



# WELDING FILLER METAL HANDBOOK

Asia Pacific 2016







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# Covered (Stick) Electrodes (SMAW)



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# ESAB 4301



An easy to use AC and DC electrode. Suitable for welding mild steels and pressure vessel steels having a nominal tensile strength not exceeding 440 N/mm<sup>2</sup>. The electrode can be used for welding of structural steels of heavy section about 25 mm in thickness.

<b>Classifications:</b>	SFA/AWS A5.1:E6019, EN ISO 2560-A:E 35 2 RA 11, JIS :D4301, KS :E4301
<b>Approvals:</b>	BV 3, LR 3, ABS 3, DNV 3, GL 3, BKI 3, ClassNK KMW3

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

<b>Welding Current:</b>	AC, DC+(-)
<b>Alloy Type:</b>	Carbon-Manganese
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	420 MPa	450 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	0 °C	110 J
As welded	-20 °C	100 J

## Typical Weld Metal Analysis %

C	Si	Mn
0.08	0.14	0.41

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	50-85 A	30 V	0.54	98	55 s	0.7 kg/h
3.2 x 350 mm	80-130 A	30 V	0.53	59	58 s	1.1 kg/h
4.0 x 400 mm	120-180 A	30 V	0.55	33	73 s	1.5 kg/h
5.0 x 400 mm	170-250 A	33 V	0.57	21	74 s	2.4 kg/h



# ESAB 6013



General-purpose electrode ideally suited for all positional welding except vertical down. Smooth and stable arc giving a flat weld bead with easy slag removal. Recommended for welding of general grade carbon steels.

<b>Classifications:</b>	SFA/AWS A5.1:E6013, EN ISO 2560-A:E 38 0 RC 11
<b>Approvals:</b>	ABS 2, DNV 2, BV 2, LR 2, GL 2, ClassNK KMW2

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

<b>Welding Current:</b>	AC, DC+(-)
<b>Alloy Type:</b>	Carbon Manganese
<b>Coating Type:</b>	Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	400 MPa	510 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	0 °C	70 J
As welded	-20 °C	35 J

## Typical Weld Metal Analysis %

C	Si	Mn
0.07	0.44	0.39

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	50-100 A	23 V	0.63	86	67 s	0.63 kg/h
3.2 x 350 mm	75-150 A	25 V	0.57	56	52 s	1.25 kg/h
4.0 x 400 mm	95-200 A	25 V	0.60	31	70 s	1.65 kg/h
5.0 x 400 mm	160-270 A	25 V	0.59	20	85 s	2.1 kg/h

# OK 46.00



OK 46.00 is the best, all-round, rutile electrode and it is relatively insensitive to rust or other surface impurities. It deposits smooth weld beads in all positions, including vertical down, and the slag is easy to remove. OK 46.00 is very easy to strike and restrike, making it ideal for short welds, root runs and tacking.

<b>Classifications:</b>	SFA/AWS A5.1:E6013, GOST 9467-75:E46, EN ISO 2560-A:E 38 0 RC 11, GOST R ISO 2560-A:E 38 0 RC 11
<b>Approvals:</b>	BV 2, CE EN 13479, DB 10.039.05, DNV 2, GL 2, LR 2, RS 2, VdTÜV 00623, ABS 2, BKI 2, ClassNK KMW2, NAKS/HAKC 2.5, 3.0, 4.0, 5.0 mm, NAKS/HAKC 2.5, 3.0, 4.0, 5.0 mm, NAKS/HAKC 2.5, 3.0, 4.0, 5.0 mm, NAKS/HAKC 3.2-4.0 mm, RRR 2

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

<b>Welding Current:</b>	AC, DC+-
<b>Alloy Type:</b>	Carbon Manganese
<b>Coating Type:</b>	Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	400 MPa	510 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	0 °C	70 J

## Typical Weld Metal Analysis %

C	Mn	Si
0.08	0.42	0.30

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
1.6 x 300 mm	30-60 A	26 V	0.63	263	36 s	0.38 kg/h
2.0 x 300 mm	50-70 A	25 V	0.60	172	38 s	0.55 kg/h
2.5 x 350 mm	60-100 A	22 V	0.65	86	50 s	0.80 kg/h
3.0 x 350 mm	70-140 A	32 V	0.51	77	46 s	1.0 kg/h
3.2 x 350 mm	80-150 A	22 V	0.65	53	57 s	1.30 kg/h
3.2 x 450 mm	80-150 A	22 V	0.64	43	63 s	1.33 kg/h

# OK 46.00

Deposition Data						
Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
4.0 x 350 mm	100-200 A	22 V	0.60	39	65 s	1.60 kg/h
4.0 x 400 mm	100-200 A	26 V	0.60	33	64 s	1.69 kg/h
4.0 x 450 mm	100-200 A	23 V	0.58	33	76 s	1.94 kg/h
5.0 x 350 mm	150-290 A	24 V	0.60	24	87 s	2.30 kg/h
5.0 x 400 mm	150-290 A	30 V	0.56	22	71 s	2.2 kg/h
5.0 x 450 mm	150-290 A	24 V	0.60	31	114 s	2.30 kg/h

# OK 48.04



OK 48.04 is an AC/DC, general purpose, LMA electrode for welding mild and low-alloy steels. It has very good welding properties and deposits a high quality weld metal with very good mechanical properties. The electrode can be used for welding restrained structures where high welding stresses cannot be avoided.

<b>Classifications:</b>	EN ISO 2560-A:E 42 4 B 32 H5, SFA/AWS A5.1:E7018
<b>Approvals:</b>	CE EN 13479, ABS 3Y H5, PRS 3Y H5, BV 3Y H5, GL 3Y H5, DNV 3Y H5, Seproz UNA 272580, RS 3Y H5, NAKS/HAKC 2.5-5.0 mm, ABS AWS A5.1 - E7018, LR 3Ym H15

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

<b>Welding Current:</b>	AC, DC+(-)
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	Carbon Manganese
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	480 MPa	560 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-30 °C	110 J
As welded	-40 °C	100 J

## Typical Weld Metal Analysis %

C	Mn	Si
0.06	1.2	0.6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition rate 90° I max
2.5 x 350 mm	75-110 A	23 V	0.64	67.0	59 s	1.00 kg/h
3.2 x 350 mm	90-155 A	22 V	0.63	42.3	62.4 s	1.37 kg/h
3.2 x 450 mm	90-155 A	25 V	0.67	30.0	92 s	1.50 kg/h
4.0 x 450 mm	125-200 A	26 V	0.68	20.0	101 s	2.00 kg/h
5.0 x 450 mm	190-260 A	26 V	0.72	13.0	106 s	2.80 kg/h

# OK 53.04



OK 53.04 is an LMA electrode for welding in all positions, excellent on AC in the vertical position. It has very good running characteristics, gives a low amount of spatter loss and a thin slag, which is easy to remove. The electrode is also characterized by good arc stability at low amperage. For root runs in single V joints welding on DC- is recommended because of the cooler weld pool.

<b>Classifications:</b>	SFA/AWS A5.1:E7016, EN ISO 2560-A:E 42 4B 12 H5
<b>Approvals:</b>	ABS 3YH5, DNV 3YH10, LR 3Y H15, GL 3YH10, BKI 3 Y H15

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

<b>Welding Current:</b>	AC, DC+(-)
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	Carbon Manganese
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	500 MPa	590 MPa	27 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-20 °C	150 J
As welded	-30 °C	130 J
As welded	-40 °C	110 J

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	70-110 A	23 V	0.56	81.0	50 s	0.9 kg/h
3.2 x 350 mm	90-140 A	23 V	0.60	48.0	62 s	1.2 kg/h
4.0 x 350 mm	120-190 A	23 V	0.61	33	66 s	1.7 kg/h

# OK 53.70



A low-hydrogen AC/DC electrode for the one-sided welding of pipes and general structures. The root penetration is good, leaving a flat bead with easily removable slag. The stable arc and the well-balanced slag system make the electrode easy to weld in all positions. Suitable for welding transmission pipelines made from pipe steels up to API 5LX56.

It is also suitable for welding the root in higher strength pipes, API 5LX60, 5LX65, 5LX70.

<b>Classifications:</b>	GOST 9467-75:E50A, SFA/AWS A5.1:E7016-1, EN ISO 2560-A:E42 5 B 12 H5
<b>Approvals:</b>	CE EN 13479, ABS 3Y H5, DNV 3Y H5, RS 4Y H5, LR 3Ym H5, ABS E7016-H4

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

<b>Welding Current:</b>	AC, DC +(-)
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	Carbon Manganese
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	450 MPa	540 MPa	32 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-45 °C	135 J
As welded	-50 °C	130 J

## Typical Weld Metal Analysis %

C	Mn	Si
0.06	1.1	0.4

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	60-85 A	26 V	0.63	87.7	57 s	0.70 kg/h
3.2 x 350 mm	80-130 A	24 V	0.59	54.5	61 s	1.10 kg/h
4.0 x 450 mm	115-190 A	24 V	0.63	24.6	86 s	1.70 kg/h
5.0 x 450 mm	150-250 A	24 V	0.66	15	104 s	2.26 kg/h

# OK Femax 33.80



High-recovery rutile electrode for high productivity welding of fillets in the horizontal-vertical position. Particularly suitable for welding thick plates and for long run-out lengths. Good bead appearance. Easy slag removal.

<b>Classifications:</b>	SFA/AWS A5.1:E7024, EN ISO 2560-A:E 42 0 RR 73
<b>Approvals:</b>	CE EN 13479, DB 10.039.28, VdTÜV 00634, ABS 2Y, ABS E7024, BV 2Y, CWB CSA W48: E4924, DNV 2Y, GL 2Y, LR 2Ym, RS 2Y, PRS 2Y, RINA 2

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

<b>Welding Current:</b>	AC, DC+-
<b>Alloy Type:</b>	Carbon Steel
<b>Coating Type:</b>	Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	460 MPa	550 MPa	27 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	0 °C	60 J

## Typical Weld Metal Analysis %

C	Mn	Si
0.09	0.7	0.4

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 450 mm	130-170 A	28 V	0.68	21.0	69 s	2.50 kg/h
4.0 x 450 mm	180-230 A	30 V	0.68	13.5	69 s	3.80 kg/h
5.0 x 450 mm	250-340 A	30 V	0.67	9.1	68 s	5.80 kg/h
6.0 x 450 mm	300-430 A	35 V	0.68	6.4	79 s	7.1 kg/h

# Pipeweld 6010 Plus



Cellulosic-coated electrode designed for welding of pipes and pipelines in all positions using conventional and stovepipe techniques. API 5L up to X56, root pass up to X80.

<b>Classifications:</b>	SFA/AWS A5.1:E6010, EN ISO 2560-A:E 38 2 C 21
<b>Approvals:</b>	LR 3, ABS 3

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Carbon - Manganese
<b>Coating Type:</b>	Cellulosic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	480 MPa	590 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	-20 °C	50 J
As welded	-29 °C	40 J

## Typical Weld Metal Analysis %

C	Mn	Si
0.11	0.44	0.13

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	40-75 A	34 V	0.79	100	54 s	0.7 kg/h
3.2 x 350 mm	60-125 A	25 V	0.69	67	57 s	1.0 kg/h
4.0 x 350 mm	80-180 A	30 V	0.63	50	58 s	1.2 kg/h
5.0 x 350 mm	120-230 A	28 V	0.71	29	65 s	1.9 kg/h



# Pipeweld 7010 PLUS



Cellulosic coated electrode for welding of low alloy steel pipes. Designed for vertical down welding, the deep penetrating arc provides good performance. Suitable for welding pipe steel types API 5L X52 to X60.

<b>Classifications:</b>	SFA/AWS A5.5:E7010-P1, EN ISO 2560-A:E 42 2 Z C 21
<b>Approvals:</b>	FBTS E 7010-P1

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C-Mn-Ni-Mo
<b>Coating Type:</b>	Cellulosic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	480 MPa	570 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	-20 °C	55 J
As welded	-30 °C	45 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Mo
0.09	0.46	0.12	0.34	0.24

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 350 mm	65-120 A	31 V	0.58	65	90 s	0.62 kg/h
4.0 x 350 mm	90-180 A	30.5 V	0.59	42	93 s	0.93 kg/h
5.0 x 350 mm	150-240 A	28.6 V	0.67	24	100 s	1.47 kg/h

# Pipeweld 8010 Plus



Cellulosic coated electrode designed for low alloy steel. Deep penetration welding in all positions, especially designed for vertical down welding of high strength pipelines. Provides high economic benefits compared to welding vertical up. Recommended for welding pipe-lines of API 5LX: X60- X70

<b>Classifications:</b>	SFA/AWS A5.5:E8010-P1, EN ISO 2560-A:E 46 3 1NiMo C 21
<b>Approvals:</b>	FBTS E 8010-P1

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C-Mn-Ni-Mo
<b>Coating Type:</b>	Cellulosic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	530 MPa	625 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	-30 °C	50 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Mo
0.07	0.65	0.13	0.70	0.40

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 350 mm	65-120 A	30 V	0.62	61	86 s	0.68 kg/h
4.0 x 350 mm	90-180 A	29 V	0.68	37	84 s	1.15 kg/h
5.0 x 350 mm	150-240 A	29 V	0.68	24	97 s	1.55 kg/h

# OK 53.16 Spezial



OK 53.16 is a double-coated electrode combining the running characteristics of a rutile electrode with the mechanical properties of a basic electrode. OK 53.16 welds on both AC and DC and the spatter loss is minimal.

<b>Classifications:</b>	SFA/AWS A5.1:E7016, EN ISO 2560-A:E 38 2B 32 H10
<b>Approvals:</b>	CE EN 13479, DNV 3YH10, ABS 3H10, 3Y, GL 3YH10, BV 3,3Y H10, DB 10.039.29, LR 3YH10, VdTÜV 02762

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

<b>Welding Current:</b>	AC, DC+-
<b>Diffusible Hydrogen:</b>	<10.0 ml/100g
<b>Alloy Type:</b>	CMn
<b>Coating Type:</b>	Basic Special

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	450 MPa	530 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-20 °C	90 J

## Typical Weld Metal Analysis %

C	Mn	Si
0.07	0.9	0.6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	50-90 A	26.8 V	0.58	83.3	59 s	0.73 kg/h
3.2 x 350 mm	90-150 A	31.2 V	0.54	53.6	56 s	1,2 kg/h
3.2 x 450 mm	90-150 A	30.3 V	0.57	39.5	72 s	1,27 kg/h
4.0 x 450 mm	120-190 A	28 V	0.59	24	90 s	1.65 kg/h
5.0 x 450 mm	160-230 A	28 V	0.61	15.5	109 s	2.14 kg/h

# OK 55.00



OK 55.00 is a reliable, high-quality, LMA electrode, particularly suitable for welding high strength low-alloy steels. The good, low-temperature impact strength of the weld metal should be noted. The weld metal is also very resistant to hot cracking. The electrode is also suitable for welding high strength ships steel, grades A, D and E.

<b>Classifications:</b>	SFA/AWS A5.1:E7018-1H4 R, EN ISO 2560-A:E 46 5 B 32 H5
<b>Approvals:</b>	CE EN 13479, DB 10.039.03, VdTÜV 00632, LR 3Y H5, BV 3Y H5, GL 3Y H5, DNV 3Y H5, RS 3Y H5, ABS 3 H5, 3Y, NAKS/HAKC 5.0mm

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

<b>Welding Current:</b>	AC, DC+
<b>Diffusible Hydrogen:</b>	< 4.0 ml/100g
<b>Alloy Type:</b>	Carbon Manganese
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	500 MPa	590 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-45 °C	85 J
As welded	-50 °C	80 J

## Typical Weld Metal Analysis %

C	Mn	Si
0.06	1.5	0.5

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	80-110 A	23 V	0.64	66	64 s	0.9 kg/h
3.2 x 350 mm	110-140 A	23 V	0.62	41	72 s	1.2 kg/h
3.2 x 450 mm	110-140 A	24 V	0.69	30	88 s	1.4 kg/h
4.0 x 350 mm	140-200 A	23.2 V	0.62	28	72.5 s	1.77 kg/h
4.0 x 450 mm	140-200 A	24 V	0.71	19	94 s	2.0 kg/h
5.0 x 450 mm	200-270 A	24 V	0.72	13	94 s	3.0 kg/h
6.0 x 450 mm	215-360 A	25 V	0.71	9	98 s	4.0 kg/h

# FILARC 56S



Basic, thin-coated AC/DC electrode providing excellent mechanical properties. The electrode ensures fully penetrated root passes, even under adverse conditions. Low moisture content coating and high resistance to moisture re-absorption. The electrode is CTOD tested.

<b>Classifications:</b>	SFA/AWS A5.1:E7016-1 H4 R, EN ISO 2560-A:E 42 5 B 1 2 H5
<b>Approvals:</b>	CE EN 13479, ABS 3YH5, BV 3YH5, DNV 4 YH5, Seproz UNA 272581, DB 10.105.15, GL 4YH5, LR 4Y40H5, VdTÜV 03012, RS 4Y42H5

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

<b>Welding Current:</b>	AC, DC+(-)
<b>Diffusible Hydrogen:</b>	< 4.0 ml/100g
<b>Alloy Type:</b>	Carbon manganese

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	470 MPa	550 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-45 °C	150 J
As welded	-50 °C	140 J

## Typical Weld Metal Analysis %

C	Mn	Si
0.06	1.3	0.4

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	55-85 A	22 V	0.58	90.0	50 s	0.80 kg/h
3.2 x 350 mm	80-140 A	22 V	0.61	52.0	53 s	1.30 kg/h
3.2 x 450 mm	80-130 A	22 V	0.61	41.0	73 s	1.20 kg/h
4.0 x 350 mm	110-180 A	22 V	0.64	34.0	62 s	1.70 kg/h
4.0 x 450 mm	110-170 A	22 V	0.65	26.0	83 s	1.70 kg/h
5.0 x 450 mm	180-230 A	22 V	0.66	17.0	90 s	2.40 kg/h

# OK 48.08



OK 48.08 is an LMA electrode with very good mechanical properties suitable for demanding applications, such as offshore. The weld metal contains approximately 1% Ni for high impact values down to -40°C. The coating is of the latest LMA type for optimum resistance to porosity and hydrogen cracking. OK 48.08 is CTOD tested.

<b>Classifications:</b>	SFA/AWS A5.5:E7018-G, EN ISO 2560-A:E 46 5 1Ni B 32 H5
<b>Approvals:</b>	CE EN 13479, ABS 3Y H5, DNV 4Y40 H5, GL 4Y H5, RS 4Y H5, DB 10.039.31, VdTÜV 05778, LR 4Y40m H5, NAKS/HAKC 2.5-5.0 mm

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

<b>Welding Current:</b>	AC, DC +(-)
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	0.9% Ni
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	540 MPa	630 MPa	26 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-50 °C	115 J
As welded	-60 °C	90 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.06	1.2	0.35	0.95	0.02	0.001

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	55-80 A	22 V	0.57	135.1	42 s	0.60 kg/h
2.5 x 350 mm	75-110 A	27 V	0.57	88	41 s	1.0 kg/h
3.2 x 350 mm	110-150 A	22 V	0.62	42.3	66 s	1.30 kg/h
3.2 x 450 mm	110-150 A	22 V	0.66	30.0	85 s	1.40 kg/h
4.0 x 450 mm	150-200 A	22 V	0.69	20.3	90 s	2.00 kg/h
5.0 x 450 mm	190-275 A	23 V	0.69	14.0	85 s	3.00 kg/h

# OK 73.08



OK 73.08 is a NiCu-alloyed LMA electrode, which deposits a weld metal with good corrosion resistance to sea-water and flue gases, for the welding of weatherproof steel and for ship's hull structural steel. The weld metal has excellent mechanical properties. It is particularly suitable for welding the shell plating of ice-breakers and other ships, which work under conditions where the protective paint coating wears off.

<b>Classifications:</b>	SFA/AWS A5.5:E8018-G, EN ISO 2560-A:E 46 5 Z B 32
<b>Approvals:</b>	CE EN 13479, DNV 3Y H10, BV 3Y H10, ABS 3Y H10, GL 3Y H10, RS 3Y H10, LR 3Ym H10, DB 10.039.20, VdTÜV 02115

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

<b>Welding Current:</b>	AC, DC+
<b>Diffusible Hydrogen:</b>	< 10.0 ml/100g
<b>Alloy Type:</b>	Weathering steel
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	520 MPa	610 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-50 °C	100 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cu
0.06	1.1	0.4	0.7	0.4

## Deposition Data

Diameter	Current	Voltage	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	80-115 A	21 V	0.62	66.0	59 s	0.90 kg/h
3.2 x 350 mm	100-150 A	23 V	0.62	43	68 s	1.2 kg/h
3.2 x 450 mm	100-150 A	22 V	0.66	30.5	90 s	1.30 kg/h
4.0 x 450 mm	130-200 A	23 V	0.68	20.0	100 s	1.80 kg/h
5.0 x 450 mm	190-280 A	27 V	0.70	13.5	106 s	2.60 kg/h

# OK 73.68



OK 73.68 is a 2.5% nickel-alloyed LMA electrode suitable for the welding of low-alloy steels with impact requirements down to -60°C. The composition of the weld metal is such that good, low-temperature impact properties are obtained, even when welding vertically up. The weld metal of OK 73.68 is also noted for its good corrosion resistance to sea-water and sulphuric acid fumes.

<b>Classifications:</b>	SFA/AWS A5.5:E8018-C1, EN ISO 2560-A:E 46 6 2Ni B 32 H5
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, NAKS/HAKC 2.5-5.0 mm, ABS 3Y400 H5*, ABS E 8018-C1, BV 5Y40M H5*, DNV 5Y H5*, GL 6Y46 H5*, LR 5Y42m H5*, PRS 5Y 42 H5, RS 5Y46M H5*, VdTUV 01529

\* Only up to 4.0 mm. NAKS/HAKC: Valid for lot numbers starting with SB. Approvals are based on factory location. Please contact ESAB for more information.

<b>Welding Current:</b>	AC, DC+
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	2.5% Ni
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
Stress relieved 1 hr 620 °C	500 MPa	600 MPa	28 %
<b>ISO</b>			
As welded	540 MPa	615 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
Stress relieved 1 hr 620 °C	-60 °C	85 J
<b>ISO</b>		
As welded	-60 °C	105 J
As welded	-80 °C	65 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.05	1	0.35	2.4	0.02	0.01

## Deposition Data

Diameter	Current	Voltage	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	70-110 A	23 V	0.62	70.0	55 s	0.90 kg/h
3.2 x 450 mm	105-150 A	23 V	0.62	32.0	81 s	1.40 kg/h
4.0 x 450 mm	140-190 A	23 V	0.65	21.0	88 s	2.00 kg/h
5.0 x 450 mm	190-270 A	27 V	0.65	13.5	104 s	2.50 kg/h



# OK 73.79



OK 73.79 is a nickel-alloyed, LMA electrode for welding 3.5 Ni steel with impact requirements down to -101°C. It is used, for example, for ethane tanks and chemical plants.

<b>Classifications:</b>	SFA/AWS A5.5:E8016-C2, EN ISO 2560-A:E 46 6 3 Ni B 12 H5
<b>Approvals:</b>	DNV 5Y H5, GL 6Y46 H5, RS 5Y46 H5

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

<b>Welding Current:</b>	AC, DC+-
<b>Diffusible Hydrogen:</b>	< 5.0 ml/100g
<b>Alloy Type:</b>	3.5% Ni
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	540 MPa	630 MPa	27 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-60 °C	130 J
As welded	-75 °C	110 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.06	0.8	0.36	3.37	0.05	0.01

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	70-110 A	25 V	0.60	76.0	60 s	0.80 kg/h
3.2 x 450 mm	80-150 A	25 V	0.60	37.0	77 s	1.50 kg/h
4.0 x 450 mm	90-190 A	27 V	0.63	26.0	88 s	1.80 kg/h
5.0 x 450 mm	110-240 A	29 V	0.60	15.0	100 s	2.10 kg/h

# OK 74.46



OK 74.46 is an LMA electrode alloyed with 0.5% Mo for welding steels for pressure vessels. The running characteristics make it suitable for welding joints in inclined positions. The composition of the coating is adapted for welding with low currents, making OK 74.46 very suitable for the welding of pipes.

<b>Classifications:</b>	SFA/AWS A5.5:E7018-A1, EN ISO 3580-A:E Mo B 3 2 H5
<b>Approvals:</b>	CE EN 13479, VdTÜV 01043

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

<b>Welding Current:</b>	AC, DC+
<b>Diffusible Hydrogen:</b>	< 5ml/100g
<b>Alloy Type:</b>	Mo
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
ISO			
PWHT 620°C 1h	460 MPa	560 MPa	27 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
ISO		
PWHT 620°C 1h	20 °C	175 J

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.05	0.77	0.38	0.04	0.57

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	55-80 A	22 V	0.59	136.0	40 s	0.7 kg/h
2.5 x 350 mm	75-110 A	23 V	0.59	73.0	55 s	0.9 kg/h
3.2 x 350 mm	105-150 A	23 V	0.54	53	66 s	1 kg/h
3.2 x 450 mm	105-150 A	25 V	0.59	37.0	81 s	1.2 kg/h
4.0 x 450 mm	140-200 A	26 V	0.65	22.5	90 s	1.8 kg/h
5.0 x 450 mm	190-270 A	27 V	0.65	14.5	104 s	2.4 kg/h

# OK 74.70



OK 74.70 is an LMA electrode used for welding high strength, low-alloyed steel. The electrode is designed for various applications, including pipelines.

<b>Classifications:</b>	SFA/AWS A5.5:E8018-G, EN ISO 2560-A:E 50 4 Z B 42 H5
<b>Approvals:</b>	NAKS/HAKC 3.2-4.0 mm

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

<b>Welding Current:</b>	DC+(-)
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	0.5% Mo
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	550 MPa	650 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-20 °C	120 J
As welded	-40 °C	90 J

## Typical Weld Metal Analysis %

C	Mn	Si	Mo
0.08	1.5	0.4	0.45

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 350 mm	80-140 A	23 V	0.58	50	63 s	1.14 kg/h
3.2 x 450 mm	80-140 A	23 V	0.61	25	91 s	1.6 kg/h
4.0 x 450 mm	90-190 A	24 V	0.63	24	93 s	1.66 kg/h

# OK 74.78



OK 74.78 is an LMA electrode suitable for welding high tensile steels used in low-temperature applications. Good notch toughness down to -40°C. Very suitable for both the enclosed welding and cladding of rails, when a hardness of about 250 HV is required. The moisture content of the coating is very low, which makes OK 74.78 suitable when preheating cannot be applied.

<b>Classifications:</b>	SFA/AWS A5.5:E9018-D1, EN ISO 18275-A:E 55 4 MnMo B 3 2 H5
<b>Approvals:</b>	CE EN 13479, DNV 3Y H5, DB 81.039.02, DB 82.039.02, VdTÜV 01027, ABS 3YQ460M H5

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

<b>Welding Current:</b>	AC, DC+
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	0.4% Mo
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	600 MPa	650 MPa	24 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-40 °C	90 J
As welded	-50 °C	70 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.05	1.60	0.35	0.03	0.03	0.35

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	75-100 A	22 V	0.62	73.0	55 s	0.90 kg/h
3.2 x 450 mm	105-140 A	23 V	0.65	32.0	86 s	1.30 kg/h
4.0 x 450 mm	140-190 A	23 V	0.65	20.5	97 s	1.80 kg/h
5.0 x 450 mm	190-260 A	24 V	0.68	14.0	100 s	2.60 kg/h
6.0 x 450 mm	240-340 A	24 V	0.69	10	103 s	3.6 kg/h

# OK 74.86 Tensitrode



A basic coated electrode for steels and castings with U.T.S. of min. 690 MPa.

<b>Classifications:</b>	SFA/AWS A5.5:E10018-D2, EN ISO 18275-A:E 62 4 Mn1NiMo B T 32 H5
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, NAKS/HAKC 3.2-4.0 mm

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

<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	1.8%Mn, 0.4%Mo
<b>Coating Type:</b>	Basic

Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
ISO			
Stress relieved 1 hr 590 °C	630 MPa	720 MPa	25 %

Typical Charpy V-Notch Properties		
Condition	Testing Temperature	Impact Value
ISO		
Stress relieved 1 hr 590 °C	-40 °C	75 J
Stress relieved 1 hr 590 °C	-50 °C	60 J

Typical Weld Metal Analysis %					
C	Mn	Si	Ni	Cr	Mo
0.06	1.74	0.37	0.83	0.04	0.34

Deposition Data						
Diameter	Current	Voltage	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	75-100 A	21.6 V	0.61	69.4	60.1 s	0.86 kg/h
3.2 x 450 mm	110-140 A	22 V	0.65	35	85.6 s	1.2 kg/h
4.0 x 450 mm	150-190 A	22.8 V	0.62	22.4	93.4 s	1.72 kg/h
5.0 x 450 mm	190-260 A	22.8 V	0.68	14.3	92.6 s	2.72 kg/h

# OK 75.75



OK 75.75 is an LMA electrode dried to a very low moisture content and suitable for the welding of high-strength, low-alloyed steels, at room temperature or with moderate preheating.

<b>Classifications:</b>	SFA/AWS A5.5:E11018-G, EN ISO 18275-A:E 69 4 Mn2NiCrMo B 42 H5
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, ABS E11018-G, DB 10.039.19, VdTÜV 01028

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

<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	Low alloy steel
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	780 MPa	830 MPa	20 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-40 °C	60 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.05	1.61	0.36	2.32	0.32	0.33

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	70-110 A	22 V	0.67	66.0	54 s	1.00 kg/h
3.2 x 450 mm	100-150 A	23 V	0.67	31.5	80 s	1.40 kg/h
4.0 x 450 mm	135-200 A	24 V	0.65	21.0	92 s	1.90 kg/h
5.0 x 450 mm	180-260 A	25 V	0.63	12.0	105 s	2.50 kg/h

# OK 76.16



Basic DC low hydrogen electrode for welding creep resisting steels of the type 1.25 % Cr 0.5 % Mo.

<b>Classifications:</b>	SFA/AWS A5.5:E8018-B2-H4R, EN ISO 3580-A:E CrMo1B 4 2 H5
<b>Approvals:</b>	CE EN 13479, Saproz UNA 272580, NAKS/HAKC 4.0-5.0 mm, VdTÜV 10731

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

<b>Welding Current:</b>	DC+(-)
<b>Diffusible Hydrogen:</b>	< 4.0 ml/100g
<b>Alloy Type:</b>	1.25 % Cr - 0.5 % Mo

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
Stress relieved 22 hr 690 °C	520 MPa	600 MPa	28 %
<b>ISO</b>			
Stress relieved 2 hr 690 °C	560 MPa	640 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
Stress relieved 22 hr 690 °C	-20 °C	175 J
Stress relieved 22 hr 690 °C	-30 °C	150 J
<b>ISO</b>		
Stress relieved 2 hr 690 °C	20 °C	150 J
Stress relieved 2 hr 690 °C	-20 °C	120 J
Stress relieved 2 hr 690 °C	-30 °C	95 J

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.06	0.7	0.3	1.3	0.5

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	70-110 A	22.7 V	0.60	74	75 s	0.65 kg/h
3.2 x 350 mm	95-150 A	22.5 V	0.59	48	71 s	1.07 kg/h
4.0 x 350 mm	130-190 A	22.1 V	0.89	30	78 s	1.55 kg/h
5.0 x 450 mm	150-260 A	23.6 V	0.66	14	102 s	2.49 kg/h

# OK 76.18



OK 76.18 is an LMA electrode for welding creep-resistant steels of the 1.Cr0.5Mo type. The electrode welds with a quiet, stable arc and produces a minimum of spatter loss. OK 76.18 deposits a weld metal which is resistant to cracking as well as porosity. The scaling temperature of the weld metal is about 575°C.

<b>Classifications:</b>	SFA/AWS A5.5:E8018-B2, EN ISO 3580-A:E CrMo1 B 4 2 H5
<b>Approvals:</b>	CE EN 13479, VdTÜV 01387, NAKS/HAKC 2.5-4.0 mm, ABS SR H5, BV Welding of low alloy steels type 1%Cr 0.5%Mo, H5, DNV -H5

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

<b>Welding Current:</b>	DC+(-)
<b>Diffusible Hydrogen:</b>	< 5ml/100g
<b>Alloy Type:</b>	Creep resisting
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
PWHT 690°C 1h	580 MPa	670 MPa	24 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
PWHT 690°C 1h	20 °C	100 J

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.06	0.7	0.3	1.3	0.5

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	55-80 A	22 V	0.58	136.0	40 s	0.70 kg/h
2.5 x 300 mm	70-110 A	24 V	0.58	88.0	52 s	0.80 kg/h
3.2 x 350 mm	95-150 A	25 V	0.59	49.0	65 s	1.10 kg/h
4.0 x 450 mm	130-190 A	27 V	0.64	23.0	90 s	1.70 kg/h
5.0 x 450 mm	150-260 A	28 V	0.64	14.5	95 s	2.70 kg/h



# OK 76.26



Basic low-hydrogen electrode for the AC/DC welding of creep-resistant steels of the 2.3% Cr/1% Mo type, such as SA - 387 Grade 22/A 335 Grade P22 or similar. The weld metal has the extra-low impurity levels specified in step-cooling requirements.

<b>Classifications:</b>	SFA/AWS A5.5:E9018-B3, EN ISO 3580-A:E CrMo2 B 32 H5
<b>Approvals:</b>	CE EN 13479, Saproz UNA 272580, NAKS/HAKC 2.5-5.0 mm, VdTÜV 10732

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

<b>Welding Current:</b>	AC, DC+
<b>Diffusible Hydrogen:</b>	< 5.0 ml/100g
<b>Alloy Type:</b>	Cr-Mo
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
PWHT 690°C 4h	520 MPa	610 MPa	21 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
PWHT 690°C 4h	20 °C	170 J
PWHT 690°C 4h	-20 °C	140 J

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.07	0.69	0.23	2.17	1.10

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	60-85 A	21 V	0.63	70	68 s	0.76 kg/h
3.2 x 350 mm	90-130 A	23 V	0.60	49	66 s	1.11 kg/h
4.0 x 450 mm	130-190 A	25 V	0.61	23	83 s	1.90 kg/h
5.0 x 450 mm	150-260 A	27 V	0.62	15	92 s	2.60 kg/h

# OK 76.28



OK 76.28 is an LMA electrode for welding creep-resistant steels containing approx. 2.25Cr1Mo. The electrode runs with a quiet, stable arc and produces a minimum of spatter loss. OK 76.28 deposits a weld metal with good cracking resistance. The scaling temperature of the weld metal is about 625°C.

<b>Classifications:</b>	SFA/AWS A5.5:E9018-B3, EN ISO 3580-A:E CrMo2 B 4 2 H5
<b>Approvals:</b>	CE EN 13479, NAKS/HACK* 2.5-5.0 mm, VdTÜV 00971, ABS SR H5, BV C2M1 H5

\*NAKS/HACK: valid for lot numbers starting with SB. Approvals are based on factory location. Please contact ESAB for more information.

<b>Welding Current:</b>	DC+(-)
<b>Diffusible Hydrogen:</b>	<5ml/100g
<b>Alloy Type:</b>	Creep-resisting
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
PWHT 690°C 1h	630 MPa	720 MPa	21 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
PWHT 690°C 1h	20 °C	130 J

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.06	0.7	0.3	2.3	1.1

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	55-80 A	23 V	0.58	136.0	40 s	0.7 kg/h
2.5 x 300 mm	70-110 A	25 V	0.58	88.0	52 s	0.8 kg/h
3.2 x 350 mm	95-150 A	26 V	0.59	49.0	62 s	1.2 kg/h
4.0 x 450 mm	130-190 A	28 V	0.64	23.0	88 s	1.8 kg/h
5.0 x 450 mm	150-260 A	29 V	0.64	14.5	92 s	2.7 kg/h
6.0 x 450 mm	200-350 A	30 V	0.64	10.5	90 s	3.9 kg/h

# OK 76.35



OK 76.35 is an LMA electrode containing 5Cr0.5Mo for welding creep-resistant steels. It is especially suitable for pipe welding. The electrode runs with a quiet, stable arc and gives a minimum amount of spatter loss. A preheating and interpass temperature of 150-260°C is normally required. The mechanical properties stated here are after one hour of heat treatment at 740°C.

<b>Classifications:</b>	SFA/AWS A5.5:E8015-B6, EN ISO 3580-A:E CrMo5 4 2 H5
<b>Approvals:</b>	Seproz UNA 272580, NAKS/HAKC 2.5-4.0 mm

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

<b>Welding Current:</b>	DC+-
<b>Diffusible Hydrogen:</b>	< 5.0 ml/100g
<b>Alloy Type:</b>	Creep resisting
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
PWHT 750°C 1h	500 MPa	620 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
PWHT 750°C 1h	20 °C	110 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.05	0.7	0.4	0.03	5	0.55

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	50-70 A	23 V	0.57	139	53 s	0.49 kg/h
2.5 x 300 mm	65-95 A	23 V	0.57	76.9	63 s	0.7 kg/h
3.2 x 350 mm	90-130 A	24 V	0.56	50.0	70 s	1.0 kg/h
4.0 x 450 mm	125-165 A	24 V	0.58	33.3	80 s	1.3 kg/h

# OK 76.96



OK 76.96 is an LMA electrode containing 9Cr1Mo for the welding of creep-resistant steels. It is especially suitable for pipe welding. The electrode runs with a quiet, stable arc and gives a minimum amount of spatter. A preheating and interpass temperature of 150-260°C is normally required. The mechanical properties stated here are after one hour of heat treatment at 740°C.

<b>Classifications:</b>	SFA/AWS A5.5:E8015-B8, EN ISO 3580-A:E (CrMo9) B 4 2 H5
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<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	<5ml/100g
<b>Alloy Type:</b>	Creep resisting
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
Stress relieved 2 hr 650 °C	730 MPa	850 MPa	17 %
Stress relieved 2 hr 750 °C	550 MPa	720 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
Stress relieved 2 hr 650 °C	20 °C	25 J
Stress relieved 2 hr 750 °C	20 °C	60 J
Stress relieved 2 hr 850 °C	20 °C	80 J

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	55-75 A	23 V	0.58	131.0	49 s	0.50 kg/h
2.5 x 300 mm	70-100 A	25 V	0.55	92.0	51 s	0.80 kg/h
3.2 x 350 mm	90-135 A	26 V	0.55	50.0	70 s	1.10 kg/h
4.0 x 450 mm	130-200 A	21 V	0.64	22.5	80 s	1.90 kg/h

# OK 76.98



OK 76.98 is a low-hydrogen electrode for welding modified 9 Cr steels like T91/P91. The electrode is suitable for all-positional welding in pipes and plates. The mechanical properties stated here are after two hours of heat treatment at 750°C.

<b>Classifications:</b>	SFA/AWS A5.5-96:E9015-B9 (nearest), EN ISO 3580-A:E CrMo91 B 4 2 H5
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, NAKS/HAKC 2.5-4.0 mm, VdTÜV 07687

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

<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	Cr-Mo-Ni-V-Nb
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
PWHT 755°C 2h	720 MPa	820 MPa	21 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
PWHT 755°C 2h	20 °C	50 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	V	Nb
0.1	0.8	0.35	0.7	9	1	0.24	0.06

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	70-100 A	21 V	0.66	71.4	56 s	0.90 kg/h
3.2 x 350 mm	90-135 A	22 V	0.60	45.5	68 s	1.20 kg/h
4.0 x 450 mm	130-200 A	23 V	0.64	22.6	85 s	1.90 kg/h

# OK 78.16



OK 78.16 is a CrMo-alloyed electrode for the welding of 0.25C-1Cr-0.3Mo-alloyed quenched and tempered steel grades. The heat treatment requirements for the weld metal are the same as those for the parent plate. The weld metal of OK 78.16 is also suitable for flame hardening. The welding of high tensile strength steel with OK 78.16 should be carried out at a preheating temperature of minimum 200°C.

<b>Classifications:</b>	SFA/AWS A5.5:E9018-G, EN ISO 18275-A:E 69 A Z B 42
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272581

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Cr 1.0 Mo 0.2 C 0.25
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	800 MPa	900 MPa	17 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	80 J

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.17	0.76	0.52	1.15	0.2

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	75-100 A	20 V	0.64	70.0	58 s	0.90 kg/h
3.2 x 450 mm	105-140 A	21 V	0.64	32.5	78 s	1.40 kg/h
4.0 x 450 mm	145-195 A	22 V	0.66	22.5	83 s	1.90 kg/h
5.0 x 450 mm	190-260 A	23 V	0.68	15.0	86 s	2.80 kg/h

# FILARC 88S



CTOD-tested, all-positional, basic AC/DC electrode with 100% recovery for offshore fabrication. Alloyed with max 1% Ni. Good CVN toughness down to -60°C; CTOD tested in the AW and SR conditions. BS4360-55F steel and similar grades. Many approved welding procedures are available. Use short arc. Weave slowly when permitted. DC+. Use DC- for root passes.

<b>Classifications:</b>	SFA/AWS A5.5:E8016-G, EN ISO 2560-A:E 50 6 Mn1Ni B 12 H5
<b>Approvals:</b>	CE EN 13479, DNV 3Y H5, Seproz UNA 272581, LR 5Y42 H5, RS 4Y H5, GL 6Y H5, DB 10.105.16, VdTÜV 06107, NAKS/HAKC 2.5-4.0 mm, ABS E8016-G

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

<b>Welding Current:</b>	AC, DC+(-)
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	C, Mn, 1% Ni
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	560 MPa	640 MPa	27 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-40 °C	115 J
As welded	-60 °C	100 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.06	1.77	0.27	0.9	0.03	0.01

## Deposition Data

Diameter	Current	Voltage	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	55-85 A	24 V	0.65	87	59 s	0.7 kg/h
3.2 x 350 mm	80-140 A	21.4 V	0.59	54.5	69 s	0.96 kg/h
4.0 x 450 mm	110-170 A	21.5 V	0.62	26.8	106 s	1.27 kg/h
5.0 x 450 mm	180-230 A	22.6 V	0.63	16.9	109 s	1.95 kg/h

# FILARC 98S



All-positional, low-hydrogen electrode for welding higher strength steels, depositing weld metal with a minimum yield strength of 550 N/mm<sup>2</sup> after stress relieving.

<b>Classifications:</b>	SFA/AWS A5.5:E9018-G, EN ISO 18275-A:E 55 6 Mn1NiMo B T 32 H5
<b>Approvals:</b>	Seproz UNA 272581, NAKS/HAKC 3.2 - 4.0 mm, ABS E9018-G

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

<b>Welding Current:</b>	AC, DC+-
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	C, Mn, 1% Ni
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
PWHT 580°C 1h	650 MPa	710 MPa	21 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
PWHT 580°C 1h	-50 °C	80 J
PWHT 580°C 1h	-60 °C	60 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.06	1.85	0.35	0.89	0.05	0.32

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	55-85 A	24.4 V	0.60	83.3	60 s	0.72 kg/h
3.2 x 350 mm	80-140 A	23.3 V	0.55	56.6	68 s	0.94 kg/h
4.0 x 450 mm	120-180 A	24.0 V	0.60	24.4	103 s	1.43 kg/h



# FILARC 118



All-positional, basic AC/DC electrode with 120% recovery for welding steels with min. 680 N/mm<sup>2</sup> yield strength; e. g. NAXTRA 70, T1, 80 HLES, HY80 and HY100. Often applied in combination with FILARC 98, where the latter is used for tack welding, root-run welding and for welding standing fillet welds. Use the shortest possible arc. Weave slowly when permitted. A slight weave can be used for standing fillet welds. DC+. Use DC- for root runs.

<b>Classifications:</b>	SFA/AWS A5.5:E11018-M, EN ISO 18275-A:E 69 5 Mn2NiMo B 32 H5
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272581, ABS AWS, E11018-M, BV 4Y62 H5, DNV 4Y62 H5, LR 4Y62 H5, MoD (N) Q1N, HY80

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

<b>Welding Current:</b>	AC, DC+-
<b>Diffusible Hydrogen:</b>	< 5.0 ml/100g
<b>Alloy Type:</b>	C, Mn, 2%Ni, 0.4%Mo
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	740 MPa	800 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-50 °C	80 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.06	1.65	0.32	2.27	0.06	0.44

## Deposition Data

Diameter	Current	Voltage	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	55-105 A	25.3 V	0.61	83.3	46.6 s	0.93 kg/h
3.2 x 350 mm	90-140 A	22.8 V	0.56	46.2	64.3 s	1.21 kg/h
4.0 x 450 mm	110-180 A	22.8 V	0.61	23.1	90.0 s	1.72 kg/h
5.0 x 450 mm	190-280 A	24.6 V	0.63	13.5	90.3 s	2.75 kg/h

# Atom Arc 8018

Atom Arc 8018 electrodes deposit 1% Ni weld metal. They are used primarily to weld high-tensile steels in the 483-552 MPa tensile strength range, especially where notch toughness at temperatures as low as -40°C is required.

<b>Classifications:</b>	ASME SFA 5.5.; AWS A5.5:E8018-C3 H4R
<b>Approvals:</b>	ABS 3Y/AWS A5.5: E8018-C3, CWB CSA W48 E5518-C3, LR 4Y40M(H10), QPL-22200/1 MIL-8018-C3
<b>Industry or Segmentation:</b>	Pipeline, Bridge Construction, Power Generation, Ship/Barge Building, Mobile Equipment, Petrochemical, Industrial and General Fabrication

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

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As Welded	510 MPa	585 MPa	30 %
Stress Relieved 8 hr 621 °C	485 MPa	560 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As Welded	-29 °C	168 J
As Welded	-40 °C	154 J
Stress Relieved 8 hr 621 °C	-29 °C	175 J
Stress Relieved 8 hr 621 °C	-40 °C	156 J

## Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Mo
0.046	1.11	0.33	0.009	0.011	0.97	0.13

## Deposition Data

Diameter	Optimal Amps	Current	Deposition Rate	Efficiency (%)
2.4 mm	90 A	70-100 A	0.8 kg/h	66.3 %
3.2 mm	120 A	90-160 A	1.2 kg/h	71.6 %
3.2 mm	140 A	90-160 A	1.2 kg/h	70.9 %
4.0 mm	170 A	130-220 A	1.7 kg/h	73.5 %
4.0 mm	140 A	130-220 A	1.1 kg/h	75 %
4.8 mm	200 A	200-300 A	2.2 kg/h	76.4 %
4.8 mm	250 A	200-300 A	2.4 kg/h	74.6 %

# Atom Arc 10018

Atom Arc 10018 electrodes are used primarily for applications which require weld joints of at least 690 MPa tensile strength, good ductility and crack resistance. Good notch toughness at temperatures as low as -51°C is possible with this electrode. Atom Arc 10018 can be used to weld HY-80 and T-1 steel.

<b>Classifications:</b>	ASME SFA 5.5.; AWS A5.5:E10018M H4R
<b>Industry or Segmentation:</b>	Ship/Barge Building, Railcars, Mobile Equipment, Bridge Construction, Industrial and General Fabrication

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Reduction in Area	Elongation
As Welded	685 MPa	745 MPa	64 %	24 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As Welded	-40 °C	62 J
As Welded	-51 °C	38 J

## Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Mo
0.051	1.46	0.31	0.011	0.013	1.72	0.27

## Deposition Data

Diameter	Optimal Amps	Current	Deposition Rate	Efficiency (%)
2.4 mm	170 A	70-100 A	0.8 kg/h	66.3 %
3.2 mm	120 A	90-160 A	1.2 kg/h	71.6 %
3.2 mm	140 A	90-160 A	1.2 kg/h	70.9 %
4.0 mm	170 A	130-220 A	1.7 kg/h	73.5 %
4.0 mm	140 A	130-220 A	1.1 kg/h	75 %
4.8 mm	200 A	200-300 A	2.2 kg/h	76.4 %
4.8 mm	250 A	200-300 A	2.4 kg/h	74.6 %

# Atom Arc 12018-M2

Atom Arc 12018-M2 is a low hydrogen, iron powder all-position electrode specially formulated to meet the more stringent requirements of Military Specification MIL-E-0022200/10 for mechanical properties, low coating moisture and diffusible hydrogen content. Hydrogen coupons analyzed by the gas chromatography method showed an average of 0.026 ml/g of diffusible hydrogen. The average percent by weight of coating moisture is 0.07% when removed from a hermetically sealed can and 0.17% after 9 hours exposure at 27°C and 80% relative humidity.

<b>Classifications:</b>	MIL :12018M2
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Reduction in Area	Elongation
As Welded	750 MPa	820 MPa	64 %	21 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As Welded	-18 °C	102 J
As Welded	-51 °C	81 J

## Typical Weld Metal Analysis %

Mn	S	P	Ni	Mo
1.13	0.009	0.014	3.65	0.57

# Atom Arc T

Atom Arc T was developed for welding T-1 steel in all applications. Mechanical properties of the welded joints equal or exceed the properties of the base steel in either the as welded or stress relieved condition, thus giving 100% design joint efficiency. In addition, Atom Arc T electrodes are suitable for many other applications, particularly where high-strength welds with excellent low temperature impact properties are required.

<b>Classifications:</b>	ASME SFA 5.5.; AWS A5.5:E11018M H4R
<b>Approvals:</b>	ABS AWS A5.5: E11018-M, CWB CSA W48 E7618-M-H4, QPL-22200/1 MIL-11018-M
<b>Industry or Segmentation:</b>	Industrial and General Fabrication, Railcars, Mobile Equipment, Bridge Construction, Civil Construction, Ship/Barge Building

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

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Reduction in Area	Elongation
As Welded	725 MPa	795 MPa	62 %	23 %
Stress Relieved Flat Position 1 hr 552 °C	705 MPa	770 MPa	63 %	23 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As Welded	-18 °C	75 J
As Welded	-40 °C	65 J
As Welded	-51 °C	60 J
Stress Relieved 1 hr 552 °C	-18 °C	68 J
Stress Relieved 1 hr 552 °C	-40 °C	57 J
Stress Relieved 1 hr 552 °C	-51 °C	34 J

## Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Cr	Mo
0.48	1.48	0.30	0.01	0.012	1.95	0.24	0.38

## Deposition Data

Diameter	Optimal Amps	Current	Deposition Rate	Efficiency (%)
2.4 mm	90 A	70-100 A	0.8 kg/h	66.3 %
3.2 mm	120 A	90-160 A	1.2 kg/h	71.6 %
3.2 mm	140 A	90-160 A	1.2 kg/h	70.9 %
4.0 mm	170 A	130-220 A	1.7 kg/h	73.5 %
4.0 mm	140 A	130-220 A	1.1 kg/h	75 %
4.8 mm	200 A	200-300 A	2.2 kg/h	76.4 %
4.8 mm	250 A	200-300 A	2.4 kg/h	74.6 %
5.6 mm	250 A	250-350 A	2.9 kg/h	75 %
5.6 mm	300 A	250-350 A	3.3 kg/h	74 %

# OK 308L



Extra low carbon stainless steel electrode for welding steels of the 19Cr10Ni-type. Also suitable for welding stabilized stainless steels of the similar composition, except when the full creep resistance of the base material is to be met.

<b>Classifications:</b>	SFA/AWS A5.4:E308L-16, JIS Z 3221:D308L-16
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<b>Welding Current:</b>	AC, DC+
<b>Ferrite Content:</b>	FN 3-10
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	420 MPa	570 MPa	45 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	-60 °C	50 J

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-90 A	31 V	0.55	99	36 s	1.1 kg/h
3.2 x 350 mm	70-130 A	31 V	0.60	49	54 s	1.4 kg/h
4.0 x 350 mm	90-180 A	32 V	0.60	33	60 s	2.0 kg/h
5.0 x 350 mm	140-250 A	33 V	0.60	20	60 s	3.0 kg/h

# OK 309L



Acid-rutile coated MMA-electrode giving an overalloyed weld metal. Suitable for welding stainless steel to mild and low alloyed steels. Also suitable for welding of transition layers when surfacing mild steel with stainless steel weld metal.

<b>Classifications:</b>	EN 1600:E 23 12 L R 3 2, SFA/AWS A5.4:E309L-16
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<b>Welding Current:</b>	AC, DC+
<b>Ferrite Content:</b>	FN 12 - 22
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
ISO			
As welded	470 MPa	580 MPa	32 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
ISO		
As welded	20 °C	50 J
As welded	-10 °C	40 J

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	45-90 A	28 V	0.60	85	38 s	1.1 kg/h
3.2 x 350 mm	65-120 A	29 V	0.60	45	51 s	1.6 kg/h
4.0 x 350 mm	85-180 A	31 V	0.60	29	51 s	2.5 kg/h

# OK 316L



Extra low carbon stainless steel electrode for welding steels of the 18Cr12Ni2.8Mo-type. Also suitable for welding stabilized steels of similar composition except when full creep resistance of the base material is to be matched.

<b>Classifications:</b>	SFA/AWS A5.4:E316L-16, JIS Z 3221:D316L-16
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<b>Welding Current:</b>	AC, DC+
<b>Ferrite Content:</b>	FN 3-10
<b>Alloy Type:</b>	CrNi
<b>Coating Type:</b>	Acid-Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	485 MPa	590 MPa	42 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	60 J
As welded	-60 °C	42 J

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	45-90 A	29 V	0.55	96	45 s	0.9 kg/h
3.2 x 350 mm	60-125 A	30 V	0.55	52	57 s	1.4 kg/h
4.0 x 350 mm	70-190 A	32 V	0.56	34	57 s	2.0 kg/h



# OK 61.30



Extra-low carbon stainless steel electrode for welding steels of the 19 Cr 10 Ni-type. Also suitable for welding stabilized stainless steels of similar composition, except when full creep resistance of the base material is to be met.

<b>Classifications:</b>	EN ISO 3581-A:E 19 9 L R 1 2, SFA/AWS A5.4:E308L-17, Werkstoffnummer :1.4316, CSA W48:E308L-17
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, ABS Stainless, CWB CSA W48: E308L-17, DB 30.039.02, DNV 308L, NAKS/HAKC 2.0-4.0 mm, VdTÜV 00792

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 3-10
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	430 MPa	580 MPa	45 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	70 J
As welded	-60 °C	49 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	N	Ferrite FN
0.03	0.7	0.9	10.0	19.3	0.09	5

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
1.6 x 300 mm	35-45 A	27 V	0.55	240	24 s	0.6 kg/h
2.0 x 300 mm	35-65 A	29 V	0.55	160	29 s	0.8 kg/h
2.5 x 300 mm	50-90 A	31 V	0.55	99	36 s	1.1 kg/h
3.2 x 350 mm	70-130 A	31 V	0.60	49	54 s	1.4 kg/h
4.0 x 350 mm	90-180 A	32 V	0.60	33	60 s	2.0 kg/h
5.0 x 350 mm	140-250 A	33 V	0.60	20	60 s	3.0 kg/h

# OK 61.35 Cryo



A basic stainless stick electrode of the 308L-type especially designed for cryogenic applications. Provides controlled low ferrite content to ensure lateral expansion of min. 0.38 mm at -196°C.

