

OK Flux 10.93

OK Flux 10.93 is a basic non-alloying agglomerated flux for the submerged arc welding of stainless steels and high-alloyed CrNiMo steels including duplex stainless steels.

Specifications

Classifications	EN ISO 14174 : S A AF 2 56 54 DC
Approvals	CE : EN 13479 DB : 51.039.10 NAKS/HAKC : RD 03-613-03 UKCA : EN 13479

Approvals are based on factory location. Please contact ESAB for more information.

Slag Type	Fluoride basic CaF ₂ -Al ₂ O ₃ -SiO ₂
Alloy Transfer	Non alloying
Density	nom: 1.0 kg/dm ³
Basicity Index	nom: 1.9

Flux Consumption

Volts	kg Flux / kg Wire DC+
34 V	0.8 kg
30 V	0.6 kg
26 V	0.5 kg
38 V	1.0 kg

Conditions : Dimension 4.0 mm , Amps 580 A , Travel speed 33 m/h

Classifications

Wire	AWS/EN	AWS - As Welded
OK Autrod 16.10	A5.9:ER308L	-
OK Autrod 16.11	A5.9:ER347	-
OK Autrod 16.30	A5.9:ER316L	-
OK Autrod 16.53	A5.9:ER309L	-
OK Autrod 16.97	14343-A:S 18 8 Mn	-
OK Autrod 2209	A5.9:ER2209/ 14343-A:S 22 9 3 N L	-
OK Autrod 2509	A5.9:ER2594/ 14343-A:S 25 9 4 N L	A5.39: F120A8-ER2594/2594
OK Autrod 308H	A5.9:ER308H/ 14343-A:S 19 9 H	-
OK Autrod 308L	A5.9:ER308L/ 14343-A:S 19 9 L	A5.39: F80A32-ER308L/308L
OK Autrod 309L	A5.9:ER309L/ 14343-A:S 23 12 L	A5.39: F80A10-ER309L/309L
OK Autrod 309MoL	A5.9:ER309LMo (mod)/ 14343-A:S 23 12 2 L	A5.39: F85A4-ER309LMo (mod)/309LMo (mod)
OK Autrod 316H	A5.9:ER316H/ 14343-A:S 19 12 3 H	-
OK Autrod 316L	A5.9:ER316L/ 14343-A:S 19 12 3 L	A5.39: F75A15-ER316L/316L
OK Autrod 316LMn	A5.9:ER316LMn/ 14343-A:S 20 16 3 Mn N L	-
OK Autrod 317L	A5.9:ER317L/ 14343-A:S 18 15 3 L	-
OK Autrod 318	A5.9:ER318/ 14343-A:S 19 12 3 Nb	-
OK Autrod 347	A5.9:ER347/ 14343-A:S 19 9 Nb	A5.39: F90A15-ER347/347
OK Autrod 410NiMo	14343-A:S 13 4	-
OK Autrod NiCrMo-3	A5.14:ERNiCrMo-3/ 18274:S Ni 6625 (NiCr22Mo9Nb)	A5.39: F100A32-ERNiCrMo-3/NiCrMo-3
OK Autrod NiCrMo-4	A5.14:ERNiCrMo-4/ 18274:S Ni 6276 (NiCr15Mo16Fe6W4)	-

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Approvals

Combined with Wire	ABS	BV	CE	ClassNK	DNV-GL	LR	VdTÜV	DB	DNV
OK Autrod 2209	•	•	•	•	•	•	•	-	-
OK Autrod 2509	-	-	•	-	-	-	•	-	-
OK Autrod 308L	•	•	•	-	•	-	•	•	-
OK Autrod 309L	•	-	•	-	•	•	•	-	-
OK Autrod 316L	•	-	•	-	-	-	•	•	•
OK Autrod 318	-	-	•	-	-	-	•	•	-
OK Autrod 347	-	-	•	-	-	-	•	•	-

