV (00249.; 00250.), ABS, GL