<b>Classifications:</b>	EN ISO 3581-A:E 19 9 L B 2 2, SFA/AWS A5.4:E308L-15, Werkstoffnummer :1.4316
<b>Approvals:</b>	VdTÜV 10721

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 2-4
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	425 MPa	580 MPa	45 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	100 J
As welded	-196 °C	50 J
<b>ISO</b>		
As welded	-196 °C	50 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	N	Ferrite FN
0.04	1.6	0.3	10.5	18.7	0.06	3

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition rate 90° I max
2.5 x 300 mm	55-85 A	22 V	0.61	92	37 s	0.9 kg/h
3.2 x 350 mm	80-120 A	25 V	0.61	50	54 s	1.3 kg/h
4.0 x 350 mm	80-180 A	27 V	0.61	33	58 s	1.9 kg/h
5.0 x 350 mm	160-210 A	26 V	0.58	22	70 s	2.3 kg/h

# OK 61.81



Nb-stabilized MMA-electrode for welding Nb- or Ti-stabilized stainless steel of the 19Cr10Ni-type. OK 61.81 has a better hot cracking resistance compared with OK 61.80. Owing to the quite high ferrite content level, the working temperature should be limited to maximum 400°C.

<b>Classifications:</b>	EN ISO 3581-A:E 19 9 Nb R 3 2, SFA/AWS A5.4:E347-16, Werkstoffnummer :1.4551
<b>Approvals:</b>	CE EN 13479, DNV 347, NAKS/HAKC 3.2 mm

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 6-12
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	560 MPa	700 MPa	31 %
Creep resistance+ 500°C 20000h	-	310 MPa	-
Creep resistance 600°C 10000h	-	135 MPa	-
Creep resistance++ 500°C 10000h	-	330 MPa	-
<b>ISO</b>			
As welded	550 MPa	700 MPa	-

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	60 J
<b>ISO</b>		
As welded	-10 °C	71 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	N	Nb	Ferrite FN
0.06	1.7	0.7	9.7	20.2	0.08	0.72	7

OK 61.81

Deposition Data						
Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	40-60 A	26 V	0.60	147	39 s	0.6 kg/h
2.5 x 300 mm	50-80 A	29 V	0.59	82	36 s	1.2 kg/h
3.2 x 350 mm	75-115 A	23 V	0.60	44	66 s	1.2 kg/h
4.0 x 350 mm	80-160 A	24 V	0.60	32	66 s	1.7 kg/h
5.0 x 350 mm	140-210 A	25 V	0.60	20	78 s	2.3 kg/h

# OK 61.85



Nb-stabilized basic coated electrode designed for welding of Nb- or Ti-stabilized stainless steels of the 19Cr10Ni-type. OK 61.85 provides the best hot cracking resistance of the products belonging to the 347 range. Due to the relatively high ferrite content level, the maximum working temperature should be limited to 400°C.

<b>Classifications:</b>	Werkstoffnummer :1.4551, EN ISO 3581-A:E 19 9 Nb B 2 2, SFA/AWS A5.4:E347-15
<b>Approvals:</b>	Sepro UN 272580, NAKS/HAKE 2.5-4.0 mm, VdTUV 05663

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 6-12
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	500 MPa	620 MPa	40 %
Stress relieved 16 hr 600 °C	500 MPa	640 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	100 J
As welded	-60 °C	70 J
Stress relieved 16 hr 600 °C	20 °C	80 J
Stress relieved 16 hr 600 °C	-60 °C	40 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	N	Nb	Ferrite FN
0.04	1.7	0.4	10.2	19.5	0.07	0.61	6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	55-80 A	25 V	0.60	98	42 s	0.9 kg/h
3.2 x 350 mm	75-110 A	23 V	0.62	49	64 s	1.2 kg/h
4.0 x 350 mm	80-150 A	24 V	0.61	33	70 s	1.6 kg/h

# OK 63.30



Extra low carbon stainless steel electrode for welding steels of the 18Cr 12Ni 2.8Mo-type. Also suitable for welding of stabilized stainless steels of similar composition, except when the full creep resistance of the base metal is to be met.

<b>Classifications:</b>	EN ISO 3581-A:E 19 12 3 L R 1 2, SFA/AWS A5.4:E316L-17, Werkstoffnummer :1.4430, CSA W48:E316L-17
<b>Approvals:</b>	CE EN 13479, BV 316L, DNV 316L, Seproz UNA 272580, GL 4571, NAKS/HAKC 2.5-4.0 mm, ABS SFA/AWS A5.4, E316L-17, CWB CSA W48: E316L-17, DB 30.039.06, LR 316L, VdTÜV 00262

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 3-10
<b>Alloy Type:</b>	Austenitic CrNiMo

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	460 MPa	570 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	60 J
As welded	-20 °C	55 J
As welded	-60 °C	43 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.02	0.6	0.8	11.0	18.1	2.6	0.10	6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
1.6 x 300 mm	30-45 A	29 V	0.56	250	37 s	0.4 kg/h
2.0 x 300 mm	45-65 A	29 V	0.60	147	39 s	0.6 kg/h
2.5 x 300 mm	45-90 A	29 V	0.55	96	45 s	0.9 kg/h
3.2 x 350 mm	60-125 A	30 V	0.55	52	57 s	1.4 kg/h
4.0 x 350 mm	70-190 A	32 V	0.56	34	57 s	2.0 kg/h
5.0 x 350 mm	100-280 A	32 V	0.56	21	63 s	3.0 kg/h

# OK 63.35



OK 63.35 is a low carbon stainless steel electrode with basic coating of the 18Cr12Ni3Mo type. It is suitable for applications where the mechanical requirements are tough. It provides good impact toughness levels. Minimum lateral expansion of 0.38 mm requirement is met down to -120°C. The same requirement can be met at -196°C when the ferrite content is at the low end of the specification i.e. FN 3 - 4.

<b>Classifications:</b>	Werkstoffnummer :1.4430, SFA/AWS A5.4:E316L-15, EN ISO 3581-A:E 19 12 3 L B 2 2
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, NAKS/HAKC 2.5-4.0 mm, ABS Stainless, VdTÜV 04812

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 3-8
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	430 MPa	560 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	95 J
As welded	-60 °C	75 J
As welded	-120 °C	60 J
As welded	-196 °C	35 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.04	1.6	0.4	12.6	18.3	2.7	0.06	4

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	55-85 A	24 V	0.63	91	42 s	0.9 kg/h
3.2 x 350 mm	80-120 A	24 V	0.63	47	58 s	1.3 kg/h
4.0 x 350 mm	80-180 A	24 V	0.62	32	63 s	1.8 kg/h

# OK 63.80



Acid rutile covered MMA-electrode for welding Nb-or Ti stabilized steels of the CrNiMo 18-12-3 type.

<b>Classifications:</b>	EN ISO 3581-A:E 19 12 3 Nb R 3 2, SFA/AWS A5.4:E318-17, Werkstoffnummer :1.4576
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 3.2 mm, VdTÜV 00639

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 6-12
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	507 MPa	614 MPa	38 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	55 J
As welded	-60 °C	41 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Nb	Ferrite FN
0.02	0.6	0.8	11.5	18.2	2.9	0.08	0.31	7

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	45-65 A	29 V	0.56	155	29 s	0.8 kg/h
2.5 x 300 mm	60-90 A	30 V	0.56	97	35 s	1.1 kg/h
3.2 x 350 mm	80-120 A	32 V	0.61	48	54 s	1.4 kg/h
4.0 x 350 mm	120-170 A	33 V	0.61	32	55 s	2.1 kg/h



# OK 63.85



OK 63.85 is a niobium-stabilised 18Cr12Ni2.8Mo electrode for welding steels of similar composition.

<b>Classifications:</b>	Werkstoffnummer :1.4576, EN ISO 3581-A:E 19 12 3 Nb B 42, SFA/AWS A5.4:E318-15
<b>Approvals:</b>	Seproz UNA 272580, VdTÜV 05662

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 5-10
<b>Alloy Type:</b>	Nb-stabilized austenitic CrNiMo-type
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	490 MPa	640 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	65 J
As welded	-120 °C	45 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Nb	Ferrite FN
0.04	1.6	0.5	13.0	17.9	2.7	0.06	0.55	5

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-80 A	22 V	0.66	81	45 s	1.0 kg/h
3.2 x 350 mm	65-120 A	23 V	0.64	43	58 s	1.5 kg/h
4.0 x 350 mm	75-160 A	24 V	0.64	28	64 s	2.0 kg/h

# OK 64.30



OK 64.30 is an acid-rutile electrode for welding 19Cr 13Ni 3.5Mo (317L) austenitic stainless steels. The high Mo content provides better resistance to acid and pitting corrosion compared with 316L types. OK 64.30 is easy to weld in all positions and yields smooth runs on both AC and DC.

<b>Classifications:</b>	EN ISO 3581-A:E Z 19 13 4 N L R 3 2, SFA/AWS A5.4:E317L-17, Werkstoffnummer : (1.4447)
<b>Approvals:</b>	Seproz UNA 272580, VdTÜV 02311

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 5-10
<b>Alloy Type:</b>	Austenitic CrNiMo
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	480 MPa	600 MPa	35 %
<b>ISO</b>			
As welded	480 MPa	600 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	45 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.02	0.7	0.7	13.1	18.4	3.6	0.08	8

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-80 A	29 V	0.56	94	52 s	0.8 kg/h
3.2 x 350 mm	60-120 A	30 V	0.56	51	52 s	1.4 kg/h
4.0 x 350 mm	80-170 A	32 V	0.56	33	58 s	2.1 kg/h

# OK 67.13



OK 67.13 is an austenitic, stainless-steel electrode for welding 25Cr20Ni steels. The weld metal resists scaling up to 1100-1150°C and does not contain any measureable ferrite. OK 67.13 can also be used for welding certain air-hardening steels such as armour plate and for welding stainless to unalloyed steel.

<b>Classifications:</b>	EN ISO 3581-A:E 25 20 R 1 2, SFA/AWS A5.4:E310-16, Werkstoffnummer :1.4842
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<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Basic Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	430 MPa	600 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	90 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr
0.12	1.9	0.6	21.1	25.6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-85 A	21 V	0.51	101	42 s	0.8 kg/h
3.2 x 350 mm	65-120 A	24 V	0.51	53	58 s	1.2 kg/h
4.0 x 350 mm	70-160 A	28 V	0.51	34	61 s	1.7 kg/h
5.0 x 350 mm	150-220 A	31 V	0.54	21	67 s	2.6 kg/h

# OK 67.15



Basic coated MMA-electrode for welding 25Cr 20Ni-steels. Also suitable for welding armour steels, austenitic manganese steels and for joining of dissimilar steels.

<b>Classifications:</b>	Werkstoffnummer :1.4842, EN ISO 3581-A:E 25 20 B 2 2, SFA/AWS A5.4:E310-15
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, DB 30.039.01, VdTÜV 01025

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	410 MPa	590 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	100 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr
0.10	2.0	0.4	21.3	25.7

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	45-55 A	24 V	0.62	162	36 s	0.6 kg/h
2.5 x 300 mm	50-85 A	25 V	0.61	96	40 s	0.9 kg/h
3.2 x 350 mm	60-115 A	25 V	0.59	50	60 s	1.2 kg/h
4.0 x 350 mm	70-160 A	26 V	0.59	28	62 s	1.8 kg/h
5.0 x 350 mm	130-200 A	26 V	0.60	22	65 s	2.5 kg/h

# OK 67.45



Austenitic stainless-steel electrode producing a weld metal with less than 5% ferrite. The tough weld metal has excellent crack resistance, even when welding steels with very poor weldability. Suitable for joining 12-14% manganese steel to itself or other steels. Also suitable for buffer layers before hardfacing.

<b>Classifications:</b>	EN ISO 3581-A:E 18 8 Mn B 2 2, SFA/AWS A5.4:(E307-15)
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, ABS Stainless, VdTÜV 01580

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN <5
<b>Alloy Type:</b>	Stainless austenitic CrNiMn
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	470 MPa	605 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	85 J
As welded	-60 °C	50 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	N	Ferrite FN
0.09	6.3	0.3	9.1	18.8	0.06	1

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-80 A	23 V	0.58	102	50 s	0.7 kg/h
3.2 x 350 mm	70-100 A	24 V	0.60	51	71 s	1.1 kg/h
4.0 x 350 mm	80-140 A	24 V	0.60	33	73 s	1.5 kg/h
5.0 x 350 mm	150-200 A	25 V	0.60	22	80 s	2.2 kg/h

# OK 67.50



OK 67.50 is an acid rutile coated type for welding of austenitic-ferritic stainless steels of CrNiMoN 22 5 3 - and CrNiN 23 4-types. The duplex all weld metal offers a high strength level combined with good ductility. The pitting corrosion resistance is good and the all weld metal is not sensitive for stress corrosion cracking.

<b>Classifications:</b>	EN ISO 3581-A:E 22 9 3 N L R 3 2, SFA/AWS A5.4:E2209-17, CSA W48:E2209-17, Werkstoffnummer : 1.4462
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, ABS Stainless*, BV 2209, CWB CSA W48: E2209-17, DNV For duplex SS, GL 4462, VdTÜV 04368

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 35-50
<b>Alloy Type:</b>	Duplex CrNiMoN
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	691 MPa	857 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	50 J
As welded	-30 °C	41 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.03	0.8	0.8	8.8	23.2	3.2	0.16	42

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition rate 90° I max
2.0 x 300 mm	30-65 A	29 V	0.55	152	33 s	0.7 kg/h
2.5 x 300 mm	50-90 A	27 V	0.58	91	38 s	1.0 kg/h
3.2 x 350 mm	80-120 A	28 V	0.58	47	55 s	1.4 kg/h
4.0 x 350 mm	90-160 A	29 V	0.58	32	59 s	1.9 kg/h
5.0 x 350 mm	150-220 A	30 V	0.58	20	64 s	2.8 kg/h

# OK 67.55



OK 67.55 is a basic coated electrode especially designed for welding duplex stainless steels i. e. UNS S31803. The deposited weld metal gives very high ductility down to -50°C/-60°C. Particularly suitable for welding duplex pipes in offshore applications.

<b>Classifications:</b>	Werkstoffnummer :1.4462, EN ISO 3581-A:E 22 9 3 N L B 2 2, SFA/AWS A5.4:E2209-15
<b>Approvals:</b>	Seproz UNA 272580, DNV For duplex SS, VdTÜV 06774

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 35-50
<b>Alloy Type:</b>	Austenitic CrNiMo
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	650 MPa	800 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	100 J
As welded	-20 °C	85 J
As welded	-40 °C	75 J
As welded	-60 °C	65 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.04	1.0	0.7	9.1	23.2	3.2	0.15	41

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-80 A	23 V	0.59	96	49 s	0.8 kg/h
3.2 x 350 mm	65-115 A	24 V	0.59	50	61 s	1.2 kg/h
4.0 x 350 mm	80-140 A	24 V	0.60	33	74 s	1.5 kg/h

# OK 67.60



Acid-rutile coated MMA electrode giving an overalloyed weld metal. Suitable for welding stainless steel to mild and low alloyed steels. Also suitable for welding of transition layers when surfacing mild steel with stainless steel weld metal.

<b>Classifications:</b>	SFA/AWS A5.4:E309L-17, EN ISO 3581-A:E 23 12 L R 3 2, CSA W48:E309L-17, Werkstoffnummer :1.4332
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, NAKS/HAKC 2.5-4.0 mm, CWB CSA W48: E309L-17, GL 4332, VdTÜV 00898

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 10-22
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	470 MPa	580 MPa	32 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	50 J
As welded	-10 °C	40 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	N	Ferrite FN
0.03	0.9	0.8	12.4	23.7	0.09	15

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	45-65 A	27 V	0.60	136	38 s	0.7 kg/h
2.5 x 300 mm	45-90 A	28 V	0.60	85	38 s	1.1 kg/h
3.2 x 350 mm	65-120 A	29 V	0.60	45	51 s	1.6 kg/h
4.0 x 350 mm	85-180 A	31 V	0.60	29	51 s	2.5 kg/h
5.0 x 350 mm	110-250 A	32 V	0.60	19	58 s	3.3 kg/h



# OK 67.70



Acid rutile MMA-electrode giving an over alloyed weld metal. Suitable for welding acid resistant stainless steels to mild and low alloyed steels. Also suitable for welding buffer layers when surfacing mild steel with acid resistant stainless steel weld metal.

<b>Classifications:</b>	EN ISO 3581-A:E 23 12 2 L R 3 2, SFA/AWS A5.4:E309LMo-17, CSA W48:E309LMo-17, Werkstoffnummer :1.4459
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, ABS SS to C&C/Mn steels, BV 309Mo, CWB CSA W48: E309LMo-17, DB 30.039.05, DNV 309 Mo, LR SS/CMn, RINA 309Mo, VdTUV 02424

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 12-22
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	510 MPa	610 MPa	32 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	50 J
As welded	-20 °C	35 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.02	0.6	0.8	13.4	22.5	2.8	0.09	18

## Deposition Data

Diameter	Current	Voltage	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	40-60 A	26 V	0.58	147	48 s	0.6 kg/h
2.5 x 300 mm	50-90 A	29 V	0.57	94	45 s	0.9 kg/h
3.2 x 350 mm	60-120 A	27 V	0.59	47	61 s	1.4 kg/h
4.0 x 350 mm	85-180 A	31 V	0.61	32	56 s	2.0 kg/h
5.0 x 350 mm	110-250 A	30 V	0.59	20	64 s	2.7 kg/h

# OK 67.75



OK 67.75 is a basic coated, stainless electrode for welding steels of the 24Cr13Ni type, for welding transition layers when surfacing mild steel with stainless, for joining dissimilar steels and welding root runs in the stainless side of clad steels.

<b>Classifications:</b>	Werkstoffnummer :1.4332, EN ISO 3581-A:E 23 12 L B 4 2, SFA/AWS A5.4:E309L-15
<b>Approvals:</b>	Seproz UNA 272580, NAKS/HAKC 2.5-5.0 mm, ABS Stainless, LR SS/CMn, DNV 309, VdTÜV 00633

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 8-15
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	470 MPa	600 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	75 J
As welded	-50 °C	64 J
As welded	-80 °C	55 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	N	Ferrite FN
0.04	2.0	0.3	12.9	23.5	0.06	11

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-80 A	22 V	0.73	78	42 s	1.1 kg/h
3.2 x 350 mm	80-110 A	24 V	0.73	39	60 s	1.5 kg/h
4.0 x 350 mm	80-150 A	26 V	0.73	25	62 s	2.3 kg/h
5.0 x 350 mm	160-220 A	27 V	0.73	17	65 s	3.4 kg/h

# OK 68.15



OK 68.15 is a stainless-steel electrode which deposits a ferritic 13Cr weld metal. OK 68.15 is designed for welding steels of similar composition, when CrNi-alloyed austenitic stainless steel electrodes cannot be used, e.g. when the structure is going to be exposed to aggressive sulphuric gases. Depending on the welding parameters, the structure and consequently the mechanical properties of untreated weld metal can vary within fairly large limits.

<b>Classifications:</b>	EN 14700:E Fe7, EN ISO 3581-A:E 13 B 4 2, SFA/AWS A5.4:E410-15, Werkstoffnummer :1.4009
<b>Approvals:</b>	Seproz UNA 272580

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	13% Cr
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
Stress relieved 1 hr 750 °C	370 MPa	520 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
Stress relieved 6 hr 750 °C	20 °C	55 J
Stress relieved 6 hr 750 °C	0 °C	35 J
Stress relieved 6 hr 750 °C	-20 °C	20 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr
0.04	0.3	0.4	0.1	12.9

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	65-115 A	25 V	0.62	73	48 s	1.0 kg/h
3.2 x 450 mm	90-160 A	25 V	0.63	33	71 s	1.5 kg/h
4.0 x 450 mm	120-220 A	30 V	0.57	24	73 s	2.0 kg/h

# OK 68.17



OK 68.17 is a coated electrode designed for the welding of stainless-steel castings of the 13Cr4NiMo type, for example. OK 68.17 can be welded in all positions apart from vertical down.

<b>Classifications:</b>	EN 14700:E Fe7, EN ISO 3581-A:E 13 4 R 3 2, SFA/AWS A5.4:E410NiMo-16, Werkstoffnummer :1.4351
<b>Approvals:</b>	Seproz UNA 272580

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

<b>Welding Current:</b>	DC+, AC
<b>Diffusible Hydrogen:</b>	<8.0 ml/100g
<b>Alloy Type:</b>	Martensitic 13Cr4Ni-Mo type
<b>Coating Type:</b>	Rutile Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
ISO			
Stress relieved 8 hr 600 °C	650 MPa	870 MPa	17 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
ISO		
Stress relieved 8 hr 600 °C	20 °C	45 J
Stress relieved 8 hr 600 °C	-10 °C	45 J
Stress relieved 8 hr 600 °C	-40 °C	40 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.02	0.6	0.4	4.6	12.0	0.6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	55-100 A	21 V	0.62	73	61 s	0.8 kg/h
3.2 x 350 mm	65-135 A	21 V	0.59	45	66 s	1.2 kg/h
4.0 x 450 mm	90-190 A	24 V	0.59	23	92 s	1.7 kg/h

# OK 68.25



OK 68.25 is an electrode for welding corrosion-resistant, martensitic and martensitic-ferritic rolled, forged and cast steels, such as castings of 13Cr4NiMo type.

<b>Classifications:</b>	EN 14700:E Fe7, Werkstoffnummer :1.4351, EN ISO 3581-A:E 13 4 B 4 2, SFA/AWS A5.4:E410NiMo-15
<b>Approvals:</b>	Seproz UNA 272580

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

<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	<5.0 ml/100g
<b>Alloy Type:</b>	Martensitic-ferritic
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
PWHT 600°C 8h	680 MPa	900 MPa	17 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
PWHT 600°C 8h	20 °C	65 J
PWHT 600°C 8h	0 °C	60 J
PWHT 600°C 8h	-20 °C	55 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.04	0.6	0.4	4.5	12.2	0.6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 450 mm	90-150 A	28 V	0.64	35	63 s	1.6 kg/h
4.0 x 450 mm	110-190 A	28 V	0.66	22	73 s	2.2 kg/h
5.0 x 450 mm	140-250 A	27 V	0.67	14	86 s	3.1 kg/h

# OK 68.55



OK 68.55 is a basic coated electrode for welding austenitic-ferritic steels of the Super Duplex type, e. g. SAF 2507 and Zeron 100. OK 68.55 deposits a weld metal with high ductility.

<b>Classifications:</b>	Werkstoffnummer : (1.4410), EN ISO 3581-A:E 25 9 4 N L B 4 2, SFA/AWS A5.4:E2594-15
<b>Approvals:</b>	DNV Duplex

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 35-50
<b>Alloy Type:</b>	Austenitic CrNiMo
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	700 MPa	900 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	90 J
As welded	-20 °C	70 J
As welded	-40 °C	55 J
As welded	-60 °C	45 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.03	0.9	0.6	10.4	25.2	4.3	0.23	45

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-80 A	23 V	0.62	93	48 s	0.8 kg/h
3.2 x 350 mm	60-100 A	23 V	0.63	46	68 s	1.1 kg/h
4.0 x 350 mm	100-140 A	23 V	0.62	32	70 s	1.6 kg/h

# OK 68.81



OK 68.81 is a high-alloyed electrode which deposits a ferritic-austenitic duplex weld metal with approx. 40% ferrite. It is resistant to stress corrosion and is highly insensitive to dilution. Good scaling resistance up to 1150°C. OK 68.81 is used for joining dissimilar steels, steels with reduced weldability and buffer layers prior to hardfacing. Applications: rolls, forging dies, hot-work tools, dies for plastics and so on.

<b>Classifications:</b>	EN 14700:E Fe11, EN ISO 3581-A:E 29 9 R 3 2, SFA/AWS A5.4:E312-17, Werkstoffnummer :1.4337
<b>Approvals:</b>	CE EN 13479, Sepro UN 272580

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

<b>Welding Current:</b>	DC+, AC
<b>Ferrite Content:</b>	FN 30 - 50
<b>Alloy Type:</b>	Stainless duplex
<b>Coating Type:</b>	Acid Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	610 MPa	790 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	30 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.13	0.9	0.7	10.2	28.9	0.04	0.09	40

## Deposition Data

Diameter	Current	Voltage	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.0 x 300 mm	40-60 A	22 V	0.64	123	41 s	0.7 kg/h
2.5 x 300 mm	50-85 A	24 V	0.64	78	48 s	0.9 kg/h
3.2 x 350 mm	60-125 A	25 V	0.62	42	65 s	1.3 kg/h
4.0 x 350 mm	80-175 A	26 V	0.62	26	66 s	2.0 kg/h
5.0 x 350 mm	150-240 A	28 V	0.65	17	68 s	3.2 kg/h

# OK 69.25



Basic coated, stainless electrode for welding corrosion-resistant, non-magnetic and cryogenic stainless steels. The electrode produces a fully austenitic Cr-Ni-Mo weld metal with an increased Mn and N content.

<b>Classifications:</b>	EN ISO 3581-A:E 20 16 3 Mn N L B 4 2, SFA/AWS A5.4:E316LMn-15, Werkstoffnummer :1.4455
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<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN <0.5
<b>Alloy Type:</b>	CrNiMo
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	450 MPa	650 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	90 J
As welded	-196 °C	50 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.04	6.5	0.5	16.0	19.0	3.0	0.15	0

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 350 mm	70-100 A	24 V	0.62	46	72 s	1.2 kg/h
4.0 x 350 mm	100-140 A	25 V	0.64	29	74 s	1.8 kg/h



# OK 69.33



OK 69.33 is a stainless-steel electrode which deposits a fully austenitic weld metal with increased resistance to sulphuric acid. The weld metal of OK 69.33 also has good resistance to intergranular and pitting corrosion.

<b>Classifications:</b>	EN ISO 3581-A:E 20 25 5 Cu N L R 3 2, SFA/AWS A5.4:E385-16, Werkstoffnummer :1.4519
<b>Approvals:</b>	CE EN 13479, Seproz UNA 272580, VdTÜV 02723

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

<b>Welding Current:</b>	AC, DC+
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	Austenitic CrNi
<b>Coating Type:</b>	Basic Rutile

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	410 MPa	590 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	80 J
As welded	-140 °C	70 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Cu	N	Ferrite FN
0.03	1.0	0.5	25.5	20.5	4.8	1.70	0.10	0

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	60-85 A	24 V	0.60	91	44 s	0.9 kg/h
3.2 x 350 mm	85-130 A	27 V	0.58	41	60 s	1.5 kg/h
4.0 x 350 mm	95-180 A	29 V	0.51	30	64 s	1.9 kg/h

# OK AIMn1



Covered electrode suitable for welding of Mn-alloyed aluminium and aluminium alloys containing up to 3 % Mg, e.g. EN AW-3103, 3207, 3003, 5005.

<b>Classifications:</b>	EN ISO 18273:AIMn1
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Aluminium alloy AIMn1
<b>Coating Type:</b>	Chloride and Fluoride Salt

## Typical Weld Metal Analysis %

Mn	Si	Al	Fe
1.3	0.1	98.1	0.3

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition rate 90° I max
2.4 x 350 mm	50-90 A	25 V	0.41	294	24 s	0.51 kg/h
3.2 x 350 mm	70-120 A	21 V	0.89	88	23 s	1.74 kg/h

## OK AISi5



Covered electrode suitable for welding of AlMgSi-alloys e.g. EN AW 6060/6063, 6005, 6201 etc. Also suitable for welding of AISi5Cu- and AISi7Mg-castings.

<b>Classifications:</b>	EN ISO 18273:AlSi5
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Aluminium-silicon alloy, AlSi5
<b>Coating Type:</b>	Chloride and Fluoride Salt

### Typical Weld Metal Analysis %

Si	Al	Fe
4.9	94.9	0.2

### Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.4 x 350 mm	50-90 A	25 V	0.37	333	24 s	0.45 kg/h
3.2 x 350 mm	70-120 A	23 V	0.47	166	27 s	0.80 kg/h

# OK AISi12



Covered electrode suitable for welding of aluminium castings of AlSi-, AlSiMg- and AlSiCu-types. Also possible to use as filler material in gas welding.

<b>Classifications:</b>	EN ISO 18273:AlSi12
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Aluminium-silicon alloy, AlSi12
<b>Coating Type:</b>	Chloride and Fluoride Salt

## Typical Weld Metal Analysis %

<b>Si</b>	<b>Al</b>	<b>Fe</b>
12.4	87.4	0.2

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition rate 90° I max
2.4 x 350 mm	50-90 A	23 V	0.42	294	23 s	0.54 kg/h
3.2 x 350 mm	70-120 A	23 V	0.45	176	30 s	0.69 kg/h

## OK Ni-1



OK Ni-1 is a stick electrode for joining commercial pure nickel in wrought and cast forms. It can also be used to join dissimilar metals such as nickel to steel, nickel to copper and copper to steel. Moreover, this electrode can be used for surfacing steel.

<b>Classifications:</b>	SFA/AWS A5.11:ENi-1, EN ISO 14172:E Ni 2061 (NiTi3)
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Nickel-base
<b>Coating Type:</b>	Lime Basic

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	330 MPa	470 MPa	30 %

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Al	Fe	Ti
0.04	0.4	0.7	96	0.10	0.4	1.5

### Deposition Data

Diameter	Current	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	70-95 A	0.55	96	47 s	0.80 kg/h
3.2 x 350 mm	90-135 A	0.55	53	56 s	1.20 kg/h

# OK NiCu 1



OK NiCu 1 is a nickel-copper electrode of the monel-alloy type for welding all types of cast iron with or without low preheat. The weld metal is easily machinable and produces a colour very similar to that of cast iron.

<b>Classifications:</b>	EN ISO 1071:E C NiCu 1
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<b>Alloy Type:</b>	Nickel-copper alloy
<b>Coating Type:</b>	Basic Special

## Typical Tensile Properties

Condition	Tensile Strength	Elongation
<b>ISO</b>		
As welded	300-350 MPa	15 %

## Typical Weld Metal Analysis %

C	Mn	Ni	Cu	Fe
0.3	0.9	65	31	3

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-100 A	18 V	0.60	96.0	66 s	0.60 kg/h
3.2 x 350 mm	60-125 A	18 V	0.65	49.0	97 s	0.80 kg/h
4.0 x 350 mm	90-140 A	18 V	0.65	32.0	130 s	0.90 kg/h

## OK NiCu-7



A nickel-copper electrode for welding NiCu alloys to themselves and to steels and for corrosion-resistant surfacing. The weld metal of OK NiCu-7 is crack resistant and ductile and meets rigorous requirements relating to corrosion resistance in sea water and in reducing and oxidising acids. OK NiCu-7 is used for welding corrosion-resistant monel alloys within the petroleum and ammonium sulphate industry and in power plants.

<b>Classifications:</b>	SFA/AWS A5.11:ENiCu-7, EN ISO 14172:E Ni 4060 (NiCu30Mn3Ti)
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<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	NiCu-alloy
<b>Coating Type:</b>	Basic

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	410 MPa	640 MPa	40 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	100 J
As welded	-196 °C	80 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cu	Fe	Ti
0.02	3.0	0.5	66	29	1.9	0.4

### Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-70 A	22 V	0.63	83	45 s	1.0 kg/h
3.2 x 350 mm	70-120 A	26 V	0.63	42	52 s	1.6 kg/h
4.0 x 350 mm	120-140 A	28 V	0.63	28	54 s	2.4 kg/h

# OK NiCrFe-2



Nickel based electrode for welding Inconel 600 and similar alloys, cryogenic steels (e.g. 9% and 5% Ni steel), martensitic to austenitic steels, dissimilar steels, heat resisting steel castings of limited weldability etc. Good weldability in all positions, including overhead.

<b>Classifications:</b>	SFA/AWS A5.11:ENiCrFe-2, EN ISO 14172:E Ni 6133 (NiCr16Fe12NbMo)
<b>Approvals:</b>	ABS

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	Nickel alloy
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	420 MPa	660 MPa	45 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	110 J
As welded	-196 °C	90 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Fe	Nb
0.03	2.7	0.5	69	16.1	1.9	7.7	1.9

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-80 A	22 V	0.63	91.0	45 s	0.90 kg/h
3.2 x 350 mm	70-105 A	23 V	0.62	57.0	57 s	1.30 kg/h
4.0 x 350 mm	95-140 A	24 V	0.65	31.0	58 s	2.10 kg/h



# OK NiCrFe-3



Nickel based electrode for welding Inconel 600 and similar Inconel alloys, cryogenic steels, martensitic to austenitic steels, dissimilar steels, heat resisting steel castings of limited weldability.

<b>Classifications:</b>	SFA/AWS A5.11:ENiCrFe-3, EN ISO 14172:E Ni 6182 (NiCr15Fe6Mn)
<b>Approvals:</b>	ABS ENiCrFe-3, NAKS/HAKC 4.0 mm

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	Ni-based Cr-alloy
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS</b>			
As welded	410 MPa	640 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS</b>		
As welded	20 °C	100 J
As welded	-196 °C	80 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Fe	Nb
0.04	6.7	0.8	71	15.6	6.3	1.7

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	50-70 A	22 V	0.63	88	50 s	0.9 kg/h
3.2 x 350 mm	65-105 A	23 V	0.62	57	60 s	1.2 kg/h
4.0 x 350 mm	75-150 A	24 V	0.64	31	60 s	2.0 kg/h
5.0 x 350 mm	120-170 A	25 V	0.64	20	68 s	2.7 kg/h

# OK NiCrMo-3



Ni-based CrMoNb electrode for welding of Ni-alloys of the same or similar type as e.g. Inconel 625, for welding of 5% and 9% Ni steel. The electrode is very suitable for welding of 254 SMO, i.e. UNS S31254 steel.

<b>Classifications:</b>	SFA/AWS A5.11:ENiCrMo-3, EN ISO 14172:E Ni 6625 (NiCr22Mo9Nb)
<b>Approvals:</b>	CE EN 13479, DNV -(H5), VdTÜV 12414

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

<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	Ni-based CrMoNb
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	500 MPa	780 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	70 J
As welded	-196 °C	50 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Fe	Nb
0.03	0.2	0.4	62.8	21.7	9.3	2.0	3.3

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	55-75 A	23 V	0.55	100	40 s	0.9 kg/h
3.2 x 350 mm	65-100 A	25 V	0.56	49	52 s	1.4 kg/h
4.0 x 350 mm	80-140 A	27 V	0.58	33	57 s	1.9 kg/h
5.0 x 350 mm	120-170 A	24 V	0.58	21	72 s	2.1 kg/h

## OK NiCrMo-5



OK NiCrMo-5 deposits an all weld metal that is similar to AWS classification ENiCrMo-5. The all weld metal consists of a Ni-Cr-Mo-W alloy of Hastelloy C type. The weld metal is tough and work hardens. The high temperature properties regarding tensile strength, hardness, thermal shock and scaling are good. It is resistant to damp chlorine gas and to hydrochloric-, nitric-, sulphuric- and phosphoric acids at room temperature.

<b>Classifications:</b>	EN 14700:E Z Ni2
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<b>Welding Current:</b>	DC+, AC
<b>Alloy Type:</b>	Nickel alloy
<b>Coating Type:</b>	Rutile Basic

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	515 MPa	750 MPa	17 %

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Fe	W
0.05	0.9	0.5	57.5	15.5	16.4	5.5	3.5

### Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	65-110 A	18 V	0.61	56	62 s	1.1 kg/h
3.2 x 350 mm	110-150 A	18 V	0.63	28	86 s	1.6 kg/h
4.0 x 350 mm	160-200 A	20 V	0.64	19	89 s	2.3 kg/h
5.0 x 350 mm	190-250 A	20 V	0.65	11	106 s	3.1 kg/h

# OK NiCrMo-13



OK NiCrMo-13 is suitable for welding Ni base materials such as Alloy 59, Hasteloy C-276, Inconel 625 and Incoloy 825. It can also be used for welding super austenitic steels type AISI/ASTM S31254 and S32654. The weld metal provides very good resistance against pitting- and chloride ion stress corrosion cracking.

<b>Classifications:</b>	SFA/AWS A5.11:ENiCrMo-13, EN ISO 14172:E Ni 6059 (NiCr23Mo16)
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<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	Ni-based CrMo
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	430 MPa	770 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-60 °C	70 J
As welded	-196 °C	60 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Fe
0.013	0.17	0.16	61	22.6	15.2	0.6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 350 mm	60-90 A	27 V	0.61	46	58 s	3.95 kg/h

# OK 92.55



OK 92.55 is an all-positional, basic coated electrode which deposits a NiCr-based alloy with additions of Mo, W and Nb. The electrode is specifically designed for welding 9%Ni steels for cryogenic applications down to -196°C.

<b>Classifications:</b>	SFA/AWS A5.11:ENiCrMo-6, EN ISO 14172:E Ni 6620 (NiCr14Mo7Fe)
<b>Approvals:</b>	CE EN 13479, ABS ENiCrMo-6, BV N50 and 9Ni*, DNV For welding NV 1.5Ni to NV 9Ni, GL NiCr14Mo7Fe, incl X8Ni9*, LR 9Ni

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

<b>Welding Current:</b>	AC, DC+-
<b>Ferrite Content:</b>	FN 0
<b>Alloy Type:</b>	Ni-based CrMoNb
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	445 MPa	727 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	-196 °C	91 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Fe	Nb	W
0.05	3.0	0.3	69.4	12.9	6.2	5.0	1.3	1.6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	65-115 A	23 V	0.70	55	70 s	1.1 kg/h
3.2 x 350 mm	70-150 A	22 V	0.66	34	68 s	1.5 kg/h
4.0 x 350 mm	120-200 A	22 V	0.67	23	82 s	1.9 kg/h
5.0 x 350 mm	150-240 A	23 V	0.68	14	91 s	2.8 kg/h

# OK 94.25



Electrode for welding copper and bronzes, especially tin bronzes. It is also suitable for cladding steels and for small-scale repair work in weldable cast irons.

For the repair and construction of parts in casting such as:

- valves
- pumps
- housings
- bearing surfaces

<b>Classifications:</b>	DIN 1733:(EL-CuSn7)
<b>Approvals:</b>	Seproz UNA 272581

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Copper alloy
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	235 MPa	330-390 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	25 J
As welded	0 °C	20 J

## Typical Weld Metal Analysis %

Mn	Cu	Sn
0.4	93	6.5

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	60-90 A	22 V	0.71	77.0	39 s	1.20 kg/h
3.2 x 350 mm	90-125 A	24 V	0.72	46.0	40 s	1.90 kg/h
4.0 x 350 mm	125-170 A	25 V	0.74	30.5	41 s	2.90 kg/h

# OK 94.35



Copper-nickel electrode used for chemical process equipment, desalination plants and offshore applications. It is suitable for the joining and cladding of matching and dissimilar alloys.

<b>Classifications:</b>	SFA/AWS A5.6:ECuNi
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Copper Nickel
<b>Coating Type:</b>	Basic

## Typical Tensile Properties

Condition	Tensile Strength	Elongation
<b>AWS</b>		
As welded	400 MPa	30 %

## Typical Weld Metal Analysis %

Mn	Ni	Cu	Fe
1.6	30	67	0.6

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	55-70 A	22 V	0.64	93	49 s	3.9 kg/h
3.2 x 350 mm	70-120 A	23 V	0.66	48	50 s	4.4 kg/h

# OK Ni-CI



OK Ni-CI is a nickel cored electrode for joining normal grades of cast iron, such as grey-, ductile- and malleable irons. It is also suitable for rectification and repair of these grades and for joining them to steel. Deposition is done on cold or slightly preheated cast iron. Weld metal is well machinable. Typical applications are repair of cast iron parts such as cracks in engine blocks, pump housings, gear boxes, frames as well as foundry defects.

<b>Classifications:</b>	SFA/AWS A5.15:ENI-CI, EN ISO 1071:E C Ni-CI 3
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<b>Welding Current:</b>	AC, DC+-
<b>Alloy Type:</b>	Ni-base alloy
<b>Coating Type:</b>	Basic Special high graphite

## Typical Tensile Properties

Condition	Tensile Strength
<b>AWS</b>	
As welded	300 MPa

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Al	Cu	Fe
1.0	0.2	0.3	93.5	0.1	0.3	4.5

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	55-110 A	21 V	0.71	83	46 s	0.9 kg/h
3.2 x 350 mm	80-140 A	20 V	0.68	45	66 s	1.2 kg/h
4.0 x 350 mm	100-190 A	19 V	0.70	29	71 s	1.7 kg/h



# OK NiFe-CI-A



A nickel-iron cored electrode for joining normal grades of cast iron, such as grey-, ductile- and malleable irons. It is also suitable for rectification and repair of these grades and for joining them to steel. Deposition is done on cold or slightly preheated cast iron. The electrode produces a weld metal stronger and more resistant to solidification cracking than that of the pure nickel electrode type. It is specially suited for high duty welds in ductile irons and for welding grey irons with increased contents of sulphur and phosphorous. Typical applications include repair of pump bodies, heavy machine sections, gear teeth, flanges and pulleys.

<b>Classifications:</b>	SFA/AWS A5.15:ENiFe-CI-A, EN ISO 1071:E C NiFe-CI-A 1
<b>Welding Current:</b>	AC, DC+/-
<b>Alloy Type:</b>	Ni-Fe alloy
<b>Coating Type:</b>	Basic Special high graphite

Typical Tensile Properties	
Condition	Tensile Strength
<b>AWS</b>	
As welded	375 MPa

Typical Weld Metal Analysis %					
C	Mn	Si	Ni	Al	Fe
1.5	0.8	0.7	51	1.4	46

Deposition Data					
Diameter	Current	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 300 mm	55-75 A	0.70	90	70 s	0.6 kg/h
3.2 x 350 mm	75-100 A	0.70	45	90 s	0.9 kg/h
4.0 x 350 mm	85-160 A	0.70	30	70 s	1.8 kg/h

# OK NiFe-Cl



A nickel-iron electrode for welding normal grades of cast iron and for joining them to steel. Can be used for malleable nodular cast iron and alloy cast iron. It has a special iron jacketed Ni core wire, which gives the electrode much improved current carrying capacity compared to electrodes with a homogeneous core wire. The electrode produces a weld metal stronger and more resistant to solidification cracking than the pure nickel electrode types. Typical applications are repair of pump bodies, heavy machine sections, gear teeth, flanges and pulleys.

<b>Classifications:</b>	SFA/AWS A5.15:ENiFe-Cl, EN ISO 1071:E C NiFe-1 3
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<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Ni-Fe alloy
<b>Coating Type:</b>	Basic Special high graphite

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	380 MPa	560 MPa	>15 %

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Al	Cu	Fe
0.9	0.6	0.5	53	0.4	0.9	44

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition rate 90° I max
2.5 x 300 mm	60-100 A	22 V	0.70	85.0	45 s	0.80 kg/h
3.2 x 350 mm	80-150 A	23 V	0.70	44.0	56 s	1.20 kg/h
4.0 x 350 mm	100-200 A	23 V	0.70	30.0	59 s	1.60 kg/h

# OK GPC



OK GPC is designed for gouging, cutting and piercing mild and alloyed steel, cast iron and non-ferrous metals with the exception of pure copper, using standard welding equipment. The electrode can be used in a wide variety of applications, e.g. for bevelling, for preparation of cracked areas before welding, for back-gouging of root runs.

<b>Welding Current:</b>	AC, DC-
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Deposition Data		
Diameter	Current	Voltage
2.5 x 350 mm	100-120 A	43 V
3.2 x 350 mm	130-180 A	43 V
4.0 x 350 mm	170-230 A	48 V
5.0 x 450 mm	230-300 A	48 V

# OK 13Mn



OK 13Mn is an austenitic manganese steel electrode which work hardens under impact and compressive stresses. It is primarily used for surfacing and building up manganese steel components exposed to severe impact and moderate abrasion. Typical applications include crusher plates and rolls, cones and mantles of rotary crushers etc. The interpass temperature should be kept as low as possible.

<b>Classifications:</b>	EN 14700:E Fe9
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<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Austenitic Mn steel
<b>Coating Type:</b>	Lime Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	480 MPa	780 MPa	20 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	70 J
As welded	-20 °C	45 J
As welded	-40 °C	35 J
As welded	-60 °C	25 J

## Typical Weld Metal Analysis %

C	Mn	Si
1.08	12.2	0.7

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 450 mm	95-135 A	23 V	0.60	36	95 s	1.1 kg/h
4.0 x 450 mm	130-180 A	23 V	0.60	24	109 s	1.4 kg/h
5.0 x 450 mm	170-230 A	25 V	0.60	15	132 s	1.8 kg/h

# OK 14MnNi



Austenitic manganese steel electrode with nickel for surfacing and building up manganese steel components exposed to severe impact and moderate abrasion. The weld metal is less prone to embrittlement and cracking compared to plain austenitic manganese steel weld metal. Applications include: crusher plates and rolls, cones and mantels of rotary crushers, rail points.

<b>Classifications:</b>	EN 14700:E Z Fe9
<b>Approvals:</b>	CE , DB 82.039.08

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

<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Austenitic Mn steel
<b>Coating Type:</b>	Zircon Basic

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>ISO</b>			
As welded	440 MPa	690 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>ISO</b>		
As welded	20 °C	100 J
As welded	-20 °C	80 J
As welded	-80 °C	45 J
As welded	-120 °C	25 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
0.67	13.2	0.2	3.0

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 450 mm	100-160 A	30 V	0.54	27	90 s	1.5 kg/h
4.0 x 450 mm	130-210 A	30 V	0.54	18	105 s	2.0 kg/h
5.0 x 450 mm	170-300 A	31 V	0.56	11	114 s	2.9 kg/h

# OK 83.30



OK 83.30 is a rutile electrode for hardfacing and cladding tracks, shafts, rolls, rails, rail frogs etc when hardness of 30-35 HRC is required from the weld metal.

<b>Classifications:</b>	EN 14700:E Z Fe1
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Approvals are based on factory location. Please contact ESAB for more information.

<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Martensitic steel
<b>Coating Type:</b>	Acid Rutile

Typical Weld Metal Analysis %			
C	Mn	Si	Cr
0.1	1.1	0.7	3.3

Deposition Data						
Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition Rate
2.5 x 350 mm	60-120 A	25 V	0.55	86	40 s	1.2 kg/h
3.2 x 350 mm	90-180 A	26 V	0.53	55	50 s	1.5 kg/h
4.0 x 450 mm	140-240 A	26 V	0.57	26	65 s	2.2 kg/h
5.0 x 450 mm	160-310 A	27 V	0.57	17	85 s	2.7 kg/h

# OK 84.58



A general purpose hardfacing electrode depositing a semi corrosion resistant martensitic steel with a hardness of about 57 HRC. The electrode is specially suitable for hardfacing parts exposed to different forms of abrasive and impact wear, e.g. farming equipment, forestry tools, loading machines and mixers. Additional information is found under the heading "Other Data".

<b>Classifications:</b>	EN 14700:E Z Fe6
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<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Martensitic steel
<b>Coating Type:</b>	Lime Basic

## Typical Weld Metal Analysis %

C	Mn	Si	Cr
0.63	0.72	0.53	10.2

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 450 mm	110-150 A	23 V	0.67	27.0	95 s	1.40 kg/h
4.0 x 450 mm	145-200 A	24 V	0.67	17.5	107 s	1.90 kg/h
5.0 x 450 mm	190-270 A	26 V	0.66	11.5	110 s	2.80 kg/h

# OK 84.78



Electrode giving a weld metal with coarse chromium carbides in an austenitic matrix. Suitable for surfacing worn parts in earth-moving equipment, sand pumps, mixers, feed screws, dust extractors, crushers etc exposed to wear by coal, ores and other minerals. Also in corrosive environment and/or elevated temperature.

<b>Classifications:</b>	EN 14700:E Z Fe14
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Approvals are based on factory location. Please contact ESAB for more information.

<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Carbide rich steel
<b>Coating Type:</b>	Rutile Basic

## Typical Weld Metal Analysis %

C	Mn	Si	Cr
4.5	1.0	0.8	31.8

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition Rate
3.2 x 350 mm	115-170 A	24 V	0.62	26	85 s	1.6 kg/h
4.0 x 350 mm	130-210 A	24 V	0.60	19	129 s	1.5 kg/h
4.0 x 450 mm	130-210 A	26 V	0.64	14	135 s	2.0 kg/h
5.0 x 450 mm	150-300 A	26 V	0.64	9	140 s	2.9 kg/h



# OK Tooltrode 50



Electrode for surfacing hot working tools. Suitable for service temperatures up to about 550°C and applications where toughness and good wear resistance are required. Typical applications include hot working blades and shears, punches and bottom dies. Preheating and interpass temperature should be minimum 200°C to avoid issues with cracking.

<b>Classifications:</b>	EN 14700:E Z Fe3
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<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	High speed steel
<b>Coating Type:</b>	Lime Basic

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Co	Nb	W
0.32	0.9	1.1	1.8	2.1	0.8	7.9

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	70-110 A	22 V	0.65	72	53 s	0.9 kg/h
3.2 x 350 mm	100-150 A	23 V	0.63	45	62 s	1.3 kg/h
4.0 x 350 mm	130-190 A	23 V	0.63	30	75 s	1.7 kg/h
5.0 x 350 mm	180-250 A	25 V	0.66	18	88 s	2.2 kg/h

# OK Tooltrode 60



Hardfacing electrode of the high-speed steel for repair welding of cutting tools, drills, stamping machines etc. The weld metal obtains its maximum hardness by double tempering. Suitable for step welding. To avoid issues with cracking, the working temperature should be preferably 400-500°C.

<b>Classifications:</b>	EN 14700:E Fe4
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<b>Welding Current:</b>	AC, DC+
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<b>Alloy Type:</b>	Tool steel
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<b>Coating Type:</b>	Lime Basic
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## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo	V	W
0.93	1.4	1.4	4.7	7.3	1.60	1.39

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	80-110 A	23 V	0.55	67	67 s	0.8 kg/h
3.2 x 350 mm	100-150 A	23 V	0.57	40	82 s	1.1 kg/h
4.0 x 350 mm	120-190 A	25 V	0.58	27	97 s	1.4 kg/h

## OK Weartrode 30



OK Weartrode 30 is a chromium-alloyed electrode for hardfacing and cladding tracks, shafts, rolls, rails and rail-crossing sections, as well as components in rolling mills, such as grooved rollers and clutches and large cog wheels made of cast steel. The joining of hardenable steels is another application.

<b>Classifications:</b>	EN 14700:E Z Fe1
<b>Approvals:</b>	CE EN 13479, DB 82.039.07

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

<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Martensitic steel
<b>Coating Type:</b>	Lime Basic

### Typical Weld Metal Analysis %

C	Mn	Si	Cr
0.1	0.7	0.7	3.2

### Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	60-90 A	20 V	0.64	69	75 s	0.7 kg/h
3.2 x 450 mm	100-140 A	21 V	0.66	34	88 s	1.2 kg/h
4.0 x 450 mm	140-190 A	22 V	0.66	23	92 s	1.7 kg/h
5.0 x 450 mm	190-260 A	23 V	0.68	15	86 s	2.8 kg/h
6.0 x 450 mm	230-320 A	23 V	0.68	11	92 s	3.7 kg/h

# OK Weartrade 35



This electrode is a hardfacing basic type yielding an as welded hardness of 300 HV. It combats metal to metal wear and slight abrasion. It is used mainly for surfacing worn train and tramway rails. Also for carbon manganese crossings.

Other areas of use: Cog-wheels.

<b>Classifications:</b>	EN 14700:E Fe1
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<b>Welding Current:</b>	DC+
<b>Ferrite Content:</b>	N/A
<b>Alloy Type:</b>	C, Si, Mn, Cr
<b>Coating Type:</b>	Basic

## Typical Weld Metal Analysis %

C	Mn	Si	Cr
0.09	0.9	0.8	3.0

## Deposition Data

Diameter	Current	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 450 mm	110-140 A	0.77	36	84 s	1.2 kg/h
4.0 x 450 mm	140-160 A	0.77	23	98 s	1.6 kg/h
5.0 x 450 mm	180-200 A	0.77	15	100 s	2.4 kg/h

# OK Weartrode 40



OK Weartrode 40 is used in applications exposed to metal to metal wear. A common application is surfacing wear resistant dies operating at temperatures up to 400°C.

OK Weartrode 40 provides a weld metal with minimum hardness level of 40 HRC, typical value is around 45 HRC.

<b>Classifications:</b>	EN 14700:E Z Fe2
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C, Mn , Si, Cr, V
<b>Coating Type:</b>	Basic

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo	V
0.20	0.9	0.4	2.0	0.5	0.5

## Deposition Data

Diameter	Current	kg weld metal/kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	90-110 A	0.59	77	58 s	0.9 kg/h
3.2 x 450 mm	90-130 A	0.71	34	97 s	1.1 kg/h
4.0 x 450 mm	160-180 A	0.67	22	112 s	1.4 kg/h
5.0 x 450 mm	170-220 A	0.71	14	127 s	2.0 kg/h

# OK Wearode 45



Heavy coated general purpose hardfacing electrode for worn parts providing a hardness level of approximately 45 HRC.

<b>Classifications:</b>	EN 14700:E Z Fe3
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic
<b>Coating Type:</b>	Basic

Typical Weld Metal Analysis %			
C	Mn	Si	Cr
0.3	2.0	0.8	1.3

Deposition Data						
Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 450 mm	100-130 A	24 V	0.63	35.3	94 s	1.1 kg/h
4.0 x 450 mm	130-180 A	26 V	0.6	25	105 s	1.4 kg/h
5.0 x 450 mm	180-220 A	25 V	0.64	15.4	124 s	1.9 kg/h

# OK Weartrode 50



General purpose hardfacing electrode for repair welding worn parts on agricultural equipment, forestry tools, loading machines, etc. Transformers with low low open circuit voltage can be used (>45 volt).

<b>Classifications:</b>	EN 14700:E Z Fe2
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<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Martensitic steel
<b>Coating Type:</b>	Acid Rutile

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.46	0.4	0.5	6.0	0.5

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	60-120 A	28 V	0.46	88	49 s	0.8 kg/h
3.2 x 350 mm	90-160 A	30 V	0.46	52	59 s	1.2 kg/h
4.0 x 450 mm	125-210 A	33 V	0.48	26	82 s	1.7 kg/h
5.0 x 450 mm	160-260 A	37 V	0.48	16	86 s	2.6 kg/h

# OK Wearode 55



Heavy coated general purpose hardfacing electrode for worn parts where a hardness level of minimum 50 HRC is required.