Typical Wire Composition %

C	Mn	Si	S	P	Ni	Cr	Mo	Cu	N
OK Autrod 16.10									
0.02	1.80	0.50	0.010	0.025	9.20	19.80	0.20	0.20	-
OK Autrod 16.11									
0.05	1.50	0.45	0.010	0.025	9.10	19.20	0.10	0.15	-
OK Autrod 16.30									
0.02	1.70	0.40	0.015	0.025	11.20	18.40	2.10	0.10	-
OK Autrod 16.53									
0.02	1.70	0.40	0.015	0.025	12.20	23.20	0.10	0.10	-
OK Autrod 16.97									
0.07	6.5	0.4	-	-	8.2	18.9	-	-	-
OK Autrod 2209									
0.01	1.5	0.5	-	-	8.5	22.7	3.2	-	0.17
OK Autrod 2509									
0.01	0.4	0.4	-	-	9.4	25.2	3.9	-	0.24
OK Autrod 308H									
0.05	1.9	0.5	-	-	9.2	19.8	-	-	0.06
OK Autrod 308L									
0.02	1.9	0.4	-	-	9.8	19.8	-	-	0.05
OK Autrod 309L									
0.02	1.8	0.4	-	-	13.4	23.2	0.10	0.1	0.05
OK Autrod 309MoL									
0.01	1.5	0.4	-	-	14.6	21.4	2.5	-	-
OK Autrod 316H									
0.05	1.7	0.4	-	-	12.5	19.3	2.2	-	-
OK Autrod 316L									
0.01	1.7	0.4	-	-	12.0	18.2	2.6	-	0.04
OK Autrod 316LMn									
0.01	6.9	0.4	-	-	15.9	19.9	3.0	-	0.18
OK Autrod 317L									
0.01	1.4	0.4	-	-	13.6	18.9	3.6	-	0.05
OK Autrod 318									
0.04	1.8	0.4	-	-	11.5	18.9	2.6	-	0.04
OK Autrod 347									
0.04	1.4	0.4	-	-	9.5	19.2	-	-	0.05
OK Autrod 410NiMo									
0.02	0.5	0.4	-	-	4.2	12.4	0.6	0.1	-

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Typical Wire Composition %

C	Mn	Si	S	P	Ni	Cr	Mo	Cu	N
OK Autrod NiCrMo-3									
0.02	0.04	0.06	-	-	Bal	22.7	8.6	-	-
OK Autrod NiCrMo-4									
0.01	0.45	0.05	-	-	Bal.	15.5	16.1	-	-

Typical Wire Composition %

Nb	PRE	FN WRC-92	W	Fe	Nb+Ta
OK Autrod 16.11					
0.70	-	-	-	-	-
OK Autrod 2209					
-	35	55	-	-	-
OK Autrod 2509					
-	42	50	-	-	-
OK Autrod 308H					
0.01	-	9	-	-	-
OK Autrod 309L					
-	-	10	-	-	-
OK Autrod 316L					
-	-	7	-	-	-
OK Autrod 317L					
-	-	7	-	-	-
OK Autrod 318					
0.7	-	11	-	-	-
OK Autrod 347					
0.6	-	7	-	-	-
OK Autrod NiCrMo-3					
-	-	-	-	0.3	3.5
OK Autrod NiCrMo-4					
-	-	-	3.5	5.8	-

Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Cr	Mo	V	Cu
OK Autrod 16.10									
0.02	1.40	0.60	-	-	8.60	18.80	-	-	-
OK Autrod 16.11 DC+, As welded									
0.05	1.20	0.55	-	-	8.50	18.30	-	-	-
OK Autrod 16.11									
-	-	-	0.015	0.025	-	-	0.10	-	0.15
OK Autrod 16.30									
-	-	-	0.015	0.025	-	-	-	-	0.10
OK Autrod 16.30 DC+, As welded									
0.02	1.40	0.50	-	-	10.60	17.50	2.00	-	-
OK Autrod 16.53 DC+, As welded									
0.02	1.40	0.50	-	-	11.60	22.10	-	-	-
OK Autrod 16.53									
-	-	-	0.015	0.025	-	-	0.10	-	0.10
OK Autrod 16.97									

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Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Cr	Mo	V	Cu
0.06	6.3	1.2	0.01	0.02	8.0	18.0	0.1	-	0.1
OK Autrod 2209									
-	-	-	0.01	0.02	-	-	-	-	0.1
OK Autrod 2209 Current: DC+, 420A, 27V									
0.02	1.3	0.5	-	-	9.0	22.5	3.1	-	-
OK Autrod 2509									
-	-	-	0.01	0.02	-	-	-	-	0.2
OK Autrod 2509 Current: DC+, 350A, 28V, 48cm/min									
0.02	0.4	0.5	-	-	9.5	24.6	3.5	-	-
OK Autrod 308H									
-	-	-	0.01	0.02	-	-	0.1	-	0.1
OK Autrod 308H DC+									
0.05	1.5	0.6	-	-	9.9	19.9	-	-	-
OK Autrod 308L DC+, As welded									
0.02	1.6	0.5	-	-	10.0	19.5	-	-	-
OK Autrod 308L									
-	-	-	0.01	0.02	-	-	0.2	-	0.1
OK Autrod 309L									
-	-	-	0.01	0.02	-	-	0.2	-	0.2
OK Autrod 309L Current: DC+, 400 A, 28 V, welding speed 48cm/min									
0.02	1.3	0.5	-	-	12.5	23.0	-	-	-
OK Autrod 309MoL									
-	-	-	0.02	0.02	-	-	-	-	0.1
OK Autrod 309MoL DC+, 380 A, 28 V, 50cm/min									
0.02	1.2	0.5	-	-	14.5	20.8	2.8	-	-
OK Autrod 316H DC+									
0.04	1.5	0.6	-	-	11.2	18.4	2.1	-	-
OK Autrod 316H									
-	-	-	0.01	0.02	-	-	-	-	0.1
OK Autrod 316L									
0.02	1.4	0.5	0.01	0.02	12.5	18.0	2.6	-	0.1
OK Autrod 316LMn									
0.02	5.4	0.7	0.01	0.01	15.5	20.0	2.5	-	0.2
OK Autrod 317L									
-	-	-	0.01	0.02	-	-	-	-	0.1
OK Autrod 317L Current: DC+, 420 A, 27 V									
0.02	1.5	0.5	-	-	13.5	18.5	3.2	-	-
OK Autrod 318									
-	-	-	0.01	0.02	-	-	-	-	0.2
OK Autrod 318 Current: DC+, 440A, 30V									
0.035	1.2	0.5	-	-	12.0	18.5	2.6	-	-
OK Autrod 347									
-	-	-	0.01	0.02	-	-	0.1	-	0.2
OK Autrod 347 Current: DC+, 420A, 27V, welding speed 48cm/min									
0.035	1.1	0.5	-	-	9.6	19.2	-	-	-
OK Autrod 410NiMo DC+, 450A, 28V									
0.02	0.4	0.5	-	-	4.1	11.7	0.51	-	-

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Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Cr	Mo	V	Cu
OK Autrod 410NiMo									
-	-	-	0.01	0.02	-	-	-	-	0.10
OK Autrod NiCrMo-3									
-	-	-	0.005	0.015	-	-	-	-	0.1
OK Autrod NiCrMo-3 Current: DC+, 400A, 28V, travel speed: 25 m/h.									
0.02	0.2	0.4	-	-	-	22	9	-	-
OK Autrod NiCrMo-4									
0.01	0.4	0.20	0.002	0.006	Bal	15.1	15.6	0.1	0.03