<b>Classifications:</b>	EN 14700:E Z Fe3
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic
<b>Coating Type:</b>	Basic

## Typical Weld Metal Analysis %

C	Mn	Si	Cr
0.5	0.6	1.4	5.7

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90° I max	Deposition rate 90° I max
3.2 x 450 mm	100-130 A	23 V	0.65	46	72.8 s	1.1 kg/h
4.0 x 450 mm	130-180 A	24 V	0.64	24	107 s	1.4 kg/h
5.0 x 450 mm	180-220 A	24 V	0.64	15	126 s	1.9 kg/h
6.0 x 450 mm	210-270 A	25 V	0.66	10.3	140 s	2.5 kg/h



## OK Weartrode 55 HD



A general purpose hardfacing electrode depositing a semi corrosion resistant martensitic steel with a hardness of about 57 HRC. The electrode is specially suitable for hardfacing parts exposed to different forms of abrasive and impact wear, e.g. farming equipment, forestry tools, loading machines and mixers.

<b>Classifications:</b>	EN 14700:E Z Fe6
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<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Martensitic steel
<b>Coating Type:</b>	Lime Basic

### Typical Weld Metal Analysis %

C	Mn	Si	Cr
0.67	0.7	0.7	10.4

### Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	75-110 A	23 V	0.67	58	62 s	1.0 kg/h
3.2 x 450 mm	110-150 A	23 V	0.67	27	95 s	1.4 kg/h
4.0 x 450 mm	145-200 A	24 V	0.67	18	107 s	1.9 kg/h
5.0 x 450 mm	190-270 A	26 V	0.66	12	110 s	2.8 kg/h

# OK Weartrode 60



Electrode for hardfacing parts of dredgers, feed screws, crusher and tractor parts exposed to wear by stone, coal, sand, soil, etc. The weld metal presents a relatively good resistance to oxidation, also at elevated temperatures.

<b>Classifications:</b>	EN 14700:E Z Fe2
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<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Martensitic steel
<b>Coating Type:</b>	Basic

## Typical Weld Metal Analysis %

C	Mn	Si	Cr
0.80	0.4	4.5	2.0

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 450 mm	100-140 A	23 V	0.68	34	87 s	1.2 kg/h
4.0 x 450 mm	140-190 A	25 V	0.68	22	90 s	1.8 kg/h

# OK Weartrode 60 T



Electrode producing a weld metal with coarse chromium carbides in an austenitic matrix. Suitable for surfacing worn parts exposed to abrasion and wear by coal, ore or other minerals. Typical applications include earth-moving machines, mixers, feeder screws, dust exhausters and crushers. It can also be used on components operating in corrosive environments and/or at elevated temperatures.

<b>Classifications:</b>	EN 14700:E Z Fe14
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<b>Welding Current:</b>	AC, DC+
<b>Alloy Type:</b>	Carbide rich steel
<b>Coating Type:</b>	Rutile Basic

Typical Weld Metal Analysis %			
C	Mn	Si	Cr
4.8	1.0	0.7	34.3

Deposition Data						
Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	90-120 A	24 V	0.62	48	60 s	1.2 kg/h
3.2 x 350 mm	115-170 A	24 V	0.62	26	85 s	1.6 kg/h
4.0 x 450 mm	130-210 A	26 V	0.64	14	135 s	2.0 kg/h
5.0 x 450 mm	150-300 A	26 V	0.64	9	140 s	2.9 kg/h

# OK Weartrade 62



A hardfacing electrode depositing a weld metal with a high volume fraction of fine carbides in a martensitic matrix.

It is designed for protection of parts subjected to severe abrasion from rock, sand, cement, etc.

Applications: earth-drilling equipment, hammers, scrapers, knives, conveyor screws, etc.

<b>Welding Current:</b>	AC, DC+-
<b>Alloy Type:</b>	Carbide rich steel
<b>Coating Type:</b>	Basic

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	V	Ti
2.9	0.4	1.9	6.2	5.2	4.9

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
2.5 x 350 mm	70-100 A	17 V	0.63	71	105 s	0.5 kg/h
3.2 x 350 mm	100-150 A	17 V	0.60	44	110 s	0.7 kg/h
4.0 x 350 mm	115-200 A	17 V	0.64	27	120 s	1.0 kg/h

# OK Weartrode 65 T



The electrode deposits a high density of wear resisting carbides in an austenitic matrix capable of resisting extreme conditions of abrasion up to 700°C. Recovery approximately 220%. Typical applications include exhaust fans, ash ploughs, conveyor screws and sinter plant components.

<b>Classifications:</b>	EN 14700:E Fe16
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic iron
<b>Coating Type:</b>	Special

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo	V	Nb	W
6.0	0.7	1.9	24.5	6.6	0.8	5.4	1.7

## Deposition Data

Diameter	Current	Voltage	kg weld metal/ kg electrodes	Number of electrodes/kg weld metal	Fusion time per electrode at 90% I max	Deposition rate 90% I max
3.2 x 350 mm	150-170 A	22 V	0.72	22	132 s	1.2 kg/h
4.0 x 350 mm	220-250 A	23 V	0.71	15	123 s	2.0 kg/h

# MIG/MAG Wires (GMAW)



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# OK Autrod 12.51

OK Autrod 12.51 is a copper-coated solid wire with higher levels of deoxidizers (manganese and silicon). The high content of deoxidizers allow welding over heavier amounts of dirt, rust, and mill scale while providing a more fluid puddle and smoother bead profile.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 38 3 C1 3Si1, EN ISO 14341-A:G 42 4 M21 3Si1
<b>Classifications Wire Electrode:</b>	EN ISO 14341-A:G 3Si1, SFA/AWS A5.18:ER70S-6, CAN/CSA-ISO 14341-B:G 49A 3 C1 S6, JIS Z 3312:YGW 12(C1)
<b>Approvals:</b>	CE EN 13479, DNV III YMS (M21), VdTÜV 00899, BV SA3YM (M21), JIS YGW12, CWB B-G 49A 3 C1 S6 (B-G 49A 3 C G6), DNV III YMS (C1), GL 3YS (C1), BV SA3YM (C1), DB 42.039.06, RINA 3YS (C1), RINA 3YS (M21), NAKS/HAKC 1.0MM-2.0MM, NAKS/HAKC 1.2MM-1.6MM, ABS 3YSA (C1 & M21), LR 3YS H15 (C1 & M21), PRS 3YS (C1 & M21), RS 3YMS (C1 & M21)

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

<b>Alloy Type:</b>	Carbon-manganese steel (Mn/Si-alloyed)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar 20CO2</b>			
As welded	480 MPa	560 MPa	26 %
Stress relieved 15 hr 620 °C	380 MPa	495 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar 20CO2</b>		
As welded	20 °C	130 J
As welded	-20 °C	130 J
As welded	-30 °C	90 J
As welded	-40 °C	90 J
Stress relieved 15 hr 620 °C	20 °C	120 J
Stress relieved 15 hr 620 °C	-20 °C	90 J

## Typical Wire Composition %

C	Mn	Si
0.078	1.46	0.85

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.6 mm	30-100 A	15-20 V	5.5-13 m/min	0.7-1.7 kg/h
0.8 mm	60-200 A	18-24 V	3.2-13 m/min	0.8-3.0 kg/h
0.9 mm	70-250 A	18-26 V	3.0-12 m/min	0.9-3.6 kg/h
1.0 mm	80-300 A	18-32 V	2.7-15 m/min	1.0-5.6 kg/h
1.2 mm	120-380 A	18-34 V	2.5-15 m/min	1.3-8.0 kg/h
1.4 mm	150-420 A	22-36 V	2.3-12 m/min	1.6-8.7 kg/h
1.6 mm	225-550 A	28-38 V	2.3-12 m/min	2.1-11.4 kg/h
2.0 mm	300-650 A	32-44 V	4-15 m/min	3.2-12.5 kg/h

# OK Autrod 12.64

OK Autrod 12.64 is a copper-coated, Mn-Si-alloyed G4Si1/ER70S-6 solid wire for the GMAW of non-alloyed steels, as used in general construction, automotive components, pressure vessel fabrication and shipbuilding. It has a slightly higher manganese and silicon content than OK Autrod 12.50 to increase the weld metal strength. This also promotes low sensitivity to surface impurities and contributes to smooth, sound welds. The wire can be used with both Ar/CO<sub>2</sub> mixed gas and pure CO<sub>2</sub> shielding gas

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 42 3 C1 4Si1, EN ISO 14341-A:G 46 4 M21 4Si1, EN ISO 636-A:W 46 3 W4Si1
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.18:ER70S-6, EN ISO 14341-A:G 4Si1, EN ISO 636-A:W4Si1
<b>Approvals:</b>	CE EN 13479, DNV III YMS (M21), ABS 3YSA (M21), ABS 3YSA (C1), BV SA3YM (C1&M21), DNV III YMS (C1), LR 3YS H15 (C1), LR 3YS H15 (M21), RS 3YMS (C1), RS 3YMS (M21), GL 3YS (C1&M21), DB 42.039.11, NAKS/HAKC 1.2MM-1.6MM, VdTÜV 04294

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

<b>Alloy Type:</b>	Carbon-manganese steel (Mn/Si-alloyed)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>			
As welded	535 MPa	595 MPa	26 %
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>			
Stress relieved 15 hr 620 °C	395 MPa	520 MPa	28 %
<b>EN CO<sub>2</sub> (C1)</b>			
As welded	427 MPa	537 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>		
As welded	20 °C	130 J
As welded	-20 °C	90 J
As welded	-30 °C	75 J
As welded	-40 °C	70 J
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>		
Stress relieved 15 hr 620 °C	20 °C	120 J
Stress relieved 15 hr 620 °C	-20 °C	90 J
<b>EN CO<sub>2</sub> (C1)</b>		
As welded	20 °C	110 J
As welded	-29 °C	76 J

# OK Autrod 12.64

## Typical Wire Composition %

C	Mn	Si
0.074	1.68	0.95

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	60-185 A	18-24 V	3.2-10 m/min	0.8-2.5 kg/h
0.9 mm	70-250 A	18-26 V	3-12 m/min	0.8-3.3 kg/h
1.0 mm	80-300 A	18-32 V	2.7-15 m/min	1-5.5 kg/h
1.2 mm	120-380 A	18-35 V	2.3-15 m/min	1.2-8 kg/h
1.4 mm	150-420 A	22-36 V	2.5-12 m/min	1.7-8.5 kg/h
1.6 mm	120-380 A	18-35 V	2.3-15 m/min	1.2-8 kg/h
2.0 mm	120-380 A	18-35 V	2.3-15 m/min	1.2-8 kg/h

# OK AristoRod 12.50

OK AristoRod 12.50 is a bare Mn-Si-alloyed G3Si1/ER70S-6 solid wire for the GMAW of non-alloyed steels, as used in general construction, automotive components, pressure vessel fabrication and shipbuilding. OK AristoRod 12.50 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 38 3 C1 3Si1, EN ISO 14341-A:G 42 4 M21 3Si1, EN ISO 14341-A:G 42 4 M20 3Si1
<b>Classifications Wire Electrode:</b>	EN ISO 14341-A:G 3Si1, SFA/AWS A5.18:ER70S-6, CAN/CSA-ISO 14341:B-G 49A 3 C1 S6, JIS Z 3312:YGW 12 (C1)
<b>Approvals:</b>	GL 3YS, DNV III YMS, VdTÜV 10052, PRS 3YS, RS 3YMS, ABS 3Y SA, BV SA3YM, CE EN 13479, CWB B-G 49A 3 C1 S6 (B-G 49A 3 C G6), DB 42.039.29, DNV III YMS, NAKS/HAKC 1.0MM-1.6MM, GL 3YS, JIS YGW12 (C1), LR 3YS H15, PRS 3YS, RINA 3Y S (C1), RINA 3Y S (M21), RS 3YMS

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

<b>Alloy Type:</b>	Carbon-manganese steel (Mn/Si-alloyed)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO2 (M21)</b>			
As welded	480 MPa	560 MPa	26 %
Stress relieved 15 hr 620 °C	380 MPa	495 MPa	28 %
<b>EN CO2 (C1)</b>			
As welded	450 MPa	540 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO2 (M21)</b>		
As welded	20 °C	130 J
As welded	-20 °C	90 J
As welded	-30 °C	70 J
As welded	-40 °C	60 J
Stress relieved 15 hr 620 °C	20 °C	120 J
Stress relieved 15 hr 620 °C	-20 °C	90 J
<b>EN CO2 (C1)</b>		
As welded	20 °C	110 J
As welded	-29 °C	98 J

# OK AristoRod 12.50

## Typical Wire Composition %

C	Mn	Si
0.08	1.46	0.85

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	60-200 A	18-24 V	3.2-10.0 m/min	0.8-2.5 kg/h
0.9 mm	70-250 A	18-26 V	3.0-12.0 m/min	0.8-3.3 kg/h
1.0 mm	80-300 A	18-32 V	2.7-15.0 m/min	1.0-5.5 kg/h
1.14 mm	100-350 A	18-34 V	2.6-15.0 m/min	1.2-7.0 kg/h
1.2 mm	120-380 A	18-35 V	2.5-15.0 m/min	1.3-8.0 kg/h
1.32 mm	130-400 A	19-35 V	2.4-15.0 m/min	1.5-8.5 kg/h
1.4 mm	150-420 A	22-36 V	2.3-15.0 m/min	1.6-8.7 kg/h
1.6 mm	225-550 A	28-38 V	2.3-15.0 m/min	2.1-11.4 kg/h

## OK AristoRod 12.52

The non copper coated OK AristoRod 12.52 is a manganese-silicon alloyed solid wire for GMAW of unalloyed steels, such as general structural, pressure vessel, ship building and for fine-grained carbon-manganese steels for the same purpose with a minimum yield strength of 420 MPa. The AristoRod wires are suitable for operating at high currents with maintained disturbance free wire feeding giving a stable arc with a low amount of spatter. OK AristoRod 12.52 can be delivered in the unique ESAB Marathon Pac, which is an excellent choice in mechanised welding applications.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 42 4 M21 3Si1
<b>Classifications Wire Electrode:</b>	EN ISO 14341-A:G 3Si1, SFA/AWS A5.18:ER70S-G, JIS Z 3312:YGW 16 (M21), (items ending with H)
<b>Approvals:</b>	JIS YGW16 (M21)

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

<b>Alloy Type:</b>	Carbon-manganese steel (Mn/Si-alloyed)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar20CO2 (M21)</b>			
As welded	480 MPa	560 MPa	26 %
Stress relieved 15 hr 620 °C	380 MPa	495 MPa	28 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar20CO2 (M21)</b>		
As welded	20 °C	130 J
As welded	-20 °C	90 J
As welded	-30 °C	70 J
As welded	-40 °C	60 J
Stress relieved 15 hr 620 °C	20 °C	120 J
Stress relieved 15 hr 620 °C	-20 °C	90 J

### Typical Weld Metal Analysis %

C	Si	Mn	P	S	Cu	Ti+Zr
0.10	0.72	1.11	0.013	0.012	0.07	<0.01

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	60-200 A	18-24 V	3.2-10.0 m/min	0.8-2.5 kg/h
0.9 mm	70-250 A	18-26 V	3.0-12.0 m/min	0.8-3.3 kg/h
1.0 mm	80-300 A	18-32 V	2.7-15.0 m/min	1.0-5.5 kg/h
1.2 mm	120-380 A	18-35 V	2.5-15.0 m/min	1.3-8.0 kg/h
1.4 mm	150-420 A	22-36 V	2.3-12.0 m/min	1.6-8.7 kg/h
1.6 mm	225-550 A	28-38 V	2.3-15.0 m/min	2.1-11.4 kg/h

# OK AristoRod 12.57

OK AristoRod 12.57 is a bare Mn-Si-alloyed G2Si/ER70S-3 solid wire for the GMAW of non-alloyed steels, as used in general construction, automotive components, pressure vessel fabrication and shipbuilding. OK AristoRod 12.57 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 35 2 C1 2Si, EN ISO 14341-A:G 38 3 M21 2Si
<b>Classifications Wire Electrode:</b>	EN ISO 14341-A:G 2Si, SFA/AWS A5.18:ER70S-3, CAN/CSA-ISO 14341-B-G 49A 2 C1 S3
<b>Approvals:</b>	CE EN 13479, CWB B-G 49A 2 C1 S3 (B-G 49A 2 C G3), DB 42.039.10, VdTÜV 10615

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

<b>Alloy Type:</b>	Carbon-manganese steel (Mn/Si-alloyed)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>			
As welded	430 MPa	515 MPa	26 %
<b>EN CO<sub>2</sub> (C1)</b>			
As welded	385 MPa	485 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>		
As welded	20 °C	140 J
As welded	-20 °C	110 J
As welded	-30 °C	90 J
<b>EN CO<sub>2</sub> (C1)</b>		
As welded	20 °C	125 J
As welded	-20 °C	90 J

## Typical Wire Composition %

C	Mn	Si
0.074	1.05	0.55

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.9 mm	70-250 A	18-26 V	3.0-12.0 m/min	0.8-3.3 kg/h
1.0 mm	80-300 A	18-32 V	2,7-15 m/min	1-5,6 kg/h
1.2 mm	120-380 A	18-34 V	2,5-15 m/min	1,3-8 kg/h
1.6 mm	120-380 A	18-34 V	2,5-15 m/min	1,3-8 kg/h

## OK AristoRod 12.62

OK AristoRod 12.62 is a bare triple deoxidised G2Ti/ER70S-2 solid wire for the GMAW of non-alloyed steels, as used in general construction, pressure vessel fabrication and shipbuilding. It yields high-quality welds in semi-killed and rimmed steels, as well as with grades with various carbon contents. Added desoxidants, Al - Ti- Zr, make the wire also suitable for steels with a dirty or rusty surface, without sacrificing weld quality.

OK AristoRod 12.62 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 42 3 C1 2Ti, EN ISO 14341-A:G 46 4 M21 2Ti
<b>Classifications Wire Electrode:</b>	EN ISO 14341-A:G 2Ti, SFA/AWS A5.18:ER70S-2

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

<b>Alloy Type:</b>	Carbon-manganese steel (Mn/Si-alloyed)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>			
As welded	570 MPa	625 MPa	26 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>		
As welded	-40 °C	180 J

### Typical Wire Composition %

C	Mn	Si
0.06	1.1	0.60

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	60-200 A	18-24 V	3.2-10.0 m/min	0.8-2.5 kg/h
0.9 mm	70-250 A	18-26 V	3.0-12.0 m/min	0.8-3.3 kg/h
1.0 mm	80-300 A	18-32 V	2.7-15.0 m/min	1.0-5.5 kg/h
1.2 mm	120-380 A	18-35 V	2.5-15.0 m/min	1.3-8.0 kg/h
1.6 mm	225-550 A	28-38 V	2.3-15.0 m/min	2.1-11.4 kg/h



# OK AristoRod 12.63

OK AristoRod 12.63 is a bare Mn-Si-alloyed G4Si1/ER70S-6 solid wire for the GMAW of non-alloyed steels, as used in general construction, automotive components, pressure vessel fabrication and shipbuilding. It has a slightly higher manganese and silicon content than OK AristoRod 12.50 to increase the weld metal strength. This also promotes a low sensitivity to surface impurities and contributes to smooth, sound welds. OK AristoRod 12.63 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 42 3 C1 4Si1, EN ISO 14341-A:G 46 4 M21 4Si1, EN ISO 14341-B:G 55A 5 M21 S6
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.18:ER70S-6, CAN/CSA-ISO 14341-B:G 49A 3 C1 S6, EN ISO 14341-A:G 4Si1, EN ISO 14341-B:G S6
<b>Approvals:</b>	CE EN 13479, DNV III YMS (M21), ABS 3YSA (M21), CWB B-G 49A 3 C1 S6 (B-G 49A 3 C G6), ABS 3YSA (C1), DB 42.039.30, DNV III YMS (C1), GL 3YS (C1), LR 3YS H15 (C1), LR 3YS H15 (M21), NAKS/HAKC 1.2MM, VdTÜV 10051, BV SA3YM (C1 & M21)

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

<b>Alloy Type:</b>	Carbon-manganese steel (Mn/Si-alloyed)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO2 (M21)</b>			
As welded	495 MPa	580 MPa	29 %
Stress relieved 15 hr 650 °C	395 MPa	520 MPa	28 %
<b>EN CO2 (C1)</b>			
As welded	485 MPa	570 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO2 (M21)</b>		
As welded	20 °C	130 J
As welded	-20 °C	90 J
As welded	-30 °C	70 J
As welded	-40 °C	60 J
Stress relieved 15 hr 650 °C	20 °C	120 J
Stress relieved 15 hr 650 °C	-20 °C	90 J
<b>EN CO2 (C1)</b>		
As welded	20 °C	110 J
As welded	-30 °C	76 J

# OK AristoRod 12.63

Typical Wire Composition %		
C	Mn	Si
0.074	1.68	0.95

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	60-185 A	18-24 V	3.2-10 m/min	0.8-2.5 kg/h
0.9 mm	70-250 A	18-26 V	3-12 m/min	0.8-3.3 kg/h
1.0 mm	80-300 A	18-32 V	2.7-15 m/min	1-5.5 kg/h
1.2 mm	120-380 A	18-35 V	2.3-15 m/min	1.2-8 kg/h
1.4 mm	120-380 A	18-35 V	2.3-15 m/min	1.2-8 kg/h
1.6 mm	120-380 A	18-35 V	2.3-15 m/min	1.2-8 kg/h

# OK AristoRod 12.70

The non copper coated OK AristoRod 12.70 is a manganese-silicon alloyed solid wire for GMAW of unalloyed steels, such as general structural, pressure vessel, ship building and for fine-grained carbon-manganese steels for the same purpose with a minimum tensile strength of 490 MPa. The electrode is designed to be welded with pure CO<sub>2</sub> as the shielding gas and contains titanium-zirconium. The AristoRod wires are suitable for operating at high currents with maintained disturbance free wire feeding giving a stable arc with a low amount of spatter. OK AristoRod 12.70 delivered in the unique ESAB Marathon Pac is excellent in mechanized welding applications.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 42 2 C1 Z
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.18:ER70S-G, JIS Z 3312:YGW11
<b>Approvals:</b>	JIS YGW 11

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

<b>Alloy Type:</b>	Carbon-manganese steel (Mn/Si-alloyed)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1</b>			
As welded	480 MPa	580 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1</b>		
As welded	0 °C	115 J
As welded	-30 °C	80 J

## Typical Wire Composition %

C	Si	Mn	P	S	Cu	Ti+Zr
0.10	0.80	1.50	0.010	0.020	0.15	0.15

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-300 A	18-32 V	2.7-15.0 m/min	1.0-5.5 kg/h
1.2 mm	120-380 A	18-35 V	2.5-15.0 m/min	1.3-8.0 kg/h
1.4 mm	150-420 A	22-36 V	2.3-12.0 m/min	1.6-8.7 kg/h
1.6 mm	225-550 A	28-38 V	2.3-15.0 m/min	2.1-11.4 kg/h

## OK AristoRod 13.08

OK AristoRod 13.08 is a 0.4Mo-alloyed (ER80S-D2), bare, solid wire for the GMAW of creep-resistant steels of the same composition, like those used with a service temperature of up to 500°C. OK AristoRod 13.08 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 46 0 C1 4Mo, EN ISO 14341-A:G 50 4 M21 4Mo
<b>Classifications Wire Electrode:</b>	EN ISO 14341-A:G 4Mo, SFA/AWS A5.28:ER80S-D2, CAN/CSA-ISO 14341:B-G 55A 3 C1 S4M31

<b>Alloy Type:</b>	Low alloyed (1.6 % Mn, 0.4 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS CO2 (C1)</b>			
As welded	540 MPa	645 MPa	25 %
<b>EN 80Ar/20CO2 (M21)</b>			
As welded	590 MPa	685 MPa	24 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS CO2 (C1)</b>		
As welded	20 °C	90 J
As welded	-20 °C	36 J
As welded	-40 °C	38 J
<b>EN 80Ar/20CO2 (M21)</b>		
As welded	20 °C	140 J
As welded	-20 °C	100 J
As welded	-40 °C	80 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.098	1.78	0.6	0.05	0.04	0.47

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	40-170 A	16-22 V	2-10.8 m/min	0.4-2.6 kg/h
0.9 mm	70-280 A	18-28 V	2.7-14.7 m/min	1-5.4 kg/h
1.0 mm	90-300 A	18-28 V	2.7-14.7 m/min	1-5.4 kg/h
1.2 mm	120-350 A	20-33 V	2.7-12.4 m/min	1.5-6.6 kg/h
1.6 mm	225-480 A	26-38 V	3.10-12 m/min	3.3-11.6 kg/h

# OK AristoRod 13.09

OK AristoRod 13.09 is a 0.5Mo-alloyed, bare, solid wire for the GMAW of creep-resistant steels of the same composition, like those used for pipes in pressure vessels and boilers with a service temperature of up to 500°C. OK AristoRod 13.09 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 38 0 C1 2Mo, EN ISO 14341-A:G 46 2 M21 2Mo
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER80S-G, EN ISO 14341-A:G 2Mo, EN ISO 21952-A:G MoSi, EN ISO 21952-B:G 1M3
<b>Approvals:</b>	CE EN 13479, DNV III YMS (M21), NAKS/HAKC 1.2MM, DB 42.039.31, VdTÜV 10088

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

<b>Alloy Type:</b>	Low alloyed (0.5 % Mo)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>80Ar/20CO2</b>			
As welded	515 MPa	630 MPa	26 %
As welded+	425 MPa	570 MPa	20 %
<b>80Ar/20CO2 Tested at 450°C</b>			
Stress relieved 15 hr 620 °C	430 MPa	545 MPa	26 %
Stress relieved 15 hr 620 °C	370 MPa	490 MPa	23 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>80Ar/20CO2</b>		
As welded	20 °C	117 J
As welded	-20 °C	75 J
As welded	-40 °C	57 J
Stress relieved 15 hr 620 °C	20 °C	150 J
Stress relieved 15 hr 620 °C	0 °C	130 J
Stress relieved 15 hr 620 °C	-20 °C	95 J
Stress relieved 15 hr 620 °C	-40 °C	90 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.094	1.09	0.61	0.04	0.07	0.45

# OK AristoRod 13.09

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	40-170 A	16-22 V	2-10.8 m/min	0.4-2.6 kg/h
1.0 mm	80-280 A	18-28 V	2.7-14.7 m/min	1-5.4 kg/h
1.2 mm	120-350 A	20-33 V	2.7-12.4 m/min	1.5-6.6 kg/h
1.6 mm	225-480 A	26-38 V	3.10-12 m/min	3.3-11.6 kg/h

# OK AristoRod 13.16

OK AristoRod 13.16 is a low-alloyed, chromium-molybdenum (1.3% Cr, 0.5% Mo) ER80S-B2, solid wire for GMAW of creep resistant steels like SA-387 Grade 11, A 335 Grade P11 or similar materials. OK AristoRod 13.16 is a high purity wire with a guaranteed Bruscato factor  $X < 15$ . It is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristics features include excellent start properties; trouble free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Wire Electrode:</b>	EN ISO 21952-A:Z CrMo1Si, EN ISO 21952-B:G 55A 1CM, SFA/AWS A5.28:ER80S-B2
<b>Approvals:</b>	CE EN 13479

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

<b>Alloy Type:</b>	Low-alloyed, 1.3Cr-0.5Mo
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar / 1-3% O2 (M13) AWS</b>			
Stress relieved 1 hr 620 °C	540 MPa	640 MPa	26 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar / 1-3% O2 (M13) AWS</b>		
Stress relieved 1 hr 620 °C	20 °C	163 J
Stress relieved 1 hr 620 °C	-20 °C	100 J
Stress relieved 1 hr 620 °C	-40 °C	>47 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.1	0.4	0.5	0.1	1.3	0.5

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.2 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h

## OK AristoRod 13.26

OK AristoRod 13.26 is a 0.8Ni-0.3Cu-alloyed, bare, solid wire for the GMAW of weathering steels such as COR-TEN, Patinax, Dillicor and so on. It is also suitable for high strength steels with a yield strength of up to 470 MPa.

OK AristoRod 13.26 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 42 0 C1 Z 3Ni1Cu, EN ISO 14341-A:G 46 4 M21 Z 3Ni1Cu
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER80S-G, EN ISO 14341-A:G Z 3Ni1Cu
<b>Approvals:</b>	CE EN 13479, DNV III YMS (M21), NAKS/HAKC 1.2MM, DB 42.039.32, DNV II YMS (C1)

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

<b>Alloy Type:</b>	Low alloyed (0.8 % Ni, 0.4 % Cu)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS 80Ar/20CO2 (M21)</b>			
As welded	540 MPa	625 MPa	26 %
<b>AWS 98Ar/2O2 (M13)</b>			
As welded	580 MPa	650 MPa	22 %
<b>EN 80Ar/20CO2 (M21)</b>			
As welded	540 MPa	625 MPa	26 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS 80Ar/20CO2 (M21)</b>		
As welded	20 °C	140 J
As welded	0 °C	142 J
As welded	-20 °C	110 J
As welded	-40 °C	83 J
As welded	-60 °C	50 J
<b>AWS 98Ar/2O2 (M13)</b>		
As welded	20 °C	140 J
As welded	-20 °C	100 J
As welded	-40 °C	70 J
As welded	-60 °C	30 J
<b>EN 80Ar/20CO2 (M21)</b>		
As welded	-60 °C	50 J



# OK AristoRod 13.26

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.095	1.32	0.80	0.84	0.12	0.02	0.30

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.0 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.2 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h
1.4 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h
1.6 mm	225-480 A	26-38 V	3,1-8,1 m/min	3,3-0 kg/h

## OK AristoRod 55

OK AristoRod 55 is a 0.5Cr-0.5Ni-0.2Mo-alloyed, bare, solid wire for the GMAW of high strength steels. OK AristoRod 55 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 16834-A:G 55 4 M Mn3NiCrMo
<b>Classifications Wire Electrode:</b>	EN ISO 16834-A:G Mn3NiCrMo, SFA/AWS A5.28:ER100S-G
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 1.2MM, LR 4Y55S H5

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

<b>Alloy Type:</b>	Low alloyed (0.5 % Cr, 0.5 % Ni, 0.2 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO2 (M21)</b>			
As welded	690 MPa	770 MPa	20 %
Stress relieved 1 hr 570 °C	660 MPa	750 MPa	24 %
Stress relieved 1 hr 620 °C	660 MPa	750 MPa	24 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO2 (M21)</b>		
As welded	0 °C	80 J
As welded	-20 °C	75 J
As welded	-30 °C	65 J
As welded	-40 °C	60 J
As welded	-50 °C	50 J
As welded	-60 °C	50 J
Stress relieved 1 hr 620 °C	0 °C	95 J
Stress relieved 1 hr 570 °C	-20 °C	60 J
Stress relieved 1 hr 620 °C	-20 °C	70 J
Stress relieved 1 hr 620 °C	-30 °C	55 J
Stress relieved 1 hr 570 °C	-40 °C	50 J
Stress relieved 1 hr 620 °C	-50 °C	40 J
Stress relieved 1 hr 570 °C	-60 °C	35 J

# OK AristoRod 55

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.12	1.38	0.71	0.53	0.58	0.20

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	40-170 A	16-22 V	2-10.8 m/min	0.4-2.6 kg/h
1.0 mm	80-280 A	18-28 V	2.7-14.7 m/min	1-5.4 kg/h
1.2 mm	120-350 A	20-33 V	2.7-12.4 m/min	1.5-6.6 kg/h
1.6 mm	225-480 A	26-38 V	3.5-12.0 m/min	3.3-11.6 kg/h

## OK AristoRod 69

The non-copper-coated OK AristoRod 69 is a low-alloyed, chromium-nickel-molybdenum (0.3% Cr, 1.4% Ni, 0.25% Mo), solid wire for GMAW of high tensile strength steels requiring tough weld metal for critical applications. Also suitable when high impact strength at lower temperatures is required. The AristoRod wires are suitable for operating at high currents with maintained disturbance free wire feeding giving a stable arc with a low amount of spatter. OK AristoRod 69 delivered in the unique ESAB Marathon Pac is excellent in mechanised welding applications.

<b>Classifications Weld Metal:</b>	EN ISO 16834-A:G 69 4 M Mn3Ni1CrMo
<b>Classifications Wire Electrode:</b>	EN ISO 16834-A:G Mn3Ni1CrMo, SFA/AWS A5.28:ER110S-G
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 1.2MM, ABS ER 110S-G (M21), DB 42.039.33, DNV IV Y69MS, GL 4Y69M, VdTÜV 11837

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

<b>Alloy Type:</b>	Low alloyed (1.4 % Ni, 0.3 % Cr, 0.3 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO2 (M21)</b>			
As welded	730 MPa	800 MPa	19 %
Stress relieved 15 hr 620 °C	690 MPa	750 MPa	20 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO2 (M21)</b>		
As welded	20 °C	100 J
As welded	-40 °C	73 J
Stress relieved 15 hr 620 °C	20 °C	130 J
Stress relieved 15 hr 620 °C	-20 °C	60 J
Stress relieved 15 hr 620 °C	-30 °C	60 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.089	1.54	0.53	1.23	0.26	0.24

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
0.9 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.0 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.2 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h
1.6 mm	225-480 A	26-38 V	3,1-8,1 m/min	3,3-0 kg/h

# OK AristoRod 79

OK AristoRod 79 is a 0.3Cr-1.9Ni-0.5Mo-alloyed, bare, solid wire for the GMAW of high strength steels, heat-treated steels and fine-grained structural steels with a yield strength of up to 850 MPa, such as XABO90. OK AristoRod 79 is treated with ESAB's unique Advanced Surface Characteristics (ASC) technology, taking MAG welding operations to new levels of performance and all-round efficiency, especially in robotic and mechanised welding. Characteristic features include excellent start properties; trouble-free feeding at high wire speeds and lengthy feed distances; a very stable arc at high welding currents; extremely low levels of spatter; low fume emission; reduced contact tip wear and improved protection against corrosion of the wire.

<b>Classifications Weld Metal:</b>	EN ISO 16834-A:G 79 4 M Mn4Ni2CrMo
<b>Classifications Wire Electrode:</b>	EN ISO 16834-A:G Mn4Ni2CrMo, SFA/AWS A5.28:ER120S-G
<b>Approvals:</b>	CE EN 13479

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

<b>Alloy Type:</b>	0.3% Cr, 1.9% Ni, 0.5% Mo
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>			
As welded	810 MPa	900 MPa	18 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>		
As welded	0 °C	70 J
As welded	-20 °C	60 J
As welded	-40 °C	55 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.09	1.82	0.89	2.03	0.25	0.64

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.2 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h

# OK AristoRod 89

The non copper coated OK AristoRod 89 is a low-alloyed, chromium-nickel-molybdenum (0.4% Cr, 2.2% Ni, 0.55% Mo), solid wire for GMAW of ultra high tensile strength steels requiring tough weld metal for critical applications. Also suitable when high impact strength at lower temperatures is required. The AristoRod wires are suitable for operating at high currents with maintained disturbance free wire feeding giving a stable arc with a low amount of spatter, due to its unique Advanced Surface Characteristics (ASC) technology. OK AristoRod 89 is delivered on spools or in the unique ESAB Marathon Pac, which is excellent in mechanised welding applications.

<b>Classifications Weld Metal:</b>	EN ISO 16834-A:G89 4 M Mn4Ni2CrMo
<b>Classifications Wire Electrode:</b>	EN ISO 16834-A:G Mn4Ni2CrMo, SFA/AWS A5.28:ER120S-G
<b>Approvals:</b>	CE EN 13479, DB 42.039.37, GL 4Y89S, VdTÜV 11881

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

<b>Alloy Type:</b>	0.4% Cr, 2.2%Ni, 0.55% Mo
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Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
<b>EN 80Ar/20CO2 (M21)</b>			
As welded	920 MPa	940 MPa	18 %

Typical Charpy V-Notch Properties		
Condition	Testing Temperature	Impact Value
<b>EN 80Ar/20CO2 (M21)</b>		
As welded	-40 °C	47 J

Typical Wire Composition %					
C	Mn	Si	Ni	Cr	Mo
0.081	1.75	0.8	2.22	0.41	0.533

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	40-170 A	16-22 V	2-10.8 m/min	0.4-2.6 kg/h
1.0 mm	80-280 A	18-28 V	2.7-14.7 m/min	1-5.4 kg/h
1.2 mm	120-350 A	20-33 V	2.7-12.4 m/min	1.5-6.6 kg/h

# OK Autrod 13.17

OK Autrod 13.17 is a 2.5Cr-1.1Mo-alloyed (ER90S-B3), copper-coated, solid wire for the GMAW of creep-resistant steels like SA-387 Grade 22, A335 Grade P22 or similar materials. The wire has a high purity chemistry with a guaranteed Bruscato factor  $X < 15$ .

<b>Classifications Wire Electrode:</b>	EN ISO 21952-B:G 62A 2C1M, SFA/AWS A5.28:ER90S-B3
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>80Ar/20CO<sub>2</sub> (M21) AWS</b>			
Stress relieved 1 hr 690 °C	590 MPa	720 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>80Ar/20CO<sub>2</sub> (M21) AWS</b>		
Stress relieved 1 hr 690 °C	-40 °C	47 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.1	0.5	0.5	0.05	2.4	1.0

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.2 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h

## OK Autrod 13.23

OK Autrod 13.23 is a 0.9 Ni-alloyed (ER80S-Ni1), copper-coated, solid wire for the GMAW of low-temperature, fine-grained steels. The wire provides good impact toughness down to -50°C and is especially suitable for use in the offshore industry.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER80S-Ni1
<b>Approvals:</b>	BV SA4Y40M, NAKS/HAKC 1.0MM

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

<b>Alloy Type:</b>	Low alloyed (1 % Ni)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS 80Ar/20CO2</b>			
As welded	480 MPa	560 MPa	30 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS 80Ar/20CO2</b>		
As welded	20 °C	150 J
As welded	0 °C	130 J
As welded	-46 °C	70 J
As welded	-60 °C	20 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.07	1.11	0.57	0.9	0.07	0.29

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	40-170 A	16-22 V	2-10.8 m/min	0.4-2.6 kg/h
1.0 mm	80-280 A	18-28 V	2.7-14.7 m/min	1-5.4 kg/h
1.2 mm	120-350 A	20-33 V	2.7-12.4 m/min	1.5-6.6 kg/h



# OK Autrod 13.28

A copper coated, Ni-alloyed (2,4% Ni), solid wire for GMAW of low-alloyed and low temperature steels in applications such as vessels, pipes and in the offshore industry with a minimum yield strength less than 470 Mpa. The wire provides a good impact toughness down to -60°C.

<b>Classifications Weld Metal:</b>	EN ISO 14341-A:G 46 6 M21 2Ni2
<b>Classifications Wire Electrode:</b>	EN ISO 14341-A:G 2Ni2, SFA/AWS A5.28:ER80S-Ni2
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC , DNV V YMS (M21), VdTÜV 06852 (RG)

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

<b>Alloy Type:</b>	Low alloyed (2.5 % Ni)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS Ar/1-502 (M13)</b>			
Stress relieved 1 hr 620 °C	540 MPa	630 MPa	29 %
<b>EN Ar/20CO2 (M21)</b>			
As welded	540 MPa	630 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS Ar/1-502 (M13)</b>		
Stress relieved 1 hr 620 °C	0 °C	162 J
Stress relieved 1 hr 620 °C	-29 °C	168 J
Stress relieved 1 hr 620 °C	-62 °C	131 J
<b>EN Ar/20CO2 (M21)</b>		
As welded	0 °C	130 J
As welded	-40 °C	100 J
As welded	-60 °C	60 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr
0.08	1.04	0.53	2.36	0.03

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	40-170 A	16-22 V	2-10.8 m/min	0.4-2.6 kg/h
1.0 mm	80-280 A	18-28 V	2.7-14.7 m/min	1-5.4 kg/h
1.2 mm	120-350 A	20-33 V	2.7-12.4 m/min	1.5-6.6 kg/h

# OK Autrod 13.37

A copper-coated, low-alloyed, chromium-molybdenum (9% Cr, 1% Mo) solid wire for the GMAW of high temperature steels and steels for hot hydrogen service, especially in oil refineries.

**Classifications Wire Electrode:** EN ISO 21952-A:G CrMo9, EN ISO 21952-B:G 55A 9C1M, SFA/AWS A5.28:ER80S-B8

**Alloy Type:** Alloyed steel (9 % Cr, 1 % Mo)

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS Ar/1-5%O<sub>2</sub> (M13)</b>			
Stress relieved 2 hr 745 °C	523 MPa	680 MPa	22 %
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>			
Stress relieved 2 hr 760 °C	536 MPa	620 MPa	23 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS Ar/1-5%O<sub>2</sub> (M13)</b>		
Stress relieved 2 hr 745 °C	20 °C	115 J
Stress relieved 2 hr 745 °C	-20 °C	50 J
<b>EN 80Ar/20CO<sub>2</sub> (M21)</b>		
Stress relieved 2 hr 760 °C	20 °C	91 J
Stress relieved 2 hr 760 °C	-20 °C	50 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.06	0.52	0.45	0.23	8.66	1.00

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.9 mm	70-250 A	18-26 V	3.0-12 m/min	0.9-3.6 kg/h
1.2 mm	120-350 A	20-33 V	2.7-12.4 m/min	1.5-6.6 kg/h

# OK Autrod 16.95

A continuous solid, corrosion resisting chromium-nickel-manganese wire for welding of austenitic stainless alloys of 18% Cr, 8% Ni, 7% Mn types. OK Autrod 16.95 has a general corrosion resistance similar to that of the corresponding parent metal. The higher silicon content improves the welding properties, such as wetting. The product is a modified variant of ER307, basically with a higher Mn content to make the weld less sensitive to hot cracking. When used for joining dissimilar materials the corrosion resistance is of secondary importance. The alloy is used in a wide range of applications across the industry such as the joining of austenitic, manganese, work hardenable steels as well as armour plate and heat resistant steels.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 18 8 Mn, SFA/AWS A5.9:ER307 mod, Werkstoffnummer :~1.4370
<b>Approvals:</b>	CE EN 13479, NAKS/HAKS 1.2MM, DB 43.039.10, VdTÜV 05420

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

<b>Alloy Type:</b>	Austenitic (18 % Cr - 8 % Ni - 7 % Mn)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	450 MPa	640 MPa	41 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	130 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.08	7.0	0.9	8.1	18.7	0.20	0.10

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
0.9 mm	65-220 A	15-28 V	3.5-18.0 m/min	1.1-5.4 kg/h
1.0 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h
1.6 mm	230-375 A	23-31 V	5.5-9.0 m/min	5.2-8.6 kg/h

## OK Autrod 308L

A continuous solid corrosion resisting chromium-nickel wire. OK Autrod 308L has a good general corrosion resistance. The alloy has a low carbon content which makes this alloy particularly recommended where there is a risk of intergranular corrosion. The alloy is widely used in the chemical and food processing industries as well as for pipes, tubes and boilers. For joining of stainless steels of 18% Cr - 8% Ni-type and Nb-stabilized steels of the same type if the service temperature will not exceed 350°C.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer :-1.4316, EN ISO 14343-A:G 19 9 L, SFA/AWS A5.9:ER308L
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<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) 19% Cr - 9% Ni - Low C
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	450 MPa	620 MPa	36 %
<b>Tested at 350\00B0C</b>			
As welded	370 MPa	490 MPa	25 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	110 J
As welded	-60 °C	90 J
As welded	-196 °C	60 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N	Ferrite FN
0.02	1.9	0.4	9.8	19.8	0.20	0.15	0.05	9

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	0.9-4.1 kg/h
0.9 mm	55-160 A	15-24 V	4.0-17.0 m/min	0.9-4.1 kg/h
1.0 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.14 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	14-28.5 V	3.0-14.0 m/min	1.6-7.5 kg/h

# OK Autrod 308LSi

A continuous solid corrosion resisting chromium-nickel wire for welding of austenitic chromium nickel alloys of 18% Cr - 8% Ni-type. OK Autrod 308LSi has a good general corrosion resistance. The alloy has a low carbon content making it particularly recommended where there is a risk of intergranular corrosion. The higher silicon content improves the welding properties, such as wetting. The alloy is widely used in the chemical and food processing industries as well as for pipes, tubes and boilers.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER308LSi, Werkstoffnummer :~1.4316, EN ISO 14343-A:G 19 9 L Si
<b>Approvals:</b>	CE EN 13479, BV 308L SA BT (M12), CWB ER308LSi, DB 43.039.01, DNV NV 308 L (M13), VdTÜV 04267, NAKS/HAKC 1.0MM-1.2MM

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

<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) 19% Cr - 9% Ni - Low C - High Si
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	400 MPa	570 MPa	36 %
<b>Tested at 350\00B0C.</b>			
As welded	370 MPa	490 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	110 J
As welded	-60 °C	70 J
As welded	-196 °C	45 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Ferrite FN
0.01	1.8	0.9	10.5	19.9	0.15	0.10	9

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
0.9 mm	65-220 A	15-28 V	3.5-18.0 m/min	1.1-5.4 kg/h
1.0 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h
1.6 mm	230-375 A	23-29 V	5.5-9.0 m/min	5.2-8.6 kg/h

## OK Autrod 308H

A continuous, solid, corrosion-resistant, chromium-nickel wire for welding austenitic chromium-nickel alloys of the 18% Cr-8% Ni type. OK Autrod 308H has good general corrosion resistance. The alloy has a high carbon content, making it suitable for applications used at higher temperatures. The alloy is used in chemical and petrochemical plants for the welding of pipes, cyclones and boilers.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 19 9 H, SFA/AWS A5.9:ER308H
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<b>Alloy Type:</b>	Austenitic 19% Cr - 9% Ni - High C
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.05	1.9	0.5	9.2	19.8	0.15	0.1

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	50-140 A	16-22 V	3.40-11.00 m/min	0.8-2.7 kg/h
1.0 mm	80-190 A	16-24 V	2,9-8,4 m/min	1,1-3,1 kg/h
1.2 mm	180-280 A	20-28 V	4,9-8,5 m/min	2,6-4,5 kg/h

# OK Autrod 309L

A continuous, solid, corrosion resisting chromium-nickel wire for welding of similar steels, wrought and cast steels of 23% Cr-12% Ni types. The alloy is also used for welding of buffer layers on CMn steels and welding of dissimilar joints. When using the wire for buffer layers and dissimilar joints it is necessary to control the dilution of the weld. OK Autrod 309L has a good general corrosion resistance. When used for joining dissimilar materials the corrosion resistance is of secondary importance.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer : ~1.4332, EN ISO 14343-A:G 23 12 L, SFA/AWS A5.9:ER309L
<b>Approvals:</b>	CE EN 13479, NAKS/HAKK 1.2MM

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

<b>Alloy Type:</b>	Austenitic (with approx. 9 % ferrite) 24 % Cr - 13 % Ni - Low C
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	440 MPa	600 MPa	41 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	160 J
As welded	-60 °C	130 J
As welded	-110 °C	90 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.02	1.8	0.4	13.4	23.2	0.10	0.05	10

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
0.9 mm	65-220 A	15-28 V	3.5-18.0 m/min	1.1-5.4 kg/h
1.0 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h

## OK Autrod 309LSi

A continuous solid corrosion resistant chromium-nickel wire for welding of similar steels, wrought and cast steels of 23% Cr-12% Ni types. The alloy is also used for welding of buffer layers on CMn steels and welding of dissimilar joints. When using the wire for buffer layers and dissimilar joints it is necessary to control the dilution of the weld.

OK Autrod 309LSi has a good general corrosion resistance. The higher silicon content improves the welding properties, such as wetting.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 23 12 L Si, SFA/AWS A5.9:ER309LSi, Werkstoffnummer :~1.4332
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 1.0MM-1.2MM, CWB ER309LSi, DB 43.039.16, VdTÜV 10020

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

<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) 24 % Cr - 13 % Ni - Low C
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	440 MPa	600 MPa	41 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	160 J
As welded	-60 °C	130 J
As welded	-110 °C	90 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Ferrite FN
0.02	1.7	0.9	13.5	23.4	0.15	0.12	9

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
0.9 mm	65-220 A	15-28 V	3.5-18.0 m/min	1.1-5.4 kg/h
1.0 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h
1.6 mm	230-375 A	23-31 V	5.5-9.0 m/min	5.2-8.6 kg/h



# OK Autrod 309MoL

A continuous solid corrosion resisting wire of "309LMo" type. OK Autrod 309MoL is used for overlay welding of unalloyed and low alloyed steels and for welding of dissimilar steels such as 316L to unalloyed and low alloyed steels when Mo is essential.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 23 12 2 L, SFA/AWS A5.9:ER309LMo (mod)
<b>Approvals:</b>	CE EN 13479, VdTÜV 07352

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

<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) "309LMo" 22 % Cr - 15 % Ni - 3 % Mo - Low C
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	400 MPa	600 MPa	31 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	110 J
As welded	-60 °C	65 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.01	1.5	0.4	14.6	21.4	2.5

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	50-140 A	16-22 V	3.4-11 m/min	0.8-2.7 kg/h
1.0 mm	80-190 A	16-24 V	2.9-8.4 m/min	1.1-3.1 kg/h
1.2 mm	180-280 A	20-28 V	4.9-8.5 m/min	2.6-4.5 kg/h

## OK Autrod 310

A continuous, solid, corrosion-resistant, chromium-nickel wire for welding heat-resistant austenitic steels of the 25% Cr, 20% Ni types. OK Autrod 310 has good general oxidation resistance, especially at high temperatures, due to its high Cr content. The alloy is fully austenitic and is therefore sensitive to hot cracking. Common applications include industrial furnaces and boiler parts, as well as heat exchangers.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 25 20, SFA/AWS A5.9:ER310
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<b>Alloy Type:</b>	Fully austenitic (25 % Cr - 20 % Ni)
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Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
As welded	390 MPa	590 MPa	43 %

Typical Charpy V-Notch Properties		
Condition	Testing Temperature	Impact Value
As welded	20 °C	175 J
As welded	-196 °C	60 J

Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Mo	Cu
0.10	1.6	0.4	20.7	25.8	0.10	0.05

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	50-140 A	16-22 V	3.4-11 m/min	0.8-2.7 kg/h
1.0 mm	80-190 A	16-24 V	2.9-8.4 m/min	1.1-3.1 kg/h
1.2 mm	180-280 A	20-28 V	4.9-8.5 m/min	2.6-4.5 kg/h
1.6 mm	230-350 A	24-28 V	3.2-5.5 m/min	3-5.2 kg/h

# OK Autrod 312

A continuous, solid, corrosion-resistant, chromium-nickel wire for welding stainless steels of the 29% Cr, 9% Ni types. OK Autrod 312 has good oxidation resistance at high temperatures due to its high content of Cr. The alloy is widely used for joining dissimilar steels, especially if one of the components is fully austenitic, and steels that are difficult to weld, i.e. machine components, tools and austenitic-manganese steels.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 29 9, SFA/AWS A5.9:ER312
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<b>Alloy Type:</b>	Ferritic-austenitic (29 % Cr - 9 % Ni)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	610 MPa	770 MPa	20 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	50 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.10	1.6	0.4	8.8	30.7	0.20	0.14

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	50-140 A	16-22 V	3.4-11 m/min	0.8-2.7 kg/h
1.0 mm	80-190 A	16-24 V	2.9-8.4 m/min	1.1-3.1 kg/h
1.2 mm	180-280 A	20-28 V	4.9-8.5 m/min	2.6-4.5 kg/h

## OK Autrod 316L

A continuous solid corrosion resisting chromium-nickel-molybdenum wire for welding of austenitic stainless alloys of 18% Cr - 8% Ni and 18% Cr - 10% Ni - 3% Mo-types. OK Autrod 316L has a good general corrosion resistance, particularly against corrosion in acid and chlorinated environments. The alloy has a low carbon content which makes it particularly recommended where there is a risk of intergranular corrosion. The alloy is widely used in the chemical and food processing industries as well as in ship building and various types of architectural structures.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer :~1.4430, EN ISO 14343-A:G 19 12 3 L, SFA/AWS A5.9:ER316L
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<b>Alloy Type:</b>	Austenitic (with appr. 8 % ferrite) 19 % Cr - 12 % Ni - 3 % Mo - Low C
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	440 MPa	620 MPa	37 %
SHT 1050°C 0.5h	350 MPa	590 MPa	42 %
<b>Tested at 350\00B0C.</b>			
As welded	340 MPa	440 MPa	26 %
SHT 1050°C 0.5h	250 MPa	430 MPa	31 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	120 J
As welded	-60 °C	95 J
As welded	-196 °C	55 J
SHT 1050°C 0.5h	20 °C	110 J
SHT 1050°C 0.5h	-60 °C	90 J
SHT 1050°C 0.5h	-196 °C	50 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N	Ferrite FN
0.01	1.7	0.4	12.0	18.2	2.6	0.10	0.04	7

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
0.9 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
1.0 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.14 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h

# OK Autrod 316LSi

A continuous, solid, corrosion-resistant, chromium-nickel-molybdenum wire for welding austenitic stainless alloys of the 18% Cr -8% Ni and 18% Cr -10% Ni -3% Mo types. OK Autrod 316LSi has good general corrosion resistance; in particular, the alloy has very good resistance to corrosion in acid and chlorinated environments. The alloy has a low carbon content which makes it particularly recommended when there is a risk of intergranular corrosion. The higher silicon content improves the welding properties such as wetting. The alloy is widely used in the chemical and food processing industries, as well as in shipbuilding and various types of architectural structure.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER316LSi, Werkstoffnummer :~1.4430, EN ISO 14343-A:G 19 12 3 L Si
<b>Approvals:</b>	CE EN 13479, VdTÜV 04268, NAKS/HAKC 1.0MM-1.2MM, CWB ER316LSi, DB 43.039.05, DNV NV 316L (M13)

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

<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) 19% Cr - 12% Ni - 3% Mo - Low C - High Si
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	400 MPa	560 MPa	37 %
<b>Tested at 350\00B0C.</b>			
As welded	340 MPa	440 MPa	26 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	120 J
As welded	-60 °C	95 J
As welded	-110 °C	70 J
As welded	-196 °C	45 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Ferrite FN
0.01	1.8	0.9	12.2	18.4	2.60	0.12	7

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	12-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
0.9 mm	65-220 A	15-28 V	3.5-18.0 m/min	1.1-5.4 kg/h
1.0 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h
1.6 mm	230-375 A	23-31 V	5.5-9.0 m/min	5.2-8.6 kg/h

# OK Autrod 317L

A continuous, solid, corrosion-resistant, chromium-nickel-molybdenum wire for welding austenitic stainless alloys of the 19% Cr, 13% Ni, 3% Mo types. OK Autrod 317L has good resistance to general corrosion and pitting due to its high content of molybdenum. The alloy has a low carbon content which makes it particularly recommended where there is a risk of intergranular corrosion. The alloy is used in severe corrosion conditions, such as in the petrochemical, pulp and paper industries.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER317L, EN ISO 14343-A:G 18 15 3 L
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<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite)
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Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
As welded	390 MPa	600 MPa	45 %

Typical Charpy V-Notch Properties		
Condition	Testing Temperature	Impact Value
As welded	20 °C	135 J
As welded	-196 °C	55 J

Typical Wire Composition %								
C	Mn	Si	Ni	Cr	Mo	Cu	N	Ferrite FN
0.01	1.4	0.4	13.6	18.9	3.6	0.05	0.05	7

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	50-140 A	16-22 V	3.4-11 m/min	0.8-2.7 kg/h
1.0 mm	80-190 A	16-24 V	2.6-7.1 m/min	0.9-2.7 kg/h
1.2 mm	180-280 A	20-28 V	4.9-8.5 m/min	2.6-4.5 kg/h
1.6 mm	230-350 A	24-28 V	3.2-5.5 m/min	3-5.2 kg/h

# OK Autrod 318Si

A continuous, solid, corrosion-resistant, stabilised, chromium-nickel-molybdenum wire for welding Cr-Ni-Mo and Cr-Ni stabilised or non-stabilised steels. OK Autrod 318Si has good general corrosion resistance. The alloy is stabilised with niobium to improve resistance to the intergranular corrosion of the weld metal. The higher silicon content improves the welding properties such as wetting. Due to stabilisation by niobium, this alloy is recommended for service temperatures up to 400°C.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 19 12 3 Nb Si, Werkstoffnummer :~1.4576
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 1.2MM, DB 43.039.14, VdTÜV 09735

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

<b>Alloy Type:</b>	Austenitic (with approx. 7 % ferrite) 19% Cr - 12% Ni - 3 % Mo - Nb
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	460 MPa	615 MPa	35 %
<b>Tested at 400\00B0C.</b>			
As welded	360 MPa	480 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	100 J
As welded	-60 °C	70 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Nb	Ferrite FN
0.05	1.7	0.8	11.9	18.8	2.60	0.10	0.50	6

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
1.0 mm	80-240 A	15-28 V	4.0-16.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h

## OK Autrod 347Si

A continuous, solid, corrosion-resistant, chromium-nickel wire for welding austenitic chromium-nickel alloys of the 18% Cr-8% Ni type. OK Autrod 347Si has good general corrosion resistance. The alloy is stabilised with niobium to improve resistance to the intergranular corrosion of the weld metal. The higher silicon content improves the welding properties such as wetting. Due to the niobium content, this alloy is recommended for use at higher temperatures.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 19 9 Nb Si, SFA/AWS A5.9:ER347Si, Werkstoffnummer :~1.4551
<b>Approvals:</b>	CE EN 13479, VdTÜV 09734, NAKS/HAKC 1.0MM-1.2MM, DB 43.039.13

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

<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) 19% Cr - 9% Ni - Nb
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	440 MPa	640 MPa	37 %
<b>Tested at 400\00B0C.</b>			
As welded	340 MPa	460 MPa	26 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	110 J
As welded	-60 °C	80 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Nb	Ferrite FN
0.04	1.7	0.7	9.8	19	0.1	0.10	0.60	7

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
1.0 mm	80-240 A	15-28 V	3.5-18.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h
1.6 mm	230-375 A	23-31 V	5.5-9.0 m/min	5.2-8.6 kg/h



# OK Autrod 385

A continuous, solid, corrosion-resistant, chromium-nickel-molybdenum-copper wire for welding austenitic stainless alloys of the 20% Cr, 25% Ni, 5% Mo, 1.5% Cu, low C types. OK Autrod 385 weld metal has good resistance to stress corrosion and intergranular corrosion and shows very good resistance to attack in non-oxidising acids. The resistance to crevice corrosion is better than that of ordinary 18% Cr, 8% Ni, Mo steels. The alloy is widely used in many applications related to the process industry.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 20 25 5 Cu L, SFA/AWS A5.9:ER385
<b>Approvals:</b>	VdTUV 04905 (IT)

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

<b>Alloy Type:</b>	Fully austenitic (20 % Cr - 25 % Ni - 5 % Mo - 1.5 % Cu - Low C)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	340 MPa	540 MPa	37 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	120 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N
0.01	1.7	0.4	25.0	20.0	4.4	1.5	0.05

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	55-160 A	15-24 V	4.0-17.0 m/min	1.0-4.1 kg/h
1.0 mm	80-240 A	15-28 V	3.5-18.0 m/min	1.5-6.0 kg/h
1.2 mm	100-300 A	15-29 V	3.0-14.0 m/min	1.6-7.5 kg/h
1.6 mm	230-375 A	23-31 V	5.5-9.0 m/min	5.2-8.6 kg/h

## OK Autrod 2209

A continuous solid corrosion resisting duplex wire for welding of austenitic-ferritic stainless alloys of 22% Cr, 5% Ni, 3% Mo types. OK Autrod 2209 has a high general corrosion resistance. In media containing chloride and hydrogen sulphide the alloy has a high resistance to intergranular, pitting and especially to stress corrosion. The alloy is used in a variety of applications across all industrial segments.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 22 9 3 N L, SFA/AWS A5.9:ER2209
<b>Approvals:</b>	CE EN 13479, VdTÜV 05387, NAKS/HAKC 1.2MM, DB 43.039.18, DNV For duplex stainless steels* (M13), GL 4462S* (M13), VdTÜV 13039*

\*Valid for lot numbers starting with PV. Approvals are based on factory location. Please contact ESAB for more information.

<b>Alloy Type:</b>	Austenitic-ferritic (22.5 % Cr - 8 % Ni - 3 % Mo - Low C)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS 98 Ar/2 O2 (M13)</b>			
As welded	590 MPa	785 MPa	31 %
<b>EN 98 Ar/2 O2 (M13)</b>			
As welded	610 MPa	785 MPa	32 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS 98 Ar/2 O2 (M13)</b>		
As welded	-30 °C	105 J
As welded	-46 °C	90 J
<b>EN 98 Ar/2 O2 (M13)</b>		
As welded	-30 °C	95 J
As welded	-46 °C	90 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	N
0.01	1.5	0.5	8.5	22.7	3.2	0.17

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	50-140 A	16-22 V	3.4-11 m/min	0.8-2.7 kg/h
1.0 mm	80-190 A	16-24 V	2.9-8.4 m/min	1.1-3.1 kg/h
1.2 mm	180-280 A	20-28 V	4.9-8.5 m/min	2.6-4.5 kg/h
1.6 mm	230-350 A	24-28 V	3.2-5.5 m/min	3-5.2 kg/h

# OK Autrod 2307

A continuous, solid, corrosion-resistant duplex wire for welding austenitic-ferritic stainless alloys of the 21% Cr-1% Ni or 23% Cr-4% Ni type. OK Autrod 2307 is overalloyed in Ni to ensure a correct Ferrite balance in the weld metal. Lean duplex types are used for civil engineering, storage tanks, containers, etc. These steels have in general medium corrosion resistance and good strength properties. The welding should be done as for ordinary austenitic steels, but high amperages should be avoided and interpass temperature should be maximum 150°C.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 23 7 N L
<b>Approvals:</b>	CE EN 13479

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

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	560 MPa	730 MPa	32 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	160 J
As welded	-60 °C	60 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N
0.01	1.4	0.5	7.1	23.2	3.20	0.2	0.15

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-190 A	16-24 V	2,9-8,4 m/min	1,1-3,1 kg/h
1.2 mm	180-280 A	20-28 V	4,9-8,5 m/min	2,6-4,5 kg/h

## OK Autrod 2509

A continuous, solid, corrosion-resistant, "Super Duplex" wire for welding austenitic-ferritic, stainless alloys of the 25% Cr, 7% Ni, 4% Mo, low C types. OK Autrod 2509 has high intergranular-corrosion, pitting and stress-corrosion resistance. The alloy is widely used in applications in which corrosion resistance is of the utmost importance. The pulp and paper industry, offshore and gas industry are areas of interest.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER2594, EN ISO 14343-A:G 25 9 4 N L
<b>Approvals:</b>	CE EN 13479

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

<b>Alloy Type:</b>	Austenitic-ferritic (25 % Cr - 10 % Ni - 4 % Mo - Low C)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	659 MPa	832 MPa	30 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	159 J
As welded	-40 °C	129 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	N
0.01	0.4	0.4	9.4	25.2	3.9	0.24

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-190 A	16-24 V	2,9-8,4 m/min	1,1-3,1 kg/h
1.2 mm	180-280 A	20-28 V	4,9-8,5 m/min	2,6-4,5 kg/h

# OK Autrod 410NiMo

A continuous, solid welding wire of the 12% Cr, 4.5% Ni, 0.5% Mo type.

OK Autrod 410NiMo is used for welding similar martensitic and martensitic-ferritic steels in different applications, such as hydro turbines.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G 13 4
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<b>Alloy Type:</b>	Martensitic-ferritic (12 % Cr - 4.5 % Ni - 0.5 % Mo)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	860 MPa	1050 MPa	13 %
Stress relieved 2 hr 600 °C	850 MPa	900 MPa	17 %
Stress relieved 8 hr 600 °C	750 MPa	850 MPa	20 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	0 °C	35 J
As welded	-20 °C	30 J
Stress relieved 2 hr 600 °C	0 °C	70 J
Stress relieved 8 hr 600 °C	0 °C	75 J
Stress relieved 2 hr 600 °C	-20 °C	55 J
Stress relieved 8 hr 600 °C	-20 °C	75 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.02	0.5	0.4	4.2	12.4	0.6	0.1

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	50-140 A	16-22 V	3.4-11 m/min	0.8-2.7 kg/h
1.0 mm	80-190 A	16-24 V	2.9-8.4 m/min	1.1-3.1 kg/h
1.2 mm	180-280 A	20-28 V	4.9-8.5 m/min	2.6-4.5 kg/h

## OK Autrod 430LNb

A continuous ferritic stainless solid wire with low carbon content, 18 % Cr and stabilized with Nb, for welding similar and matching steels. OK Autrod 430LNb (W) is developed and designed for the automotive industry and used for production of exhaust systems. The wire should be used when there is a need for good resistance to corrosion and thermal fatigue. The OK Autrod 430LNb (W) is a new version of OK Autrod 430LNb, with restricted Nb limits.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer : ~1.4511, EN ISO 14343-A:G 18 L Nb
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<b>Alloy Type:</b>	18 % Cr - 0.5 % Nb
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	275 MPa	420 MPa	26 %

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Nb
0.01	0.5	0.5	0.2	18.5	0.06	0.10	0.45

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	50-140 A	16-22 V	3.4-11 m/min	0.8-2.7 kg/h
1.2 mm	180-280 A	20-28 V	4.9-8.5 m/min	2.6-4.5 kg/h

# OK Autrod 430LNbTi

A ferritic stainless solid wire with low carbon content and excellent welding properties, 18 % Cr and stabilized with Nb and Ti, for welding similar and matching steels. OK Autrod 430LNbTi is developed and designed for the Automotive industry and used for production of exhaust systems. The wire should be used when there is a need for very good resistance to corrosion and thermal fatigue.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G Z 18 L Nb Ti, Werkstoffnummer :1.4509 mod
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<b>Alloy Type:</b>	18 % Cr - Nb stabilized
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## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Ti
0.01	0.5	0.5	0.2	18.5	0.06	0.10	0.20

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	180-280 A	20-28 V	4.9-8.5 m/min	2.6-4.5 kg/h

## OK Autrod 430Ti

A ferritic, stainless, solid wire with a content of 18% Cr and stabilised with 0.5% Ti for welding similar and matching steels. The alloy is also used for cladding on unalloyed and low-alloyed steels. OK Autrod 430Ti is also widely used in the automotive industry for the welding of manifolds, catalytic converters and exhaust pipes.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:G Z 17 Ti, Werkstoffnummer :1.4502
<b>Approvals:</b>	CE EN 13479

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

<b>Alloy Type:</b>	18 % Cr - 0.5 % Ti
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
Stress relieved 0.5 hr 780 °C	380 MPa	580 MPa	28 %
Stress relieved 0.5 hr 780 °C	390 MPa	600 MPa	24 %

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Ti
0.07	0.5	0.9	0.3	17.6	0.05	0.10	0.400

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-190 A	16-24 V	2,9-8,4 m/min	1,1-3,1 kg/h
1.2 mm	180-280 A	20-28 V	4,9-8,5 m/min	2,6-4,5 kg/h
1.6 mm	230-350 A	24-28 V	3,2-5,5 m/min	3-5,2 kg/h



# OK Autrod 1100

OK Autrod 1100 is highly resistant to chemical attack and weathering. It is a relatively soft alloy that is very formable and is used extensively in thin gauge and foil products. It has good welding characteristics. A desirable characteristic of the alloy is the bright finish obtained by anodising. Non-heat treatable.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER1100, EN ISO 18273:S Al 1100 (Al99,0Cu)
<b>Approvals:</b>	CWB AWS A5.10/A5.10M:2012 (ER1100)

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

<b>Alloy Type:</b>	Al
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	30 MPa	75 MPa	35 %

## Typical Wire Composition %

Cu	Be	Si+Fe	Zn
0.07	0.0001	0.55	0.01

## Deposition Data

Diameter	Current	Voltage
1.0 mm	140-260 A	20-29 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V

## OK Autrod 18.22

Continuous solid wire suitable for welding of aluminium alloys with more than 3 % Mg, e.g. AlMg4.5Mn, AlMg5Mn and AlMg5Cr, where high tensile strength is required. Can also be used for materials of type AlMgSiCu and AlSi1MgMn and weldable AlZnMg-alloys, like AlZn4.5Mg1. The welding wire has small additions of Zr which increases the fine grained structure of weld deposit and makes it less sensitive to hot cracking during welding.

<b>Alloy Type:</b>	AlMgMn
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	160 MPa	330 MPa	25 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	26 J

### Typical Wire Composition %

Mn	Si	Al	Cu	Mg	Ti	Zr
0.8	0.06	92.93	0.03	5.8	0.03	0.1

### Deposition Data

Diameter	Current	Voltage
1.2 mm	140-260 A	20-29 V

# OK Autrod 4043

OK Autrod 4043 is one of the most widely used welding and brazing alloys and can be classed as a general purpose filler alloy. The silicon additions result in improved fluidity (wetting action) to make the alloy a preferred choice by welders. The alloy is not sensitive to weld cracking and produces bright and almost smut free welds. Not recommended for anodizing. Non-heat treatable.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER4043, EN ISO 18273:S Al 4043 (AlSi5), JIS Z 3232:A4043
<b>Approvals:</b>	CE EN 13479, DB 61.039.05, JIS JIS Z 3232, VdTÜV 12187, CWB AWS A5.10/A5.10M:2012 (ER4043)

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

<b>Alloy Type:</b>	AlSi
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	55 MPa	124 MPa	18 %

## Typical Wire Composition %

Mn	Si	Al	Cu	Fe	Ti	Zn
0.01	5.00	Rem	0.02	0.14	0.01	0.01

## Deposition Data

Diameter	Current	Voltage
0.8 mm	60-170 A	13-24 V
0.9 mm	60-170 A	13-24 V
1.0 mm	90-210 A	15-26 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V
2.0 mm	280-400 A	26-31 V
2.4 mm	280-400 A	26-31 V

# OK Autrod 4047

OK Autrod 4047 was originally developed as a brazing alloy to take advantage of its low melting point and narrow freezing range. In addition, it has higher silicon content than OK Autrod 4043, which provides an increased fluidity and reduced shrinkage. The alloy produces bright and almost smut free welds. Hot cracking is significantly reduced when using OK Autrod 4047 as a filler alloy. The alloy may be used in applications of sustained elevated temperatures.

Non-heat treatable.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER4047, EN ISO 18273:S Al 4047 (AlSi12)
<b>Approvals:</b>	CWB AWS A5.10

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

<b>Alloy Type:</b>	AlSi
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	55 MPa	124 MPa	12 %

## Typical Wire Composition %

Mn	Si	Al	Cu	Fe	Zn
0.01	11.5	Rem	0.01	0.18	0.01

## Recommended Welding Parameters

Diameter	Current	Voltage
0.8 mm	60-170 A	13-24 V
0.9 mm	60-170 A	13-24 V
1.0 mm	90-210 A	15-26 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V

# OK Autrod 5087

Continuous solid wire suitable for welding aluminium alloys with up to 5% Mg and alloys where a higher tensile strength is required. The alloying element Zr produces improved resistance to hot cracking during solidification.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER5087, EN ISO 18273:S Al 5087 (AlMg4,5MnZr)
<b>Approvals:</b>	CE EN 13479, DB 61.039.07, VdTÜV 05816

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

<b>Alloy Type:</b>	AlMgMn
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	130 MPa	280 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	35 J

## Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn	Zr
0.8	0.04	0.08	Rem	0.01	0.12	4.7	0.08	0.01	0.11

## Recommended Welding Parameters

Diameter	Current	Voltage
1.0 mm	90-210 A	15-26 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V

# OK Autrod 5183

OK Autrod 5183 was developed to provide the highest strengths possible in the as welded condition of alloy AA 5083 and other similar high magnesium alloys. The more common OK Autrod 5356 will typically fail to meet the as-welded tensile requirements of AA 5083. The alloy is typically utilised in marine and structural applications where high strengths, high fracture toughness for impact resistance and exposure to corrosive elements are important. The alloy is not recommended for elevated temperature applications due to its susceptibility to stress corrosion cracking. The alloy is non-heat treatable.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER5183, EN ISO 18273:S Al 5183 (AlMg4,5Mn0,7(A)), JIS Z 3232:A5183
<b>Approvals:</b>	CE EN 13479, JIS JIS Z 3232, BV WC, ClassNK KAI5RCG(I-1)(I-4), DB 61.039.03, DNV 5183, GL RAlMg4,5Mn, LR WC1/I-1, VdTÜV 04666, ABS ER 5183, CWB A5.10/A5.10M:2012 ER5183, RINA WC (*)

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

<b>Alloy Type:</b>	AlMgMn
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## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	90 J

## Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn
0.65	0.04	0.08	94.200	0.01	0.13	4.9	0.100	0.01

## Recommended Welding Parameters

Diameter	Current	Voltage
0.8 mm	60-170 A	13-24 V
1.0 mm	90-210 A	15-26 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V
2.4 mm	280-400 A	26-31 V

# OK Autrod 5356

OK Autrod 5356 is the most widely used welding alloy and can be classified as a general purpose type filler alloy. OK Autrod 5356 is typically chosen because of its relatively high shear strength. The 5XXX alloy base material, welded with OK Autrod 5356, with a weld pool chemistry greater than 3 % Mg and service temperatures in excess of 65°C are susceptible to stress corrosion cracking. The alloy is non-heat treatable.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER5356, EN ISO 18273:S Al 5356 (AlMg5Cr(A)), JIS Z 3232:A53556
<b>Approvals:</b>	CE EN 13479, JIS JIS Z 3232, ABS ER 5356, BV WB, DB 61.039.01, DNV 5356, LR WB/I1, VdTUV 04664, RINA WC (*), CWB A5.10/A5.10M:2012 ER5356, GL S-AlMg 5

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

<b>Alloy Type:</b>	AlMg 5
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Typical Wire Composition %							
Mn	Si	Cr	Al	Cu	Fe	Mg	Zn
0.13	0.05	0.12	94.560	0.01	0.13	4.9	0.01

Recommended Welding Parameters		
Diameter	Current	Voltage
0.8 mm	60-170 A	13-24 V
0.9 mm	60-170 A	13-24 V
1.0 mm	90-210 A	15-26 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V
2.4 mm	280-400 A	26-31 V

## OK Autrod 5554

OK Autrod 5554 is a solid aluminium wire with a content of 2.7% Mg. It is recommended for welding AlMg alloys like 5454. Typical applications include chemical storage tanks, automotive components like wheels and frame sections. The weld metal is not sensitive to stress corrosion cracking at elevated temperatures.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER5554, EN ISO 18273:S Al 5554 (AlMg2,7Mn)
<b>Approvals:</b>	CE EN 13479, CWB A5.10/A5.10:2012 ER5554

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

<b>Alloy Type:</b>	AlMg 2.7Mn
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	110 MPa	230 MPa	17 %

### Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn
0.7	0.1	0.1	96	0.01	0.1	2.7	0.15	0.01

### Recommended Welding Parameters

Diameter	Current	Voltage
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V



# OK Autrod 5556

Continuous solid wire suitable for welding of aluminium alloys with up to approx. 5 % Mg that are not age-hardenable and alloys where a higher tensile strength is required. The corrosion resistance in marine atmosphere is high.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER5556, EN ISO 18273:S Al 5556A (AlMg5Mn1Ti)
<b>Approvals:</b>	ABS ER 5556, CWB A5.10/A5.10:2012 ER5556

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

<b>Alloy Type:</b>	AlMgMn
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	145 MPa	295 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	24 J

## Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn
0.7	0.05	0.10	Rem	0.01	0.12	5.2	0.080	0.005

## Recommended Welding Parameters

Diameter	Current	Voltage
1.0 mm	90-210 A	15-26 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V
2.4 mm	280-400 A	26-31 V

# OK Autrod 5556A

Continuous solid wire suitable for welding aluminium alloys with up to approx. 5% Mg that are not age hardenable and alloys where a higher tensile strength is required. The corrosion resistance in a marine atmosphere is high.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:ER5556A, EN ISO 18273:S Al 5556A (AlMg5Mn)
<b>Approvals:</b>	CE EN 13479, VdTÜV 05794

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

<b>Alloy Type:</b>	AlMgMn
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	145 MPa	295 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	24 J

## Typical Wire Composition %

Mn	Si	Cr	Cu	Fe	Mg	Ti
0.68	0.05	0.10	0.01	0.12	5.2	0.08

## Recommended Welding Parameters

Diameter	Current	Voltage
1.0 mm	90-210 A	15-26 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V
2.4 mm	280-400 A	26-31 V

# OK Autrod 5754

OK Autrod 5754 is a solid aluminium wire with a content of 3 % Mg. It is recommended for welding of Al-Mg alloys with less than 3 % magnesium. The alloy has a relatively high strength and corrosion resistance.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 5754 (AlMg3), SFA/AWS A5.10:ER5754
<b>Approvals:</b>	VdTUV 04758

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

<b>Alloy Type:</b>	AlMg
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	110 MPa	230 MPa	23 %

## Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn
0.26	0.03	0.15	96.19	0.01	0.09	3.1	0.13	0.01

## Recommended Welding Parameters

Diameter	Current	Voltage
0.8 mm	60-170 A	13-24 V
0.9 mm	60-170 A	13-24 V
1.0 mm	90-210 A	15-26 V
1.2 mm	140-260 A	20-29 V
1.6 mm	190-350 A	25-30 V

## OK Autrod Ni-1

A continuous solid nickel based electrode alloyed with about 3% Ti for welding of high purity nickel (min 99.6%Ni), ordinary wrought nickel and nickel with reduced C content. The weld metal can be used in a wide range of applications were the construction is working with corrosive media.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNi-1, EN ISO 18274:S Ni 2061 (NiTi3)
<b>Approvals:</b>	VdTÜV 12658 (MV), VdTÜV 12664 (FP)

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

<b>Alloy Type:</b>	Nickel (Ni + 2.5 % Ti)
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### Typical Wire Composition %

C	Mn	Si	Ni	Al	Cu	Fe	Ti
0.01	0.4	0.5	96	0.06	0.01	0.04	3.1

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	100-200 A	21-27 V	6-13 m/min	2,5-5,5 kg/h

# OK Autrod NiCr-3

Continuous solid Ni-Cr wire for welding of high alloyed heat-resisting and corrosion resisting materials, 9%Ni-steels and similar steels with high notch toughness at low temperatures. Also for joining of dissimilar metals of the types mentioned. The weld metal has very good mechanical properties at high and low temperatures. Good resistance to stress corrosion.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCr-3, EN ISO 18274:S Ni 6082 (NiCr20Mn3Nb)
<b>Approvals:</b>	VdTÜV 12656 (MV), VdTÜV 12666 (FP)

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

<b>Alloy Type:</b>	Alloyed nickel (Ni + 20 % Cr + 3 % Mn + 2.5 % Nb)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	400 MPa	650 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	150 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Fe	Nb+Ta
0.04	3.0	0.2	bal	20.0	1.3	2.5

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.8 mm	70-190 A	20-27 V	5-18 m/min	1,3-4,8 kg/h
1.0 mm	100-200 A	21-27 V	6-13 m/min	2,5-5,5 kg/h
1.2 mm	160-280 A	24-30 V	6-10 m/min	3,6-6 kg/h

## OK Autrod NiCrMo-3

A continuous solid corrosion and heat-resisting Ni-Cr-Mo wire for welding of high alloyed heat-resisting and corrosion resisting materials, 9%Ni-steels and similar steels with high notch toughness at low temperatures. Also for joining of dissimilar metals of the types mentioned. The weld metal has very good mechanical properties at high and low temperatures. Good resistance to pitting and stress corrosion. This alloy is extensively required for weld cladding of valve components and pipe inner diameters in oil and gas applications.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-3, EN ISO 18274:S Ni 6625
<b>Approvals:</b>	CE EN 13479, DNV For NV 1.5Ni up to NV 9Ni, VdTÜV 12413, NAKS/HAKK 1.0MM

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

<b>Alloy Type:</b>	Alloyed nickel (Ni + 22 % Cr + 9 % Mo - 3.5 % Nb)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	500 MPa	780 MPa	45 %
As welded+	380 MPa	580 MPa	48 %
SHT 1175°C 0.5h	375 MPa	765 MPa	46 %
SHT+ 1175°C 0.5h	270 MPa	590 MPa	46 %
Stress relieved 15 hr 550 °C	490 MPa	796 MPa	40 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	130 J
As welded	-105 °C	120 J
As welded	-196 °C	110 J
SHT 1175°C 0.5h	20 °C	185 J
SHT 1175°C 0.5h	-105 °C	170 J
SHT 1175°C 0.5h	-196 °C	150 J
Stress relieved 15 hr 550 °C	20 °C	140 J
Stress relieved 15 hr 550 °C	-196 °C	120 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Fe	Nb+Ta
0.02	0.04	0.06	bal	22.7	8.6	0.3	3.5

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
0.9 mm	80-190 A	20-27 V	5-16 m/min	2-4.2 kg/h
1.0 mm	100-200 A	21-27 V	6-13 m/min	2.5-5.5 kg/h
1.14 mm	130-240 A	22-28 V	6-12 m/min	3-5.7 kg/h
1.2 mm	160-280 A	24-30 V	6-10 m/min	3.6-6 kg/h
1.6 mm	200-350 A	25-32 V	4-8 m/min	4.3-8.6 kg/h

# OK Autrod NiCrMo-4

OK Autrod NiCrMo-4 is a corrosion and heat resistant, nickel-chromium wire welding of high alloyed steel, heat resistant steel, corrosion resistant steel, 9Ni steels and similar steels with high notch toughness at low temperatures. Good resistance to stress corrosion.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-4, EN ISO 18274:S Ni 6276 (NiCr15Mo16Fe6W4)
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## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Fe	W
0.01	0.45	0.05	Bal.	15.5	16.1	5.8	3.5

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	100-200 A	21-27 V	6-13 m/min	2.5-5.5 kg/h
1.2 mm	160-280 A	24-30 V	6-10 m/min	3.6-6 kg/h

## OK Autrod NiCrMo-13

A continuous solid Ni-Cr-Mo electrode for welding of high alloyed Ni-base materials, 9%Ni steel and super austenitic steels of type 20Cr-25Ni with 4-6% Mo. Can also be used for welding carbon steel to Ni base steel. The weld metal has a very good toughness and is corrosion resistant over a wide range of applications in oxidising and reducing media.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-13, EN ISO 18274:S Ni 6059 (NiCr23Mo16)
<b>Approvals:</b>	VdTUV 12662 (MV)

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

<b>Alloy Type:</b>	Alloyed nickel (Ni + 23 % Cr + 16 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	500 MPa	750 MPa	40 %
As welded	500 MPa	700 MPa	42 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	-110 °C	120 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Al	Fe
0.01	0.2	0.1	61.0	23.0	16.0	0.3	1.0

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	100-200 A	21-27 V	6-13 m/min	2,5-5,5 kg/h
1.2 mm	160-280 A	24-30 V	6-10 m/min	3,6-6 kg/h
1.6 mm	200-350 A	25-32 V	4-8 m/min	4,3-8,6 kg/h



## OK Autrod NiCu-7

A continuous solid nickel based electrode alloyed with 30% Cu for welding of base materials of the same type. Can also be used to join these alloys to steel. The weld metal has good resistance to flowing seawater and has high strength and toughness over a rather wide temperature range. This alloy also has good resistance to hydrofluoric acid, sulfuric acid, alkalis etc. Can be used for welding of similar types of base materials which are age-hardenable with small additions of Ti and Al. Usable for cladding on carbon steel with an intermediate layer of OK Autrod Ni-1.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCu-7, EN ISO 18274:S Ni 4060 (NiCu30Mn3Ti)
<b>Approvals:</b>	VdTÜV 12660 (MV), VdTÜV 12668 (FP)

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

<b>Alloy Type:</b>	Alloyed nickel (Ni + 30 % Cu + 2 % Ti + 2 % Fe)
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### Typical Wire Composition %

C	Mn	Si	Ni	Al	Cu	Fe	Nb+Ta	Ti
0.03	3	0.3	64	0.03	28	2	< 0.5	2

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	160-280 A	24-30 V	6-10 m/min	3,6-6 kg/h

## OK Autrod NiFeCr-1

OK Autrod NiFeCr-1 is developed for overlay welding of low alloy steel pipes in the oil and gas industry. OK Autrod NiFeCr-1 can also be used to join 825 and materials of similar chemical composition using GTAW and GMAW.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiFeCr-1, EN ISO 18274:S Ni 8065
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<b>Alloy Type:</b>	Nickel alloy (22% Fe, 22% Cr, 3% Mo)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Fe	Ti
0.01	0.5	0.3	bal	21	3.0	2.3	24	0.7

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.14 mm	130-240 A	22-28 V	6-12 m/min	3-5.7 kg/h

## OK Autrod 19.12

A continuous, solid, copper wire for the GMAW joining of oxygen-free, pure copper and low-alloyed copper. OK Autrod 19.12 is alloyed with tin and has good flow properties. OK Autrod 19.12 is normally welded with pure Ar as the shielding gas.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCu, EN ISO 24373:CuSn1
<b>Approvals:</b>	NAKS/HAKC 1.2MM

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

<b>Alloy Type:</b>	Copper (Cu + 0.7 % Sn)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	75 MPa	220 MPa	30 %

### Typical Wire Composition %

Mn	Si	Cu	Fe
0.2	0.2	Bal	0.05

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed
0.8 mm	60-165 A	13-17.5 V	4-13 m/min
1.0 mm	80-210 A	12.5-18 V	4-12 m/min
1.2 mm	150-320 A	16-29 V	5-11.5 m/min

# OK Autrod 19.30

A continuous, solid, copper wire for the GMAW joining of copper-zinc alloys and low-alloyed copper and for the GMAW brazing of zinc-coated steel sheets. OK Autrod 19.30 is alloyed with silicon and manganese and has good flow properties and wear resistance. The alloy is widely used in the joining of zinc-coated steel sheets in car body production, as well as for overlay welding on low- and non-alloyed steels and cast iron. Pulsed GMAW is recommended. OK Autrod 19.30 is normally welded with pure Ar as the shielding gas; however, for GMAW brazing, the addition of 1% O<sub>2</sub> improves the brazing properties.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCuSi-A, EN ISO 24373:CuSi3Mn1
<b>Approvals:</b>	VdTÜV 09147

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

<b>Alloy Type:</b>	Alloyed copper (Cu + 3 % Si)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	130 MPa	350 MPa	40 %

## Typical Wire Composition %

Mn	Si	Cu	Fe	Sn	Zn
0.9	3	96	0.05	0.01	0.05

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed
0.8 mm	60-165 A	13-17.5 V	4.0-13.0 m/min
1.0 mm	80-210 A	12.5-18 V	4.0-12.0 m/min
1.2 mm	150-320 A	16-29 V	5-11.5 m/min

## OK Autrod 19.40

A continuous, solid, copper wire for the GMAW joining of aluminium bronzes. OK Autrod 19.40 is alloyed with aluminium and is recognised for its high strength, good wear resistance and very good corrosion resistance, particularly in salt water. The alloy is widely used for joining corrosion-resistant pipes made of aluminium bronze or other special brass alloys. Other common applications include the overlay welding of bearings, ships propellers and rails. OK Autrod 19.40 is normally welded with pure Ar as the shielding gas.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCuAl-A1, EN ISO 24373:S Cu 6100 (CuAl7)
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<b>Alloy Type:</b>	Alloyed copper ( Cu + 8 % Al)
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Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
As welded	175 MPa	420 MPa	40 %

Typical Wire Composition %						
Mn	Si	Al	Cu	Fe	Pb	Zn
0.3	0.1	7	Bal	0.4	0.01	0.1

Deposition Data			
Diameter	Current	Voltage	Wire Feed Speed
0.8 mm	60-165 A	13-17.5 V	4.0-13.0 m/min
1.0 mm	80-210 A	12.5-18 V	4.0-12.0 m/min
1.2 mm	150-320 A	16-29 V	5.0-11.5 m/min

# OK Autrod 19.49

A continuous, solid, Cu-Ni wire for welding similar alloys like 90Cu10Ni, 80Cu20Ni and 70Cu30Ni alloys. The addition of nickel strengthens the weld metal and improves the corrosion resistance, particularly in the case of salt water. The alloy is used for the overlay welding of steels and is widely used for welding Cu-Ni components for desalination plants.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCuNi, EN 14640:S Cu 7158 (CuNi30)
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<b>Alloy Type:</b>	Alloyed copper (Cu + 30 % Ni)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	180 MPa	350 MPa	40 %

## Typical Wire Composition %

C	Mn	Si	Ni	Cu	Fe
0.02	0.7	0.05	31	Bal	0.5

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed
0.8 mm	60-165 A	13-17.5 V	4-13 m/min
1.0 mm	80-210 A	12.5-18 V	4-12 m/min
1.2 mm	150-320 A	16-29 V	5-11.5 m/min

## OK Autrod CuSi Laser

A solid copper wire intended for laser brazing of zinc coated steel sheets. OK Autrod CuSi Laser is especially developed for laser brazing of body-in-white applications within the automotive industry. Compared to a standard CuSi3Mn1 copper wire OK Autrod CuSi Laser provides a more stable brazing process as well as a superior surface finish.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCuSi-A, EN 14640:S Cu 6560 (CuSi3Mn1)
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<b>Alloy Type:</b>	S Cu 6560 (CuSi3Mn1)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	130 MPa	350 MPa	40 %

### Typical Wire Composition %

Mn	Si	Cu	Fe	Sn	Zn
0.9	2.85	96	0.05	0	0.05

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed
1.0 mm	80-210 A	12.5-18 V	4-12 m/min
1.2 mm	150-320 A	16-29 V	5-11.5 m/min

## OK Autrodur 38 G M

OK Autrod 13.89 is a copper-coated, low-alloyed, solid GMAW wire used for hardfacing and building up, producing a wear-resistant weld metal with a hardness of between 35-40 HRC. It is used for the repair and maintenance of tracks, rails, wheels, rolls, rail crossings, shafts, shovel teeth and other parts on digging machines, tools like dies and so on.

<b>Classifications Wire Electrode:</b>	EN 14700:Fe2
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<b>Alloy Type:</b>	Low alloyed (0.7 C, 2 % Mn, 1 % Cr, 0.2 % Ti)
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### Typical Wire Composition %

C	Mn	Si	Cr	Ti
0.69	1.92	0.49	1.00	0.2

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.2 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h

## OK Autrodur 56 G M

OK Autrod 13.91 is a copper coated, low-alloyed solid GMAW wire used for hardfacing and building up highly wear-resistant layers on tools and machinery parts, driving rollers, digging tools and so on.  
The hardness of the weld metal becomes 50-60 HRC.

<b>Classifications Wire Electrode:</b>	EN 14700:Fe8
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<b>Alloy Type:</b>	Low alloyed (0.45 % C, 3 % Si, 9 % Cr)
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### Typical Wire Composition %

C	Mn	Si	Cr
0.44	0.4	3.02	9.24

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.2 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h
1.6 mm	225-480 A	26-38 V	3,1-8,1 m/min	3,3-0 kg/h

## OK Autrodur 58 G M

OK Autrod 13.90 is a copper-coated, low-alloyed, solid GMAW wire used for hardfacing and building up highly wear-resistant layers on machinery parts like shafts, feed screws, driving rollers, cutting tools, dies and other parts subjected to heavy wear. The hardness of the weld metal becomes 50-60 HRC.

<b>Classifications Wire Electrode:</b>	EN 14700:ZFe8
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<b>Alloy Type:</b>	Low alloyed (1.1 % C, 2 % Mn, 1.8 % Cr, 0.2 % Ti)
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### Typical Wire Composition %

C	Mn	Si	Cr
1.04	1.87	0.48	1.82

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.0 mm	80-280 A	18-28 V	2,7-14,7 m/min	1-5,4 kg/h
1.2 mm	120-350 A	20-33 V	2,7-12,4 m/min	1,5-6,6 kg/h



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## OK Tigrod 12.60

OK Tigrod 12.60 is a copper-coated Mn-Si-alloyed W2Si/ER70S-3 solid rod for the GTAW of non-alloyed steels, as used in general construction, pressure vessel fabrication and shipbuilding.

<b>Classifications Weld Metal:</b>	EN ISO 636-A:W 38 3 W2Si
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.18:ER70S-3, EN ISO 636-A:W2Si
<b>Approvals:</b>	CE EN 13479, BV 3YM, ABS ER70S-s, DNV III YM (I1)*, NAKS/HAKC 2.0MM, VdTÜV 11141, ABS 3YSA

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

<b>Alloy Type:</b>	Carbon-manganese steel
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) EN</b>			
As welded	420 MPa	515 MPa	26 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) EN</b>		
As welded	-30 °C	90 J

### Typical Wire Composition %

C	Mn	Si
0.10	1.11	0.72

## OK Tigrod 12.62

A triple deoxidized copper-coated rod designed for GTAW of mild and fine grained structural and pressure vessel steels as well as shipbuilding steels. The rod is capable of producing high quality welds in semi-killed and rimmed steel as well as steel of various carbon levels. Because of added deoxidants, Al-Ti-Zr, the rod can also be used for welding steels with a rusty or dirty surface without any sacrifice of weld quality.

<b>Classifications Weld Metal:</b>	EN ISO 636-A:W 46 4 W2Ti
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.18:ER70S-2, EN ISO 636-A:W2Ti

<b>Alloy Type:</b>	Carbon-manganese steel
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) EN</b>			
As welded	570 MPa	625 MPa	26 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) EN</b>		
As welded	-40 °C	180 J

### Typical Wire Composition %

C	Mn	Si
0.06	1.1	0.6

## OK Tigrod 12.64

OK Tigrod 12.64 is a copper-coated Mn-Si-alloyed W4Si1/ER70S-6 solid rod for the GTAW of non-alloyed steels, as used in general construction, pressure vessel fabrication and shipbuilding. It has a slightly higher manganese and silicon content than OK Tigrod 12.61 to increase the weld metal strength. This also promotes low sensitivity to surface impurities and contributes to smooth, sound welds.

<b>Classifications Weld Metal:</b>	EN ISO 636-A:W 46 3 W4Si1
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.18:ER70S-6, EN ISO 636-A:W4Si1
<b>Approvals:</b>	CE EN 13479, DNV III YM (I1), ABS 3Y (I1), BV 3YM (I1), GL 3Y (I1), LR 3Ym H15 (I1), NAKS/HAKC 1.6MM-2.4MM, VdTÜV 05260

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

<b>Alloy Type:</b>	Carbon-manganese steel
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) EN</b>			
As welded	525 MPa	595 MPa	26 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) EN</b>		
As welded	-30 °C	70 J

### Typical Wire Composition %

C	Mn	Si
0.074	1.68	0.95

# OK Tigrod 13.08

OK Tigrod 13.08 is a 1.5Mn-0.4Mo-alloyed (ER80S-D2), copper-coated rod for the GTAW of creep-resistant steels of the same type, such as pipes in pressure vessels and boilers with a working temperature of up to about 500°C. The rod can also be used for welding low-alloyed, high tensile strength steels.

<b>Classifications Weld Metal:</b>	EN ISO 636-B:W55 3 W4M31
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER80S-D2, EN ISO 636-B:W4M31
<b>Approvals:</b>	NAKS/HAKC 2.4mm

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

<b>Alloy Type:</b>	Low alloyed steel (0.5 % Mo)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) AWS</b>			
As welded	520 MPa	615 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) AWS</b>		
As welded	-29 °C	80 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.07	1.8	0.7	0.05	0.05	0.4

## OK Tigrod 13.09

OK Tigrod 13.09 is a 0.5Mo-alloyed, copper-coated rod for the GTAW of creep-resistant steels of the same type, such as pipes in pressure vessels and boilers with a working temperature of up to about 500°C.

<b>Classifications Weld Metal:</b>	EN ISO 636-A:W 46 2 W2Mo
<b>Classifications Wire Electrode:</b>	EN ISO 636-A:W2Mo, EN ISO 21952-A:W MoSi, EN ISO 21952-B:W 52 1M3, SFA/AWS A5.28:ER70S-A1 (ER80S-G)
<b>Approvals:</b>	CE EN 13479, DNV III YMS, DB 42.039.08, NAKS/HAKC 2.0MM-3.2MM, VdTÜV 04950

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

<b>Alloy Type:</b>	Low alloyed steel (0.5 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS Ar (I1)</b>			
As welded	520 MPa	620 MPa	27 %
PWHT 620°C 1h	510 MPa	610 MPa	28 %
<b>EN Ar (I1)</b>			
PWHT 620°C 1h	450 MPa	550 MPa	31 %
As welded	490 MPa	600 MPa	30 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS Ar (I1)</b>		
As welded	-29 °C	150 J
As welded	-46 °C	130 J
PWHT 620°C 1h	-20 °C	220 J
<b>EN Ar (I1)</b>		
As welded	20 °C	180 J
As welded	-20 °C	160 J
As welded	-40 °C	90 J
As welded	-60 °C	25 J
PWHT 620°C 1h	20 °C	190 J
PWHT 620°C 1h	-20 °C	170 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.094	1.09	0.61	0.05	0.05	0.45

# OK Tigrod 13.16

OK Tigrod 13.16 is a 1.3Cr-0.5Mo-alloyed (ER80S-B2), copper-coated rod for the GTAW of creep-resistant steels like SA-387 Grade 11, A 335 Grade P11 or similar materials. The rod has a high purity chemistry with a guaranteed Bruscato factor  $X < 15$ .

<b>Classifications Wire Electrode:</b>	EN ISO 21952-A:Z CrMo1Si, SFA/AWS A5.28:ER80S-B2, EN ISO 21952-B:W 55 1CM
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 2.0MM-2.4MM

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

<b>Alloy Type:</b>	Low alloyed steel (1,3%Cr, 0.5 % Mo)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) AWS</b>			
Stress relieved 1 hr 620 °C	640 MPa	730 MPa	24 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) AWS</b>		
Stress relieved 1 hr 620 °C	-40 °C	>47 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.08	0.5	0.5	0.08	1.3	0.5



## OK Tigrod 13.17

OK Tigrod 13.17 is a 2.5Cr-1.1Mo-alloyed (ER90S-B3), copper-coated rod for the GMAW of creep-resistant steels like SA-387 Grade 22, A335 Grade P22 or similar materials. The rod has a high purity chemistry with a guaranteed Bruscato factor  $X < 15$ .

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER90S-B3, EN ISO 21952-A:Z CrMo2Si, EN ISO 21952-B:W 62 2C1M
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 2.0-2.4MM

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

<b>Alloy Type:</b>	Low alloyed steel (2,5%Cr, 1 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
Stress relieved 1 hr 690 °C	620 MPa	730 MPa	22 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
Stress relieved 1 hr 690 °C	-40 °C	>47 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.08	0.5	0.5	0.05	2.4	1.0

# OK Tigrod 13.23

OK Tigrod 13.23 is a 0.9Ni-alloyed (ER80S-Ni1), copper-coated rod for the GTAW of low-temperature, fine-grained steels. The wire provides good impact toughness down to -50°C and is especially suitable for use in the offshore industry.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER80S-Ni1
<b>Approvals:</b>	DNV IVY40M, NAKS/HAKC 2.0MM-2.4MM

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

<b>Alloy Type:</b>	Low alloyed steel (1 % Ni)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) AWS</b>			
As welded	500 MPa	600 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) AWS</b>		
As welded	0 °C	230 J
As welded	-20 °C	200 J
As welded	-46 °C	140 J
As welded	-60 °C	90 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.07	1.11	0.57	0.9	0.07	0.29

## OK Tigrod 13.26

A copper coated, low alloyed, nickel copper (0.8% Ni, 0.3 %Cu) rod for the GTAW of weathering steels such as COR-TEN, Patinax, Dillicor etc. The weld metal composition and mechanical properties also make this product suitable for welding high strength steels with a minimum yield strength less than 470 Mpa.

<b>Classifications Weld Metal:</b>	EN ISO 636-A:W46 6 W3Ni1
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER80S-G, EN ISO 636-A:W3Ni1
<b>Approvals:</b>	CE EN 13479, DNV IV YM*

\*Valid for lot numbers starting with PV. Approvals are based on factory location. Please contact ESAB for more information.

<b>Alloy Type:</b>	Low alloyed steel (0.8 % Ni - 0.4 % Cu)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) AWS</b>			
Stress relieved 2 hr 650 °C	430 MPa	545 MPa	32 %
<b>Ar (I1) EN</b>			
As welded	490 MPa	580 MPa	30 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) AWS</b>		
Stress relieved 2 hr 650 °C	20 °C	230 J
Stress relieved 2 hr 650 °C	-20 °C	210 J
Stress relieved 2 hr 650 °C	-40 °C	170 J
Stress relieved 2 hr 650 °C	-60 °C	160 J
<b>Ar (I1) EN</b>		
As welded	20 °C	200 J
As welded	-20 °C	140 J
As welded	-40 °C	60 J
As welded	-60 °C	100 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.095	1.32	0.80	0.8	0.06	0.006	0.5

# OK Tigrod 13.28

OK Tigrod 13.28 is 2.4Ni-alloyed (ER80S-Ni2), copper-coated rod for the GTAW of low-temperature, fine-grained steels in applications such as pressure vessels, pipes and the offshore industry, with a minimum yield strength of up to 470 MPa. The wire provides good impact toughness down to -60°C.

<b>Classifications Weld Metal:</b>	EN ISO 636-A:W 46 6 W2Ni2
<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER80S-Ni2, EN ISO 636-A:W2Ni2
<b>Approvals:</b>	VdTÜV 06243 (RG)

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

<b>Alloy Type:</b>	Low alloyed steel ( 2.8 % Ni)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar AWS</b>			
As welded	495 MPa	600 MPa	31 %
Stress relieved 1 hr 620 °C	515 MPa	585 MPa	30 %
<b>I1 EN</b>			
As welded	540 MPa	630 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar AWS</b>		
As welded	-60 °C	180 J
Stress relieved 1 hr 620 °C	-60 °C	150 J
Stress relieved 1 hr 620 °C	-101 °C	150 J
<b>I1 EN</b>		
As welded	-60 °C	150 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr
0.08	1.04	0.53	2.36	0.03

## OK Tigrod 13.32

OK Tigrod 13.32 is a 5Cr-0.5Mo-alloyed (ER80S-B6), copper-coated rod for the GTAW of creep-resistant steels of similar composition. The rod is also suitable for welding high strength steels with a minimum yield strength of up to 730 MPa. AWS has changed the classification for this product. The previous classification was A5.9 ER502.

<b>Classifications Wire Electrode:</b>	EN ISO 21952-A:W CrMo5Si, EN ISO 21952-B:W 55 5CM, SFA/AWS A5.28:ER80S-B6
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<b>Alloy Type:</b>	Low alloyed steel (5 % Cr - 0.5 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) AWS</b>			
As welded	730 MPa	900 MPa	22 %
Stress relieved 1 hr 745 °C	580 MPa	680 MPa	22 %
<b>Ar (I1) EN</b>			
Stress relieved 1 hr 730-760 °C	550 MPa	640 MPa	23 %
Stress relieved 1 hr 730-760 °C	430 MPa	477 MPa	19 %
Stress relieved 1 hr 730-760 °C	465 MPa	527 MPa	18 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) AWS</b>		
As welded	20 °C	100 J
As welded	-20 °C	80 J
As welded	-29 °C	50 J
Stress relieved 1 hr 745 °C	20 °C	230 J
Stress relieved 1 hr 745 °C	-20 °C	200 J
Stress relieved 1 hr 745 °C	-29 °C	200 J
<b>Ar (I1) EN</b>		
Stress relieved 1 hr 730-760 °C	20 °C	250 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.07	0.48	0.44	0.06	5.73	0.58

# OK Tigrod 13.37

OK Tigrod 13.37 is a 9Cr-1Mo-alloyed, copper-coated rod for the GTAW of high temperature steels and steels for hot hydrogen service, especially in oil refineries. The electrode is a plain ER505 type.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER80S-B8, EN ISO 21952-A:W CrMo9, EN ISO 21952-B:W 55 9C1M
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<b>Alloy Type:</b>	Alloyed steel (9 % Cr - 1 % Mo) "ER505"
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) EN</b>			
Stress relieved 2 hr 760 °C	540 MPa	660 MPa	26 %
Stress relieved 4 hr 735 °C	560 MPa	680 MPa	22 %
<b>Tested at 450°C</b>			
Stress relieved 2 hr 760 °C	430 MPa	500 MPa	17 %
<b>Tested at 482°C</b>			
Stress relieved 2 hr 760 °C	410 MPa	480 MPa	18 %
<b>Tested at 560°C</b>			
Stress relieved 2 hr 760 °C	350 MPa	390 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) EN</b>		
Stress relieved 4 hr 735 °C	-20 °C	150 J
Stress relieved 4 hr 735 °C	-40 °C	130 J
Stress relieved 4 hr 735 °C	-60 °C	50 J
Stress relieved 2 hr 760 °C	-20 °C	140 J
Stress relieved 2 hr 760 °C	-40 °C	120 J
Stress relieved 2 hr 760 °C	-60 °C	90 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.06	0.52	0.45	0.23	8.66	1.00

# OK Tigrod 13.38

OK Tigrod 13.38 is a non-copper coated, low alloyed, 9CrMoVN rod for the GTAW of high-temperature steels and steels for hot hydrogen service, especially in oil refineries. It should preferably be used for 9% Cr steels, such as P 91/T 91 steels. The alloy is modified in terms of the limits for impurity elements and is extremely "clean". This produces improved strength levels both at room temperature and at higher temperatures. AWS has changed the classification for this product. The previous classification was A5.9 ER505.