Typical Weld Metal Analysis %

N	Nb	Co	FN WRC-92	W	Fe	Nb+Ta
OK Autrod 16.11 DC+, As welded						
-	0.50	-	-	-	-	-
OK Autrod 2209 Current: DC+, 420A, 27V						
0.17	-	-	45	-	-	-
OK Autrod 2509 Current: DC+, 350A, 28V, 48cm/min						
0.20	-	-	58	<0.002	-	-
OK Autrod 308L						
0.06	-	-	9	-	-	-
OK Autrod 309L						
-	-	-	8	-	-	-
OK Autrod 316L						
0.047	-	-	9	-	-	-
OK Autrod 316LMn						
0.13	-	-	-	-	-	-
OK Autrod 318						
-	-	-	9	-	-	-
OK Autrod 318 Current: DC+, 440A, 30V						
-	0.3	-	-	-	-	-
OK Autrod 347 Current: DC+, 420A, 27V, welding speed 48cm/min						
-	0.5	-	8	-	-	-
OK Autrod NiCrMo-3						
-	-	-	-	-	-	3
OK Autrod NiCrMo-3 Current: DC+, 400A, 28V, travel speed: 25 m/h.						
-	-	-	-	-	5	-
OK Autrod NiCrMo-4						
-	-	0.1	-	3.6	5.8	-

Typical Mechanical Properties

Combined with Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 16.10	As Welded DC+	410 MPa (59 ksi)	570 MPa (83 ksi)	38 %	80 J @ -60 °C (59 ft-lb @ -76 °F) 60 J @ -110 °C (44 ft-lb @ -166 °F) 45 J @ -196 °C (33 ft-lb @ -320.8 °F)
OK Autrod 16.11	As Welded DC+	420 MPa (61 ksi)	590 MPa (86 ksi)	36 %	60 J @ -60 °C (44 ft-lb @ -76 °F)

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Typical Mechanical Properties					
Combined with Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
					45 J @ -110 °C (33 ft-lb @ -166 °F) 30 J @ -196 °C (22 ft-lb @ -320.8 °F)
OK Autrod 16.30	As Welded DC+	400 MPa (58 ksi)	530 MPa (77 ksi)	35 %	70 J @ -60 °C (52 ft-lb @ -76 °F) 65 J @ -110 °C (48 ft-lb @ -166 °F) 40 J @ -196 °C (30 ft-lb @ -320.8 °F)
OK Autrod 16.53	As Welded DC+	430 MPa (62 ksi)	570 MPa (83 ksi)	35 %	65 J @ -60 °C (48 ft-lb @ -76 °F) 55 J @ -110 °C (41 ft-lb @ -166 °F) 35 J @ -196 °C (26 ft-lb @ -320.8 °F)
OK Autrod 16.97	As Welded DC+	400 MPa (58 ksi)	600 MPa (87 ksi)	45 %	60 J @ -20 °C (44 ft-lb @ -4 °F)
OK Autrod 2209	As Welded	630 MPa (91 ksi)	780 MPa (113 ksi)	30 %	140 J @ 20 °C (104 ft-lb @ 68 °F) 125 J @ -20 °C (93 ft-lb @ -4 °F) 110 J @ -40 °C (81 ft-lb @ -40 °F) 80 J @ -60 °C (59 ft-lb @ -76 °F) 28 J @ -110 °C (21 ft-lb @ -166 °F)
OK Autrod 2509	As Welded DC+	670 MPa (97 ksi)	870 MPa (126 ksi)	24 %	65 J @ 20 °C (48 ft-lb @ 68 °F) 40 J @ -60 °C (30 ft-lb @ -76 °F)
OK Autrod 308L	As Welded dia 2.4mm, travel speed 56cm/min 400A DC+ 28V	400 MPa (58 ksi)	570 MPa (83 ksi)	40 %	100 J @ 20 °C (74 ft-lb @ 68 °F) 75 J @ -40 °C (56 ft-lb @ -40 °F) 65 J @ -60 °C (48 ft-lb @ -76 °F) 55 J @ -110 °C (41 ft-lb @ -166 °F) 47 J @ -196 °C (35 ft-lb @ -320.8 °F)
OK Autrod 309L	As Welded DC+	430 MPa (62 ksi)	570 MPa (83 ksi)	33 %	90 J @ 20 °C (67 ft-lb @ 68 °F) 70 J @ -60 °C (52 ft-lb @ -76 °F) 60 J @ -110 °C (44 ft-lb @ -166 °F) 25 J @ -196 °C (19 ft-lb @ -320.8 °F)
OK Autrod 309MoL	As Welded DC+	430 MPa (62 ksi)	610 MPa (88 ksi)	31 %	50 J @ 20 °C (37 ft-lb @ 68 °F) 35 J @ -40 °C (26 ft-lb @ -40 °F)
OK Autrod 316H	As Welded AWS	410 MPa (59 ksi)	550 MPa (80 ksi)	40 %	85 J @ 20 °C