<b>Classifications Wire Electrode:</b>	EN ISO 21952-A:W CrMo91, EN ISO 21952-B:W 62 9Cr1MV, SFA/AWS A5.28:ER90S-B9
<b>Approvals:</b>	VdTÜV 07686

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

<b>Alloy Type:</b>	Alloyed steel (9 % Cr - 1 % Mo - V - N) "9CrMoVN"
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) EN</b>			
Stress relieved 4 hr 735 °C	670 MPa	760 MPa	20 %
Stress relieved 2 hr 760 °C	690 MPa	785 MPa	20 %
<b>Tested at 450°C</b>			
Stress relieved 2 hr 760 °C	510 MPa	580 MPa	14 %
<b>Tested at 482°C</b>			
Stress relieved 2 hr 760 °C	500 MPa	560 MPa	16 %
<b>Tested at 560°C</b>			
Stress relieved 2 hr 760 °C	420 MPa	450 MPa	22 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) EN</b>		
Stress relieved 4 hr 735 °C	20 °C	210 J
Stress relieved 4 hr 735 °C	0 °C	190 J
Stress relieved 4 hr 735 °C	-20 °C	130 J
Stress relieved 4 hr 735 °C	-40 °C	60 J
Stress relieved 4 hr 735 °C	-60 °C	30 J
Stress relieved 2 hr 760 °C	20 °C	200 J
Stress relieved 2 hr 760 °C	0 °C	180 J
Stress relieved 2 hr 760 °C	-20 °C	150 J
Stress relieved 2 hr 760 °C	-40 °C	90 J
Stress relieved 2 hr 760 °C	-60 °C	70 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	V	N
0.1	0.5	0.3	0.5	8.7	0.9	0.20	0.05

# OK Tigrod 55

A copper coated, low alloyed, chromium-nickel-molybdenum (0.5% Cr, 0.5% Ni, 0.2% Mo) rod for GTAW of high strength steels with a minimum tensile strength of 690 MPa. The rod is also suitable for welding of steels where a good impact strength at low temperatures is required.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.28:ER100S-G, EN ISO 16834-A:Mn3NiCrMo
<b>Classifications:</b>	SFA/AWS A5.28:ER100S-G, EN ISO 16834-A:W 55 4 Mn3NiCrMo, EN ISO 16834-A:Mn3NiCrMo

<b>Alloy Type:</b>	Low alloyed steel (0.5 % Cr - 0.5 % Ni - 0.2 % Mo)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>Ar (I1) EN</b>			
As welded	720 MPa	817 MPa	21 %
Stress relieved 2 hr 620 °C	629 MPa	716 MPa	23 %
<b>Ar(I1) AWS</b>			
As welded	636 MPa	713 MPa	16 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>Ar (I1) EN</b>		
As welded	-30 °C	129 J
As welded	-40 °C	120 J
Stress relieved 2 hr 620 °C	-30 °C	140 J
Stress relieved 2 hr 620 °C	-40 °C	79 J
<b>Ar(I1) AWS</b>		
As welded	-30 °C	123 J
As welded	-40 °C	86 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.118	1.38	0.71	0.52	0.57	0.19



## OK Tigrod 16.95

Bare, corrosion-resistant, chromium-nickel-manganese welding rods for welding austenitic stainless alloys of the 18% Cr, 8% Ni, 7% Mn types. OK Tigrod 16.95 has general corrosion resistance similar to that of the corresponding parent metal. The higher silicon content improves the welding properties such as wetting. When used for joining dissimilar materials, the corrosion resistance is of secondary importance. The alloy is used in a wide range of applications across the industry, such as the joining of austenitic, manganese, work-hardenable steels, as well as armour plate and heat-resistant steels.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER307 mod, Werkstoffnummer :~1.4370, EN ISO 14343-A:W 18 8 Mn
<b>Approvals:</b>	CE EN 13479, DB 43.039.12, VdTÜV 05421

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

<b>Alloy Type:</b>	Austenitic (18 % Cr - 8 % Ni - 7 % Mn)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	450 MPa	640 MPa	41 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	130 J
As welded	-60 °C	56 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.08	7.0	0.9	8.1	18.7	0.20	0.10

# OK Tigrod 308L

OK Tigrod 308L has a good general corrosion resistance. The alloy has a low carbon content which makes this alloy particularly recommended where there is a risk of intergranular corrosion. The alloy is widely used in the chemical and food processing industries as well as for pipes, tubes and boilers. For joining of stainless steels of 18% Cr - 8% Ni-type with low carbon content and Nb-stabilized steels of the same type if the service temperature will not exceed 350°C. Can also be used for welding of Cr-steels except in sulphur rich environments.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer : ~1.4316, SFA/AWS A5.9:ER308L, EN ISO 14343-A:W 19 9 L
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 1.6MM-2.4MM, CWB ER308L, DNV 308L (-60°C), VdTÜV 04269

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

<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) 19% Cr - 9% Ni - Low C
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	480 MPa	610 MPa	36 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	170 J
As welded	-80 °C	135 J
As welded	-196 °C	80 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N	Ferrite FN
0.02	1.9	0.4	9.8	19.8	0.20	0.15	0.05	9

# OK Tigrod 308H

Bare, corrosion-resistant, chromium-nickel rods for welding austenitic chromium-nickel alloys of the 18% Cr-8% Ni type. OK Tigrod 308H has good general corrosion resistance. The alloy has a high carbon content, which makes it suitable for applications at higher temperatures. The alloy is used in the chemical and petrochemical industries for the welding of tubes, cyclones and boilers.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER308H, EN ISO 14343-A:W 19 9 H
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<b>Alloy Type:</b>	Austenitic 19% Cr - 9% Ni - High C
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Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
As welded	350 MPa	550 MPa	30 %

Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Mo	Cu
0.05	1.9	0.5	9.2	19.8	0.15	0.1

# OK Tigrod 309L

Bare corrosion resisting chromium-nickel welding rod for welding of similar steels of 24% Cr, 13% Ni types. The alloy is also used for welding of buffer layers on CMn steels and welding of dissimilar joints. When using the wire for buffer layers and dissimilar joints it is necessary to control the dilution of the weld. OK Tigrod 309L has a good general corrosion resistance. When used for joining dissimilar materials the corrosion resistance is of secondary importance.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer : ~1.4332, SFA/AWS A5.9:ER309L, EN ISO 14343-A:W 23 12 L
<b>Approvals:</b>	CE EN 13479, CWB ER309L, NAKS/HAKC 1.6MM, VdTÜV 10021

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

<b>Alloy Type:</b>	Austenitic (with approx. 10 % ferrite) 24 % Cr - 13 % Ni - Low C
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	430 MPa	590 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	160 J
As welded	-60 °C	130 J
As welded	-110 °C	90 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N	Ferrite FN
0.02	1.8	0.4	13.4	23.2	0.10	0.08	0.05	9

# OK Tigrod 309MoL

Bare, corrosion-resistant rod of "309LMo" type. OK Tigrod 309MoL is used for the overlay welding of unalloyed and low-alloyed steels and for welding dissimilar steels such as 316L to unalloyed and low-alloyed steels when Mo is essential.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER309LMo (mod), EN ISO 14343-A:W 23 12 2 L
<b>Approvals:</b>	DNV 309MoL

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

<b>Alloy Type:</b>	Austenitic (with approx. 8% ferrite) "309LMo", 22 % Cr - 15 % Ni - 3 % Mo - Low C
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	500 MPa	610 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	130 J
As welded	-60 °C	65 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.01	1.5	0.4	14.6	21.4	2.5	0.12

# OK Tigrod 310

Bare, corrosion-resistant, chromium-nickel welding rod for welding heat-resistant austenitic steels of the 25Cr-20Ni type. The wire has a high Cr content and provides good oxidation resistance at high temperatures. Common applications include industrial furnaces and boiler parts, as well as heat exchangers.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER310, EN ISO 14343-A:W 25 20
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<b>Alloy Type:</b>	Fully austenitic (25 % Cr - 20 % Ni)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	390 MPa	590 MPa	43 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	175 J
As welded	-196 °C	60 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.10	1.6	0.4	20.7	25.8	0.10	0.05

# OK Tigrod 312

Bare, corrosion-resistant, chromium-nickel welding rods for welding materials of the 29% Cr, 9% Ni types.

OK Tigrod 312 has good oxidation resistance at high temperatures due to its high content of Cr. The alloy is widely used for joining dissimilar steels, especially if one of the components is fully austenitic, and for steels that are difficult to weld, i.e. machine components, tools and austenitic-manganese steels.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER312, EN ISO 14343-A:W 29 9
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<b>Alloy Type:</b>	Ferritic-austenitic (29 % Cr - 9 % Ni)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	610 MPa	770 MPa	20 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	50 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.10	1.6	0.4	8.8	30.7	0.20	0.14

# OK Tigrod 316L

Bare corrosion resisting chromium-nickel-molybdenum welding rods for welding of austenitic stainless alloys of 18% Cr - 8% Ni and 18% Cr - 10% Ni - 3% Mo-types. OK Tigrod 316L has a good general corrosion resistance, particularly against corrosion in acid and chlorinated environments. The alloy has a low carbon content which makes it particularly recommended where there is a risk of intergranular corrosion. The alloy is widely used in the chemical and food processing industries as well as in shipbuilding and various types of architectural structures.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer : ~1.4430, SFA/AWS A5.9:ER316L, EN ISO 14343-A:W 19 12 3 L
<b>Approvals:</b>	CE EN 13479, ABS ER 316L, NAKS/HAKC 2.0MM-3.2MM, BV 316L BT, CWB ER316L, DNV 316L (-60 °C), VdTÜV 04270

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

<b>Alloy Type:</b>	Austenitic (with approx. 10 % ferrite) 19% Cr - 12% Ni - 3% Mo - Low C
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	470 MPa	600 MPa	32 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	175 J
As welded	-60 °C	130 J
As welded	-110 °C	120 J
As welded	-196 °C	75 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N	Ferrite FN
0.01	1.7	0.4	12.0	18.2	2.6	0.10	0.04	7



## OK Tigrod 317L

Bare, corrosion-resistant, chromium-nickel-molybdenum welding rods for welding austenitic stainless alloys of the 19% Cr, 9% Ni, 3% Mo types. OK Tigrod 317L has good resistance to general corrosion and pitting due to its high content of molybdenum. The alloy has a low carbon content which makes it particularly recommended when there is a risk of intergranular corrosion. The alloy is used in severe corrosion conditions such as in the petrochemical, pulp and paper industries.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER317L, EN ISO 14343-A:W18 15 3 L
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<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) 19% Cr - 12% Ni - 3% Mo - Low C
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Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
As welded	390 MPa	600 MPa	45 %

Typical Charpy V-Notch Properties		
Condition	Testing Temperature	Impact Value
As welded	20 °C	135 J
As welded	-196 °C	55 J

Typical Wire Composition %								
C	Mn	Si	Ni	Cr	Mo	Cu	N	Ferrite FN
0.01	1.4	0.4	13.6	18.9	3.6	0.05	0.05	7

# OK Tigrod 318Si

Bare, corrosion-resistant, stabilised, chromium-nickel-molybdenum wire for welding Cr-Ni-Mo and Cr-Ni stabilised or non-stabilised steels. OK Tigrod 318Si has good general corrosion resistance. The alloy is stabilised with niobium to improve resistance to the intergranular corrosion of the weld metal. The higher silicon content improves the welding properties such as wetting. Due to stabilisation by niobium, this alloy is recommended for service temperatures up to 400°C.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer :~1.4576, EN ISO 14343-A:W 19 12 3 Nb Si
<b>Approvals:</b>	CE EN 13479, DB 43.039.15, VdTÜV 09737

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

<b>Alloy Type:</b>	Austenitic (with approx. 7 % ferrite) 19% Cr - 12% Ni - 3 % Mo - Nb
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	460 MPa	615 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	40 J
As welded	-60 °C	70 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Nb	Ferrite FN
0.05	1.7	0.8	11.9	18.8	2.60	0.10	0.50	6

# OK Tigrod 347

Bare, corrosion-resistant, chromium-nickel rods for welding stabilised austenitic chromium-nickel alloys of the 18% Cr-8% Ni type. The rods are stabilised with niobium, which provides good resistance to the intergranular corrosion of the weld metal. Due to the niobium content, this alloy is recommended for use at higher temperatures.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer :~1.4551, SFA/AWS A5.9:ER347, EN ISO 14343-A:W 19 9 Nb
<b>Approvals:</b>	NAKS/HAKC 2.4mm

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

<b>Alloy Type:</b>	Austenitic (with approx. 8 % ferrite) 19% Cr - 9% Ni - Nb
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	510 MPa	655 MPa	35 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	130 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Nb	Ferrite FN
0.04	1.4	0.4	9.5	19.3	0.10	0.05	0.50	7

# OK Tigrod 385

Bare, corrosion-resistant welding rods for welding austenitic stainless steels of the 20Cr-25Ni-4.5Mo-1.5Cu type. The weld metal has good resistance to stress corrosion and intergranular corrosion and shows very good resistance to attack in non-oxidising acids. The resistance to pitting and crevice corrosion is better than that of ordinary 18Cr-8Ni-Mo steels.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER385, EN ISO 14343-A:W 20 25 5 Cu L
<b>Approvals:</b>	VdTUV 05444 (IT)

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

<b>Alloy Type:</b>	Fully austenitic (20 % Cr - 25 % Ni - 5 % Mo - 1.5 % Cu - Low C)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	340 MPa	540 MPa	37 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	120 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N
0.01	1.7	0.4	25.0	20.0	4.4	1.5	0.05

# OK Tigrod 2209

Bare, corrosion-resistant, duplex welding rods for welding austenitic-ferritic stainless alloys of the 22% Cr, 5% Ni, 3% Mo types. OK Tigrod 2209 has high general corrosion resistance. In media containing chloride and hydrogen sulphide, the alloy has high resistance to intergranular corrosion, pitting and especially to stress corrosion. The alloy is used in a variety of applications across all industrial segments.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER2209, EN ISO 14343-A:W 22 9 3 N L
<b>Approvals:</b>	CE EN 13479, VdTÜV 05519, VdTÜV 06282, NAKS/HAKC 2.0MM-3.2MM, DB 43.039.19, VdTÜV 13010

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

<b>Alloy Type:</b>	Austenitic-ferritic (22.5 % Cr - 8 % Ni - 3 % Mo - Low C)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	600 MPa	765 MPa	28 %
SHT 1050°C 0.5h	450 MPa	730 MPa	34 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	100 J
As welded	-20 °C	85 J
As welded	-60 °C	60 J
SHT 1050°C 0.5h	20 °C	130 J
SHT 1050°C 0.5h	-20 °C	110 J
SHT 1050°C 0.5h	-60 °C	90 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	N
0.01	1.5	0.5	8.5	22.7	3.2	0.17

# OK Tigrod 2307

A continuous, solid, corrosion-resistant duplex wire for welding austenitic-ferritic stainless alloys of the 21% Cr-1% Ni or 23% Cr-4% Ni type. Lean duplex types are used for civil engineering, storage tanks, containers, etc. The welding should be done as for ordinary austenitic steels, but high amperages should be avoided and the interpass temperature should be maximum 150°C.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:W 23 7 N L
<b>Approvals:</b>	CE EN 13479

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

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	560 MPa	730 MPa	32 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	160 J
As welded	-60 °C	60 J

## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N
0.01	1.4	0.5	7.1	23.2	3.20	0.2	0.15

## OK Tigrod 2509

Bare, corrosion-resistant, "Super Duplex" rods for welding austenitic-ferritic stainless alloys of the 25% Cr, 7% Ni, 4% Mo, low C types. OK Autrod 2509 has high intergranular-corrosion, pitting and stress-corrosion resistance. The alloy is widely used in applications where corrosion resistance is of the utmost importance. The pulp and paper industry, offshore and gas industry are areas of interest.

<b>Classifications:</b>	SFA/AWS A5.9:ER2594, EN ISO 14343-A:W 25 9 4 N L
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<b>Alloy Type:</b>	Austenitic-ferritic (25 % Cr - 10 % Ni - 4 % Mo - Low C)
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Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
As welded	660 MPa	835 MPa	37 %

Typical Charpy V-Notch Properties		
Condition	Testing Temperature	Impact Value
As welded	-20 °C	200 J
As welded	-50 °C	180 J

Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Mo	N
0.01	0.4	0.4	9.4	25.2	3.9	0.24

## OK Tigrod 410NiMo

Bare welding rods of the 420NiMo type alloyed with 13% Cr, 4.5% Ni and 0.5% Mo. This alloy is used for welding similar composition martensitic and martensitic-ferritic steels in different applications, such as hydroturbines.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:W 13 4
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<b>Alloy Type:</b>	Martensitic-ferritic (13 % Cr - 4.5 % Ni - 0.5 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
Stress relieved 2 hr 600 °C	930 MPa	1000 MPa	17 %
Stress relieved 8 hr 600 °C	770 MPa	870 MPa	22 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
Stress relieved 2 hr 600 °C	0 °C	120 J
Stress relieved 2 hr 600 °C	-20 °C	120 J
Stress relieved 8 hr 600 °C	0 °C	175 J
Stress relieved 8 hr 600 °C	-20 °C	165 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu
0.02	0.5	0.4	4.2	12.4	0.6	0.1

## OK Tigrod 430LNbTi

A ferritic stainless solid wire with low carbon content and excellent welding properties, 18 % Cr and stabilized with Nb and Ti, for welding similar and matching steels. OK Tigrod 430LNbTi is developed and designed for the automotive industry and used for production of exhaust systems. The wire should be used when there is a need for very good resistance to corrosion and thermal fatigue.

<b>Classifications Wire Electrode:</b>	Werkstoffnummer :1.4509 mod, EN ISO 14343-A:W Z 18 L Nb Ti
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<b>Alloy Type:</b>	18 % Cr - Nb stabilized
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	Ti
0.01	0.5	0.5	0.2	18.5	0.06	0.10	0.20



## OK Tigrod 1100

OK Tigrod 1100 is highly resistant to chemical attack and weathering. It is a relatively soft alloy that is very formable and it is used extensively in thin-gauge and foil products. It has good welding characteristics. One desirable characteristic of the alloy is the bright finish obtained by anodising. Non-heat treatable.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 1100 (Al99,0Cu), SFA/AWS A5.10:R1100
<b>Approvals:</b>	CWB AWS A5.10/A5.10M:2012 (ER1100)

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

<b>Alloy Type:</b>	Al
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	30 MPa	75 MPa	35 %

### Typical Wire Composition %

Cu	Be	Si+Fe	Zn
0.07	0.0001	0.55	0.01

## OK Tigrod 4043

OK Tigrod 4043 is one of the most widely used welding alloys. The alloy is used for welding AlMgSi - types and AlSi - alloys with up to 7% Silicon. Not recommended for anodizing. Non-heat treatable.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 4043 (AlSi5), JIS Z 3232:A4043, SFA/AWS A5.10:R4043
<b>Approvals:</b>	CE EN 13479, DB 61.039.06, JIS JIS Z 3232, CWB AWS A5.10/A5.10M:2012 (ER4043)

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

<b>Alloy Type:</b>	AlSi
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	55 MPa	124 MPa	18 %

### Typical Wire Composition %

Mn	Si	Al	Cu	Fe	Ti	Zn
0.01	5.00	Rem	0.02	0.14	0.01	0.01

# OK Tigrod 4047

OK Tigrod 4047 was originally developed as a brazing alloy to take advantage of its low melting point and narrow freezing range. In addition, it has higher silicon content than OK Tigrod 4043, which provides an increased fluidity and reduced shrinkage. Hot cracking is significantly reduced when using OK Autrod 4047 as a filler alloy. The alloy may be used in applications of sustained elevated temperatures. Non-heat treatable.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 4047 (AlSi12), SFA/AWS A5.10:R4047
<b>Approvals:</b>	CWB AWS A5.10

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

<b>Alloy Type:</b>	Alloyed aluminium (Al + 12 % Si)
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	55 MPa	124 MPa	12 %

## Typical Wire Composition %

Mn	Si	Al	Cu	Fe	Zn
0.01	11.5	Rem	0.01	0.18	0.01

# OK Tigrod 5087

Bare welding rod suitable for welding aluminium alloys with up to 5% Mg and alloys where a higher tensile strength is required. The alloying element Zr produces improved resistance to hot cracking during solidification.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 5087 (AlMg4,5MnZr), SFA/AWS A5.10:R5087
<b>Approvals:</b>	CE EN 13479, DB 61.039.08, VdTÜV 05796

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

<b>Alloy Type:</b>	AlMgMn
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## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	130 MPa	280 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	35 J

## Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn	Zr
0.8	0.04	0.08	Rem	0.01	0.12	4.7	0.08	0.01	0.11

## OK Tigrod 5183

OK Tigrod 5183 was developed to provide the highest strengths possible in the as welded condition of alloy AA 5083 and other similar high magnesium alloys. The more common OK Tigrod 5356 will typically fail to meet the as-welded tensile requirements of AA 5083. The alloy is typically utilised in marine and structural applications where high strengths, high fracture toughness for impact resistance and exposure to corrosive elements are important. The alloy is not recommended for elevated temperature applications due to its susceptibility to stress corrosion cracking. The alloy is non-heat treatable.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 5183 (AlMg4,5Mn0,7(A)), JIS Z 3232:A5183, SFA/AWS A5.10:R5183
<b>Approvals:</b>	CE EN 13479, JIS JIS Z 3232, DB 61.039.04, VdTÜV 04667, CWB A5.10/A5.10M:2012 ER5183, ABS R 5183, NAKS/HAKS 3.2MM

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

<b>Alloy Type:</b>	AlMgMn
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	140 MPa	290 MPa	25 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	90 J

### Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn
0.65	0.04	0.08	94.200	0.01	0.13	4.9	0.100	0.01

## OK Tigrod 5356

OK Tigrod 5356 is the most widely used welding alloy and can be classified as a general purpose type filler alloy. OK Tigrod 5356 is typically chosen because of its relatively high shear strength. The 5XXX alloy base material, welded with OK Tigrod 5356, with a weld pool chemistry greater than 3 % Mg and service temperatures in excess of 65°C are susceptible to stress corrosion cracking. The alloy is non-heat treatable.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 5356 (AlMg5Cr(A)), SFA/AWS A5.10:R5356
<b>Approvals:</b>	CE EN 13479, JIS JIS Z 3232, DB 61.039.02, VdTÜV 04665, CWB A5.10/A5.10M:2012 ER5356, ABS R 5356

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

<b>Alloy Type:</b>	AlMg 5
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### Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Zn
0.13	0.05	0.12	94.560	0.01	0.13	4.9	0.01

## OK Tigrod 5554

OK Tigrod 5554 is a solid aluminium rod with a content of 2.7% Mg. It is recommended for the welding of AlMg alloys like 5454. Typical applications include chemical storage tanks, automotive components like wheels and frame sections. The weld metal is not sensitive to stress corrosion cracking at elevated temperatures.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 5554 (AlMg2,7Mn), SFA/AWS A5.10:R5554
<b>Approvals:</b>	CWB A5.10/A5.10:2012 ER5554

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

<b>Alloy Type:</b>	AlMg 5
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	110 MPa	230 MPa	17 %

### Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn
0.7	0.1	0.1	96	0.01	0.1	2.7	0.15	0.01

## OK Tigrod 5556

Bare welding rod suitable for welding of aluminium alloys with up to approx. 5 % Mg that are not age-hardenable and alloys where a higher tensile strength is required. The corrosion resistance in marine atmosphere is very good.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 5556A (AlMg5Mn1Ti), SFA/AWS A5.10:R5556
<b>Approvals:</b>	CWB A5.10/A5.10:2012 ER5556, ABS R 5556

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

<b>Alloy Type:</b>	AlMgMn
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	145 MPa	295 MPa	25 %

### Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Ti	Zn
0.7	0.05	0.10	Rem	0.01	0.12	0.080	0.005

## OK Tigrod 5556A

Bare welding rod suitable for welding aluminium alloys with up to approx. 5% Mg that are not age hardenable and alloys where a higher tensile strength is required. The corrosion resistance in a marine atmosphere is very good.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.10:R5556, EN ISO 18273:S Al 5556A (AlMg5Mn)
<b>Approvals</b>	VdTÜV 05795

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

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As Welded	145 MPa	295 MPa	25 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As Welded	+20 °C	25 J

## OK Tigrod 5754

OK Tigrod 5754 is a solid aluminium rod with a content of 3% Mg. It is recommended for welding of Al-Mg alloys with less than 3% magnesium. The alloy has a relatively high strength and corrosion resistance.

<b>Classifications Wire Electrode:</b>	EN ISO 18273:S Al 5754 (AlMg3), SFA/AWS A5.10:R5754
<b>Approvals:</b>	VdTÜV 04759

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

<b>Alloy Type:</b>	AlMg
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	110 MPa	230 MPa	23 %

### Typical Wire Composition %

Mn	Si	Cr	Al	Cu	Fe	Mg	Ti	Zn
0.26	0.03	0.15	96.19	0.01	0.09	3.1	0.13	0.01

# OK Tigrod Ni-1

A bare nickel based rod alloyed with about 3% Ti for welding of high purity nickel (min 99.6 %Ni), ordinary wrought nickel and nickel with reduced C content. The weld metal can be used in a wide range of applications where the construction is working with corrosive media.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNi-1, EN ISO 18274:S Ni 2061 (NiTi3)
<b>Approvals:</b>	VdTUV 12659, VdTUV 12665

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

<b>Alloy Type:</b>	Nickel (Ni + 2.5 % Ti)
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Typical Wire Composition %							
C	Mn	Si	Ni	Al	Cu	Fe	Ti
0.01	0.4	0.5	96	0.06	0.01	0.04	3.1

## OK Tigrod NiCr-3

Bare corrosion and heat-resisting Ni-Cr-Mo rods for welding of high alloyed heat-resisting and corrosion resisting materials, 9%Ni-steels and similar steels with high notch toughness at low temperatures.

Also for joining of dissimilar metals of the types mentioned. The weld metal has very good mechanical properties at high and low temperatures. Good resistance to pitting and stress corrosion.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCr-3, EN ISO 18274:S Ni 6082 (NiCr20Mn3Nb)
<b>Approvals:</b>	VdTÜV 12657, VdTÜV 12667

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

<b>Alloy Type:</b>	Alloyed nickel (Ni + 20 % Cr + 3 % Mn + 2.5 % Nb)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	400 MPa	650 MPa	40 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	20 °C	150 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Cu	Fe	Nb+Ta	Ti
0.04	3.0	0.2	72.50	20.0	0.01	1.3	2.5	0.35

## OK Tigrod NiCrMo-3

Bare corrosion and heat-resisting Ni-Cr-Mo rods for welding of high alloyed heat-resisting and corrosion resisting materials, 9%Ni-steels and similar steels with high notch toughness at low temperatures. Also for joining of dissimilar metals of the types mentioned. The weld metal has very good mechanical properties at high and low temperatures. Good resistance to pitting and stress corrosion.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-3, EN ISO 18274:S Ni 6625
<b>Approvals:</b>	DNV For NV1.5Ni up to NV9Ni, VdTÜV 12460

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

<b>Alloy Type:</b>	Alloyed nickel (Ni + 22 % Cr + 9 % Mo - 3.5 % Nb)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	550 MPa	780 MPa	40 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	-196 °C	100 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Fe	Nb+Ta
0.02	0.04	0.06	64.8	22.7	8.6	0.3	3.5

## OK Tigrod NiCrMo-4

OK Tigrod NiCrMo-4 is a corrosion and heat resistant, nickel-chromium rod for TIG welding of high alloyed steel, heat resistant steel, corrosion resistant steel, 9Ni steels and similar steels with high notch toughness at low temperatures. Good resistance to stress corrosion.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-4, EN ISO 18274:S Ni 6276 (NiCr15Mo16Fe6W4)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Fe	W
0.01	0.45	0.05	Bal.	15.5	16.1	5.8	3.5



## OK Tigrod NiCrMo-13

Bare Ni-Cr-Mo rods for welding of high alloyed Ni-base materials, 9% Ni steel and super austenitic steels of type 20Cr-25Ni with 4-6% Mo. Can also be used for welding carbon steel to Ni base steel. The weld metal has a very good toughness and is corrosion resistant over a wide range of applications in oxidizing and reducing media.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-13, EN ISO 18274:S Ni 6059 (NiCr23Mo16)
<b>Approvals:</b>	VdTÜV 12663 (MV)

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

<b>Alloy Type:</b>	Alloyed nickel (Ni + 23 % Cr + 16 % Mo)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	500 MPa	750 MPa	40 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	-110 °C	120 J

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Al	Fe
0.01	0.2	0.1	61.0	23.0	16.0	0.3	1.0

## OK Tigrod NiCu-7

Bare nickel based welding rods alloyed with 30% Cu for welding of base materials of the same type. Can also be used to join these alloys to steel. The weld metal has good resistance to flowing seawater and has high strength and toughness over a rather wide temperature range. Has also good resistance to hydrofluoric acid, sulfuric acid, alkalis etc. Can be used for welding of similar types of base materials which are age-hardenable with small additions of Ti and Al.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCu-7, EN ISO 18274:S Ni 4060 (NiCu30Mn3Ti)
<b>Approvals:</b>	VdTÜV 12661 (MV), VdTÜV 12669 (FP)

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

<b>Alloy Type:</b>	Alloyed nickel (Ni + 30 % Cu + 2 % Ti + 2 % Fe)
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### Typical Wire Composition %

C	Mn	Si	Ni	Al	Cu	Fe	Nb+Ta	Ti
0.03	3	0.3	64	0.03	28	2	< 0.5	2

## OK Tigrod 19.12

A continuous, solid, Cu-Ni wire for welding similar alloys like 90Cu10Ni, 80Cu20Ni and 70Cu30Ni alloys. The addition of nickel strengthens the weld metal and improves the corrosion resistance, particularly in the case of salt water. The alloy is used for the overlay welding of steels and is widely used for welding Cu-Ni components for desalination plants.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCu, EN ISO 24373:CuSn1
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<b>Alloy Type:</b>	Copper (Cu + 0.7 % Sn)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	75 MPa	220 MPa	30 %

### Typical Wire Composition %

Mn	Si	Cu	Fe
0.2	0.2	Bal	0.05

## OK Tigrod 19.30

Bare copper wire for the GTAW joining of copper-zinc alloys and low-alloyed copper alloys. OK Tigrod 19.30 is alloyed with silicon and manganese and has good flow properties and wear resistance. The alloy is widely used in the joining of zinc-coated steel sheets and/or joining low- and non-alloyed steels and cast iron. OK Tigrod 19.30 is normally welded with pure Ar as the shielding gas.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCuSi-A, EN ISO 24373:CuSi3Mn1
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<b>Alloy Type:</b>	Alloyed copper (Cu + 3 % Si)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	150 MPa	350 MPa	40 %

### Typical Wire Composition %

Mn	Si	Cu	Fe	Sn	Zn
0.9	3	96	0.05	0.01	0.05

## OK Tigrod 19.40

An aluminium-bronze (CuAl8) rod for the GTAW of rolled and cast aluminium-bronze alloys. The alloy is noted for its high strength, good wear resistance and very good corrosion resistance, particularly in salt water. OK Tigrod 19.40 is normally welded with pure Ar as the shielding gas.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCuAl-A1, EN ISO 24373:CuAl7
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<b>Alloy Type:</b>	Alloyed copper ( Cu + 8 % Al)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	175 MPa	420 MPa	40 %

### Typical Wire Composition %

Mn	Si	Al	Cu	Fe	Pb	Zn
0.3	0.1	7	Bal	0.4	0.01	0.1

## OK Tigrod 19.49

Bare Cu-Ni rods for welding similar alloys, such as 90Cu10Ni, 80Cu20Ni and 70Cu30Ni alloys. The addition of nickel strengthens the weld metal and improves corrosion resistance, particularly to salt water. The alloy is used for the overlay welding of steels and is widely used for welding Cu-Ni components for desalination plants.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.7:ERCuNi, EN 14640:S Cu 7158 (CuNi30)
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<b>Approvals:</b>	VdTÜV 11600
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Approvals are based on factory location. Please contact ESAB for more information.

<b>Alloy Type:</b>	Alloyed copper (Cu + 30 % Ni)
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	180 MPa	350 MPa	40 %

### Typical Wire Composition %

C	Mn	Si	Ni	Cu	Fe
0.02	0.7	0.05	31	Bal	0.5

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# Dual Shield 7100

FCAW wire for mild steel and 490N/mm<sup>2</sup> class high tensile strength steel. Dual Shield 7100 is a multi-purpose all position flux cored wire for use with CO<sub>2</sub> gas.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.20:E71T-1C, KS D 7104:YFW-C50DR, JIS Z 3313:YFW-C50DR, EN ISO 17632-A:T 42 0 P C 1 H10
<b>Approvals:</b>	CCS 2S 2YS H10 (C1), ABS 2SA 2YSA H10 (C1), BV SA2YM HH (C1), ClassNK KSW52G H10 (C1), DNV II YMS H10 (C1), GL 2YH10S (C1), KR RSW 51G(52G) HH (C1), LR 2S 2YS H15 (C1)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS C1 shielding gas</b>			
As welded	491 MPa	563 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS C1 shielding gas</b>		
As welded	0 °C	90 J
As welded	-20 °C	58 J

## Typical Weld Metal Analysis %

C	Mn	Si
<b>C1 Shielding gas</b>		
0.040	1.270	0.572

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	140-330 A	22-34 V	5.1-15.2 m/min	1.7-5.3 kg/h
1.6 mm	170-460 A	24-36 V	3.8-12.7 m/min	2.5-8.3 kg/h

## Dual Shield 7100 Ultra

Like many other Dual Shield products, Dual Shield 7100 Ultra operates in a wider parameter range and generates less welding fumes than many similar welding wires. The low spatter levels and easy slag removal minimizes post weld cleanup. Dual Shield 7100 Ultra can be used with either 100% CO<sub>2</sub> or 75% Ar/25% CO<sub>2</sub>. This versatility in gas selection provides the fabricator greater flexibility in choosing both wire and gas. Applications include railcar and earth moving equipment, as well as general structural steel fabrication.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.20:E71T-1C, SFA/AWS A5.20:E71T-9C, SFA/AWS A5.20:E71T-9M, JIS Z 3313:T49 2 T1-1 C AP-U (KR), EN ISO 17632-A:T 42 2 P C 1 H10, EN ISO 17632-A:T 42 2 P M 1 H10
<b>Approvals:</b>	CE EN 13479, DNV III YMS (M21), ABS 3YSA (C1), DNV III YMS (C1), DNV III YMS H10, ABS 2SA (C1), ABS 3YSA, H10 (C1), ABS 3YSA, H10 (M21), BV SA3YM H10 (C1), BV SA3YM H10 (M21), BV SA3YM H15 (C1), CCS 4YSH5 (C1), ClassNK KSW53G(C) H10 (C1), ClassNK KSW53G(M2)H10 (M21), CWB E491T-9-H8 (C1), CWB E491T-9M-H16 (M21), DNV III YMS H10 (C1), GL 3Y H10S (C1), GL 3Y H10S (M21), GL 3Y H15S (C1), KR 3YSG(C)H10 (C1), LR 3YS H10 (C1), LR 3YS H10 (M21), RS 3YS H10 (C1), VdTÜV 06616

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 shielding gas</b>			
As welded	515 MPa	585 MPa	26 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 shielding gas</b>		
As welded	-20 °C	55 J
As welded	-29 °C	34 J

### Typical Weld Metal Analysis %

C	Mn	Si
<b>C1 shielding gas</b>		
0.038	1.30	0.55

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	140-330 A	22-34 V	5.1-15.2 m/min	1.7-5.3 kg/h
1.4 mm	155-390 A	23-35 V	4.5-14.0 m/min	2.2-6.8 kg/h
1.6 mm	170-460 A	24-36 V	3.8-12.7 m/min	2.5-8.3 kg/h



## Dual Shield 7100SR

Dual Shield 7100SR (H4) is an all-position gas shielded flux cored wire with a unique balanced formulation to produce superior mechanical properties and to provide excellent operator appeal. The flux cored wire is designed for both As-Welded and post-weld heat treatment applications. The wire is formulated to provide excellent impact toughness down to -46°C and to have extremely low diffusible hydrogen of a weld metal less than 4.0 mL/100g. Excellent wet-in action of a weld puddle to produces flatter to a slight convex weld bead profile for easy slag detachment.

<b>Classifications Weld Metal:</b>	KS D 7104:YFW-C502R/YFL-C503R, SFA/AWS A5.20:E71T-1C-9C-J/12C-J H4, JIS Z 3313:YFW-C502R/YFL-C503R
<b>Approvals:</b>	LR 4YS H5 (C1), DNV IV YMS H5 (C1), ClassNK KSW54G(C)H5, BV SA4YM H5 (C1), ABS 4YSA H5 (C1), CCS 4YS H5 (C1), GL 4Y H5S (C1), KR 4YSG(C)H5 (C1)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn Ni

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding Gas</b>			
PWHT	435 MPa	520 MPa	31 %
As welded	451 MPa	541 MPa	31 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding Gas</b>		
As welded	-30 °C	152 J
As welded	-40 °C	123 J
As welded	-46 °C	88 J
PWHT	-30 °C	128 J
PWHT	-40 °C	85 J
PWHT	-46 °C	75 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni
0.03	1.24	0.42	0.47

## Dual Shield II 71 HI

Dual Shield II 71-HI is an all-position flux cored wire designed for optimum performance when using 100% CO<sub>2</sub> shielding gas, while producing diffusible hydrogen levels of <4 mL/100g over a wide range of welding parameters. This wire was designed to join low and medium carbon steels where higher impacts and toughness are required. Dual Shield II 71-HI has excellent welder appeal and performs well over steels with moderate rust and mill scale. The smooth metal transfer facilitates easy deposition of vertical – up stringer beads.

<b>Classifications Weld Metal:</b>	EN ISO 17632-A:T 42 4 P C 1 H5, KS D 7104:YFL-C504R, JIS Z 3313:T494T1-1CA-U, SFA/AWS A5.20:E71T-9C-J
<b>Approvals:</b>	CE EN 13479, GL 4YH5S (C1), CCS 4YSH5 (C1), LR 4YS H5 (C1), KR 4YSG H5 (C1), DNV IV YMS H5 (C1), ClassNK KSW54G(C)H5, BV SA4YM H5 (C1), ABS 4YSA H5 (C1)
<b>Industry or Segmentation:</b>	Marine and Offshore, Ship/Barge Building, Bridge Construction, Industrial and General Fabrication, Mobile Equipment, Pressure Vessels

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn
<b>Coating Type:</b>	Rutile

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1</b>			
As Welded	520 MPa (75.4 ksi)	585 MPa (84.8 ksi)	31 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As Welded	-30 °C (-22 °F)	120 J (88 ft-lb)
As Welded	-40 °C (-40 °F)	110 J (81 ft-lb)

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni
0.03	1.25	0.33	0.005	0.012	0.35

## Dual Shield 70 Ultra Plus

Dual Shield 70 Ultra Plus is an all-position wire that is uniquely designed to provide high deposition, outstanding all position performance and a fume emission rate approaching that of solid wires. It is optimized for use with 90% Ar/10% CO<sub>2</sub> shielding but works well with mixes ranging from 75% Ar/25% CO<sub>2</sub> to 95% Ar/5% CO<sub>2</sub>. Among the outstanding features of Dual Shield 70 Ultra Plus are a very wide operating window, very high out of position deposition rates (vertical up and overhead at over 5.44 kg/h), and welds that are virtually spatter free. Dual Shield 70 Ultra Plus may be used in a variety of applications including railcar, automotive, heavy equipment, and general structural steel fabrication. It is especially recommended in applications where reduction of welding fume is a priority.

<b>Classifications:</b>	AWS A5.20:E71T1-M-H8/T-9M-H8, AWS A5.36:E71T1-M21A4-CS1-H8, AWS A5.36:E71T1-M20A2-CS1, ASME SFA 5.20, ASME SFA 5.36
<b>Approvals:</b>	ABS , CWB CSA W48 E491T-1M-H8
<b>Industry or Segmentation:</b>	Bridge Construction, Civil Construction, Railcars, Mobile Equipment, Ship/Barge Building, Industrial and General Fabrication, Steel Industry, Process, Automotive

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

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>75% Ar - 25% CO<sub>2</sub></b>			
As Welded	525 MPa	595 MPa	29 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>75% Ar - 25% CO<sub>2</sub></b>		
As Welded	-18 °C	72 J
As Welded	-29 °C	54 J
<b>90% Ar - 10% CO<sub>2</sub></b>		
As Welded	-18 °C	92 J
As Welded	-29 °C	58 J

### Typical Weld Metal Analysis %

C	Mn	Si	S	P
<b>75% Ar - 25% CO<sub>2</sub></b>				
0.04	1.2	0.6	0.012	0.016

# Dual Shield 70 Ultra Plus

Deposition Data					
Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
<b>92% Ar - 8% CO<sub>2</sub></b>					
1.2 mm	150 A	25.5 V	508 cm/min	1.8 kg/h	84 %
1.2 mm	200 A	26.5 V	762 cm/min	2.7 kg/h	86 %
1.2 mm	245 A	27.5 V	1016 cm/min	3.7 kg/h	86 %
1.2 mm	293 A	29 V	1270 cm/min	4.6 kg/h	87 %
1.2 mm	335 A	30.5 V	1524 cm/min	5.5 kg/h	87 %
1.4 mm	157 A	24 V	381 cm/min	1.8 kg/h	86 %
1.4 mm	205 A	24.5 V	508 cm/min	2.5 kg/h	86 %
1.4 mm	265 A	26 V	762 cm/min	3.7 kg/h	86 %
1.4 mm	335 A	27.5 V	1016 cm/min	5.0 kg/h	87 %
1.4 mm	365 A	29 V	1270 cm/min	6.3 kg/h	87 %
1.4 mm	465 A	31.5 V	1524 cm/min	7.5 kg/h	87 %
1.6 mm	210 A	24.5 V	381 cm/min	2.5 kg/h	86 %
1.6 mm	315 A	25.5 V	635 cm/min	4.2 kg/h	86 %
1.6 mm	360 A	26.5 V	762 cm/min	4.9 kg/h	86 %
1.6 mm	410 A	27.5 V	889 cm/min	5.7 kg/h	86 %
1.6 mm	432 A	28.5 V	1016 cm/min	6.7 kg/h	87 %
1.6 mm	545 A	30 V	1270 cm/min	8.3 kg/h	87 %

Recommended Welding Parameters			
Diameter	Amps	Volts	Wire Feed Speed
<b>75% Ar - 25% CO<sub>2</sub></b>			
1.2 mm	150-200 A	25.5-26.5 V	508-762 cm/min
1.2 mm	245-293 A	27.5-29 V	1016-1270 cm/min
1.2 mm	335 A	30.5 V	1524 cm/min
1.4 mm	157-205 A	24-24.5 V	381-508 cm/min
1.4 mm	265-335 A	26-27.5 V	762-1016 cm/min
1.4 mm	365-465 A	29-31.5 V	1270-1524 cm/min
1.6 mm	210-315 A	24.5-25.5 V	381-635 cm/min
1.6 mm	360-410 A	26.5-27.5 V	762-889 cm/min
1.6 mm	432-545 A	28.5-30 V	1016-1270 cm/min

## Dual Shield T-5

Dual Shield T-5 is a basic slag flux cored wire that produces crack resistant, highly ductile weld deposits. The small diameter wires, such as 1.2mm-1.6mm diameters can be used out-of-position. The arc characteristics are globular but can be improved with the use of argon mixes. Dual Shield T-5 is recommended for medium to heavy fabrication of many mild steels where superior toughness and crack resistance are required. It is a good choice for mild steel or when being joined to quenched and tempered low alloy high strength steels. The weld metal analysis is similar to an E7018 or E7018-1 low hydrogen electrode.

<b>Classifications:</b>	A5.20:E71T-5C-JH4/T-5M-JH4, AWS A5.36:E71T5-M21A6-CS1-H4, AWS A5.36:E71T5-M21P6-CS1-H4, ASME SFA 5.20, ASME SFA 5.36
<b>Approvals:</b>	TUV
<b>Industry or Segmentation:</b>	Civil Construction, Railcars, Mobile Equipment, Industrial and General Fabrication

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

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Reduction in Area	Elongation
<b>75% Ar - 25% CO<sub>2</sub></b>				
As Welded	460 MPa	560 MPa	71 %	31 %
Stress Relieved 2 hr 621 °C	355 MPa	500 MPa	76 %	34 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>75% Ar - 25% CO<sub>2</sub></b>		
As Welded	-18 °C	130 J
As Welded	-29 °C	110 J
As Welded	-40 °C	96 J
As Welded	-51 °C	80 J
Stress Relieved 2 hr 621 °C	-18 °C	236 J
Stress Relieved 2 hr 621 °C	-29 °C	178 J
Stress Relieved 2 hr 621 °C	-40 °C	140 J
Stress Relieved 2 hr 621 °C	-51 °C	126 J

### Typical Weld Metal Analysis %

C	Mn	Si	S	P
<b>75% Ar - 25% CO<sub>2</sub></b>				
0.066	1.45	0.52	0.013	0.007

### Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	TTW Dist.	Efficiency
<b>75% Ar - 25% CO<sub>2</sub></b>						
1.2 mm	170 A	19 V	724 cm/min	3.2 kg/h	19 mm	96 %
1.2 mm	250 A	30 V	1191 cm/min	4.9 kg/h	25.4 mm	91 %

## Dual Shield T-5

### Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	TTW Dist.	Efficiency
1.2 mm	300 A	32 V	1539 cm/min	6.4 kg/h	25.4 mm	92 %
1.6 mm	300 A	30 V	574 cm/min	4.5 kg/h	25.4 mm	92 %
1.6 mm	400 A	32 V	937 cm/min	7.3 kg/h	25.4 mm	92 %

### Recommended Welding Parameters

Diameter	Amps	Volts	Wire Feed Speed	TTW Dist.
<b>75% Ar - 25% CO<sub>2</sub></b>				
1.2 mm	140-190 A	19-28 V	635-889 cm/min	19-25.4 mm
1.2 mm	240-300 A	29-32 V	1143-1651 cm/min	19-25.4 mm
1.2 mm	300 A	32 V	1651 cm/min	19-25.4 mm
1.6 mm	220-280 A	29-30 V	457-635 cm/min	19-25.4 mm
1.6 mm	280-380 A	31-32 V	635-1016 cm/min	25.4-31.75 mm

# Coreweld 70

Coreweld 70 is a tubular wire containing ingredients primarily comprised of metal powder along with additional arc stabilizers and alloying elements. The net result is a high efficiency (90 to 98%) wire. Arc characteristics, weld metal transfer, spatter levels are improved, while silica islands are minimized with the use of Argon mixtures up to 92% Argon. Due to the high level of iron powder and low slag components, the only slag formed by this wire are small islands of silica. Coreweld 70 was designed for multipass welding in robotic applications where slag removal between passes is difficult. This metal cored product is intended for use on carbon steels having tensile strengths up to 485 MPa. Coreweld 70 wires from .1.2 mm up to 1.6 mm are capable of being welded out-of-position.

<b>Classifications:</b>	AWS A5.18:E70C-6M-H4, AWS A5.36:E70T15-M21A2-CS1-H4, AWS A5.36:E70T15-M20A2-CS1-H4, ASME SFA 5.18, ASME SFA 5.36
<b>Approvals:</b>	DB , CWB CSA W48 E491C-6M-H4
<b>Industry or Segmentation:</b>	Automotive, Mobile Equipment, Industrial and General Fabrication, Power Generation, Bridge Construction, Civil Construction, Pipeline, Ship/Barge Building, Railcars

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

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Reduction in Area	Elongation
<b>75% Ar - 25% CO<sub>2</sub></b>				
As Welded	460 MPa	550 MPa	67 %	28 %
<b>92% Ar - 8% CO<sub>2</sub></b>				
As Welded	545 MPa	585 MPa	65 %	26 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>75% Ar - 25% CO<sub>2</sub></b>		
As Welded	-18 °C	68 J
As Welded	-29 °C	54 J
<b>92% Ar - 8% CO<sub>2</sub></b>		
As Welded	-18 °C	81 J
As Welded	-29 °C	68 J

## Typical Weld Metal Analysis %

C	Mn	Si	S	P
<b>75% Ar - 25% CO<sub>2</sub></b>				
0.06	1.4	0.6	0.019	0.010
<b>92% Ar - 8% CO<sub>2</sub></b>				
0.06	1.5	0.6	0.019	0.009

# Coreweld 111 RB

Coreweld 111RB is a low slag type cored wire with superior pit resistance in welding of primer coated steels. This wire shows good usability similar to conventional flux cored wires but provides high deposition rate and high deposition efficiency.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.20:E70T-1C, JIS Z 3313:T490T1-0CA-U, JIS Z 3313:YFW-C50DM, KS D 7104:YFW-C50DM
<b>Approvals:</b>	ABS 2YSA H10 , ABS 3YA H10, BV A3M, A3YM, BV SA2YM HH, ClassNK KSW52G(C)H10, DNV II YMS H10, DNV III YM, GL 2Y H10S, KR 3YMG(C), KR 2YSG (C) H10, LR 2 YS H10 (C1), LR 3YM H15, RINA 2YS H10

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn Ni

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding gas</b>			
As welded	498 MPa	587 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding gas</b>		
As welded	0 °C	75 J
As welded	-20 °C	50 J

## Typical Weld Metal Analysis %

C	Mn	Si
<b>C1 shielding gas</b>		
0.05	1.46	0.54



# Coreweld 111 Ultra

Coreweld 111 Ultra is a low slag type cored wire with a bright surface finish that is specially designed to provide very high deposition rates, high deposition efficiency, and low fume emission rates. This wire is most suitable for fillet welding of inorganic zinc primer coated steels in the shipbuilding.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.20:E70T-1C/9C, JIS Z 3313:T492T1-0CA-U, JIS Z 3313:YFW-C502M, KS D 7104:YFW-C502M
<b>Approvals:</b>	CE EN 13479, GL 3YS, BV SA3YM, DNV III YMS, ABS 3YSA H10, CCS 3YSH10, BV A3YM, ABS 3YA H10- Tandem, CCS 3M,3YM , ClassNK KAW53MG(C) - Tandem, KR 3YMG (C), CCS 3S,3YS H10 , GL 3YM - Tandem, KR 3YSG, LR 3YM (tandem), LR 3YS H10 , RINA 3Y S H10

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn Ni

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding gas</b>			
As welded	500 MPa	580 MPa	30 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding gas</b>		
As welded	-20 °C	67 J
As welded	-30 °C	43 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
0.057	1.375	0.652	0.348

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-330 A	28-34 V	5.1-15.2 m/min	1.9-5.9 kg/h
1.6 mm	190-500 A	27-39 V	3.8-12.7 m/min	2.8-9.1 kg/h
2.0 mm	250-450 A	26-31 V	2.8-6.6 m/min	2.9-6.7 kg/h

## Dual Shield 55

An all-positional rutile cored wire for welding steels with a minimum yield strength of 550 MPa, for use with M21 shielding gas.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E91T1-M21A4-G, EN ISO 18276-A:T 55 4 Z P M 2 H5
<b>Approvals:</b>	CE EN 13479, ABS 4YQ500

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

<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	< 5 ml/100g
<b>Alloy Type:</b>	Low alloy steel (<1% Ni)

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>M21 shielding gas</b>			
As welded	604 MPa	663 MPa	27 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>M21 shielding gas</b>		
As welded	-40 °C	106 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni
<b>M21 shielding gas</b>			
0.05	1.45	0.41	0.95

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	100-300 A	21-32 V	3.2-14.5 m/min	1.3-5.8 kg/h

# Dual Shield 62

An all-positional rutile cored wire for welding steels with a minimum yield strength of 620 MPa, for use with M21 shielding gas.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E101T1-M21A4-G-H4, EN ISO 18276-A:T 62 4 Mn1.5Ni P M 2 H5
<b>Approvals:</b>	NAKS/HAKC 1.2 mm

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Low alloy

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>M21 shielding gas</b>			
As welded	670 MPa	740 MPa	24 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>M21 shielding gas</b>		
As welded	-40 °C	95 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
<b>M21 shielding gas</b>			
0.061	1.58	0.41	1.50

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	100-300 A	21-32 V	3.2-14.5 m/min	1.3-5.8 kg/h

## Dual Shield 69

Dual Shield 69 is ESAB's new all-positional, low hydrogen rutile cored wire for use with Ar/CO<sub>2</sub> shielding gas mixtures. Designed for high integrity welding of high strength steels this wire produces tough weld metal down to -60°C and meets the low diffusible hydrogen grade of H4. High strength steels are increasingly being used as they offer the designer the possibility of making lighter, higher performance structures with good overall cost effectiveness together with lower environmental impacts. The use of high-strength steel can mean lower fabrication costs, increased payloads, more durable products, more effective space utilisation and increased safety.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E111T1-M21A6-G-H4, EN ISO 18276-A:T 69 6 Z P M 2 H5
<b>Approvals:</b>	ABS 4Y69M, ABS E111T1-GJM-H4

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Low Alloy (Ni-Mo)

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	740 MPa	790 MPa	20 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	-40 °C	65 J
As welded	-60 °C	58 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Mo
0.095	1.25	0.34	2.8	0.4

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-350 A	21-32 V	5.6-19.8 m/min	2.1-7.5 kg/h

# Dual Shield 110C

High strength steels are increasingly being used as they offer the designer the possibility of making lighter, higher performance structures with good overall cost effectiveness together with lower environmental impacts. The use of high-strength steel can mean lower fabrication costs, increased payloads, more durable products, more effective space utilization and increased safety.

Dual Shield 110C is ESAB's new all-positional, low hydrogen rutile cored wire for use with CO<sub>2</sub> shielding gas mixtures. Designed for high integrity welding of high strength steels this wire produces tough weld metal down to -60°C and meets the low diffusible hydrogen grade of H4. The benefits of using this wire with CO<sub>2</sub> shielding gas include availability, cost and the advantageous depth to width bead profile.

Dual Shield 110C is extremely welder friendly. It is easy to obtain flat welds with good penetration and smooth wetting into the plate edges. The brittle slag is easily removed leaving a smooth weld appearance. Typical positional welding defects such as lack of fusion and slag inclusions are avoided. The wires have a high tolerance for poor joint preparation and high quality one-sided root runs can be made economically on ceramic backing.

High strength steels can be difficult to weld and in order to achieve the desired mechanical properties, without defects requires strict control of the welding parameters including the weld cooling rate.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E111T1-C1A6-G-H4, EN ISO 18276-A:T 69 6 Z P C 2 H5
<b>Approvals:</b>	ABS 4Y69M*, ABS E111T1-GJM-H4*

\* CVN >47J at -60°C. Approvals are based on factory location. Please contact ESAB for more information.

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Low Alloy (Ni Mo)

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 shielding gas AWS</b>			
As welded	761 MPa	840 MPa	18 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 shielding gas AWS</b>		
As welded	-60 °C	60 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Mo
<b>C1 Shielding gas</b>				
0.055	1.21	0.39	2.3	0.4

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	100-300 A	21-32 V	3.2-14.5 m/min	1.3-5.8 kg/h

## Dual Shield 4130N

Dual Shield 4130N is an all-position wire designed for welding alloy steels such as AISI 8630, 4130, and comparable types. This wire produces exceptional mechanical properties and low temperature impact toughness after PWHT.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.29:E101T1-GC
<b>Approvals:</b>	ABS 4YQ550SA, H5, BV SA4Y55M, H5, DNV IV Y55, H5

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn Cr Ni Mo

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding gas</b>			
PWHT	620 MPa	730 MPa	21 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding gas</b>		
PWHT	-10 °C	80 J
PWHT	-30 °C	50 J
PWHT	-40 °C	40 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.045	1.50	0.25	0.93	0.40	0.40

## Dual Shield 8000-B2

Dual Shield 8000-B2 is an all-position flux cored electrode which contains 1.25% Cr - 0.5% Mo. The analysis is very similar to Dual Shield 88 CM, except 8000-B2 is for out-of-position welding. The weld metal analysis is similar to an E8018-B2 low Hydrogen electrode. Dual Shield 8000-B2 wire is used for the welding of such steel as 0.5% Cr - 0.5% Mo, 1% Cr-0.5% Mo, and 1.25% Cr - 0.5% Mo. This wire is designed for single or multiple pass welding. Shielding gases of 100% CO<sub>2</sub> and 75% Ar - Remainder CO<sub>2</sub> may be used.

<b>Classifications:</b>	AWS A5.29:E81T1-B2C/E81T1-B2M, AWS A5.36:E81T1-C1PZ-B2, AWS A5.36:E81T1-M21PZ-B2, ASME SFA 5.29, ASME SFA 5.36
<b>Industry or Segmentation:</b>	Pipeline, Petrochemical, Power Generation

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>100% CO<sub>2</sub></b>			
Stress Relieved 1 hr 690 °C	593 MPa	680 MPa	22 %
<b>75% Ar - 25% CO<sub>2</sub></b>			
Stress Relieved 8 hr 690 °C	558 MPa	648 MPa	24 %

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Cr	Mo
<b>75% Ar - 25% CO<sub>2</sub></b>						
0.06	0.70	0.60	0.008	0.009	1.30	0.50

### Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
<b>75% Ar - 25% CO<sub>2</sub></b>					
1.2 mm	150 A	28 V	508 cm/min	1.91 kg/h	86 %
1.2 mm	210 A	29 V	762 cm/min	86 kg/h	86 %
1.2 mm	250 A	30 V	1016 cm/min	3.86 kg/h	87 %
1.2 mm	290 A	33 V	1270 cm/min	4.85 kg/h	87 %
1.2 mm	330 A	34 V	1524 cm/min	5.76 kg/h	87 %
1.4 mm	155 A	25 V	381 cm/min	2 kg/h	87 %
1.4 mm	245 A	28 V	635 cm/min	3.31 kg/h	86 %
1.4 mm	310 A	33 V	889 cm/min	4.63 kg/h	85 %
1.4 mm	360 A	36 V	1143 cm/min	6.03 kg/h	85 %
1.4 mm	430 A	37 V	1524 cm/min	7.98 kg/h	87 %
1.6 mm	190 A	27 V	38 cm/min	2.77 kg/h	87 %
1.6 mm	300 A	30 V	35 cm/min	4.63 kg/h	87 %
1.6 mm	365 A	33 V	762 cm/min	5.58 kg/h	86 %
1.6 mm	410 A	33 V	889 cm/min	6.35 kg/h	88 %
1.6 mm	450 A	33 V	1016 cm/min	7.3 kg/h	87 %
1.6 mm	500 A	39 V	1270 cm/min	9.11 kg/h	87 %

## Dual Shield 8000-Ni2

Dual Shield 8000-Ni2 is an all-position flux cored electrode that deposits 2.5% Ni deposit with an 565 MPa minimum tensile strength. Dual Shield 8000-Ni2 may be used with CO<sub>2</sub> or argon mixtures. The argon-CO<sub>2</sub> mixtures reduce spatter and further improve weldability especially for small vertical-up fillets. Dual Shield 8000-Ni2 produces superior weld metal properties which make it most desirable for such applications as shipbuilding and heavy machinery construction. The weld metal analysis is similar to an E8018-C1 low hydrogen electrode.

<b>Classifications:</b>	AWS A5.29:E81T1-Ni2C-JH8/E81T1-Ni2M H8, AWS A5.36:E81T1-C1A6-Ni2-H8, AWS A5.36:E81T1M21A4-Ni2-H8, ASME SFA 5.29, ASME SFA 5.36
<b>Approvals:</b>	ABS , MIL-E-24403/1 MIL-81T1-Ni2C-J/Ni2M, CWB CSA W48: E551T1-Ni2M, E551T1-Ni2C-H8
<b>Industry or Segmentation:</b>	Mobile Equipment, Industrial and General Fabrication, Bridge Construction, Process

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

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Reduction in Area	Elongation
<b>100% CO<sub>2</sub></b>				
As Welded	550 MPa	605 MPa	67 %	26 %
<b>75% Ar - 25% CO<sub>2</sub></b>				
As Welded	565 MPa	620 MPa	68 %	27 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>100% CO<sub>2</sub></b>		
As Welded	-18 °C	84 J
As Welded	-29 °C	58 J
As Welded	-40 °C	53 J
As Welded	-51 °C	46 J
<b>75% Ar - 25% CO<sub>2</sub></b>		
As Welded	-18 °C	69 J
As Welded	-29 °C	64 J
As Welded	-40 °C	54 J
As Welded	-51 °C	37 J

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni
<b>100% CO<sub>2</sub></b>					
0.05	0.90	0.30	0.010	0.012	2.20
<b>75% Ar - 25% CO<sub>2</sub></b>					
0.05	1.10	0.40	0.010	0.012	2.20



## Dual Shield 8000-Ni2

Deposition Data					
Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
1.2 mm	150 A	28 V	508 cm/min	1.91 kg/h	86 %
1.2 mm	210 A	29 V	762 cm/min	86 kg/h	86 %
1.2 mm	250 A	30 V	1016 cm/min	3.86 kg/h	87 %
1.2 mm	290 A	33 V	1270 cm/min	4.85 kg/h	87 %
1.2 mm	330 A	34 V	1524 cm/min	5.76 kg/h	87 %
1.4 mm	155 A	25 V	381 cm/min	2 kg/h	87 %
1.4 mm	245 A	28 V	635 cm/min	3.31 kg/h	86 %
1.4 mm	310 A	33 V	889 cm/min	4.63 kg/h	85 %
1.4 mm	360 A	36 V	1143 cm/min	6.03 kg/h	85 %
1.4 mm	430 A	37 V	1524 cm/min	7.98 kg/h	87 %
1.6 mm	190 A	27 V	38 cm/min	2.77 kg/h	87 %
1.6 mm	300 A	30 V	35 cm/min	4.63 kg/h	87 %
1.6 mm	365 A	33 V	762 cm/min	5.58 kg/h	86 %
1.6 mm	410 A	33 V	889 cm/min	6.35 kg/h	88 %
1.6 mm	450 A	33 V	1016 cm/min	7.3 kg/h	87 %
1.6 mm	500 A	39 V	1270 cm/min	9.11 kg/h	87 %

## Dual Shield 9000-C1

Dual Shield 9000-C1 is an all-position flux cored electrode which produces a 2.5% Ni deposit. The analysis is very similar to the Dual Shield T-90C1 except that this product has out-of-position capability. Dual Shield 9000-C1 is used for welding of 2-3% Ni steels and castings used in applications requiring good toughness at subzero temperatures. Shielding gas 100% CO<sub>2</sub> and 75% Ar - Remainder CO<sub>2</sub> may be used.

<b>Classifications:</b>	AWS A5.29:E91T1-Ni2C/E91T1-Ni2M, AWS A5.36:E91T1-C1A4-Ni2, AWS A5.36:E91T1-M21A4-Ni2, ASME SFA 5.29, ASME SFA 5.36
<b>Industry or Segmentation:</b>	Process, Ship and Offshore Yards

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>100% CO<sub>2</sub></b>			
As Welded	580 MPa	665 MPa	25 %
<b>75% Ar - 25% CO<sub>2</sub></b>			
As Welded	610 MPa	680 MPa	24 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>100% CO<sub>2</sub></b>		
As Welded	-18 °C	52 J
As Welded	-40 °C	41 J
<b>75% Ar - 25% CO<sub>2</sub></b>		
As Welded	-40 °C	45 J

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni
<b>100% CO<sub>2</sub></b>					
0.07	1.20	0.50	0.010	0.013	2.50
<b>75% Ar - 25% CO<sub>2</sub></b>					
0.08	1.50	0.70	0.011	0.014	2.60

# Dual Shield 9000-C1

## Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
<b>75% Ar - 25% CO<sub>2</sub></b>					
1.2 mm	150 A	28 V	508 cm/min	1.91 kg/h	86 %
1.2 mm	210 A	29 V	762 cm/min	86 kg/h	86 %
1.2 mm	250 A	30 V	1016 cm/min	3.86 kg/h	87 %
1.2 mm	290 A	33 V	1270 cm/min	4.85 kg/h	87 %
1.2 mm	330 A	34 V	1524 cm/min	5.76 kg/h	87 %
1.4 mm	155 A	25 V	381 cm/min	2 kg/h	87 %
1.4 mm	245 A	28 V	635 cm/min	3.31 kg/h	86 %
1.4 mm	310 A	33 V	889 cm/min	4.63 kg/h	85 %
1.4 mm	360 A	36 V	1143 cm/min	6.03 kg/h	85 %
1.4 mm	430 A	37 V	1524 cm/min	7.98 kg/h	87 %
1.6 mm	190 A	27 V	38 cm/min	2.77 kg/h	87 %
1.6 mm	300 A	30 V	35 cm/min	4.63 kg/h	87 %
1.6 mm	365 A	33 V	762 cm/min	5.58 kg/h	86 %
1.6 mm	410 A	33 V	889 cm/min	6.35 kg/h	88 %
1.6 mm	450 A	33 V	1016 cm/min	7.3 kg/h	87 %

## Dual Shield 9000-B3

Dual Shield 9000-B3 is an all-position flux cored electrode which deposits a 2.25% Cr - 1% Mo weld metal. The analysis is very similar to Dual Shield 98 CM, except 9000-B3 is for out-of-position welding. The weld metal analysis is similar to an E9018-B3 low hydrogen electrode. Dual Shield 9000-B3 is recommended for welding 2.25% Cr - 1% Mo steels. This wire is designed for single or multiple pass welding. Shielding gas of 100% CO<sub>2</sub> and 75% Ar - remainder CO<sub>2</sub> may be used.

<b>Classifications:</b>	AWS A5.29:E91T1-B3C, AWS A5.36:E91T1-C1PZ-B3, ASME SFA 5.29, ASME SFA 5.36
<b>Industry or Segmentation:</b>	Power Generation, Pipeline

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>100% CO<sub>2</sub></b>			
Stress Relieved 3 hr 690 °C	642 MPa	739 MPa	20 %

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Cr	Mo
<b>100% CO<sub>2</sub></b>						
0.06	0.60	0.60	0.008	0.01	2.20	1.00

### Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
<b>75% Ar - 25% CO<sub>2</sub></b>					
1.2 mm	150 A	28 V	508 cm/min	1.91 kg/h	86 %
1.2 mm	210 A	29 V	762 cm/min	86 kg/h	86 %
1.2 mm	250 A	30 V	1016 cm/min	3.86 kg/h	87 %
1.2 mm	290 A	33 V	1270 cm/min	4.85 kg/h	87 %
1.2 mm	330 A	34 V	1524 cm/min	5.76 kg/h	87 %
1.4 mm	155 A	25 V	381 cm/min	2 kg/h	87 %
1.4 mm	245 A	28 V	635 cm/min	3.31 kg/h	86 %
1.4 mm	310 A	33 V	889 cm/min	4.63 kg/h	85 %
1.4 mm	360 A	36 V	1143 cm/min	6.03 kg/h	85 %
1.4 mm	430 A	37 V	1524 cm/min	7.98 kg/h	87 %
1.6 mm	190 A	27 V	38 cm/min	2.77 kg/h	87 %
1.6 mm	300 A	30 V	35 cm/min	4.63 kg/h	87 %
1.6 mm	365 A	33 V	762 cm/min	5.58 kg/h	86 %
1.6 mm	410 A	33 V	889 cm/min	6.35 kg/h	88 %
1.6 mm	450 A	33 V	1016 cm/min	7.3 kg/h	87 %
1.6 mm	500 A	39 V	1270 cm/min	9.11 kg/h	87 %

## Dual Shield B6

Dual Shield B6 is an all-position flux cored electrode designed for use with 75% Ar / 25% CO<sub>2</sub> or 100% CO<sub>2</sub> shielding gas. Dual Shield B6 is intended for use on pipe and plate steels having a nominal 5% chromium - 0.5% molybdenum composition. These steels are typically used in process piping in the oil, gas, petrochemical, and marine industries.

<b>Classifications:</b>	AWS A5.29:E81T1-B6C/E81T1-B6M, AWS A5.36:E81T1-C1PZ-B6, AWS A5.36:E81T1-M21PZ-B6, ASME SFA 5.29, ASME SFA 5.36
<b>Industry or Segmentation:</b>	Pipeline, Petrochemical, Power Generation

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>100% CO<sub>2</sub></b>			
Stress Relieved 2 hr 746 °C	540 MPa	640 MPa	20 %
<b>75% Ar - 25% CO<sub>2</sub></b>			
Stress Relieved 2 hr 746 °C	580 MPa	676 MPa	20 %

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Cr	Mo
<b>100% CO<sub>2</sub></b>						
0.08	0.60	0.50	0.006	0.01	4.70	0.50
<b>75% Ar - 25% CO<sub>2</sub></b>						
0.05	0.50	0.70	0.007	0.006	5.40	0.50

### Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
<b>75% Ar - 25% CO<sub>2</sub></b>					
1.2 mm	150 A	28 V	508 cm/min	1.91 kg/h	86 %
1.2 mm	210 A	29 V	762 cm/min	86 kg/h	86 %
1.2 mm	250 A	30 V	1016 cm/min	3.86 kg/h	87 %
1.2 mm	290 A	33 V	1270 cm/min	4.85 kg/h	87 %
1.2 mm	330 A	34 V	1524 cm/min	5.76 kg/h	87 %
1.4 mm	155 A	25 V	381 cm/min	2 kg/h	87 %
1.4 mm	245 A	28 V	635 cm/min	3.31 kg/h	86 %
1.4 mm	310 A	33 V	889 cm/min	4.63 kg/h	85 %
1.4 mm	360 A	36 V	1143 cm/min	6.03 kg/h	85 %
1.4 mm	430 A	37 V	1524 cm/min	7.98 kg/h	87 %
1.6 mm	190 A	27 V	38 cm/min	2.77 kg/h	87 %
1.6 mm	300 A	30 V	35 cm/min	4.63 kg/h	87 %
1.6 mm	365 A	33 V	762 cm/min	5.58 kg/h	86 %
1.6 mm	410 A	33 V	889 cm/min	6.35 kg/h	88 %
1.6 mm	450 A	33 V	1016 cm/min	7.3 kg/h	87 %
	500 A	39 V	1270 cm/min	9.11 kg/h	87 %

## Dual Shield B9

Dual Shield B9 is an all-position flux cored electrode designed for the welding of modified 9% chromium creep resisting steels, such as ASTM A335 Grade P91 or ASTM A213 T91. This product is formulated with a combined Mn & Ni <1.20% to meet stringent customer specifications. Dual Shield B9 is packaged on layer level-wound wire spool baskets to allow the product to be placed in a heated storage oven. In addition, the wire is packaged in a vacuum-sealed foil bag to prevent moisture pick-up until such time the sealed bag has been opened.

<b>Classifications:</b>	AWS A5.29:E91T1-B9M, AWS A5.36:E91T1-M21PZ-B91, ASME SFA 5.29, ASME SFA 5.36, ASME IX F No. 6
<b>Industry or Segmentation:</b>	Power Generation, Pipeline

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>75% Ar - 25% CO<sub>2</sub></b>			
Stress Relieved 2 hr 760 °C	600 MPa	738 MPa	21 %

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Cr	Mo	V	N	Nb	X-Factor
0.10	0.96	0.18	0.008	0.009	9.25	1.00	0.22	0.04	0.04	< 15

### Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
<b>75% Ar - 25% CO<sub>2</sub></b>					
1.2 mm	150 A	28 V	508 cm/min	1.91 kg/h	86 %
1.2 mm	210 A	29 V	762 cm/min	86 kg/h	86 %
1.2 mm	250 A	30 V	1016 cm/min	3.86 kg/h	87 %
1.2 mm	290 A	33 V	1270 cm/min	4.85 kg/h	87 %
1.2 mm	330 A	34 V	1524 cm/min	5.76 kg/h	87 %
1.4 mm	155 A	25 V	381 cm/min	2 kg/h	87 %
1.4 mm	245 A	28 V	635 cm/min	3.31 kg/h	86 %
1.4 mm	310 A	33 V	889 cm/min	4.63 kg/h	85 %
1.4 mm	360 A	36 V	1143 cm/min	6.03 kg/h	85 %
1.4 mm	430 A	37 V	1524 cm/min	7.98 kg/h	87 %
1.6 mm	190 A	27 V	38 cm/min	2.77 kg/h	87 %
1.6 mm	300 A	30 V	35 cm/min	4.63 kg/h	87 %
1.6 mm	365 A	33 V	762 cm/min	5.58 kg/h	86 %
1.6 mm	410 A	33 V	889 cm/min	6.35 kg/h	88 %
1.6 mm	450 A	33 V	1016 cm/min	7.3 kg/h	87 %
1.6 mm	500 A	39 V	1270 cm/min	9.11 kg/h	87 %

# Dual Shield MoL

An all-positional rutile cored wire which contains 0.5Mo. Designed for argon 15-25% carbon dioxide shielding gas.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E81T1-M21PY-A1, EN ISO 17634-A:T MoL P M 2 H5
<b>Approvals:</b>	VdTÜV 12161

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	0.5Mo

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>M21 Shielding gas</b>			
PWHT 615°C 1h	563 MPa	626 MPa	27 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>M21 Shielding gas</b>		
PWHT 615°C 1h	20 °C	156 J
PWHT 615°C 1h	0 °C	149 J
PWHT 615°C 1h	-20 °C	131 J

## Typical Weld Metal Analysis %

C	Mn	Si	Mo
0.043	0.72	0.25	0.47

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-350 A	23-35 V	5.8-20.7 m/min	2.1-7.5 kg/h

## Dual Shield CrMo1

Dual Shield CrMo1 is an all positional rutile, low-hydrogen flux-cored wires for welding 1.25%Cr creep resisting steels. Designed for use in Ar/CO<sub>2</sub> shielding gas, it has excellent weldability and produce flat beads with good wetting and appearance as well as good impact toughness down to -20°C after stress relieving.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E81T1-M21PY-B2, EN ISO 17634-A:T CrMo1 P M 2 H5
<b>Approvals:</b>	VdTÜV 12138

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	1Cr 0.5Mo

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
PWHT 690°C 1h	563 MPa	626 MPa	27 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
PWHT 690°C 1h	20 °C	156 J
PWHT 690°C 1h	0 °C	149 J
PWHT 690°C 1h	-20 °C	55 J

### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.06	0.90	0.35	1.29	0.54

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-350 A	23-35 V	5.8-20.7 m/min	2.1-7.5 kg/h



## Dual Shield CrMo2

An all-positional rutile cored wire which contains 2Cr 1Mo. Designed for use with argon + 15-25% carbon dioxide shielding gas.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E91T1-M21PY-B3, EN ISO 17634-A:T CrMo2 P M 2 H5
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	2Cr 1Mo

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
PWHT 690°C 1h	625 MPa	710 MPa	20 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
PWHT 690°C 1h	20 °C	130 J
PWHT 690°C 1h	0 °C	110 J
PWHT 690°C 1h	-20 °C	65 J

### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.06	0.84	0.33	2.26	0.94

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-350 A	23-35 V	5.8-20.7 m/min	2.1-7.5 kg/h

## Dual Shield II 80-Ni1 H4

Dual Shield II 80-Ni1H4 produces diffusible Hydrogen levels of <4mL/100g over a wide range of welding parameters. Applications include petrochemical equipment, bridge fabrication, offshore oil construction, ship fabrication railcar, and heavy machinery.

<b>Classifications:</b>	AWS A5.29:E81T1-Ni1MJ-H4, AWS A5.36:E81T1-M21A6-Ni1-H4, AWS A5.36:E81T1-M21P6-Ni1-H4, ASME SFA 5.29, ASME SFA 5.36
<b>Approvals:</b>	ABS , BV , MIL-E-24403/1 MIL-81T1-Ni1M, LR , CWB E551T1-Ni1M-JH4, DNV-GL
<b>Industry or Segmentation:</b>	Railcars, Mobile Equipment, Industrial and General Fabrication, Civil Construction, Bridge Construction, Ship/Barge Building

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

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Reduction in Area	Elongation
<b>75% Ar - 25% CO2</b>				
As Welded	545 MPa	615 MPa	71 %	28 %
Stress Relieved 2 hr 621 °C	505 MPa	570 MPa	71 %	28 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>75% Ar - 25% CO2</b>		
As Welded	-29 °C	149 J
As Welded	-40 °C	114 J
Stress Relieved 2 hr 620 °C	-29 °C	122 J
Stress Relieved 2 hr 620 °C	-40 °C	68 J
Stress Relieved 2 hr 620 °C	-51 °C	87 J

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni
<b>75% Ar - 25% CO2</b>					
0.05	1.20	0.32	0.009	0.014	0.93

### Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
<b>75% Ar - 25% CO2</b>					
1.2 mm	150 A	28 V	508 cm/min	1.91 kg/h	86 %
1.2 mm	210 A	29 V	762 cm/min	2.86 kg/h	86 %
1.2 mm	250 A	30 V	1016 cm/min	3.86 kg/h	87 %
1.2 mm	290 A	33 V	1270 cm/min	4.85 kg/h	87 %
1.4 mm	155 A	25 V	381 cm/min	2 kg/h	87 %

# Dual Shield II 80-Ni1 H4

## Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate	Efficiency
1.4 mm	245 A	28 V	635 cm/min	3.31 kg/h	86 %
1.6 mm	310 A	33 V	889 cm/min	4.63 kg/h	85 %
1.6 mm	360 A	36 V	1 143 cm/min	6.03 kg/h	85 %
1.6 mm	190 A	27 V	381 cm/min	2.77 kg/h	87 %
1.6 mm	300 A	30 V	635 cm/min	4.63 kg/h	87 %
1.6 mm	365 A	33 V	762 cm/min	5.58 kg/h	86 %
1.6 mm	410 A	33 V	889 cm/min	6.35 kg/h	88 %
2.0 mm	250 A	26 V	284 cm/min	2.9 kg/h	85 %
2.0 mm	350 A	28 V	447 cm/min	4.76 kg/h	85 %
2.0 mm	450 A	31 V	655 cm/min	6.71 kg/h	85 %

## Recommended Welding Parameters

Diameter	Amps	Volts	Wire Feed Speed	TTW Dist.
<b>75% Ar - 25% CO<sub>2</sub></b>				
1.2 mm	130-200 A	22-26 V	381-660 cm/min	9.5-12.7 mm
1.2 mm	200-225 A	24-27 V	660-965 cm/min	12.7-19 mm
1.2 mm	225-265 A	26-29 V	965-1321 mm/min	19-25.4 mm
1.4 mm	130-220 A	22-26 V	279-508 cm/min	12.7-15.9 mm
1.4 mm	220-280 A	25-29 V	508-762 cm/min	15.9-19 mm
1.4 mm	280-320 A	26-31 V	762-1016 cm/min	19-25.4 mm
1.6 mm	185-290 A	24-28 V	279-559 cm/min	15.9-25.4 mm
1.6 mm	290-350 A	26-30 V	559-838 cm/min	25.4-31.75 mm

# Dual Shield II 91-LT

Dual Shield II 91-LT is a high strength all position flux cored wire designed to provide satisfactory low impact toughness down to -60°C and a good CTOD value at -40°C.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.29:E91T1-Ni2C
<b>Approvals:</b>	ABS 5YQ500SA H5, BV 5Y50SA, H5, DNV VY50 (H5), GL 6Y50H5S, LR 5Y50S, H5

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

<b>Welding Current:</b>	DC+
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Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
C1 shielding Gas			
As welded	575 MPa	650 MPa	26 %

Typical Charpy V-Notch Properties		
Condition	Testing Temperature	Impact Value
C1 shielding Gas		
As welded	-40 °C	100 J
As welded	-60 °C	85 J

Typical Weld Metal Analysis %			
C	Mn	Si	Ni
0.05	1.38	0.30	2.20

## Dual Shield II 91-K2

FCAW wire for mild steel and 620 MPa class high tensile strength steel. Dual Shield II 91-K2 is an all-positional wire developed to meet hydrogen levels of less than 5ml/100g of weld metal. This wire produces exceptional mechanical properties and low temperature impact toughness. It is intended for use on EH47, EQ51 and others steel types with a minimum yield of 500 Mpa.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.29:E91T1-K2C, SFA/AWS A5.36:E91T1-C1A8-K2, JIS Z 3313:T626T1-1CA-N3M1
<b>Approvals:</b>	ABS 5YQ500SA, H5, BV SA5Y50, H5, CCS 5Y50, S, H5, DNV V Y50MS(H5)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn Ni

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding Gas</b>			
As welded	580 MPa	640 MPa	28 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding gas</b>		
As welded	-30 °C	120 J
As welded	-40 °C	90 J
As welded	-60 °C	65 J

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Cr	Mo
0.035	1.33	0.33	0.008	0.011	1.58	0.030	0.002

## Dual Shield II 91-H4

Dual Shield II 91-H4 is an all-position wire developed to meet the tests for hydrogen levels of less than 4ml/100g of weld metal. This designed for high mechanical properties and low temperature impact toughness. It is intended for use on EH50, 55, EQ 56 and others of which Min. Y.S 550Mpa.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.29:E91T1-K2C, SFA/AWS A5.36:E91T1-C1A2-K2, JIS Z 3313:T624T1-1CA-N3M1
<b>Approvals:</b>	ABS 4YQ550SA, H5, BV SA4Y55,H5, CCS 4Y55,S,H5, DNV IV Y55MS(H5), LR 4Y55, H5

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Mn Ni

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding Gas</b>			
As welded	590 MPa	690 MPa	24 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding Gas</b>		
As welded	-30 °C	95 J
As welded	-40 °C	80 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni
<b>C1 Shielding gas</b>			
0.040	1.40	0.30	1.64

# FILARC PZ6114S

An all-positional rutile cored wire with good toughness down to -40°C for use with C1 shielding gas. Diameters less than 1.4 mm are all positional, with the exception of vertical down.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E71T1-C1A4-CS2-H4, EN ISO 17632-A:T 46 4 P C 1 H5
<b>Approvals:</b>	CE EN 13479, ABS 4YSA H5, LR 3YS H5 (C1), CRS 4Y H5S (C1), BV S4YM H5 (C1), CCS 4Y40SH5 (C1), DB 42.105.15, DNV IV Y40MS (H5) (C1), GL 4YH5S, PRS 4YS H5 (C1), RS 4Y42MSH5 (C1), VdTÜV 07683, NAKS/HAKC 1.2 mm

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	CMn

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 shielding gas</b>			
As welded	539 MPa	605 MPa	23.9 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 shielding gas</b>		
As welded	-40 °C	105 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
<b>C1 shielding gas</b>			
0.06	1.39	0.43	0.40

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-350 A	27-35 V	5.6-19.8 m/min	2.1-7.5 kg/h

# FILARC PZ6116S

An all-positional rutile cored wire with good toughness down to -60°C for use with C1 shielding gas. Diameters of less than 1.4 mm are all positional, with the exception of vertical down.

<b>Classifications Weld Metal:</b>	EN ISO 17632-A:T 46 6 1.5Ni P C 1 H5, SFA/AWS A5.36:E81T1-C1A8-K2-H4
<b>Approvals:</b>	CE EN 13479, PRS 3YS H5 (C1), ABS 3SA H5, 3YSA H5, BV S3YMH5 (C1), DNV V Y46MS (H5) (C1), GL 6Y40H5S, LR 5Y40S H5 (C1), RINA 4Y S (C1), RS 5Y42MSH5 (C1)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Low alloy

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	553 MPa	624 MPa	24 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	-60 °C	69 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
0.054	1.38	0.43	1.42

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-350 A	23-35 V	5.6-19.8 m/min	2.1-7.5 kg/h



# FILARC PZ6138S SR

An all-positional rutile cored wire for use with C1 providing very good toughness down to -60°C after stress relieving. Diameters less than 1.4 mm are all-positional except vertical down.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.29:E81T1-Ni1C J, SFA/AWS A5.36:E71T1-C1P8-Ni1, SFA/AWS A5.36:E81T1-C1A8-Ni1, EN ISO 17632-A:T 46 6 1Ni P C 1 H5
<b>Approvals:</b>	DNV V Y46MS (H5) (C1), ABS 5Y42M H5, ABS 5Y46M H5, BV 5Y42 H5 (C1), BV 5Y46 H5 (C1), DNV V Y42MS (H5) (C1), GL 5Y42H5S (stress relieved), GL 5Y46H5S (as welded)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Low alloy

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 shielding gas</b>			
As welded	498 MPa	579 MPa	28 %
Stress relieved 2 hr 600 °C	480 MPa	560 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 shielding gas</b>		
As welded	-60 °C	90 J
Stress relieved 2 hr 600 °C	-60 °C	83 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
<b>C1 shielding gas</b>			
0.05	1.20	0.30	0.90

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	175-350 A	25-38 V	5.6-12.8 m/min	2.8-8.1 kg/h

# Primeweld 81-Ni1

A seamless positional rutile cored wire for use with C1 shielding, providing very good toughness down to -60°C and very low diffusible hydrogen content even after exposure to high temperatures and humidity.

<b>Classifications Weld Metal:</b>	EN ISO 17632-A: T 46 6 1Ni P C 1 H5, SFA/AWS A5.36:E81T1-C1A8-Ni1-H4
<b>Approvals:</b>	ABS 5YQ460SA H5, DNV V Y46MS H5, GL 5Y46H5S, RS 5Y46S H5 (C1)

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

<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	< 4 ml/100g
<b>Alloy Type:</b>	Low alloy steel (1% Ni)

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding gas AWS</b>			
As welded	561 MPa	620 MPa	25 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding gas AWS</b>		
As welded	-60 °C	85 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
<b>C1 Shielding gas</b>			
0.05	1.15	0.34	0.96

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	170-310 A	23-35 V	6.0-16.5 m/min	2.5-6.2 kg/h
1.4 mm	180-400 A	23-38 V	4.0-13.5 m/min	2.6-7.1 kg/h

# Primeweld 81-Ni1M

A seamless positional rutile cored wire for use with M21 shielding gas, providing very good toughness down to -60°C and very low diffusible hydrogen content even after exposure to high temperatures and humidity.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E81T1-M21A8-Ni1-H4, EN ISO 17632-A:T 50 6 1Ni P M 1 H5
<b>Approvals:</b>	ABS 5YQ460SA H5, GL 5Y46H5S, DNV V Y46MS (H5), RS 5Y46S H5 (M21)

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

<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	< 4 ml/100g
<b>Alloy Type:</b>	Low alloy steel (1% Ni)

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>M21 Shielding gas AWS</b>			
As welded	565 MPa	622 MPa	26 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>M21 Shielding gas AWS</b>		
As welded	-60 °C	103 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
<b>M21 shielding gas</b>			
0.03	1.29	0.34	0.90

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	170-310 A	23-35 V	6.0-16.5 m/min	2.5-6.2 kg/h

## Shield-Bright 308H

Shield-Bright 308H was developed for welding Type 304H stainless steel and can also be used for welding Type 301, 302, and 304 steels. It contains a higher carbon level than 308L filler metals to give greater high temperature strength. The ferrite content is also lower for high temperature service. It has greater ductility than 347 types at high temperatures and for that reason it is sometimes used to weld Types 321 and 347 for service above 399°C coupled with high stress.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E308HT1-1, SFA/AWS A5.22:E308HT1-4, KS D 3612:YF 308C, EN ISO 17633-A:T 19 9 H P M21 2, JIS Z 3232:TS308H-FB1, EN ISO 17633-A:T 19 9 H P C1 2
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>M21 Shielding Gas</b>			
As welded	371 MPa	580 MPa	46 %

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr
<b>M21 shielding gas</b>				
0.05	1.08	0.87	9.65	19.21

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	130-220 A	24-29 V	5.8-14.4 m/min	1.9-4.6 kg/h

## Shield-Bright 308L

Shield-Bright 308L is a rutile cored wire designed for the all-positional welding of stainless steels excluding vertical down. In addition to the 304L and 308L grades it is also suitable for welding the stabilised 321 and 347 grades with 15%Ar - 25%CO<sub>2</sub> or CO<sub>2</sub> shielding gas.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E308LT1-4, SFA/AWS A5.22:E308LT1-1, JIS Z 3323:TS308L-FB1, KS D 3612:YF 308LC, EN ISO 17633-A:T 19 9 L P C1 2, EN ISO 17633-A:T 19 9 L P M21 2
<b>Approvals:</b>	CE EN 13479, ABS E308LT1-1 (C1), BV 308L (C1), CCS 308L (C1), ClassNK KW308LG(C) (C1), CWB E308LT1-1 (C1), CWB E308LT1-4 (M21), DNV NV 308L (C1), KR RW308LG (C) (C1), LR 304L (C1), VdTÜV 04832 (M20,M21)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic 308L

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding gas</b>			
As welded	410 MPa	580 MPa	44 %

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr
<b>C1 shielding gas</b>				
0.030	1.20	0.90	10.0	19.0

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	130-220 A	24-29 V	5.8-14.4 m/min	1.9-4.6 kg/h

## Shield-Bright 308L X-tra

Shield-Bright 308L X-tra was designed for welding type 304L stainless steel but can be used for types 301, 302, and 304 steels. It may also be used successfully for welding of types 321 and 347 stainless steel. Service conditions should not exceed an approximate of 399°C. Shield-Bright 308L X-tra was designed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E308LT0-1, SFA/AWS A5.22:E308LT0-4, JIS Z 3323:TS308L-FB0 - KR, KS D 3612:YF 308LC - KR, EN ISO 17633-A:T 19 9 L R C1 3, EN ISO 17633-A:T 19 9 L R M21 3
<b>Approvals:</b>	CE EN 13479, ABS E308LT0-1 (C1), BV 308L (M21), CWB E308LT0-1 (C1), CWB E308LT0-4 (M21), DNV 308L (C1), KR RW308LG(C) (C1), LR 304L S (C1), VdTÜV 06611

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic 308L

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 shielding gas AWS</b>			
As welded	410 MPa	580 MPa	40 %

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr
<b>C1 shielding gas</b>				
0.022	1.40	0.90	9.9	19.6

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-250 A	25-32 V	8.0-16.0 m/min	2.5-7.0 kg/h
1.6 mm	200-350 A	26-34 V	4.0-11.0 m/min	3.0-7.5 kg/h

# Shield-Bright 309L

Shield-Bright 309L is a rutile cored wire designed for the all-positional welding, except vertical down, of stainless steels to carbon or low alloy steels and for the first layer cladding of carbon and low alloy steels with 15%Ar - 25%CO<sub>2</sub> or CO<sub>2</sub> shielding gas.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E309LT1-4, SFA/AWS A5.22:E309LT1-1, JIS Z 3323:TS309L-FB1, KS D 3612:YF-309LC, EN ISO 17633-A:T 23 12 L P C1 2, EN ISO 17633-A:T 23 12 L P M21 2
<b>Approvals:</b>	CE EN 13479, BV 309L (C1), ABS E309LT1-1 (C1), CCS 309L (C1), ClassNK KW309LG(C) (C1), CWB E 309LT1-1 (C1), CWB E 309LT1-4 (M21), DNV NV 309L (C1), GL 4332S (C1), KR RW309LG(C) (C1), LR SS/CMn (C1), VdTÜV 04833 (M20,M21)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic 309L

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding gas</b>			
As welded	450 MPa	580 MPa	40 %

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr
<b>C1 shielding gas</b>				
0.030	1.30	0.90	12.5	23.5

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	130-220 A	24-29 V	5.8-14.4 m/min	1.9-4.6 kg/h

## Shield-Bright 309L X-tra

Shield-Bright 309L X-tra was developed for the welding of stainless steels to carbon or low alloy steels and for the first layer cladding of carbon and low alloy steels. Shield-Bright 309L X-tra was developed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal. For joining thick sections, it is preferred the non-stainless steel be buttered with a layer of Shield-Bright 309L X-tra and the joint completed with Shield-Bright 316L X-tra or 308L X-tra. The service temperature should not exceed approximately 399°C.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E309LT0-1, SFA/AWS A5.22:E309LT0-4, JIS Z 3323:TS309L-FB0 - KR, KS D 3612:YF 309LC - KR, EN ISO 17633-A:T 23 12 L R C1 3, EN ISO 17633-A:T 23 12 L R M21 3
<b>Approvals:</b>	CE EN 13479, BV 309L (C1), ABS E309LT0-1 (C1), CCS 309LS (C1), CWB E309LT0-1 (C1), CWB E309LT0-4 (M21), DNV 309L MS (C1), DNV 309L MS (M21), VdTÜV 06594

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic 309L

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 shielding gas AWS</b>			
As welded	480 MPa	600 MPa	35 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 shielding gas AWS</b>		
As welded	20 °C	40 J
As welded	-110 °C	32 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr
<b>C1 shielding gas</b>				
0.030	1.40	0.80	12.5	24.5

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-250 A	25-32 V	8.0-16.0 m/min	2.5-7.0 kg/h
1.6 mm	200-350 A	26-34 V	4.0-11.0 m/min	3.0-7.5 kg/h



## Shield-Bright 309LMo

Shield-Bright 309LMo was designed for welding type 316 clad steels on the first pass in cladding steels or for welding dissimilar metals such as molybdenum-containing austenitic stainless steels to carbon steels. It is used in paper mills and in power plants to give greater corrosion resistance. This wire performs best when used out-of-position shielded with either Argon/CO<sub>2</sub> or 100% CO<sub>2</sub>.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E309LMoT1-1, SFA/AWS A5.22:E309LMoT1-4, JIS Z 3323:TS309LMo-FB1, KS D 3612:YF309MoLC, EN ISO 17633-A:T 23 12 2 L P C1 2, EN ISO 17633-A:T 23 12 2 L P M21 2
<b>Approvals:</b>	DNV VL 309MoL, KR RW 309MoLG(C)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic 309LMo

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding Gas</b>			
As welded	480 MPa	620 MPa	30 %

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
0.03	1.267	0.63	12.55	22.50	2.69

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	130-220 A	24-29 V	5.8-14.4 m/min	1.9-4.6 kg/h

## Shield-Bright 309LMo X-tra

Shield-Bright 309LMo X-tra was developed for the welding of stainless steels to carbon or low alloy steels. For thick sections it is often preferable that the non-stainless steel should be buttered with a layer of Shield-Bright 309L X-tra and the joint made with Shield-Bright 316L X-tra or 308L X-tra. It was also developed for the first layer cladding of carbon and low alloy steels prior to subsequent layers from Shield-Bright 316L X-tra or 317L X-tra. The service temperature of all the resulting weldments should not exceed about 370°C. Multiple layer cladding with Shield-Bright 309LMo X-tra can be used for additional corrosion resistance in some applications in the pulp and paper industry. Shield-Bright 309LMo X-tra was developed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal. It can be used with either 75% Ar + 25% CO<sub>2</sub> or 100% CO<sub>2</sub> gases.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E309LMoT0-1, SFA/AWS A5.22:E309LMoT0-4, JIS Z 3323:YF 309MoLC - KR, KS D 3612:YF 309MoLC - KR, EN ISO 17633-A:T 23 12 2 L R C1 3, EN ISO 17633-A:T 23 12 2 L R M21 3
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic 309LMo

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength
<b>C1 shielding gas AWS</b>		
As welded	480 MPa	620 MPa

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
<b>C1 shielding gas</b>					
0.030	1.2	0.75	13.5	23.5	2.5

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-250 A	25-32 V	8.0-16.0 m/min	2.5-7.0 kg/h

# Shield-Bright 316L

Shield-Bright 316L was developed for the welding of Type 316L stainless steel but can be used for other stainless steels including Types 316 and 304L. In a few cases, e.g. nitric acid service, Shield-Bright 316L should not be used to weld 304L. It contains molybdenum which resists pitting corrosion induced by sulphuric and sulphurous acids, chlorides and cellulose solutions. Used widely in the rayon, dye and paper making industries.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E316LT1-4, SFA/AWS A5.22:E316LT1-1, JIS Z 3323:TS316L-FB1, KS D 3612:YF 316LC, EN ISO 17633-A:T 19 12 3 L P C1 2, EN ISO 17633-A:T 19 12 3 L P M21 2
<b>Approvals:</b>	CE EN 13479, ABS E316LT1-1 (C1), BV 316L (C1), DNV 316L (C1), ClassNK KW316LG (C1), CWB E 316LT1-1 (C1), CWB E 316LT1-4 (M21), KR RW316LG(C) (C1), LR 316L (C1), VdTÜV 04834 (M20,M21)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic 316L

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding gas</b>			
As welded	450 MPa	580 MPa	40 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding gas</b>		
As welded	-120 °C	40 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
<b>C1 shielding gas</b>					
0.030	1.30	0.60	12.0	18.5	2.7

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	130-220 A	24-29 V	5.8-14.4 m/min	1.9-4.6 kg/h

## Shield-Bright 316L X-tra

Shield-Bright 316L X-tra was developed for the welding Type 316L stainless steel and also can be used for the other stainless steels including Types 316 and 304L. In a few cases, e.g. nitric acid service, Shield-Bright 316L X-tra should not be used to weld 304L. It was designed specifically for applications where the service environment can produce pitting corrosion. Shield-Bright 316L X-tra was developed for welding in the flat position and for horizontal fillet welds with flat to concave beads with excellent slag removal.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E316LT0-1, SFA/AWS A5.22:E316LT0-4, JIS Z 3323:TS316L-FB0 - KR, KS D 3612:YF 316LC - KR, EN ISO 17633-A:T 19 12 3 L R C1 3, EN ISO 17633-A:T 19 12 3 L R M21 3
<b>Approvals:</b>	CE EN 13479, ABS E316LT0-1 (C1), CWB E316LT0-1 (C1), CWB E316LT0-4 (M21), DNV 316L (C1), KR RW316LG (C1), LR 316L S (C1), VdTÜV 06612

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Austenitic 316L

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 shielding gas AWS</b>			
As welded	450 MPa	580 MPa	36 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 shielding gas AWS</b>		
As welded	-110 °C	38 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
<b>C1 shielding gas</b>					
0.030	1.30	0.60	12.0	18.5	2.7

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-250 A	25-32 V	8.0-16.0 m/min	2.5-7.0 kg/h
1.6 mm	200-350 A	26-34 V	4.0-11.0 m/min	3.0-7.5 kg/h

# Shield-Bright 347

An all-positional rutile cored wire for the welding of pipes with a minimum strength of 610 MPa, for use with M21 shielding gas.

Classifications Weld Metal:	SFA/AWS A5.22:E347T1-1, SFA/AWS A5.22:E347T1-4, EN ISO 17633-A:T 19 9 Nb P M21 2
Welding Current:	DC+
Alloy Type:	347 stainless

Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
As welded	510 MPa	670 MPa	34 %

Typical Weld Metal Analysis %				
C	Mn	Si	Ni	Cr
0.03	1.2	0.90	9.8	19.3

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	130-220 A	24-29 V	5.8-14.4 m/min	1.9-4.6 kg/h

# Shield-Bright 410

Shield Bright 410 is 13% Cr martensitic stainless steel flux cored wire. It is used for overlay welding on valve sheet surface of its martensitic structure in as-welded condition which shows high hardness and wear resistance properties. It shows a good ductility and excellent corrosion resistance after post-weld heat treatment at 600°C - 850°C. It is suitable for welding AISI 410, 403, 420J1 and 420J2.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E410T1-1(4), JIS Z 3323:YF410C, KS D 3612:YF410C
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	C Cr

Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
C1 Shielding gas			
PWHT	490 MPa	585 MPa	25 %

Typical Weld Metal Analysis %				
C	Mn	Si	Ni	Cr
C1 Shielding gas				
0.02	0.39	0.38	0.51	11.25

## Shield-Bright 410NiMo

Shield-Bright 410NiMo is an all-positional gas shielded flux cored wire for fabrication and repair of hydroelectric turbine “runners” and other similar applications. Its spray-like transfer enhances the arc characteristics while minimizing post-weld clean up and rework. The ease of use and “user-friendly” characteristics minimize training while producing consistent quality welds. The self-peeling slag removal and easy post-weld clean up minimize the cost to deposit while improving performance efficiency. This electrode is designed for use with Argon/CO<sub>2</sub> shielding gas (75 to 80% Argon, balance CO<sub>2</sub>).

<b>Classifications:</b>	JIS Z3323:TS410NiMo-FB1, AWS A5.22:E410NiMoT1-1(4)
<b>Approvals:</b>	JIS
<b>Industry or Segmentation:</b>	Power Generation

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

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>100% CO<sub>2</sub></b>			
PWHT 1 hr 600 °C	938 MPa	970 MPa	19 %
<b>75% Ar - 25% CO<sub>2</sub></b>			
PWHT 1 hr 600 °C	767 MPa	927 MPa	17 %

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Cr	Mo
<b>100% CO<sub>2</sub></b>							
0.025	0.34	0.40	0.004	0.020	4.75	11.60	0.45
<b>75% Ar - 25% CO<sub>2</sub></b>							
0.027	0.50	0.70	0.004	0.020	4.50	11.30	0.50

# Shield-Bright 2209

Shield-Bright 2209 was developed for the welding of "2205" duplex stainless steels (UNS S31803, S32205, and J92205). It can also be used for the welding of leaner grades of duplex stainless steels. It has been approved with a 25°C critical pitting temperature and impact toughness at -40°C.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.22:E2209T1-4, E2209T1-1, EN ISO 17633-A:T 22 9 3 N L P C1 2, EN ISO 17633-A:T 22 9 3 N L P M21 2
<b>Approvals:</b>	CE EN 13479, ABS E2209T1-1 (C1), BV 2205 (C1), CCS 2205-S (C1), DNV Duplex (C1), LR S31803 (C1), VdTÜV 09123 , CWB E2209T1-1 (C1), CWB E2209T1-4 (M21), DNV-GL Duplex (M21)

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Duplex stainless steel

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>80%Ar/20%CO<sub>2</sub> Shielding Gas (M21)</b>			
As welded	640 MPa	840 MPa	27 %
<b>CO<sub>2</sub> Shielding Gas (C1)</b>			
As welded	650 MPa	800 MPa	28 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>80%Ar/20%CO<sub>2</sub> Shielding Gas (M21)</b>		
As welded	-20 °C	55 J
As welded	-45 °C	45 J
As welded	-46 °C	52 J
<b>CO<sub>2</sub> Shielding Gas (C1)</b>		
As welded	-46 °C	50 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N
0.03	1.05	0.45	8.85	22.95	3.44	0.16

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	130-220 A	25-30 V	5.8-14.4 m/min	1.9-4.6 kg/h
1.6 mm	170-300 A	25-29 V	3.9-8.2 m/min	2.4-5.2 kg/h





# Shield-Bright 2507

Shield-Bright 2507 is an all-position stainless steel cored wire designed for welding duplex stainless steel resulting in beautiful beads with excellent slag removal. It can deposit metal of 25% Cr-9% Ni-3.5% Mo-0.25% N. Shield-Bright 2507 is used in duplex stainless steels such as UNS S32520, S32550, S32750, S32760, S32900, JIS 329J4L.

Classifications:	AWS A5.22:E2553T1-G
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Typical Tensile Properties		
Yield Strength	Tensile Strength	Elongation
100% CO2		
628 MPa	863 MPa	28 %

Typical Weld Metal Analysis %									
C	Mn	Si	S	P	Ni	Cr	Mo	N	Ferrite FN
100% CO2									
0.03	1.10	0.55	0.008	0.010	9.5	25.0	3.75	0.22	40-65

# Shield-Bright 2594

Shield-Bright 2594 is designed for the welding of 25Cr-9Ni-3Mo-0.2N super duplex stainless steel (UNS S32750, S32760). It has excellent slag removal and bead shape with all position welding for use with Ar/CO<sub>2</sub> gas mixtures (M21).

<b>Classifications Weld Metal:</b>	EN ISO 17633-A:T 25 9 4 N L P M21 2, SFA/AWS A5.22:E2594T1-4
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Super Duplex

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	700 MPa	860 MPa	27 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	-29 °C	48 J
As welded	-46 °C	44 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N
0.03	0.95	0.62	9.68	25.34	3.59	0.23

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-220 A	25-30 V	8.3-11.5 m/min	2.4-4.6 kg/h

## Cryo-Shield 308L

Cryo-Shield 308L is an all-position flux cored wire adaptable to a variety of shop and field erection applications. Designed for cryogenic applications where good weld metal toughness is required. Applications include cryogenic vessel fabrication and process piping repair. Cryo-Shield 308L was developed for the welding of types 304 and 304L stainless steels for the low temperature service, even down to liquid helium temperatures. This is done by controlling the composition and the ferrite content to give good toughness at temperatures of -196°C and lower. Cryo-Shield 308L was developed for welding in all positions and performs particularly well in the vertical position with excellent slag removal.

<b>Classifications:</b>	AWS A5.22:E308LT1-1(4), JIS Z3323:TS308L-FB1
<b>Approvals:</b>	DNV , BV , LR , JIS , NK , KR

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

### Typical Tensile Properties

Yield Strength	Tensile Strength	Elongation
<b>100% CO<sub>2</sub></b>		
363 MPa	552 MPa	59 %

### Typical Charpy V-Notch Properties

Testing Temperature	Impact Value
<b>100% CO<sub>2</sub></b>	
-196 °C	41 J

### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Cr	Ferrite FN
<b>100% CO<sub>2</sub></b>							
0.024	1.43	0.67	0.010	0.027	10.0	18.50	Max 8

## Cryo-Shield 316L

Cryo-Shield 316L is all position flux cored wire adaptable to a variety of shop and field erection applications. Designed for cryogenic applications where good weld metal toughness is required. Cryo-Shield 316L was developed for the welding of type 316, 316L austenitic stainless steels for the low temperatures. It contains molybdenum which resists pitting corrosion induced by sulphuric and sulphurous acids, chlorides and cellulose solutions. Cryo-Shield 316L was designed titania based slag system with excellent slag removal so they can have high welding speeds because of possible welding in all position in high current area.

<b>Classifications:</b>	AWS A5.22:E316LT1-1(4), JIS Z3323:TS316L-FB1
<b>Approvals:</b>	DNV , BV , LR , JIS , NK , KR

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

Typical Tensile Properties		
Yield Strength	Tensile Strength	Elongation
<b>100% CO<sub>2</sub></b>		
392 MPa	529 MPa	50 %

Typical Charpy V-Notch Properties	
Testing Temperature	Impact Value
<b>100% CO<sub>2</sub></b>	
-196 °C	40 J

Typical Weld Metal Analysis %								
C	Mn	Si	S	P	Ni	Cr	Mo	Ferrite FN
<b>100% CO<sub>2</sub></b>								
0.026	1.50	0.70	0.008	0.025	12.4	17.5	2.20	3-8

# Shield-Bright NiCrMo-3

A positional rutile wire for the welding Ni-Cr-Mo alloys with 80% Ar + 20% CO2 shielding gas.

<b>Classifications Weld Metal:</b>	AWS A5.34:ENiCrMo3T1-4
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Ni-Cr-Mo

Typical Tensile Properties			
Condition	Yield Strength	Tensile Strength	Elongation
As welded	501 MPa	788 MPa	42 %

Typical Charpy V-Notch Properties		
Condition	Testing Temperature	Impact Value
As welded	0 °C	75 J
As welded	-196 °C	70 J

Typical Weld Metal Analysis %									
C	Mn	Si	Ni	Cr	Mo	Fe	Nb	Nb+Ta	Ti
0.023	0.24	0.36	64.3	21.89	8.63	0.52	3.8	3.57	0.18

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	130-210 A	23-32 V	5.8-13.8 m/min	1.9-4.2 kg/h

## Shield Bright NiCrMo-3 CO<sub>2</sub>

Shield Bright NiCrMo-3 CO<sub>2</sub> is a gas shielded flux cored wire designed for welding in all positions using 100 percent CO<sub>2</sub>. Exhibiting excellent weldability, Shield Bright NiCrMo-3 CO<sub>2</sub> can be used in a wide variety of similar and dissimilar welding and cladding applications. The iron content of the all weld deposit is kept below one percent for applications requiring enhanced corrosion resistance.

<b>Classifications Weld Metal:</b>	AWS A5.34M:ENiCrMo3T1-1, EN ISO 12153:TNi 6625-11
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<b>Welding Current:</b>	DC+
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### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>C1 Shielding gas</b>			
As welded	510 MPa	780 MPa	37 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>C1 Shielding gas</b>		
As welded	-196 °C	60 J

### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo	Fe	Nb+Ta	Ti
0.02	0.15	0.25	22.0	9.0	0.4	3.65	0.2

## Coreshield 8

Coreshield 8 is a self-shielded flux cored wire designed to weld critical structural applications while maintaining excellent arc characteristics and high welder appeal using DCEN polarity. Coreshield 8 is tested and certified to meet the new AWS D designation requirements, making this self-shielded wire an excellent choice for demand critical welds when the AWS D1.8 Seismic Supplement is utilized

<b>Classifications Weld Metal:</b>	SFA/AWS A5.20:E71T-8, EN ISO 17632-A:T 42 2 Y N 2
<b>Approvals:</b>	CE EN 13479, GL 3YS, ABS 3YSA H10, NAKS/HAKC 1.6MM, BV SA3YM H10, CWB E491T-8-H16, DB 42.039.35, DNV III YMS H10, LR 3YS H10, VdTÜV 10019

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

<b>Welding Current:</b>	DC-
<b>Alloy Type:</b>	C Mn

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	457 MPa	552 MPa	26 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	-20 °C	75 J
As welded	-29 °C	63 J

### Typical Weld Metal Analysis %

C	Mn	Si	Al
0.17	0.45	0.12	0.50

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.6 mm	155-240 A	21-25 V	3.8-7.6 m/min	1.9-3.7 kg/h

## Coreshield 8-Ni1 H5

Coreshield 8-Ni1 H5 is a self-shielded flux cored wire designed to produce welds with low diffusible hydrogen and robust mechanical properties. It is welder friendly and has excellent all-position welding operability. Using DCEN polarity, it produces nice weld beads by either up-hill or down-hill welding to suit for a wider range of WPS requirements. Coreshield 8-Ni1 H5 is especially suited for making root passes or handling poor fit-up, and it features a diffusible hydrogen content lower than 5.0 ml/100g. Coreshield 8-Ni1 H5 can be ideally used in critical steel applications, such as offshore TKY joints, pipe structures, bridges, storage tanks and other applications where cold-cracking resistance is preferred.

<b>Classifications:</b>	AWS A5.29:E71T8-Ni1-J, AWS A5.36:E71T8-A4-Ni1, ASME SFA 5.29, ASME SFA 5.36
<b>Industry or Segmentation:</b>	Offshore Oil, Bridge Construction, Mobile Equipment, Civil Construction, Industrial and General Fabrication, Ship/Barge Building

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As Welded	447 MPa	536 MPa	30 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As Welded	-29 °C	150 J
As Welded	-40 °C	146 J

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### Typical Weld Metal Analysis %

C	Mn	Si	S	P	Ni	Cr	Mo	V	Al	Cu	Nb
0.02	1.4	0.35	0.008	0.008	1.00	0.04	0.01	0.008	0.75	0.04	0.003

### Deposition Data

Diameter	Amps	Volts	Wire Feed Speed	Deposition Rate
2.0 mm	120 A	20 V	127 cm/min	0.83 kg/h
2.0 mm	170 A	21 V	190.5 cm/min	1.38 kg/h
2.0 mm	210 A	23 V	254 cm/min	1.92 kg/h
2.0 mm	250 A	24 V	317.5 cm/min	2.35 kg/h
2.0 mm	280 A	25 V	381 cm/min	2.83 kg/h

### Recommended Welding Parameters

Diameter	Amps	Volts	Wire Feed Speed	TTW Dist.
2.0 mm	120-280 A	20-25 V	127-381 cm/min	19-25.4 mm



# Coreshield 11

Coreshield 11 is an all-position self-shielded flux cored welding wire meeting all requirements for the E71T-11 classification. Coreshield 11 is excellent for use on single or multiple pass lap, fillet and butt welds on mild steels in all welding positions. Limitations do exist for multipass welds in excess of 1/2 in (12.7 mm). It produces smooth arc action, full slag coverage, easy slag removal, and low spatter. This product should find excellent acceptance in general purpose mild steel fabrication. In structural fabrication, the product can be used where no seismic requirements are present. Coreshield 11 is run DCEN.