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Typical Mechanical Properties					
Combined with Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
	475A; 30V; H.I 2.0 kJ /mm DC+				(63 ft-lb @ 68 °F) 75 J @ 0 °C (56 ft-lb @ 32 °F)
OK Autrod 316L	As Welded ø2.4mm, Feed Speed 48cm/min 350A DC+ 28V	420 MPa (61 ksi)	550 MPa (80 ksi)	42 %	100 J @ 20 °C (74 ft-lb @ 68 °F) 65 J @ -60 °C (48 ft-lb @ -76 °F) 52 J @ -110 °C (38 ft-lb @ -166 °F) 27 J @ -196 °C (20 ft-lb @ -320.8 °F)
OK Autrod 316LMn	As Welded 420A, 30V, 30m/h DC+	410 MPa (59 ksi)	600 MPa (87 ksi)	30 %	70 J @ -60 °C (52 ft-lb @ -76 °F) 60 J @ -110 °C (44 ft-lb @ -166 °F) 40 J @ -196 °C (30 ft-lb @ -320.8 °F)
OK Autrod 317L	As Welded DC+	440 MPa (64 ksi)	615 MPa (89 ksi)	28 %	80 J @ 20 °C (59 ft-lb @ 68 °F) 50 J @ -60 °C (37 ft-lb @ -76 °F)
OK Autrod 318	As Welded DC+	440 MPa (64 ksi)	600 MPa (87 ksi)	40 %	100 J @ 20 °C (74 ft-lb @ 68 °F) 90 J @ -60 °C (67 ft-lb @ -76 °F) 40 J @ -110 °C (30 ft-lb @ -166 °F)
OK Autrod 347	As Welded DC+	455 MPa (66 ksi)	635 MPa (92 ksi)	36 %	90 J @ 20 °C (67 ft-lb @ 68 °F) 85 J @ -60 °C (63 ft-lb @ -76 °F) 38 J @ -110 °C (28 ft-lb @ -166 °F) 25 J @ -196 °C (19 ft-lb @ -320.8 °F)
OK Autrod 410NiMo	As Welded DC+, 450A, 28V	900 MPa (131 ksi)	1000 MPa (145 ksi)	15.5 %	30 J @ 0 °C (22 ft-lb @ 32 °F) 30 J @ -20 °C (22 ft-lb @ -4 °F)
OK Autrod NiCrMo-3	As Welded DC+	450 MPa (65 ksi)	710 MPa (103 ksi)	45 %	90 J @ -60 °C (67 ft-lb @ -76 °F) 80 J @ -196 °C (59 ft-lb @ -320.8 °F)
OK Autrod NiCrMo-4	As Welded 350A DC+	460 MPa (67 ksi)	705 MPa (102 ksi)	45 %	90 J @ -60 °C (67 ft-lb @ -76 °F) 85 J @ -110 °C (63 ft-lb @ -166 °F) 75 J @ -196 °C (56 ft-lb @ -320.8 °F)