<b>Classifications:</b>	ASME SFA 5.36:, ASME SFA 5.20:, AWS A5.36:E71T11-Z-CS3, AWS A5.20:E71T-11
<b>Approvals:</b>	CWB CSA W48
<b>Industry or Segmentation:</b>	Civil Construction, Industrial and General Fabrication, Automotive

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

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As Welded	435 MPa	620 MPa	22 %

## Typical Weld Metal Analysis %

C	Mn	Si	S	P	Al
0.22	0.60	0.21	0.003	0.01	1.10

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate	TTW Dist.	Efficiency (%)
0.9 mm	120 A	17 V	394 cm/min	0.8 kg/h	9.5 mm	77 %
0.9 mm	200 A	17 V	995 cm/min	2.0 kg/h	9.5 mm	81 %
0.9 mm	80 A	15 V	206 cm/min	0.4 kg/h	9.5 mm	75 %
1.2 mm	150 A	17 V	300 cm/min	1.0 kg/h	12.5 mm	79 %
1.2 mm	225 A	18 V	356 cm/min	1.2 kg/h	12.5 mm	82 %
1.2 mm	95 A	15 V	137 cm/min	0.4 kg/h	12.5 mm	74 %
1.6 mm	160 A	17 V	142 cm/min	1.0 kg/h	16 mm	78 %
1.6 mm	200 A	18 V	193 cm/min	1.3 kg/h	16 mm	80 %
1.6 mm	275 A	19 V	335 cm/min	2.4 kg/h	16 mm	81 %
2.0 mm	185 A	19 V	127 cm/min	1.1 kg/h	25 mm	77 %
2.0 mm	250 A	20 V	231 cm/min	2.0 kg/h	25 mm	79 %
2.0 mm	300 A	21 V	343 cm/min	3.0 kg/h	25 mm	81 %

# Coreshield 15

Coreshield 15 is an all-position self-shielded flux cored welding wire for single pass applications. Coreshield 15 produces smooth arc action, full slag coverage, easy slag removal, and low spatter. The use of DCEN (electrode negative) current minimizes the risk of burn-through. Coreshield 15 is excellent for use on lap and fillet welds on thin gauge galvanized and mild steels in all welding positions. The availability of 0.8 mm diameter makes it possible to use this product on materials as thin as 1.2 mm (18 gauge). The wire is particularly suitable for thin gauge materials 0.8-5.0 mm. in galvanised, zinc-aluminum carbon, or aluminised carbon steels. In structural fabrications, the product can be used where no seismic requirements are present.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.20:E71T-GS
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<b>Welding Current:</b>	DC-
<b>Alloy Type:</b>	C Mn

Typical Tensile Properties	
Condition	Tensile Strength
As welded	614 MPa

Typical Weld Metal Analysis %			
C	Mn	Si	Al
0.23	0.70	0.40	1.98

Deposition Data			
Diameter	Current	Voltage	Wire Feed Speed
0.8 mm	40-100 A	14-16 V	3.0-7.0 m/min

# Coreweld 46 LS

Coreweld 46 LS is a new generation metal cored wire based on ESAB's revolutionary cored wire surface technology. It has been developed for the welding of thin-plate with a minimum thickness of 1.0 mm and provides fabricators with a substantially faster and higher quality welding solution to solid MAG wire. The absence or very low levels of silica on the weld surface and minimal spatter result in reduced post weld cleaning before coating/painting. Coreweld 46 LS is a unique product that markedly lowers the welding costs for mechanised and robotic fabrication.

The many advantages relative to solid wire are associated with the extremely wide spray arc parameter envelope that starts as low as 160A. With solid wire spray arc starts at around 200A for diameter 1.0 mm and 230A for diameter 1.2 mm. These features are valid for the standard shielding gas M21 (Ar + 15-25% CO<sub>2</sub>), although optimal results are obtained in 92% Ar + 8% CO<sub>2</sub> mixtures. Switching from solid wire to Coreweld 46 LS will in most cases, require no change in the positioning of the welding gun so the conversion time is limited to the optimisation of welding parameters.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.36:E71T15-M20A4-CS1 H4, SFA/AWS A5.36:E71T15-M21A4-CS1 H4, EN ISO 17632-A:T 46 4 M M 2 H5
<b>Approvals:</b>	CE EN 13479, DB 42.039.38, VdTÜV 12152, ABS 4Y40M H5 (M20), ABS 4Y40M H5 (M21), BV 4Y40 H5 (M20), BV 4Y40 H5 (M21), DNV IV Y40MS(H5) (M20), DNV IV Y40MS(H5) (M21), GL 4Y40H5S (M20), GL 4Y40H5S (M21)

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

<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	< 4 ml/100g
<b>Alloy Type:</b>	C Mn steel

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
As welded	485 MPa	545 MPa	29 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
As welded	-40 °C	72 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
0.04	1.25	0.63	0.35

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	100-360 A	16-32 V	1.8-13.0 m/min	1.3-8.0 kg/h
1.4 mm	150-380 A	18-34 V	2.5-9.0 m/min	1.8-7.0 kg/h
1.6 mm	150-450 A	17-36 V	2.0-9.3 m/min	1.7-7.8 kg/h

## Arcaloy MC308L

Arcaloy MC308L is a composite metal cored stainless steel wire which has a stainless steel sheath. Arcaloy MC308L is used for welding types 301, 302, 304, and 304L. This may be used for welding types 321 and 347 if service temperatures do not exceed 260°C. Its higher deposition rate and less penetration compared to solid wire makes it very suitable for making butt, fillet and lap welds on gauge material. Higher speeds are also possible compared to solid wire. The low spatter and slag-free welds make this electrode ideal for automatic and robotic welding. The pushing technique can be used to further minimize the penetration and oxide film formed on the surface of the weld. Typical applications include automobile catalytic converters, manifolds, mufflers, exhaust systems. For welding in the spray mode of metal transfer, the shielding gas should be argon with 1% or 2% oxygen or carbon dioxide. Pulse welding can also be used to further minimize penetration in thin gauge steels. This metal cored wire can also be used in submerged arc welding in combination with OK Flux 10.93.

<b>Classifications:</b>	AWS A5.22: EC308L
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### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Ni	Mo	Cu	Ferrite FN
<b>98% Ar - 2% O<sub>2</sub></b>							
0.025	1.5	0.55	20	10	0.1	0.1	10

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate	Efficiency (%)
1.2 mm	144 A	16 V	406 cm/min	1.9 kg/h	99.3 %
1.2 mm	245 A	25 V	673 cm/min	3.2 kg/h	99.3 %
1.2 mm	321 A	26 V	939 cm/min	4.5 kg/h	99.4 %
1.2 mm	390 A	28 V	1206 cm/min	5.9 kg/h	98.5 %
1.2 mm	441 A	30 V	1473 cm/min	7.2 kg/h	99.2 %
1.6 mm	212 A	23 V	368 cm/min	3.1 kg/h	99.2 %
1.6 mm	285 A	23 V	571 cm/min	4.9 kg/h	98.8 %
1.6 mm	332 A	26 V	762 cm/min	6.2 kg/h	98.1 %
1.6 mm	420 A	28 V	965 cm/min	8.3 kg/h	99.5 %
1.6 mm	500 A	31 V	1168 cm/min	10.22 kg/h	98.9 %

## Arcaloy MC309L

Arcaloy MC309L is a composite metal cored stainless steel wire which has a stainless steel sheath. Arcaloy MC 309L is designed for welding type 309 wrought or for welding type 304 to mild carbon steel. It is also recommended for cladding 304 when welded to carbon steel. As a small diameter cored wire, it can be used for welding thin gauge 304L where increased corrosion resistance over Arcaloy MC308L is needed. It is also used for dissimilar welding between the 300 and 400 series stainless steels and mild and low alloys steels. Its higher deposition rate and less penetration compared to solid wire make it very suitable for making butt, fillet and lap welds on gauge material. Higher speeds are also possible compared to solid wire. The low spatter and slag-free welds make this electrode ideal for automatic and robotic welding. The pushing technique can be used to further minimize the penetration and oxide film formed on the surface of the weld. Typical applications include automobile catalytic converters, manifolds, mufflers, exhaust systems. For welding in the spray mode of metal transfer, the shielding gas should be argon with 1% or 2% oxygen or carbon dioxide. Pulse welding can also be used to further minimize penetration in thin gauge steels. This metal cored wire can also be used in submerged arc welding in combination with OK Flux 10.93.

**Classifications:**

AWS A5.22: EC309L

**Typical Weld Metal Analysis %**

C	Mn	Si	Cr	Ni	Mo	Cu	Ferrite FN
<b>98% Ar - 2% O<sub>2</sub></b>							
0.025	1.5	0.55	24	12.5	0.1	0.1	18

**Deposition Data**

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate	Efficiency (%)
1.2 mm	144 A	16 V	406 cm/min	1.9 kg/h	99.3 %
1.2 mm	245 A	25 V	673 cm/min	3.2 kg/h	99.3 %
1.2 mm	321 A	26 V	939 cm/min	4.5 kg/h	99.4 %
1.2 mm	390 A	28 V	1206 cm/min	5.9 kg/h	98.5 %
1.2 mm	441 A	30 V	1473 cm/min	7.2 kg/h	99.2 %
1.6 mm	212 A	23 V	368 cm/min	3.1 kg/h	99.2 %
1.6 mm	285 A	23 V	571 cm/min	4.9 kg/h	98.8 %
1.6 mm	332 A	26 V	762 cm/min	6.2 kg/h	98.1 %
1.6 mm	420 A	28 V	965 cm/min	8.3 kg/h	99.5 %
1.6 mm	500 A	31 V	1168 cm/min	10.22 kg/h	98.9 %

## Arcaloy MC316L

Arcaloy MC316L is a composite metal cored stainless steel wire which has a stainless steel sheath. The addition of molybdenum helps reduce pitting corrosion. As a small diameter cored wire it can be used for the welding of thin gauge 316, 316L and sometimes 304 and 304L stainless steels. Its higher deposition rate and less penetration compared to solid wire makes it very suitable for making butt, fillet and lap welds on gauge material. Higher speeds are also possible compared to solid wire. The low spatter and slag-free welds make this electrode ideal for automatic and robotic welding. The pushing technique can be used to further minimize the penetration and oxide film formed on the surface of the weld. Typical applications include automobile catalytic converters, manifolds, mufflers, exhaust systems. For welding in the spray mode of metal transfer, the shielding gas should be argon with 1% or 2% oxygen or carbon dioxide. Pulse welding can also be used to further minimize penetration in thin gauge steels. This metal cored wire can also be used in submerged arc welding. It can be used with OK Flux 10.93.

**Classifications:**

AWS A5.22: EC316L

**Typical Weld Metal Analysis %**

C	Mn	Si	Cr	Ni	Mo	Cu	Ferrite FN
<b>98% Ar - 2% O<sub>2</sub></b>							
0.022	1.4	0.5	18.5	12	2.7	0.1	7

**Deposition Data**

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate	Efficiency (%)
1.2 mm	144 A	16 V	406 cm/min	1.9 kg/h	99.3 %
1.2 mm	245 A	25 V	673 cm/min	3.2 kg/h	99.3 %
1.2 mm	321 A	26 V	939 cm/min	4.5 kg/h	99.4 %
1.2 mm	390 A	28 V	1206 cm/min	5.9 kg/h	98.5 %
1.2 mm	441 A	30 V	1473 cm/min	7.2 kg/h	99.2 %
1.6 mm	212 A	23 V	368 cm/min	3.1 kg/h	99.2 %
1.6 mm	285 A	23 V	571 cm/min	4.9 kg/h	98.8 %
1.6 mm	332 A	26 V	762 cm/min	6.2 kg/h	98.1 %
1.6 mm	420 A	28 V	965 cm/min	8.3 kg/h	99.5 %
1.6 mm	500 A	31 V	1168 cm/min	10.22 kg/h	98.9 %

# Arcaloy MC409Ti

Arcaloy MC409Ti is a 12% Cr alloy metal cored electrode stabilized with Titanium (Ti) for arc stability and to improve corrosion resistance, increase strength at high temperatures, and promote the ferritic microstructure. Arcaloy MC409Ti produces a smooth spray-type metal transfer with very minimal spatter. It is particularly suited for welding parts with poor fit up. It was designed for welding stainless steel catalytic converters, manifolds, mufflers, and exhaust systems.

**Classifications:**

AWS A5.22:EC409

**Typical Weld Metal Analysis %**

C	Mn	Si	Cr	Ti
<b>98% Ar - 2% CO<sub>2</sub></b>				
0.02	0.5	0.6	11.6	0.95

**Deposition Data**

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate	TTW Dist.	Efficiency (%)
1.2 mm	192 A	20 V	530 cm/min	2.2 kg/h	12.7 mm	90.1 %
1.2 mm	213 A	21 V	580 cm/min	2.6 kg/h	12.7 mm	95.9 %
1.2 mm	237 A	22 V	640 cm/min	2.8 kg/h	12.7 mm	96.6 %
1.2 mm	290 A	24 V	760 cm/min	3.4 kg/h	12.7 mm	96.3 %
1.2 mm	270 A	24 V	890 cm/min	4.0 kg/h	19.1 mm	96.5 %

## Arcaloy MC439Ti

Arcaloy MC439Ti is an 16-17% Cr alloy metal cored electrode stabilized with Titanium (Ti). The high level of chromium provides additional oxidation and corrosion resistance when welding stainless steel catalytic converters, manifolds, mufflers, and exhaust systems. It is also suited for welding parts with poor fit up. Arcaloy MC439Ti produces a spray-type metal transfer with minimal spatter.

<b>Classifications:</b>	AWS A5.22:EC439
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### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Ti
<b>98% Ar - 2% CO<sub>2</sub></b>				
0.02	0.5	0.5	17.5	0.5

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate	TTW Dist.	Efficiency (%)
1.2 mm	192 A	20 V	530 cm/min	2.2 kg/h	12.7 mm	90.1 %
1.2 mm	213 A	21 V	580 cm/min	2.6 kg/h	12.7 mm	95.9 %
1.2 mm	237 A	22 V	640 cm/min	2.8 kg/h	12.7 mm	96.6 %
1.2 mm	290 A	24 V	760 cm/min	3.4 kg/h	12.7 mm	96.3 %
1.2 mm	270 A	24 V	890 cm/min	4.0 kg/h	19.1 mm	96.5 %

## Arcaloy MC18CrCb

Arcaloy MC18CrCb is an 18% Cr alloy metal cored electrode stabilized with Titanium (Ti) and Niobium (Nb). It is designed for welding Armco 18Cr-Cb HP-10TM stainless steels used in catalytic converters, manifolds, mufflers, and exhaust systems. It is also suited for welding parts with poor fit up. Arcaloy MC18CrCb produces a smooth spray-type metal transfer with very minimal spatter.

<b>Classifications:</b>	AWS A5.22:EC439Nb
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### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Ti	Nb
<b>98% Ar - 2% CO<sub>2</sub></b>					
0.02	0.5	0.5	18.2	0.3	0.5

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate	TTW Dist.	Efficiency (%)
1.2 mm	192 A	20 V	530 cm/min	2.2 kg/h	12.7 mm	90.1 %
1.2 mm	213 A	21 V	580 cm/min	2.6 kg/h	12.7 mm	95.9 %
1.2 mm	237 A	22 V	640 cm/min	2.8 kg/h	12.7 mm	96.6 %
1.2 mm	290 A	24 V	760 cm/min	3.4 kg/h	12.7 mm	96.3 %
1.2 mm	270 A	24 V	890 cm/min	4.0 kg/h	19.1 mm	96.5 %



## NICORE 55

Nicore 55 is a composite metal cored wire for repair and joining of cast iron materials. The deposit, which is approximately 53% iron and 45% nickel, provides an excellent match for the coefficient of expansion exhibited by cast irons. Cracking is minimized because thermal stresses caused by the heat of welding are minimized. The light slag is easily removed enhancing visual weld inspection. The fact that this is a continuous electrode will improve the operating factor and minimize unnecessary stops and starts. This electrode can replace covered electrodes such as AWS ENiFe-CI or ENiFe-CI-A. It may be used for repair welds or for joining various types of cast irons. Cast irons may be welded to steel and other ferrous and non-ferrous materials with this product. The machinability of the weld deposit is comparable to the matching covered electrode. Substantial savings in weld metal deposition costs will be realized when replacing 55% nickel coated electrodes with Nicore 55. The deposition rate of this wire is more than twice that of a comparable coated electrode. The efficiency (approximately 97%) compared to that of coated electrodes (56% assuming 76mm stub loss) is substantially greater. These two factors result in substantial savings in weld metal deposition costs. Because of the high deposition rate, the travel rate is very fast, resulting in lower heat input which is advantageous in welding cast irons.

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Cast iron

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Al
1.04	0.23	0.71	45.3	0.01

### Deposition Data

Diameter	Current	Voltage
1.2 mm	220-250 A	28-30 V

## OK Tubrodur 12Cr S

A cored wire which produces a martensitic 12%-chromium alloy steel deposit with nitrogen addition. It is used under flux in the submerged arc process.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe7
<b>Welding Current:</b>	DC+-
<b>Alloy Type:</b>	Surfacing alloy: martensitic stainless steel weld metal

Typical Weld Metal Analysis %								
C	Mn	Si	Ni	Cr	Mo	V	N	Nb
OK Flux 10.33								
0.05	0.86	0.51	3.88	11.9	1.02	0.10	0.061	0.11

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h

## OK Tubrodur 13Cr G

OK Tubrodur 13Cr G is a versatile, metal-cored, hardfacing wire which deposits a martensitic 13Cr alloy steel deposit, especially suitable for applications involving wear at elevated temperatures. They include shafts, valve seats, rolls and other parts subjected to wear and/or corrosion at high temperatures. An 80% Ar + 20% CO<sub>2</sub> gas mix is recommended.

<b>Classifications Weld Metal:</b>	EN 14700:T Z Fe7
<b>Approvals:</b>	NAKS/HAKC 1.6 mm

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic stainless steel weld metal

Typical Weld Metal Analysis %							
C	Mn	Si	Ni	Cr	Mo	V	Nb
M21 shielding gas							
0.15	1.14	0.31	2.23	12.53	1.40	0.23	0.23

Deposition Data		
Diameter	Current	Voltage
1.6 mm	200-260 A	28-30 V

# OK Tubrodur 13Cr S

OK Tubrodur 13Cr S is a cored wire which produces a 13%-chromium alloy steel deposit used with OK Flux 10.37 or OK Flux 10.61.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe7
<b>Approvals:</b>	NAKS/HAKC 3.0mm

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Surfacing alloy: martensitic stainless steel weld metal

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
2.4 mm	250-450 A	28-38 V	2.0-5.0 m/min	4.0-9.0 kg/h
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h

# OK Tubrodur 13Mn O/G

OK Tubrodur 13Mn O/G is a self-shielded, flux-cored wire of the austenitic-manganese type. The work hardening characteristics and extremely tough crack-resistant weld metal ensure that OK Tubrodur 13Mn O/G is the ideal solution for rebuilding 13Mn steels, normally found in crusher jaws, swing hammers and numerous parts of earth-moving, mining and quarrying equipment.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe9
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	13% manganese steel weld metal

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Al
0.85	11.78	0.63	2.95	0.38

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.6 mm	150-260 A	24-30 V	2.0-4.2 m/min	2.5-3.2 kg/h

## OK Tubrodur 15CrMn O/G

OK Tubrodur 15.65 is a flux-cored wire for self- or CO<sub>2</sub> shielding, depositing a martensitic-austenitic, work-hardening deposit. OK Tubrodur 15.65 can be used for the rebuilding of mild, low-alloy and 13Mn steels. The weld metal combines excellent abrasion and impact resistance and is suitable for applications such as crusher jaws and hammers, railway point frogs, ripper teeth and wear plates.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe9
<b>Approvals:</b>	CE EN 13479, DB 82.039.10

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	14% Mn 14%Cr steel weld metal

Typical Weld Metal Analysis %						
C	Mn	Si	Ni	Cr	Mo	V
0.3	13.5	0.5	1.75	16.0	0.8	0.65

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-250 A	28-37 V	6.5-21.5 m/min	3.3-7.2 kg/h
1.6 mm	200-330 A	24-33 V	5.0-12.0 m/min	3.7-8.0 kg/h

## OK Tubrodur 23Cr S

A tubular electrode for submerged arc welding with OK Flux 10.92. This electrode produces a weld metal with the following composition: 22% chromium, 4% nickel and 1% molybdenum. The weld metal is oxidation and heat resistant.

Applications: This electrode is suitable for a wide range of components subjected to corrosive media or high-temperature conditions. Examples include shafts, axles, wheels, rollers and so on which are subject to wear by corrosion-oxidation processes. It can be used as a buffer layer on high carbon-base material, prior to hardfacing with high carbon deposits.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe7
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Typical Weld Metal Analysis %					
C	Mn	Si	Ni	Cr	Mo
0.04	0.23	0.77	4.0	23.4	1.3

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h

## OK Tubrodur 30 O M

OK Tubrodur 30 O M is a self-shielded, flux-cored wire for semi-automatic hardfacing, producing a chromium-manganese-alloyed weld metal with a hardness of 28-36 HRC. It is ideal for the on-site rebuilding of rollers, shafts, wheels and worn parts of CMn railway tracks, point frogs and so on.

<b>Classifications Weld Metal:</b>	EN 14700:T Z Fe1
<b>Approvals:</b>	CE EN 13479, DB 82.039.09

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Al
0.10	1.41	0.43	2.94	1.37

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.6 mm	150-300 A	25-36 V	5.0-12.6 m/min	2.4-6.8 kg/h
2.4 mm	250-550 A	26-40 V	2.5-9.0 m/min	3.7-11.4 kg/h

## OK Tubrodur 35 G M

OK Tubrodur 35 G M is a CO<sub>2</sub>-shielded, flux-cored wire for the hardfacing deposit of a manganese-chromium-molybdenum-alloyed weld metal. It is used for the surfacing of wheel runners, wheels and rollers for conveyor belts, wheels for mine trucks, rolls and shafts.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe1
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

### Typical Weld Metal Analysis %

C	Mn	Si	Cr
<b>C1 shielding gas</b>			
0.21	1.40	1.10	1.47

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.6 mm	250-350 A	28-34 V	5.0-12.6 m/min	2.4-6.8 kg/h

## OK Tubrodur 35 O M

OK Tubrodur 35 O M is a self-shielded, flux-cored, tubular wire, primarily developed for the on-site rebuilding of worn CMn railway and tram tracks. The weld deposit is of the CrNiMo type and has excellent compressive strength with a hardness of 30-40 HRC.

<b>Classifications Weld Metal:</b>	EN 14700:T Z Fe3
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Surfacing alloy: martensitic steel weld metal

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Al
0.14	1.10	0.28	2.23	1.04	0.48	1.5

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-250 A	28-37 V	6.5-21.5 m/min	3.3-7.2 kg/h
1.6 mm	150-300 A	25-36 V	5.0-12.6 m/min	2.4-6.8 kg/h

## OK Tubrodur 35 S M

OK Tubrodur 15.40S is a flux-cored wire for SAW hardfacing in conjunction with OK Flux 10.71, depositing a manganese-chromium-molybdenum-alloyed weld metal with a hardness of 32-36 Rockwell C. Suitable for surfacing wheel runners, track links, wheels and rollers for conveyor belts, wheels for mine trucks, rolls and shafts, where a hardness within the range of 32-40 Rockwell C is desired. With negative polarity, less heat input to the base material, less dilution of the weld metal and a higher deposition rate are obtained. In most cases, surfacing with OK Tubrodur 15.40S can be performed without preheat. The need for preheat and increased interpass temperature is determined by the weldability of the parent material in question and the form and dimensions of the workpiece. Whenever possible, surfaced axles and similar objects, which are exposed to a bending stress during rotation, should always be stress relieved at 500-600°C.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe1
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

### Typical Weld Metal Analysis %

C	Mn	Si	Cr
0.21	1.40	1.10	1.47

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h
4.0 mm	500-900 A	28-34 V	2.0-5.0 m/min	6.5-12.5 kg/h

## OK Tubrodur 40 O M

OK Tubrodur 15.42 is a self- or CO<sub>2</sub>-shielded, flux-cored wire for GMAW hardfacing. It is designed for surfacing wheel runners, track links, billet rolls, wheels and rollers for conveyor belts, wheels for mine trucks, rolls and shafts, where a hardness of 35-45 HRC is desired.

<b>Classifications Weld Metal:</b>	EN 14700:T Z Fe2
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Al
0.14	1.59	0.62	0.55	4.64	0.49	1.55

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.6 mm	150-300 A	25-36 V	5.0-12.6 m/min	2.4-6.8 kg/h

## OK Tubrodur 40 S M

A tubular hardfacing wire for rebuilding and surfacing using the submerged arc welding process.

<b>Classifications Weld Metal:</b>	EN 14700:T Z Fe1
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
<b>OK Flux 10.71</b>				
0.15	1.14	0.51	4.07	0.77

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h
4.0 mm	500-900 A	28-34 V	2.0-5.0 m/min	6.5-12.5 kg/h

## OK Tubrodur 53 G M

A cored wire which produces a Cr-Mo-V-Co-W alloyed weld metal for hardfacing used with C1 shielding gas.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe3, DIN 8555:MF3-50T
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Surfacing alloy Cr-Mo-V-Co-W

Typical Weld Metal Analysis %							
C	Mn	Si	Cr	Mo	V	Co	W
C1 shielding gas							
0.33	1.14	0.94	1.76	0.44	0.40	2.03	8.17

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.6 mm	150-450 A	21-40 V	2.4-11.9 m/min	1.8-9.0 kg/h

## OK Tubrodur 55 O A

OK Tubrodur 55 O A is a self-shielded, Cr-carbide type flux-cored wire. The weld metal is extremely resistant to abrasive wear by gritty fine grain materials such as earth, ore, clay, etc. Typical applications are the hardfacing of bucket lips, auger points, mining and earthmoving equipment, scraper blades etc. Maximum 2-3 layers should be deposited.

<b>Classifications Weld Metal:</b>	EN 14700:T Z Fe14
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Carbide-rich steel weld metal

Typical Weld Metal Analysis %					
C	Mn	Si	Cr	Mo	V
3.6	0.88	0.53	22.5	3.5	0.5

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.6 mm	150-300 A	25-36 V	5.0-12.6 m/min	2.4-6.8 kg/h



## OK Tubrodur 58 O/G M

OK Tubrodur 58 O/G M is a self- or CO<sub>2</sub>-shielded, flux-cored wire for hardfacing with a hardness of 55-60 HRC. It is designed for hardfacing feed screws, mixer blades and vessels and ring grooves on diesel-engine pistons.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe6
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

Typical Weld Metal Analysis %					
C	Mn	Si	Cr	Mo	Al
No shielding gas					
0.42	1.22	0.31	4.89	1.14	0.6

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.6 mm	200-300 A	28-36 V	7.0-12.6 m/min	2.4-5.5 kg/h

## OK Tubrodur 58 S M

OK Tubrodur 58 S M is a flux cored wire for SAW hardfacing in conjunction with OK Flux 10.71. OK Tubrodur 58 S M is designed for hardfacing of feed screws, mixer blades and vessels, ring grooves on diesel motor pistons.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe6
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

Typical Weld Metal Analysis %				
C	Mn	Si	Cr	Mo
OK Flux 10.71				
0.45	1.61	0.68	5.2	1.25

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h

# OK Tubrodur 60 G M

OK Tubrodur 60 G M deposits a weld metal with a structure consisting of evenly divided, hard chromium carbides in a martensitic matrix, with a hardness of HV 600-700. It is suitable for hardfacing parts subjected to extremely severe service conditions involving a combination of impact and abrasion. The weld deposit can only be machined by grinding. It is advisable to apply no more than three layers of weld metal. When badly worn surfaces have to be rebuilt, it is recommended to begin by using a tougher weld metal.

Applications:

- Mill hammers
- Parts of agricultural equipment
- Earth-moving equipment
- Grinders for animal carcasses

<b>Classifications Weld Metal:</b>	DIN 8555:MF6-55GP, EN 14700:T Z Fe2
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<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	5%Cr 1%Mo

## Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo
0.67	0.78	0.71	5.33	1.00

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
1.2 mm	150-350 A	18-34 V	5.3-16.4 m/min	2.2-7.0 kg/h
1.6 mm	150-450 A	21-40 V	2.4-11.9 m/min	1.8-9.0 kg/h

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## OK Autrod 12.10

Copper-coated, unalloyed wire for Submerged Arc Welding. For low requirements or in combination with high Si and Mn alloying fluxes. Suitable for non- and low alloyed steels.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.17:EL12, EN ISO 14171-A:S1
<b>Approvals:</b>	CE EN 13479, DB 52.039.01, VdTÜV 12103

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

### Typical Wire Composition %

C	Mn	Si
0.07	0.52	0.08

## OK Autrod 12.22

Copper-coated, unalloyed wire for Submerged Arc Welding. Suitable in combination with most fluxes. Increased Si content and thus especially for neutral fluxes (e.g. OK Flux 10.62) or in order to increase the fluidity of the molten pool. For structural steels, ship buildings steels, pressure vessel steels, fine grained steels, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.17:EM12K, EN ISO 14171-A:S2Si
<b>Approvals:</b>	CE EN 13479, VdTÜV 12103, DB 52.039.05, NAKS/HAKC 2.0 mm-5.0 mm

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

### Typical Wire Composition %

C	Mn	Si
0.09	1.01	0.19

## OK Autrod 12.32

Copper-coated, unalloyed wire for Submerged Arc and Electroslag Welding. Increased Si content and thus especially suitable for neutral fluxes (e.g.: OK Flux 10.62) or in order to increase the fluidity of the molten pool. With OK Flux 10.62 excellent toughness values; CTOD tested. For structural steels, ship building steels, pressure vessel steels, fine grained steels, off-shore constructions, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.17:EH12K, EN ISO 14171-A:S3Si
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC 2.0, 3.0, 4.0, 5.0 mm, VdTÜV 12103, DB 52.039.12

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

Typical Wire Composition %		
C	Mn	Si
0.13	1.77	0.30

## OK Autrod 12.40

Copper-coated, unalloyed wire for Submerged Arc and Electroslag Welding. For structural steels, ship building steels, pressure vessel steels, fine grained steels, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.17:EH14, EN ISO 14171-A:S4
<b>Approvals:</b>	VdTÜV 12103

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

Typical Wire Composition %		
C	Mn	Si
0.12	2.04	0.08

# OK Tubrod 15.00S

OK Tubrod 15.00S is a tubular wire for submerged arc welding in conjunction with OK Flux 10.71, when high integrity welded joints are required in mild and medium tensile steels. General fabrication, structural engineering and shipbuilding are the principal areas of application. The welding of primed plate at high speeds is a particular benefit.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.17:F7A4-EC1 (OK Flux 10.71), SFA/AWS A5.17:F7A5-EC1 (OK Flux 10.62), EN ISO 14171-A:S 42 4 AB T3 (OK Flux 10.71)
<b>Approvals:</b>	CE EN 13479, CE EN 13479 (10.71), LR 3Ym, ABS 3YM, BV A3YM, DNV III YM, GL 3YM, PRS 3YM (10.71), VdTÜV 09144, DB 52.039.14

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

<b>Welding Current:</b>	DC+, AC
<b>Diffusible Hydrogen:</b>	<5ml/100g
<b>Alloy Type:</b>	C Mn

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>OK Flux 10.62</b>			
As welded	465 MPa	540 MPa	26 %
<b>OK Flux 10.71</b>			
As welded	463 MPa	556 MPa	29 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>OK Flux 10.62</b>		
As welded	-40 °C	140 J
As welded	-60 °C	75 J
<b>OK Flux 10.71</b>		
As welded	-40 °C	114 J

## Typical Weld Metal Analysis %

C	Mn	Si
<b>OK Flux 10.62</b>		
0.06	1.40	0.35
<b>OK Flux 10.71</b>		
0.07	1.61	0.59

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
2.4 mm	250-350 A	28-38 V	1.5-2.5 m/min	3.5-9.5 kg/h
3.0 mm	400-800 A	28-40 V	2.5-6.0 m/min	6.0-14.5 kg/h
4.0 mm	500-900 A	28-40 V	2.0-5.5 m/min	7.0-18.0 kg/h



## OK Autrod 12.24

Mo-alloyed, copper-coated wire for Submerged Arc Welding. For creep resistant steels (0.5% Mo), structural steels, ship building steels, pressure vessel steels, pipeline steels up to X70, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EA2, EN ISO 14171-A:S2Mo, EN ISO 24598-A:S S Mo
<b>Approvals:</b>	CE EN 13479, VdTÜV 12103, DB 52.039.06, NAKS/HAKC 3.0, 4.0, 5.0 mm

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

Typical Wire Composition %			
C	Mn	Si	Mo
0.09	1.08	0.14	0.48

## OK Autrod 12.34

Mo-alloyed, copper-coated wire for Submerged Arc and Electroslag Welding. For creep resistant steels (0.5% Mo), structural steels, ship building steels, pressure vessel steels, pipeline steels up to X80, high strength steels, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EA4, EN ISO 14171-A:S3Mo, EN ISO 24598-A:S S MnMo
<b>Approvals:</b>	VdTÜV 12103, NAKS/HAKC 4.0 mm

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

Typical Wire Composition %			
C	Mn	Si	Mo
0.13	1.51	0.16	0.48

## OK Autrod 13.10 SC

Cr-, Mo-alloyed, copper-coated wire for Submerged Arc Welding. Very low level of impurities. X-factor (Bruscati) max. 11. With OK Flux 10.63 for highest toughness requirements also after Step-Cooling; very clean weld metal with X-factor max. 15. Mainly for creep resistant steels (1.25% Cr, 0.5% Mo).

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EB2R, EN ISO 24598-A:S S CrMo1
<b>Approvals:</b>	CE EN 13479, VdTÜV 12104, NAKS/HAKC 3.2-4.0 mm, DB 52.039.09

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

Typical Wire Composition %					
C	Mn	Si	Cr	Mo	X
0.10	0.83	0.12	1.21	0.49	≤ 11

## OK Autrod 13.20 SC

OK Autrod 13.20 SC is a Cr-, Mo-alloyed, copper-coated wire for Submerged Arc Welding. Very low level of impurities. X-factor (Bruscati) max. 11. With OK Flux 10.63 for highest toughness requirements also after Step-Cooling; very clean weld metal with X-factor max. 15. Mainly for creep resistant steels (2,25% Cr, 1% Mo).

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EB3R, EN ISO 24598-A:S S CrMo2
<b>Approvals:</b>	CE EN 13479, VdTÜV 12104, NAKS/HAKC 3.0 mm, 4.0mm

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

Typical Wire Composition %					
C	Mn	Si	Cr	Mo	X
0.11	0.66	0.15	2.33	0.95	≤ 11

## OK Autrod 13.21

Ni-alloyed, copper-coated wire for Submerged Arc Welding. For structural steels, ship building steels, pressure vessel steels, fine grained steels, etc. at lower temperatures.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:ENi1, EN ISO 14171-A:S2Ni1
<b>Approvals:</b>	VdTÜV 12103

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

Typical Wire Composition %			
C	Mn	Si	Ni
0.11	0.98	0.15	0.90

## OK Autrod 13.24

Ni-, Mo-alloyed, copper-coated wire for Submerged Arc Welding. With OK Flux 10.62 excellent toughness values; CTOD tested. For low temperature steels and fine grained steels in ship building and off-shore industries, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:ENi6, EN ISO 14171-A:S3Ni1Mo0,2
<b>Approvals:</b>	CE EN 13479, VdTÜV 12103, NAKS/HAKC 3.2-4.0 mm

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

Typical Wire Composition %				
C	Mn	Si	Ni	Mo
0.12	1.52	0.23	0.88	0.19

## OK Autrod 13.27

Ni-alloyed, copper-coated wire for Submerged Arc Welding. With OK Flux 10.62 excellent toughness values; CTOD tested. For low temperature steels and fine grained steels in ship building, off-shore, pressure vessel industries, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:ENi2, EN ISO 14171-A:S2Ni2
<b>Approvals:</b>	CE EN 13479, VdTÜV 12103, DB 52.039.08, NAKS/HAKC 2.5, 3.0, 4.0 mm

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

Typical Wire Composition %			
C	Mn	Si	Ni
0.10	1.02	0.14	2.19

## OK Autrod 13.33

Cr-, Mo-alloyed, copper-coated wire for Submerged Arc Welding. Mainly for creep resistant steels (5% Cr, 0.5% Mo).

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EB6, EN ISO 24598-A:S S CrMo5
<b>Approvals:</b>	VdTÜV 12104

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

Typical Wire Composition %				
C	Mn	Si	Cr	Mo
0.09	0.51	0.42	5.73	0.53

## OK Autrod 13.35

Cr-, Mo-alloyed, non copper-coated wire for Submerged Arc Welding. Mainly for creep resistant steels (9% Cr, 1% Mo V Nb).

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EB91, EN ISO 24598-A:S S CrMo91
<b>Approvals:</b>	VdTÜV 12104

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

Typical Wire Composition %								
C	Mn	Si	Ni	Cr	Mo	V	N	Nb
0.10	0.52	0.22	0.67	8.82	0.92	0.20	0.05	0.07

## OK Autrod 13.36

Ni-, Cu-, Cr-alloyed, copper-coated wire for Submerged Arc Welding. For weather resistant steels such as COR-TEN, Patinax, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EG, EN ISO 14171-A:S2Ni1Cu
<b>Approvals:</b>	CE EN 13479, VdTÜV 12103, DB 52.039.04

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

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Cu
0.10	0.95	0.29	0.78	0.29	0.48

## OK Autrod 13.40

Ni-, Mo-alloyed, copper-coated wire for Submerged Arc Welding. Preferably in combination with OK Flux 10.62. For high strength steels with minimum yield strengths up to 620 MPa, low temperature steels, fine grained steels, etc.

<b>Classifications Wire Electrode:</b>	EN ISO 14171-A:S3Ni1Mo, EN ISO 26304-A:S3Ni1Mo, EN ISO 26304-B:(SUN2M2), SFA/AWS A5.23:EG
<b>Approvals:</b>	CE EN 13479, VdTÜV 12103, NAKS/HAKC 3.2-4.0 mm

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

### Typical Wire Composition %

C	Mn	Si	Ni	Mo
0.11	1.63	0.16	0.86	0.51

## OK Autrod 13.43

Ni-, Cr-, Mo-alloyed, copper-coated wire for Submerged Arc Welding. Preferably in combination with OK Flux 10.62. For high strength steels with minimum yield strengths up to 690 MPa, low temperature steels, fine grained steels, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EG, EN ISO 26304-A:S3Ni2,5CrMo, EN ISO 26304-B:(SUN4C1M3)
<b>Approvals:</b>	CE EN 13479, VdTÜV 12104

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

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.12	1.55	0.19	2.29	0.67	0.47

## OK Autrod 13.49

Ni-alloyed, copper-coated wire for Submerged Arc Welding. Mainly for low temperature steels down to temperatures of -101°C.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:ENi3, EN ISO 14171-A:S2Ni3
<b>Approvals:</b>	VdTÜV 12103

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

Typical Wire Composition %			
C	Mn	Si	Ni
0.09	0.95	0.15	3.28

## OK Autrod 13.64

Low-alloyed and Ti-B micro-alloyed, copper-coated solid wire for Submerged Arc Welding. Especially for high dilution welds where low temperature impact toughness properties are required. For fine grained steels, pipeline steels, ship building steels, etc.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.23:EA2TiB, EN ISO 14171-A:S2MoTiB
<b>Approvals:</b>	VdTÜV 12103 , NAKS/HAKC 3.0, 4.0, 5.0 mm

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

Typical Wire Composition %					
C	Mn	Si	Mo	B	Ti
0.07	1.22	0.28	0.49	0.013	0.14

# OK Tubrod 15.24S

A 1% Ni basic cored wire for submerged arc welding giving good toughness down to -50 °C.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.23:F7P8-EC-G (10.61), SFA/AWS A5.23:F8A6-EC-G (10.62), SFA/AWS A5.23:F8A6-EC-G (10.71), EN ISO 14171-A:S 46 4 AB TZ (10.71), EN ISO 14171-A:S 46 5 FB T3Ni1 (10.62)
<b>Approvals:</b>	ABS 4YQ460M H5 (10.62), BV 4Y46M H5 (10.62), CE EN 13479 (10.62), CE EN 13479 (10.71), DNV IV Y46M(H5) (10.62)

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

<b>Diffusible Hydrogen:</b>	<5ml/100g
<b>Alloy Type:</b>	Low alloy (1% Ni)

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>AWS OK Flux 10.62</b>			
As welded	510 MPa	610 MPa	29 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>AWS OK Flux 10.62</b>		
As welded	-50 °C	106 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni
<b>with OK Flux 10.61</b>			
0.10	2.00	0.40	0.90
<b>with OK Flux 10.62</b>			
0.08	1.61	0.24	0.65
<b>with OK Flux 10.71</b>			
0.10	2.30	0.70	0.90

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
2.4 mm	250-500 A	28-38 V	1.5-2.5 m/min	3.5-9.5 kg/h
3.0 mm	400-800 A	28-40 V	2.5-6.0 m/min	6.0-14.5 kg/h
4.0 mm	500-900 A	28-40 V	2.0-5.5 m/min	7.0-18.0 kg/h

## OK Tubrod 15.25S

OK Tubrod 15.25S is a 2.5Ni tubular wire for submerged arc welding in conjunction with OK Flux 10.62 when Charpy V values down to -60°C are required. It has also high tolerance to shop primer when welding high-speed fillets, as well as single-sided, single-pass butt joints.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.23:F7A8-EC-Ni2
<b>Classifications:</b>	EN ISO 14174:S A FB 1 55 AC H5, SFA/AWS A5.23:F7A8-EC-Ni2

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

<b>Welding Current:</b>	AC, DC+
<b>Diffusible Hydrogen:</b>	<5 ml/100g
<b>Alloy Type:</b>	Low alloy steel -2.5% Nickel

### Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>OK Flux 10.62</b>			
As welded	450 MPa	564 MPa	33 %

### Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>OK Flux 10.62</b>		
As welded	-60 °C	112 J

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cu
<b>OK Flux 10.62</b>				
0.05	1.28	0.35	2.26	0.02

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
4.0 mm	500-900 A	28-40 V	2.0-5.5 m/min	7.0-18.0 kg/h

# OK Tubrod 15.27S

A basic cored wire designed for the submerged arc welding of steels with a minimum yield strength of 690 MPa.

<b>Classifications Weld Metal:</b>	SFA/AWS A5.23:F11A8-EC-G (OK Flux 10.62), EN ISO 26304-A:T 69 6 FB TZ H5 (OK Flux 10.62)
<b>Approvals:</b>	CE EN 13479, CE EN 13479 (10.62), NAKS/HAKC 4.0mm, ABS 5YQ690M H5 (10.62), DNV V Y69MH5 (10.62), GL 6Y69MH5 (10.62), LR 5Y69M H5 (10.62)

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

<b>Welding Current:</b>	DC+
<b>Diffusible Hydrogen:</b>	< 5 ml/100g
<b>Alloy Type:</b>	Low alloy high strength steel

## Typical Tensile Properties

Condition	Yield Strength	Tensile Strength	Elongation
<b>OK Flux 10.62</b>			
As welded	747 MPa	812 MPa	23 %

## Typical Charpy V-Notch Properties

Condition	Testing Temperature	Impact Value
<b>OK Flux 10.62</b>		
As welded	-40 °C	110 J
As welded	-60 °C	80 J

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Mo
<b>OK Flux 10.62</b>				
0.07	1.90	0.40	2.44	0.32

## Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
2.4 mm	250-500 A	28-38 V	1.5-2.5 m/min	3.5-9.5 kg/h
3.0 mm	300-700 A	28-38 V	2.5-5.5 m/min	6.0-12.5 kg/h
3.2 mm	350-750 A	28-38 V	2.5-5.0 m/min	5.5-13.5 kg/h
4.0 mm	450-900 A	28-40 V	2.0-5.5 m/min	7.0-18.0 kg/h



# OK Autrod 308L

A continuous solid corrosion resisting chromium-nickel wire. OK Autrod 308L has a good general corrosion resistance. The alloy has a low carbon content which makes this alloy particularly recommended where there is a risk of intergranular corrosion. The alloy is widely used in the chemical and food processing industries as well as for pipes, tubes and boilers. The alloy has a low carbon content which makes this alloy particularly recommended where there is a risk of intergranular corrosion. OK Autrod 308L can be used in combination with OK Flux 10.92, OK Flux 10.93, OK Flux 10.99 or others.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER308L, EN ISO 14343-A:S 19 9 L
<b>Approvals:</b>	CE EN 13479, VdTÜV 12101, NAKS/HAKC 3.2-4.0 mm, DB 52.039.15

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

<b>Alloy Type:</b>	Austenitic (with approx. 10 % ferrite) 19% Cr - 9% Ni - Low C
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Typical Wire Composition %						
C	Mn	Si	Ni	Cr	N	Ferrite FN
0.02	1.9	0.4	9.8	19.8	0.05	9

## OK Autrod 308H

A continuous solid corrosion resisting chromium-nickel wire for the welding of austenitic chromium nickel alloys of the 18% Cr - 8% Ni type. OK Autrod 308H has a good general corrosion resistance. The alloy has a high carbon content which makes this alloy suitable for applications used at higher temperatures. The alloy is used in chemical and food processing industries as well as for pipes, tubes and boilers. OK Autrod 308H can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER308H, EN ISO 14343-A:S 19 9 H
<b>Approvals:</b>	VdTÜV 12101

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

<b>Alloy Type:</b>	Austenitic 19% Cr - 9% Ni - High C
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr
0.05	1.9	0.5	9.2	19.8

## OK Autrod 309L

A continuous solid corrosion resisting chromium-nickel wire for joining stainless steels to non-alloy or low-alloy steels as well as for welding austenitic stainless alloys of 24% Cr, 13% Ni types. OK Autrod 309L has a good general corrosion resistance. When used for joining dissimilar materials, the corrosion resistance is of secondary importance. OK Autrod 309L can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER309L, EN ISO 14343-A:S 23 12 L
<b>Approvals:</b>	CE EN 13479, VdTÜV 12101, NAKS/HAKC 3.2-4.0 mm

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

<b>Alloy Type:</b>	Austenitic (with approx. 12 % ferrite) 24 % Cr - 13 % Ni - Low C
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.02	1.8	0.4	13.4	23.2	0.10	0.05	10

## OK Autrod 309MoL

OK Autrod 309MoL is a stainless steel, over-alloyed wire for submerged arc welding. Suitable for joining of stainless Cr-Ni and Cr-Ni-Mo steels 304, 309 or 316 to ensure corrosion resistance in e.g. the pulp and paper industry. Dissimilar steels when alloying with Mo is essential. OK Autrod 309MoL can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER309LMo (mod), EN ISO 14343-A:S 23 12 2 L
<b>Approvals:</b>	VdTÜV 12101

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

Typical Wire Composition %					
C	Mn	Si	Ni	Cr	Mo
0.01	1.5	0.4	14.6	21.4	2.5

## OK Autrod 310

A continuous solid corrosion resisting chromium-nickel wire for welding heat resistant austenitic steels of the 25% Cr, 20% Ni type. OK Autrod 310 has a good general oxidation resistance especially at high temperatures due to its high Cr content. The alloy is fully austenitic and therefore sensitive to hot cracking. Common applications are industrial furnaces and boiler parts as well as heat exchangers. OK Autrod 310 can be used in combination with OK Flux 10.93 or OK Flux 10.92.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER310, EN ISO 14343-A:S 25 20
<b>Alloy Type:</b>	Fully austenitic (25 % Cr - 20 % Ni)

Typical Wire Composition %				
C	Mn	Si	Ni	Cr
0.10	1.6	0.4	20.7	25.8

## OK Autrod 312

A continuous solid corrosion resisting chromium-nickel wire for welding stainless steels of the 29% Cr, 9% Ni type. OK Autrod 312 has a good oxidation resistance at high temperatures due to its high content of Cr. The alloy is widely used for joining dissimilar steels, especially if one of the component is fully austenitic, and for steels that are difficult to weld, i.e. machine components, tools, austenitic manganese steels. OK Autrod 312 can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER312, EN ISO 14343-A:S 29 9
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<b>Alloy Type:</b>	Ferritic-austenitic (29 % Cr - 9 % Ni)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr
0.10	1.6	0.4	8.8	30.7

## OK Autrod 316L

A continuous solid corrosion resisting chromium-nickel-molybdenum wire for welding of austenitic stainless alloys of 18% Cr - 8% Ni and 18% Cr - 8% Ni - 3% Mo-types. OK Autrod 316L has a good general corrosion resistance, in particular the alloy has very good resistance against corrosion in acid and chlorinated environments. The alloy has a low carbon content which makes it particularly recommended where there is a risk of intergranular corrosion. The alloy is widely used in the chemical and food processing industries as well as in ship building and various types of architectural structures. OK Autrod 316L can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER316L, EN ISO 14343-A:S 19 12 3 L
<b>Approvals:</b>	CE EN 13479, VdTÜV 12101, NAKS/HAKC 3.2-4.0 mm, DB 52.039.16

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

<b>Alloy Type:</b>	Austenitic (with approx. 10 % ferrite) 19% Cr - 12% Ni - 3% Mo - Low C
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Typical Wire Composition %							
C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.01	1.7	0.4	12.0	18.2	2.6	0.04	7

## OK Autrod 316H

A continuous solid corrosion resisting chromium-nickel-molybdenum wire for welding of austenitic stainless alloys of 17% Cr 12% Ni 3% Mo types. OK Autrod 316H can be used in combination with OK Flux 10.93. OK Autrod 316H has a good general corrosion resistance. The alloy has a high carbon content which makes this alloy suitable for applications used at higher temperatures. The alloy is used in the chemical and food processing industries as well as for pipes, tubes and boilers.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:S 19 12 3 H, SFA/AWS A5.9:ER316H
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<b>Alloy Type:</b>	Austenitic (with approx. 10 % ferrite)
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Typical Wire Composition %							
C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.05	1.7	0.4	12.5	19.3	2.2	0.04	6

# OK Autrod 317L

A continuous solid corrosion resisting chromium-nickel-molybdenum wire for welding of austenitic stainless alloys of 19% Cr 13% Ni 3% Mo types. OK Autrod 317L has a good resistance to general corrosion and pitting due to its high content of molybdenum. The alloy has a low carbon content which makes this alloy particularly recommended where there is a risk of intergranular corrosion. The alloy is used in severe corrosion conditions such as in the petrochemical and paper industries. OK Autrod 317L can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:S 18 15 3 L, SFA/AWS A5.9:ER317L
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<b>Alloy Type:</b>	Austenitic (with approx. 10 % ferrite)
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## Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.01	1.4	0.4	13.6	18.9	3.6	0.05	7

## OK Autrod 318

OK Autrod 318 is an extra low carbon, stainless wire for the submerged arc welding of corrosion-resistant steels of the 18Cr12Ni3Mo type, such as AISi 316 and 316L or somewhat lower alloyed types. OK Autrod 318 can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:S 19 12 3 Nb, SFA/AWS A5.9:ER318
<b>Approvals:</b>	CE EN 13479, VdTÜV 12101, DB 52.039.11, NAKS/HAKC 4.0mm

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

Typical Wire Composition %								
C	Mn	Si	Ni	Cr	Mo	N	Nb	Ferrite FN
0.04	1.8	0.4	11.5	18.9	2.6	0.04	0.7	11

## OK Autrod 347

A continuous solid corrosion resisting chromium-nickel wire for the welding of austenitic chromium nickel alloys of the 18% Cr - 8% Ni type. OK Autrod 347 has a good general corrosion resistance. The alloy is stabilized with niobium to improve the resistance against intergranular corrosion of the weld metal. Due to the niobium content this alloy is recommended for use at higher temperatures. OK Autrod 347 can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:S 19 9 Nb, SFA/AWS A5.9:ER347
<b>Approvals:</b>	CE EN 13479, VdTÜV 12101, DB 52.039.07, NAKS/HAKC 2.4, 3.2, 4.0 mm

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

<b>Alloy Type:</b>	Austenitic (with approx. 10 % ferrite) 19% Cr - 9% Ni - Nb
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Typical Wire Composition %								
C	Mn	Si	Ni	Cr	N	Nb	Ferrite FN	
0.04	1.4	0.4	9.5	19.2	0.05	0.6	7	

## OK Autrod 385

A continuous solid corrosion resisting chromium-nickel-molybdenum-copper wire for welding of austenitic stainless alloys of 20% Cr, 25% Ni, 5% Mo, 1.5% Cu, low C types. OK Autrod 385 weld metal has a good resistance to stress corrosion and intergranular corrosion and shows a very good resistance to attack in non-oxidizing acids. The resistance and crevice corrosion is better than for ordinary 18% Cr, 8% Ni, Mo steels. The alloy is widely used in many applications related to the process industry. OK Autrod 385 can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER385, EN ISO 14343-A:S 20 25 5 Cu L
<b>Approvals:</b>	VdTÜV 12101

<b>Alloy Type:</b>	Fully austenitic (20 % Cr - 25 % Ni - 5 % Mo - 1.5 % Cu - Low C)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Cu	N
0.01	1.7	0.4	25.0	20.0	4.4	1.5	0.05

## OK Autrod 2209

A continuous solid corrosion resisting Duplex wire for welding of austenitic-ferritic stainless alloys of 22% Cr, 5% Ni, 3% Mo types. OK Autrod 2209 has a high general corrosion resistance. In media containing chloride and hydrogen sulphide the alloy has a high resistance to intergranular, pitting and especially to stress corrosion. The alloy is used in a variety of applications across all industrial segments. OK Autrod 2209 can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER2209, EN ISO 14343-A:S 22 9 3 N L
<b>Approvals:</b>	CE EN 13479, VdTÜV 12101, NAKS/HAKC 3.2-4.0mm

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

<b>Alloy Type:</b>	Austenitic-ferritic (22.5 % Cr - 8 % Ni - 3 % Mo - Low C)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	N
0.01	1.5	0.5	8.5	22.7	3.2	0.17



## OK Autrod 2307

A continuous, solid, corrosion-resistant duplex wire for welding austenitic-ferritic stainless alloys of 21% Cr, 1% Ni or 23% Cr, 4% Ni types. OK Autrod 2307 is overalloyed in Ni to ensure correct Ferrite balance in the weld metal. Lean duplex types is used for civil engineering, storage tanks, containers, etc. These steels have in general medium corrosion resistance and good strength properties. The welding should be done as for ordinary austenitic steels, but high amperages should be avoided and interpass temperature should be maximum 150°C.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:S 23 7 N L
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<b>Alloy Type:</b>	Austenitic-ferritic
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Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Cu	N
0.01	1.4	0.5	7.1	23.2	0.2	0.15

## OK Autrod 2509

A continuous solid corrosion resisting "Super Duplex" wire for welding of austenitic-ferritic stainless alloys of 25% Cr, 10% Ni, 4% Mo, low C types. OK Autrod 2509 has a high intergranular corrosion resistance and pitting. The alloy is widely used in applications where corrosion resistance is of utmost importance. Pulp and paper industry, offshore and gas industry are areas of interest. OK Autrod 2509 can be used in combination with OK Flux 10.93 or OK Flux 10.94.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:S 25 9 4 N L, SFA/AWS A5.9:ER2594
<b>Approvals:</b>	CE EN 13479, VdTÜV 12101

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

<b>Alloy Type:</b>	Austenitic-ferritic (25% Cr - 10% Ni - 4% Mo - Low C)
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Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Mo	N
0.01	0.4	0.4	9.4	25.2	3.9	0.24

## OK Autrod 410

A continuous solid welding wire of 13% Cr type. OK Autrod 410 is used for welding of similar martensitic and martensitic-ferritic steels in different applications. OK Autrod 410 can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER410
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<b>Alloy Type:</b>	Martensitic-ferritic (13 % Cr)
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### Typical Wire Composition %

C	Mn	Si	Cr
0.12	0.5	0.3	12.2

## OK Autrod 410NiMo

A continuous solid corrosion resisting "410NiMo" type alloyed with 13 % Cr, 4.5 % Ni and 0.5 % Mo. This alloy is used for welding of similar martensitic and martensitic-ferritic steels in different applications such as for example hydro-turbines. OK Autrod 410NiMo can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	EN ISO 14343-A:S 13 4
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<b>Alloy Type:</b>	Martensitic-ferritic (12 % Cr - 4.5 % Ni - 0.5 % Mo)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo
0.02	0.5	0.4	4.2	12.4	0.6

## OK Autrod 430

A continuous solid corrosion resisting 17% Cr wire for welding of stainless alloys of 13-18% Cr. OK Autrod 430 is used for cladding on un-alloyed and low alloyed steels. The wire can be used in combination with OK Flux 10.93.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.9:ER430
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<b>Alloy Type:</b>	Ferritic (17 % Cr)
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### Typical Wire Composition %

C	Mn	Si	Cr
0.02	0.4	0.3	16.8

## OK Band 308L

OK Band 308L is a stainless welding strip designed for surfacing using the submerged arc welding process. Together with OK Flux 10.05, it produces a 308L type of weld deposit.

<b>Classifications:</b>	EN ISO 14343-A:B 19 9 L, SFA/AWS A5.9:EQ308L
<b>Approvals:</b>	VdTÜV 12102

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

<b>Alloy Type:</b>	Austenitic CrNi
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Typical Wire Composition %						
C	Mn	Si	Ni	Cr	N	Ferrite FN
0.015	1.8	0.3	10.5	20.0	0.06	12

## OK Band 309L

OK Band 309L is a stainless welding strip designed for surfacing using the submerged arc strip cladding process. Commonly used as a buffer layer. Often used with OK Flux 10.05.

<b>Classifications:</b>	EN ISO 14343-A:B 23 12 L, SFA/AWS A5.9:EQ309L
<b>Approvals:</b>	VdTÜV 12102, NAKS/HAKC 30x0.5mm, NAKS/HAKC 60x0.5mm

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

<b>Alloy Type:</b>	Austenitic 24Cr - 13Ni
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Typical Wire Composition %						
C	Mn	Si	Ni	Cr	N	Ferrite FN
0.01	1.71	0.36	13.3	23.72	0.05	15

## OK Band 309LNb

OK Band 309LNb is a stainless welding strip designed for the submerged arc or electroslag welding process. Together with OK Flux 10.05 it produces a 309LNb type of weld deposit using SAW. In combination with OK Flux 10.14 it manufactures a 347 type of weld deposit using single layer electroslag strip cladding.

<b>Classifications:</b>	EN ISO 14343-A:B 23 12 L Nb
<b>Approvals:</b>	VdTÜV 12102

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

Typical Wire Composition %							
C	Mn	Si	Ni	Cr	N	Nb	Ferrite FN
0.01	1.98	0.23	12.5	23.83	0.03	0.7	23

## OK Band 309L ESW

OK Band 309L ESW is a stainless strip for single layer electroslag strip surfacing. Together with OK Flux 10.10 it produces a 308L type of weld deposit.

<b>Classifications:</b>	EN ISO 14343-A:B 22 11 L
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	N	Ferrite FN
0.010	1.8	0.2	11.0	21.1	0.05	15

## OK Band 309LMo ESW

OK Band 309LMo ESW is a stainless strip for single layer electroslag strip surfacing. Together with OK Flux 10.10 and OK Flux 10.14 it produces a 316L type of weld deposit.

<b>Classifications:</b>	EN ISO 14343-A:B 21 13 3 L, SFA/AWS A5.9:EQ309LMo (Mod)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.015	1.8	0.2	13.5	20.5	2.9	0.06	13

## OK Band 309LNb ESW

OK Band 309LNb ESW is a stainless strip for single layer electroslag strip surfacing. Together with OK Flux 10.10 it produces a 347 type of weld deposit.

<b>Classifications:</b>	EN ISO 14343-A:B 22 12 L Nb
<b>Approvals:</b>	NAKS/HAKC 30, 60 and 90 mm

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

### Typical Wire Composition %

C	Mn	Si	Ni	Cr	N	Nb	Ferrite FN
0.01	1.74	0.20	11.0	21.14	0.04	0.6	15

## OK Band 316L

OK Band 316L is a stainless welding strip designed for surfacing using the Submerged Arc Welding process. Together with OK Band 309L and OK Flux 10.05, produces a type 316L weld deposit.

<b>Classifications:</b>	SFA/AWS A5.9:EQ316L, EN ISO 14343-A:B 19 12 3 L
<b>Approvals:</b>	VdTÜV 12102

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

<b>Alloy Type:</b>	Austenitic CrNiMo
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Typical Wire Composition %							
C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.01	1.73	0.4	12.6	18.5	2.9	0.05	7

## OK Band 317L

OK Band 317L is a stainless welding strip designed for surfacing using the Submerged Arc Welding process. Together with OK Band 309L and OK Flux 10.05, produces a type 317L weld deposit.

<b>Classifications:</b>	EN ISO 14343-A:B 18 15 3 L, SFA/AWS A5.9:EQ317L
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<b>Alloy Type:</b>	Austenitic 18Cr- 15Ni - 3Mo - L
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Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Mo	N
0.01	1.26	0.45	14.0	19.0	3.6	0.05

## OK Band 347

OK Band 347 is a stainless welding strip designed for surfacing using the Submerged Arc Welding process. Together with OK Band 309L and OK Flux 10.05, produces a type 347 weld deposit.

<b>Classifications:</b>	EN ISO 14343-A:B 19 9 Nb, SFA/AWS A5.9:EQ347
<b>Approvals:</b>	VdTÜV 12102, NAKS/HAKC 30x0.5mm, NAKS/HAKC 60x0.5mm

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

<b>Alloy Type:</b>	Austenitic CrNiNb
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Typical Wire Composition %							
C	Mn	Si	Ni	Cr	N	Nb	Ferrite FN
0.02	1.8	0.37	10.0	19.5	0.06	0.5	11

## OK Band 2209

An duplex austenitic-ferritic stainless welding strip designed for surfacing using the submerged arc welding process. Together with OK Flux 10.05 it produces a duplex 2209 type of weld deposit.

<b>Classifications:</b>	EN ISO 14343-A:B 22 9 3 N L, SFA/AWS A5.9:EQ2209
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<b>Alloy Type:</b>	Duplex Austenitic-Ferritic CrNiMo
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Typical Wire Composition %							
C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
0.015	1.5	0.4	9.0	23.0	3.2	0.15	50

## OK Band NiCr3

OK Band NiCr3 is a nickel-based strip for submerged arc strip cladding. Together with OK Flux 10.11, OK Flux 10.16 or OK Flux 10.17 it produces a weld overlay with good corrosion resistance and high temperature properties.

<b>Classifications:</b>	SFA/AWS A5.14:EQNiCr-3, EN ISO 18274:B Ni 6082 (NiCr20Mn3Nb)
<b>Approvals:</b>	VdTÜV 12102

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

Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Fe	Nb
< 0.1	3.0	0.2	≥67.0	20.0	≤3.0	2.5

## OK Band NiCrMo3

OK Band NiCrMo3 is a nickel-based strip for submerged arc strip cladding. Together with OK Flux 10.11, OK Flux 10.16 or OK Flux 10.17 it produces a weld overlay with good corrosion resistance and high temperature properties.

<b>Classifications:</b>	SFA/AWS A5.14:EQNiCrMo-3, EN ISO 18274:B Ni 6625 (NiCr22Mo9Nb)
<b>Approvals:</b>	VdTÜV 12102

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

Typical Wire Composition %							
C	Mn	Si	Ni	Cr	Mo	Fe	Nb+Ta
<0.1	0.3	0.1	≥58.0	22.0	9.0	≤2.0	4.0

## OK Band NiCrMo7

OK Band NiCrMo7 is a nickel-based strip for submerged arc and electroslag strip cladding.

<b>Classifications:</b>	SFA/AWS A5.14:EQNiCrMo-7, EN ISO 18274:B Ni 6455 (NiCr16Mo16Ti)
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Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Mo	Fe
≤ 0.01	≤1.0	≤0.08	≥56.0	16.0	16.0	≤3.0

## OK Band NiCu7

OK Band NiCu7 is a Monel strip for submerged arc strip cladding. Together with OK Flux 10.18 it produces a weld overlay with good corrosion resistance and high temperature properties.

<b>Classifications:</b>	SFA/AWS A5.14:EQNiCu-7, EN ISO 18274:B Ni 4060 (NiCu30Mn3Ti)
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<b>Alloy Type:</b>	NiCu-7
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Typical Wire Composition %						
C	Mn	Si	Ni	Cu	Fe	Ti
< 0.1	3.0	1.0	67.0	29	≤2.0	2.5

## OK Autrod NiCr-3

OK Autrod NiCr-3 is a corrosion and heat resistant, nickel-chromium wire for submerged arc welding of high alloyed steel, heat resistant steel, corrosion resistant steel, 9Ni steels and similar steels with high notch toughness at low temperatures. OK Autrod NiCr-3 can be combined with OK Flux 10.90 or OK Flux 10.16.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCr-3, EN ISO 18274:S Ni 6082 (NiCr20Mn3Nb)
<b>Approvals:</b>	VdTÜV 12101

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

Typical Wire Composition %						
C	Mn	Si	Ni	Cr	Fe	Nb+Ta
0.04	3.0	0.2	bal	20.0	1.3	2.5

## OK Autrod NiCrMo-3

Ni-based solid wire for SAW welding. Corrosion and heat resistant. For welding of high alloyed steels, heat resistant steels, corrosion resistant steels, 9% Ni-steels and similar steels with high toughness at low temperatures. OK Autrod NiCrMo-3 shall be combined with OK Flux 10.90 or OK Flux 10.16.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-3, EN ISO 18274:S Ni 6625 (NiCr22Mo9Nb)
<b>Alloy Type:</b>	NiCrMo-3

Typical Wire Composition %							
C	Mn	Si	Ni	Cr	Mo	Fe	Nb+Ta
0.02	0.04	0.06	Bal	22.7	8.6	0.3	3.5



## OK Autrod NiCrMo-4

OK Autrod NiCrMo-4 is a corrosion and heat resistant, nickel-chromium wire for submerged arc welding of high alloyed steel, heat resistant steel, corrosion resistant steel, 9Ni steels and similar steels with high notch toughness at low temperatures. OK Autrod NiCrMo-4 can be combined with OK Flux 10.90 or OK Flux 10.16.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-4, EN ISO 18274:S Ni 6276 (NiCr15Mo16Fe6W4)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Fe	W
0.01	0.45	0.05	Bal.	15.5	16.1	5.8	3.5

## OK Autrod NiCrMo-13

OK Autrod NiCrMo-13 is a Nb-free, Ni-Cr-Mo wire for welding high-alloyed steels of the 20Cr25Ni4-6Mo type and nickel-based alloys of similar type. The wire can also be used for welding these steels with dissimilar steels. The weld metal has very good corrosion resistance in both oxidizing and reducing media. OK Autrod NiCrMo-13 can be combined with OK Flux 10.90 or OK Flux 10.16.

<b>Classifications Wire Electrode:</b>	SFA/AWS A5.14:ERNiCrMo-13, EN ISO 18274:S Ni 6059 (NiCr23Mo16)
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	Al	Fe
0.01	0.2	0.1	Bal	23.0	16.0	0.3	1.0

## OK Tubrodur 12Cr S

A cored wire which produces a martensitic 12%-chromium alloy steel deposit with nitrogen addition. It is used under flux in the submerged arc process.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe7
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<b>Welding Current:</b>	DC+-
<b>Alloy Type:</b>	Surfacing alloy: martensitic stainless steel weld metal

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	V	N	Nb
<b>OK Flux 10.33</b>								
0.05	0.86	0.51	3.88	11.9	1.02	0.10	0.061	0.11

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h

## OK Tubrodur 13Cr S

OK Tubrodur 13Cr S is a cored wire which produces a 13%-chromium alloy steel deposit used with OK Flux 10.37 or OK Flux 10.61.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe7
<b>Approvals:</b>	NAKS/HAKC 3.0mm

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

<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Surfacing alloy: martensitic stainless steel weld metal

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
2.4 mm	250-450 A	28-38 V	2.0-5.0 m/min	4.0-9.0 kg/h
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h

## OK Tubrodur 15.40S

This is a tubular hardfacing wire for rebuilding and surfacing using the submerged arc welding process.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe6
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
2.4 mm	250-450 A	28-38 V	2.0-5.0 m/min	4.0-9.0 kg/h
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h
4.0 mm	500-900 A	28-34 V	2.0-5.0 m/min	6.5-12.5 kg/h

## OK Tubrodur 15.42S

A tubular hardfacing wire for rebuilding and surfacing using the submerged arc welding process.

<b>Classifications Weld Metal:</b>	EN 14700:T Z Fe1
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Martensitic steel weld metal

Deposition Data				
Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h
4.0 mm	500-900 A	28-34 V	2.0-5.0 m/min	6.5-12.5 kg/h

## OK Tubrodur 15.72S

A cored wire which produces a martensitic 12%-chromium alloy steel deposit with nitrogen addition. Used under flux in the submerged arc process.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe7
<b>Welding Current:</b>	DC+-
<b>Alloy Type:</b>	Surfacing alloy: martensitic stainless steel weld metal

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
2.4 mm	250-450 A	28-38 V	2.0-5.0 m/min	4.0-9.0 kg/h

## OK Tubrodur 15.73S

A cored wire which produces a 13%-chromium alloy steel deposit used with OK Flux 10.37 or OK Flux 10.61.

<b>Classifications Weld Metal:</b>	EN 14700:T Fe7
<b>Welding Current:</b>	DC+
<b>Alloy Type:</b>	Surfacing alloy: martensitic stainless steel weld metal

### Deposition Data

Diameter	Current	Voltage	Wire Feed Speed	Deposition Rate
2.4 mm	250-450 A	28-38 V	2.0-5.0 m/min	4.0-9.0 kg/h
3.0 mm	400-700 A	28-36 V	2.5-5.5 m/min	5.5-12.0 kg/h
4.0 mm	500-900 A	28-34 V	2.0-5.0 m/min	6.5-12.5 kg/h

## OK Band 7018

A low alloy welding strip designed for surfacing using the submerged arc welding process.

<b>Alloy Type:</b>	CMn-steel
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Typical Wire Composition %		
C	Mn	Si
0.11	0.39	0.23

## OK Band 430

OK Band 430 is a 17Cr welding strip designed for surfacing using the submerged arc welding and electroslag processes. The strip is used mainly for R+M applications. In combination with OK Flux 10.07 is giving a weld metal with 14Cr-4Ni-1Mo and a hardness of 370-420 HB.

<b>Classifications:</b>	EN ISO 14343-A:B 17
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<b>Alloy Type:</b>	17Cr
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Typical Wire Composition %			
C	Mn	Si	Cr
0.04	0.66	0.4	17.0

## OK Band 11.21

A sintered welding strip electrode designed for hardfacing by submerged arc or electroslag strip cladding.

<b>Alloy Type:</b>	CrMo 5-3
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Typical Wire Composition %				
C	Mn	Si	Cr	Mo
0.29	1.80	0.31	5.3	3.0

## OK Band 11.23

A sintered welding strip designed for hardfacing of steel mill rollers.

<b>Alloy Type:</b>	13Cr - 1Mo
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### Typical Wire Composition %

C	Mn	Si	Cr	Mo
0.29	1.35	0.17	14.3	1.4

## OK Band 11.27

A sintered welding strip designed for hardfacing of steel mill rollers.

<b>Alloy Type:</b>	13Cr - 1Mo - V
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### Typical Wire Composition %

C	Mn	Si	Cr	Mo	V
0.27	0.70	0.53	12.8	1.8	0.12

## OK Band 11.84

A welding strip designed for surfacing using the electroslag strip cladding process.

<b>Alloy Type:</b>	7Cr - Mo - W - with higher C content
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	W
0.35	1.18	0.22	0.5	6.5	1.7	1.8

## OK Band 11.85

Sintered strip electrode for single layer submerged arc or electroslag strip cladding.

<b>Alloy Type:</b>	13Cr - 2Ni - Mo
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### Typical Wire Composition %

C	Mn	Si	Ni	Cr	Mo	V	Nb
0.20	0.75	0.25	2.2	14.0	1.2	0.25	0.25

## OK Flux 10.62

Agglomerated fluoride-basic flux for Submerged Arc Welding. Primarily for multi-run welding. For highest demands on impact properties, low temperature toughness, strength and CTOD-values. Especially suitable for narrow gap welding due to good slag detachability and smooth side-wall blending. For offshore constructions, pressure vessels, power generation, shipbuilding, pipe mills, civil constructions, transport industries, etc. Produces low-oxygen weld metal (approx. 300 ppm) with hydrogen contents maximum 5 ml/100 g, in BlockPac (moisture protection) maximum 4 ml/100g. Operates optimally at the lower end of the voltage range. Designed for single and multi wire procedures, for butt and fillet welds. Works equally well on DC and AC current. Single layer and multi layer welding of unlimited plate thickness.

<b>Classifications:</b>	EN ISO 14174:S A FB 1 55 AC H5, EN ISO 14174:S A FB 1 55 AC H4 only BlockPac/moisture-protection
<b>Approvals:</b>	CE EN 13479, NAKS/HAKC RD 03-613-03, DB 51.039.07

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

<b>Diffusible Hydrogen:</b>	max 5 ml H/100g weld metal (Redried flux); max 4 ml H/100g in BlockPac (moisture protection)
<b>Slag Type:</b>	Fluoride-basic
<b>Alloy Transfer:</b>	No Silicon or Manganese alloying
<b>Density:</b>	nom: 1.1 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 3.2
<b>Grain Size (met):</b>	0.2-1.6 mm (10x65 mesh)

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	1.0 kg	0.9 kg
34 V	1.3 kg	1.2 kg
38 V	1.6 kg	1.4 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.22	A5.17:EM12K/ 14171-A:S2Si	S 38 5 FB S2Si	A5.17: F7A8-EM12K	A5.17: F6P8-EM12K
OK Autrod 12.24	A5.23:EA2/ 14171-A:S2Mo; 24598-A:S S Mo	S 46 4 FB S2Mo	A5.23: F8A6-EA2-A2	A5.23: F8P6-EA2-A2
OK Autrod 12.32	A5.17:EH12K/ 14171-A:S3Si	S 46 6 FB S3Si	A5.17: F7A8-EH12K	A5.17: F7P8-EH12K
OK Autrod 12.34	A5.23:EA4/ 14171-A:S3Mo; 24598-A:S S MnMo	S 50 4 FB S3Mo	A5.23: F8A6-EA4-A4	A5.23: F8P6-EA4-A4
OK Autrod 12.40	A5.17:EH14/ 14171-A:S4	S 50 4 FB S4	A5.17: F7A6-EH14	A5.17: F7P6-EH14

# OK Flux 10.62

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 13.10 SC	A5.23:EB2R/ 24598-A:S S CrMo1	-	-	A5.23: F8P2-EB2R-B2
OK Autrod 13.20 SC	A5.23:EB3R/ 24598-A:S S CrMo2	-	-	A5.23: F8P2-EB3R-B3
OK Autrod 13.21	A5.23:ENi1/ 14171-A:S2Ni1	S 42 4 FB S2Ni1	A5.23: F7A6-ENi1-Ni1	A5.23: F7P8-ENi1-Ni1
OK Autrod 13.24	A5.23:ENi6/ 14171-A:S3Ni1Mo0,2	S 50 6 FB S3Ni1Mo0.2	A5.23: F8A10-ENi6-Ni6	A5.23: F8P8-ENi6-Ni6
OK Autrod 13.27	A5.23:ENi2/ 14171-A:S2Ni2	S 46 7 FB S2Ni2	A5.23: F7A10-ENi2-Ni2	A5.23: F7P10-ENi2-Ni2
OK Autrod 13.40	A5.23:EG/ 14171-A:S3Ni1Mo 26304-A:S3Ni1Mo 26304-B:(SUN2M2)	S 55 6 FB S3Ni1Mo (DC+)	A5.23:F9A8-EG-F3 (DC+)	A5.23: F9P8-EG-F3
OK Autrod 13.43	A5.23:EG/ 26304-A:S3Ni2,5CrMo; 26304-B:(SUN4C1M3)	S 69 6 FB S3Ni2,5CrMo	A5.23: F11A8-EG-G	A5.23: F11P8-EG-G
OK Autrod 13.49	A5.23:ENi3/ 14171-A:S2Ni3	S 46 8 FB S2Ni3	A5.23: F8A15-ENi3-Ni3	A5.23: F8P15-ENi3-Ni3

## Approvals

Wire	ABS	BV	DNV	GL	LR	DB	CE	RINA	RS	VdTÜV
OK Autrod 12.22	•	•	•	•	•	•	•	-	-	•
OK Autrod 12.24	-	-	-	-	-	-	•	-	-	•
OK Autrod 12.32	•	•	•	•	•	•	•	•	•	•
OK Autrod 12.34	•	•	•	•	•	-	-	-	-	-
OK Autrod 13.10 SC	-	-	-	-	-	•	•	-	-	•
OK Autrod 13.20 SC	-	-	-	-	-	-	•	-	-	•
OK Autrod 13.24	•	•	•	•	•	-	•	-	-	-
OK Autrod 13.27	•	•	•	•	•	•	•	•	•	•
OK Autrod 13.40	•	•	•	•	•	-	•	-	-	•
OK Autrod 13.43	•	•	•	•	•	-	•	-	-	-
OK Tubrod 15.27S	•	-	•	•	•	-	•	-	-	-

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.



## OK Flux 10.62

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.22	As Welded AWS DC+	410 MPa	500 MPa	33 %	170 J @ 0°C 160 J @ -20°C 90 J @ -40°C 70 J @ -50°C 35 J @ -62°C
OK Autrod 12.24	As Welded AWS DC+	500 MPa	580 MPa	25 %	140 J @ 20°C 115 J @ 0°C 80 J @ -20°C 60 J @ -40°C 45 J @ -51°C
OK Autrod 12.32	As Welded AWS DC+	475 MPa	560 MPa	28 %	175 J @ 20°C 150 J @ 0°C 130 J @ -30°C 110 J @ -40°C 70 J @ -62°C
OK Autrod 12.34	As Welded AWS DC+	540 MPa	620 MPa	24 %	170 J @ 20°C 160 J @ 0°C 140 J @ -20°C 115 J @ -40°C 45 J @ -51°C
OK Autrod 12.40	As Welded AWS DC+	530 MPa	620 MPa	26 %	140 J @ 20°C 110 J @ 0°C 80 J @ -20°C 50 J @ -40°C 40 J @ -51°C
OK Autrod 13.10 SC	Stress relieved 690°C 1.0h AWS DC+	500 MPa	610 MPa	26 %	110 J @ -18°C 80 J @ -29°C
OK Autrod 13.20 SC	Stress relieved 690°C 1.0h AWS DC+	525 MPa	620 MPa	25 %	120 J @ -18°C 80 J @ -29°C
OK Autrod 13.21	As Welded AWS DC+	470 MPa	560 MPa	28 %	195 J @ 20°C 185 J @ 0°C 160 J @ -20°C 70 J @ -40°C 60 J @ -51°C
OK Autrod 13.24	As Welded AWS DC+	530 MPa	620 MPa	25 %	120 J @ -40°C 110 J @ -50°C 70 J @ -60°C 50 J @ -73°C
OK Autrod 13.27	As Welded AWS DC+	460 MPa	570 MPa	28 %	140 J @ -20°C 110 J @ -40°C 80 J @ -60°C 50 J @ -73°C
OK Autrod 13.40	As Welded AWS DC+	610 MPa	690 MPa	24 %	90 J @ -40°C 80 J @ -50°C 50 J @ -62°C
OK Autrod 13.43	As Welded AWS DC+	700 MPa	800 MPa	21 %	100 J @ -20°C 75 J @ -40°C 65 J @ -50°C 50 J @ -62°C
OK Autrod 13.49	As Welded AWS DC+	500 MPa	600 MPa	27 %	95 J @ -70°C 40 J @ -101°C

# OK Flux 10.62

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
<b>OK Autrod 12.22 DC+, 580A, 29V</b>					
0.07	1.0	0.30	-	-	-
<b>OK Autrod 12.24 DC+, 580A, 29V</b>					
0.07	1.0	0.22	-	-	0.5
<b>OK Autrod 12.32 DC+, 580A, 29V</b>					
0.10	1.6	0.35	-	-	-
<b>OK Autrod 12.34 DC+, 580A, 29V</b>					
0.10	1.45	0.21	-	-	0.5
<b>OK Autrod 12.40 DC+, 580A, 29V</b>					
0.08	1.9	0.12	-	-	-
<b>OK Autrod 13.10 SC DC+, 580A, 29V</b>					
0.08	0.7	0.22	-	1.1	0.5
<b>OK Autrod 13.20 SC DC+, 580A, 29V</b>					
0.08	0.60	0.20	-	2.2	0.95
<b>OK Autrod 13.21 DC+, 580A, 29V</b>					
0.06	1.0	0.25	0.9	-	-
<b>OK Autrod 13.24 DC+, 580A, 29V</b>					
0.08	1.4	0.30	0.9	-	0.2
<b>OK Autrod 13.27 DC+, 580A, 29V</b>					
0.06	1.0	0.25	2.1	-	-
<b>OK Autrod 13.40 DC+, 580A, 29V</b>					
0.07	1.50	0.26	0.9	-	0.5
<b>OK Autrod 13.43 DC+, 580A, 29V</b>					
0.11	1.5	0.25	2.2	0.6	0.5
<b>OK Autrod 13.49 DC+, 580A, 29V</b>					
0.06	1.0	0.25	3.1	-	-

## OK Flux 10.63

OK Flux 10.63 is an agglomerated, high-basic flux for submerged arc welding. It is used for multi-run welding of creep resistant Cr-Mo-alloyed steels when high toughness values are required, even after step cooling heat treatment. It can be used for single and multi-wire procedures, for butt and fillet welds and works equally well on DC and AC current. The flux is neutral in terms of Si and Mn alloying and thus it is perfect for multi-layer welding of unlimited plate thicknesses. It is well suited for narrow gap welding, due to good slag detachability and smooth sidewall blending. The optimum voltage is at the lower end of the voltage range. The weld metal produced has a very low level of impurities with well controlled X-factors with various wires. It has a low oxygen content, approx. 300ppm and hydrogen levels lower than 5ml/100g. OK Flux 10.63 is used in the petrochemical, chemical, power generation and pressure vessels industries, mainly for creep resistant steels when the requirements on toughness values are high. Due to the very clean weld metal, it is especially suited when stringent requirements after a step cooling treatment need to be fulfilled.

<b>Classifications:</b>	EN ISO 14174:S A FB 1 55 AC H5
<b>Approvals:</b>	NAKS/HAKC RD 03-613-03

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

<b>Diffusible Hydrogen:</b>	max 5 ml H/100g weld metal (Redried flux)
<b>Slag Type:</b>	Fluoride-basic
<b>Alloy Transfer:</b>	No Silicon or Manganese alloying
<b>Density:</b>	nom: 1.1 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 3.0
<b>Grain Size (met):</b>	0.2-1.6 mm (10x65 mesh)

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	1.0 kg	0.9 kg
34 V	1.3 kg	1.2 kg
38 V	1.6 kg	1.4 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal
<b>Wire</b>	<b>AWS/EN</b>	<b>AWS - PWHT</b>
OK Autrod 13.10 SC	A5.23:EB2R/ 24598-A:S S CrMo1	A5.23: F8P4-EB2R-B2R
OK Autrod 13.20 SC	A5.23:EB3R/ 24598-A:S S CrMo2	A5.23: F8P8-EB3R-B3R

## OK Flux 10.63

### Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 13.10 SC	Stress relieved 690°C 1.0h AWS DC+	500 MPa	600 MPa	27 %	200 J @ -20°C 150 J @ -29°C 140 J @ -40°C
OK Autrod 13.20 SC	Stress relieved 690°C 1.0h AWS DC+	530 MPa	630 MPa	25 %	180 J @ 20°C 150 J @ -20°C 110 J @ -40°C 50 J @ -62°C

### Typical Weld Metal Analysis %

C	Mn	Si	Cr	Mo	X
<b>OK Autrod 13.10 SC DC+, 485A, 30V</b>					
0.075	0.8	0.25	1.1	0.5	<= 15
<b>OK Autrod 13.20 SC DC+, 580A, 29V</b>					
0.07	0.60	0.20	2.1	1.0	<= 15

## OK Flux 10.69

An agglomerated, basic flux specifically designed as a backing flux for one-sided submerged arc welding. The flux creates a perfect root weld with a smooth surface and has a good capability to support the molten weld pool, even at high heat inputs. Since this flux is a backing flux it does not take part in the welding process in a metallurgical way, so no alloying takes place from this flux. OK Flux 10.69 is mainly used in shipbuilding industries where it is applied to a copper backing bar with a groove that supports the flux on the backside of the weld joint. Welding is done with single wire, tandem or 3-wire systems. Plates up to approx 25 mm thickness can be welded in one run from a single side.

<b>Classifications:</b>	EN ISO 14174:S A CS 4
<b>Slag Type:</b>	Calcium-silicate
<b>Alloy Transfer:</b>	No alloying
<b>Density:</b>	nom: 1.3 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.8
<b>Grain Size (met):</b>	0.2-1.25 mm (14x65 mesh)

## OK Flux 10.70

OK Flux 10.70 is an agglomerated, basic flux for submerged arc welding. It is designed for welding joints with high dilution such as I-joints with one run from each side and fillet welds. Due to its high alloying of mainly Mn, it creates a weld metal with good toughness values in these joints. It can be used for single and multi-wire procedures and works equally well on DC and AC. On multi-pass welding the number of passes is limited and the plate thickness should not exceed approx. 25 mm. Non-alloyed wires such as OK Autrod 12.10 and OK Autrod 12.20 are the preferred ones to be matched with OK Flux 10.70. The main application area for OK Flux 10.70 is in shipbuilding. Here it is used preferably in the two run, double-sided technique. However, it is also used in other market segments where joints with high dilution or a number of passes are welded. This is in the construction of pressure vessels, in the transport industries and general construction.

<b>Classifications:</b>	EN ISO 14174:S A AB 1 79 AC
<b>Approvals:</b>	CE EN 13479, DB 51.039.06

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

<b>Slag Type:</b>	Aluminate-basic
<b>Alloy Transfer:</b>	Moderately Silicon and very high Manganese alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.4
<b>Grain Size (met):</b>	0.2-1.6 mm (10x65 mesh)

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	1.0 kg	0.9 kg
34 V	1.3 kg	1.2 kg
38 V	1.6 kg	1.4 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.10	A5.17:EL12/ 14171-A:S1	S 42 3 AB S1	A5.17: F7A4-EL12	A5.17: F7P4-EL12
OK Autrod 12.20	A5.17:EM12/ 14171-A:S2	S 46 3 AB S2	A5.17: F7A2-EM12	A5.17: F7P2-EM12
OK Autrod 12.24	A5.23:EA2/ 14171-A:S2Mo; 24598-A:S S Mo	S 50 0 AB S2Mo	A5.23: F9A0-EA2-A3	A5.23: F9PZ-EA2-A3

## OK Flux 10.70

### Approvals

Wire	ABS	BV	DNV	GL	LR	DB	CE	PRS	RS	VdTÜV
OK Autrod 12.10	•	•	•	•	•	•	•	•	•	•
OK Autrod 12.20	-	-	-	-	-	•	•	-	-	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

### Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.10	As Welded AWS DC+	430 MPa	520 MPa	30 %	125 J @ 20°C 100 J @ 0°C 70 J @ -20°C 55 J @ -30°C 40 J @ -40°C
OK Autrod 12.20	As Welded AWS DC+	470 MPa	580 MPa	29 %	100 J @ 20°C 90 J @ 0°C 75 J @ -20°C 50 J @ -29°C
OK Autrod 12.24	As Welded AWS DC+	580 MPa	670 MPa	23 %	60 J @ 20°C 50 J @ 0°C 40 J @ -18°C

### Typical Weld Metal Analysis %

C	Mn	Si	Mo
<b>OK Autrod 12.10 DC+ , 580A, 29V</b>			
0.05	1.7	0.5	-
<b>OK Autrod 12.20 DC+, 580A, 29V</b>			
0.06	1.9	0.6	-
<b>OK Autrod 12.24 DC+, 580A, 29V</b>			
0.06	2.0	0.6	0.5

## OK Flux 10.71

OK Flux 10.71 is an agglomerated, basic flux for submerged arc welding. It is used for single and multi-run welding of all plate thicknesses. It can be combined with a wide range of solid wires and cored wires and thus it is suitable for all kinds of steels. OK Flux 10.71 combines good toughness values with excellent weldability. It is used for single and multiwire procedures such as tandem, twin-arc, tandem-twin welding and many more, for butt, overlap and fillet welds. It works equally well on DC and AC current. The good slag detachability and limited alloying of Si and Mn makes it well suited for multi-pass thick section welding. High welding speeds can be achieved producing a finely rippled weld metal, all this in combination with very good impact values. In general construction, OK Flux 10.71 is one of the most used SAW fluxes. Not just for structural steels and fine-grained steels, but also for weather resistant steels e.g. for bridges. Pressure vessels are welded with this flux, because it can be used for a wide range of steels including low temperature steels. This reduces the number of different fluxes a customer needs to have in stock. Wind tower production with plate thicknesses of greater than 50 mm require not only excellent slag detachability, particularly in the first run, and high deposition rates in all following runs, but also excellent toughness values. Since OK Flux 10.71 offers all this it is well established in this market segment. Other applications are in shipbuilding with approvals or in the production of pipes with steels up to X70 strength level. OK Flux 10.71 can also be combined with a number of SAW cored wires in order to increase the productivity and the mechanical properties of the weld metal.

<b>Classifications:</b>	EN ISO 14174:S A AB 1 67 AC H5
<b>Approvals:</b>	CE EN 13479, NAKS/HAK RD 03-613-03, NAKS/HAK RD 03-613-03, DB 51.039.05

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

<b>Diffusible Hydrogen:</b>	max 5 ml H/100g weld metal (Redried flux)
<b>Slag Type:</b>	Aluminate-basic
<b>Alloy Transfer:</b>	Slightly Silicon and moderately Manganese alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.5
<b>Grain Size (met):</b>	0.2-1.6 mm (10x65 mesh) or 0.315 -2.0 mm (9x48 mesh)

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	1.0 kg	0.9 kg
34 V	1.3 kg	1.2 kg
38 V	1.6 kg	1.4 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.10	A5.17:EL12/ 14171-A:S1	S 35 4 AB S1	A5.17: F6A4-EL12	A5.17: F6P5-EL12
OK Autrod 12.20	A5.17:EM12/ 14171-A:S2	S 38 4 AB S2	A5.17: F7A4-EM12	A5.17: F6P4-EM12
OK Autrod 12.22	A5.17:EM12K/ 14171-A:S2Si	S 38 4 AB S2Si	A5.17: F7A5-EM12K	A5.17: F6P5-EM12K



# OK Flux 10.71

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.24	A5.23:EA2/ 14171-A:S2Mo; 24598-A:S S Mo	S 46 2 AB S2Mo	A5.23: F8A2-EA2-A4	A5.23: F7P0-EA2-A4
OK Autrod 12.30	14171-A:S3	S 46 3 AB S3	-	-
OK Autrod 12.32	A5.17:EH12K/ 14171-A:S3Si	S 46 4 AB S3Si	A5.17: F7A5-EH12K	A5.17: F7P5-EH12K
OK Autrod 12.34	A5.23:EA4/ 14171-A:S3Mo; 24598-A:S S MnMo	S 50 3 AB S3Mo	A5.23: F8A4-EA4-A3	A5.23: F8P2-EA4-A3
OK Autrod 13.24	A5.23:ENi6/ 14171-A:S3Ni1Mo0,2	S 50 4 AB S3Ni1Mo0,2	A5.23: F8A5-ENi6-Ni6	A5.23: F8P4-ENi6-Ni6
OK Autrod 13.27	A5.23:ENi2/ 14171-A:S2Ni2	S 46 5 AB S2Ni2	A5.23: F8A6-ENi2-Ni2	A5.23: F7P6-ENi2-Ni2
OK Autrod 13.36	A5.23:EG/ 14171-A:S2Ni1Cu	S 46 3 AB S2Ni1Cu	A5.23: F8A2-EG-G	-
OK Autrod 13.64	A5.23:EA2TiB/ 14171-A:S2MoTiB	-	A5.23: F8TA6-EA2TiB	-

## Approvals

Wire	ABS	BV	DNV	GL	LR	DB	CE	PRS	RINA	RS	ClassNK	VdTÜV
OK Autrod 12.10	•	•	•	•	•	•	•	•	-	•	-	•
OK Autrod 12.20	•	•	•	•	•	•	•	•	•	•	-	•
OK Autrod 12.22	•	•	•	•	•	•	•	-	-	•	•	•
OK Autrod 12.24	•	•	•	•	•	•	•	•	•	•	•	•
OK Autrod 12.30	-	-	-	-	-	•	•	-	-	-	-	•
OK Autrod 12.32	-	-	-	-	-	•	•	-	-	-	-	•
OK Autrod 13.27	-	-	-	-	-	-	-	-	-	-	-	•
OK Autrod 13.36	-	-	-	-	-	-	•	-	-	-	-	-

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

## Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.10	As Welded AWS DC+	360 MPa	465 MPa	30 %	125 J @ 0°C 95 J @ -20°C 75 J @ -30°C 65 J @ -40°C
OK Autrod 12.20	As Welded AWS DC+	410 MPa	510 MPa	29 %	135 J @ 20°C 125 J @ 0°C 80 J @ -20°C 55 J @ -40°C

# OK Flux 10.71

## Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.22	As Welded AWS DC+	425 MPa	520 MPa	29 %	140 J @ 0°C 100 J @ -20°C 60 J @ -40°C 40 J @ -46°C
OK Autrod 12.24	As Welded AWS DC+	500 MPa	580 MPa	24 %	125 J @ 20°C 100 J @ 0°C 60 J @ -18°C 40 J @ -29°C
OK Autrod 12.30	As Welded EN DC+	490 MPa	580 MPa	29 %	130 J @ 20°C 110 J @ 0°C 90 J @ -20°C 60 J @ -30°C
OK Autrod 12.32	As Welded AWS DC+	480 MPa	580 MPa	28 %	150 J @ 20°C 130 J @ 0°C 95 J @ -20°C 65 J @ -40°C 40 J @ -46°C
OK Autrod 12.34	As Welded AWS DC+	535 MPa	620 MPa	27 %	120 J @ 20°C 105 J @ 0°C 70 J @ -20°C 60 J @ -30°C 45 J @ -40°C
OK Autrod 13.24	As Welded AWS DC+	560 MPa	630 MPa	25 %	120 J @ 20°C 85 J @ -20°C 70 J @ -30°C 60 J @ -40°C 40 J @ -46°C
OK Autrod 13.27	As Welded AWS DC+	500 MPa	600 MPa	28 %	100 J @ -20°C 60 J @ -40°C 50 J @ -51°C
OK Autrod 13.36	As Welded AWS DC+	490 MPa	580 MPa	27 %	120 J @ 20°C 70 J @ -20°C 55 J @ -29°C
OK Autrod 13.64	Two-Run (acc. to AWS) Plate thickness 12mm Heat input 2.2kJ/mm 700A, 32V, 60cm/min DC+	550 MPa	650 MPa	28 %	40 J @ -51°C

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Cu
<b>OK Autrod 12.10 DC+ , 580A, 29V</b>						
0.04	1.0	0.3	-	-	-	-
<b>OK Autrod 12.20 DC+, 580A, 29V</b>						
0.05	1.35	0.3	-	-	-	-

# OK Flux 10.71

Typical Weld Metal Analysis %						
C	Mn	Si	Ni	Cr	Mo	Cu
<b>OK Autrod 12.22 DC+, 580A, 29V</b>						
0.05	1.4	0.5	-	-	-	-
<b>OK Autrod 12.24 DC+, 580A, 29V</b>						
0.05	1.4	0.4	-	-	0.5	-
<b>OK Autrod 12.30 DC+, 580A, 29V</b>						
0.09	1.65	0.4	-	-	-	-
<b>OK Autrod 12.32 DC+, 580A, 29V</b>						
0.09	2.0	0.5	-	-	-	-
<b>OK Autrod 12.34 DC+, 580A, 29V</b>						
0.09	1.6	0.4	-	-	0.5	-
<b>OK Autrod 13.24 DC+, 580A, 29V</b>						
0.07	1.70	0.5	0.9	-	0.2	-
<b>OK Autrod 13.27 DC+, 580A, 29V</b>						
0.05	1.4	0.4	2.2	-	-	-
<b>OK Autrod 13.36 DC+, 580A, 29V</b>						
0.08	1.3	0.5	0.7	0.3	-	0.5

## OK Flux 10.72

OK Flux 10.72 is an agglomerated, basic flux, designed for the production of wind towers. It combines the high demands for multi-layer thick section welding, using high deposition rates with respectable toughness values down to -50°C when combined with a standard non-alloyed SAW wire. It is used for single and multi-wire procedures such as tandem, twin arc, tandem-twin welding and many more, for butt and fillet welds. It works equally well on DC and AC current. The excellent slag removal in narrow V-joints allows the included angle of the joint to be reduced. OK Flux 10.72 can be applied for unlimited plate thicknesses. In wind tower production, plate thicknesses of 50 mm and above are common, generally welded with Y-joints. It is essential that the slag is easily removable on the first run. For the remaining filling passes the flux needs to offer a high current carrying capacity, to allow for high deposition rates, for example, 38 kg/h with the tandem twin process. Often toughness values down to -500°C are required throughout the thickness. This excellent flux can also be utilised in other market segments with similar welding requirements e.g. pressure vessels and general construction welding.

<b>Classifications:</b>	EN ISO 14174:S A AB 1 57 AC H5
<b>Approvals:</b>	CE EN 13479, DB 51.039.12

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

<b>Diffusible Hydrogen:</b>	max 5 ml H/100g weld metal (Redried flux)
<b>Slag Type:</b>	Aluminate-basic
<b>Alloy Transfer:</b>	No Silicon and moderately Manganese alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.9
<b>Grain Size (met):</b>	0.315-2.0 mm (9x48 mesh)

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	1.0 kg	0.9 kg
34 V	1.3 kg	1.2 kg
38 V	1.6 kg	1.4 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.20	A5.17:EM12/ 14171-A:S2	S 38 5 AB S2	A5.17: F7A8-EM12	A5.17: F6P8-EM12
OK Autrod 12.22	A5.17:EM12K/ 14171-A:S2Si	S 38 5 AB S2Si	A5.17: F7A8-EM12K	A5.17: F6P8-EM12K
OK Autrod 12.24	A5.23:EA2/ 14171-A:S2Mo; 24598-A:S S Mo	S 46 3 AB S2Mo	A5.23: F8A5-EA2-A3	A5.23: F8P5-EA2-A3
OK Autrod 13.27	A5.23:ENi2/ 14171-A:S2Ni2	S 46 6 AB S2Ni2	A5.23: F8A8-ENi2-Ni2	A5.23: F7P8-ENi2-Ni2
OK Autrod 13.64	A5.23:EA2TiB/ 14171-A:S2MoTiB	-	A5.23: F8TA8-EA2TiB	-

# OK Flux 10.72

## Approvals

Wire	DNV	GL	DB	CE	CWB	VdTÜV
OK Autrod 12.20	-	-	•	•	-	•
OK Autrod 12.22	•	•	•	•	•	•
OK Autrod 12.24	-	-	•	•	-	•
OK Autrod 13.27	-	-	-	•	-	-

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

## Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.20	As Welded AWS DC+	415 MPa	500 MPa	30 %	125 J @ -30°C 100 J @ -40°C 70 J @ -50°C 50 J @ -62°C
OK Autrod 12.22	As Welded AWS DC+	415 MPa	500 MPa	30 %	120 J @ -30°C 100 J @ -40°C 70 J @ -50°C 50 J @ -62°C
OK Autrod 12.24	As Welded AWS DC+	500 MPa	590 MPa	25 %	60 J @ -30°C 40 J @ -40°C 35 J @ -46°C
OK Autrod 13.27	As Welded AWS DC+	490 MPa	610 MPa	30 %	100 J @ -40°C 80 J @ -51°C 50 J @ -62°C
OK Autrod 13.64	Two-Run (acc. to AWS) Plate thickness 12mm Heat input 2.2kJ/mm 700A, 32V, 60cm/min DC+	560 MPa	660 MPa	27 %	50 J @ -62°C

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Mo
<b>OK Autrod 12.20 DC+, 580A, 29V</b>				
0.05	1.5	0.2	-	-
<b>OK Autrod 12.22 DC+, 580A, 29V</b>				
0.05	1.5	0.3	-	-
<b>OK Autrod 12.24 DC+, 580A, 29V</b>				
0.05	1.6	0.2	-	0.5
<b>OK Autrod 13.27 DC+, 520A, 29V</b>				
0.05	1.4	0.30	2.2	-

## OK Flux 10.74

OK Flux 10.74 is an agglomerated, basic flux designed primarily for multi-wire procedures in the production of longitudinal welded line pipes. The flux alloys some Si and Mn to the weld metal and works equally well on DC and AC current. It offers best weldability on SAW processes with at least 3 independent welding wires.

OK Flux 10.74 produces a low bead profile in longitudinal line pipe welding at high welding speeds. A low profile without peaks means cost saving in the later pipe coating operation, since the coating thickness can be reduced. With various wires, OK Flux 10.74 is suited for all pipe steels. In combination with the Ti-B micro alloyed wire OK Autrod 13.64 toughness values are increased to an outstanding level. Due to the careful metallurgical design OK Flux 10.74 produces a weld metal free of hard spots.

<b>Classifications:</b>	EN ISO 14174:S A AB 1 67 AC H5
<b>Approvals:</b>	NAKS/HAKC RD 03-613-03

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

<b>Diffusible Hydrogen:</b>	max 5 ml H/100g weld metal (Redried flux)
<b>Slag Type:</b>	Aluminate-basic
<b>Alloy Transfer:</b>	Slightly Silicon and moderately Manganese alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.4
<b>Grain Size (met):</b>	0.2-2.0 mm (9x65 mesh)

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	1.0 kg	0.9 kg
34 V	1.3 kg	1.2 kg
38 V	1.6 kg	1.4 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.20	A5.17:EM12/ 14171-A:S2	S 42 4 AB S2	A5.17: F7A6-EM12	A5.17: F6P6-EM12
OK Autrod 12.22	A5.17:EM12K/ 14171-A:S2Si	S 42 4 AB S2Si	A5.17: F7A6-EM12K	A5.17: F6P6-EM12K
OK Autrod 12.24	A5.23:EA2/ 14171-A:S2Mo; 24598-A:S S Mo	S 46 2 AB S2Mo	A5.23: F8A2-EA2-A4	A5.23: F7P0-EA2-A4
OK Autrod 12.34	A5.23:EA4/ 14171-A:S3Mo; 24598-A:S S MnMo	S 50 2 AB S3Mo	A5.23: F9A2-EA4-A3	A5.23: F9P0-EA4-A3
OK Autrod 13.64	A5.23:EA2TiB/ 14171-A:S2MoTiB	-	A5.23: F8TA6-EA2TiB	-

## OK Flux 10.74

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.20	As Welded AWS DC+	440 MPa	540 MPa	30 %	60 J @ -40°C 40 J @ -51°C
OK Autrod 12.22	As Welded AWS DC+	440 MPa	540 MPa	30 %	55 J @ -40°C 35 J @ -51°C
OK Autrod 12.24	As Welded AWS DC+	520 MPa	590 MPa	24 %	100 J @ 0°C 65 J @ -20°C 50 J @ -29°C 30 J @ -40°C
OK Autrod 12.34	As Welded AWS DC+	590 MPa	670 MPa	24 %	90 J @ 0°C 60 J @ -18°C 55 J @ -20°C 40 J @ -29°C
OK Autrod 13.64	Two-Run (acc. to AWS) Plate thickness 12mm Heat input 2.2kJ/mm 700A, 32V, 60cm/min DC+	550 MPa	650 MPa	26 %	70 J @ -51°C

Typical Weld Metal Analysis %			
C	Mn	Si	Mo
<b>OK Autrod 12.20 DC+, 580A, 29V</b>			
0.07	1.5	0.3	-
<b>OK Autrod 12.22 DC+, 580A, 29V</b>			
0.07	1.5	0.5	-
<b>OK Autrod 12.24 DC+, 580A, 29V</b>			
0.05	1.4	0.4	0.5
<b>OK Autrod 12.34 DC+, 580A, 29V</b>			
0.08	1.6	0.4	0.5

## OK Flux 10.77

OK Flux 10.77 is an agglomerated, basic flux designed primarily for multi-wire procedures in the production of spiral welded line pipes. The flux alloys some Si and Mn to the weld metal and it works equally well on DC and AC current. It is used in single wire, tandem and 3-wire systems and it is also suitable for longitudinal welded pipes of limited plate thicknesses. OK Flux 10.77 produces welded joints with shallow reinforcement, low transition angles and smooth surface finish even at high welding speeds. A shallow reinforcement means cost saving in the later pipe coating operation, since the coating thickness can be reduced. With different wires it is suitable for all mild and high strength line pipe steels.

<b>Classifications:</b>	EN ISO 14174:S A AB 1 67 AC H5
<b>Approvals:</b>	CE EN 13479

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

<b>Diffusible Hydrogen:</b>	max 5 ml H/100g weld metal (Redried flux)
<b>Slag Type:</b>	Aluminate-basic
<b>Alloy Transfer:</b>	Slightly Silicon and moderately Manganese alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.3
<b>Grain Size (met):</b>	0.2-1.6 mm (10x65 mesh)

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	1.0 kg	0.9 kg
34 V	1.3 kg	1.2 kg
38 V	1.6 kg	1.4 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.20	A5.17:EM12/ 14171-A:S2	S 38 4 AB S2	A5.17: F7A4-EM12	A5.17: F6P4-EM12
OK Autrod 12.22	A5.17:EM12K/ 14171-A:S2Si	S 38 4 AB S2Si	A5.17: F7A5-EM12K	A5.17: F6P5-EM12K
OK Autrod 12.24	A5.23:EA2/ 14171-A:S2Mo; 24598-A:S S Mo	S 46 2 AB S2Mo	A5.23: F8A4-EA2-A2	A5.23: F7P2-EA2-A2
OK Autrod 12.34	A5.23:EA4/ 14171-A:S3Mo; 24598-A:S S MnMo	S 50 3 AB S3Mo	A5.23: F8A4-EA4-A4	A5.23: F8P2-EA4-A4
OK Autrod 13.64	A5.23:EA2TiB/ 14171-A:S2MoTiB	-	A5.23: F8TA6-EA2TiB	-



# OK Flux 10.77

Approvals	
Wire	CE
OK Autrod 12.20	•
OK Autrod 12.22	•
OK Autrod 12.24	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.20	As Welded AWS DC+	420 MPa	500 MPa	28 %	80 J @ -20°C 65 J @ -30°C 55 J @ -40°C
OK Autrod 12.22	As Welded AWS DC+	420 MPa	520 MPa	26 %	130 J @ -20°C 110 J @ -30°C 80 J @ -40°C 50 J @ -46°C
OK Autrod 12.24	As Welded AWS DC+	495 MPa	580 MPa	25 %	90 J @ 0°C 60 J @ -18°C 60 J @ -20°C 50 J @ -29°C 40 J @ -40°C
OK Autrod 12.34	As Welded AWS DC+	540 MPa	630 MPa	25 %	70 J @ -20°C 60 J @ -29°C 45 J @ -40°C
OK Autrod 13.64	Two-Run (acc. to AWS) Plate thickness 12mm Heat input 2.2kJ/mm 700A, 32V, 60cm/min DC+	550 MPa	650 MPa	24 %	60 J @ -51°C

Typical Weld Metal Analysis %			
C	Mn	Si	Mo
<b>OK Autrod 12.20 DC+, 580A, 29V</b>			
0.06	1.4	0.3	-
<b>OK Autrod 12.22 DC+, 580A, 29V</b>			
0.07	1.4	0.4	-
<b>OK Autrod 12.24 DC+, 580A, 29V</b>			
0.07	1.3	0.3	0.5
<b>OK Autrod 12.34 DC+, 580A, 29V</b>			
0.08	1.5	0.3	0.5

# OK Flux 10.80

OK Flux 10.80 is an agglomerated, neutral-basicity flux for submerged arc welding. It alloys a lot of Si and Mn to the weld metal and thus is suited for single and limited pass butt welds and for surfacing tasks. It is welded with single and multi-wire procedures, with either DC or AC current. Due to the high alloying the flux is intended for plate thickness up to approximately 20 mm in joining applications. OK Flux 10.80 is used in general construction, pressure vessel industries and others. It is appreciated for surface buildup jobs such as the repair of diesel engine pistons, because hardness of the weld metal is increased due to the high alloying.

<b>Classifications:</b>	EN ISO 14174:S A CS 1 89 AC
<b>Approvals:</b>	CE EN 13479, DB 51.039.02

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

<b>Slag Type:</b>	Calcium-silicate
<b>Alloy Transfer:</b>	High Silicon and very high Manganese alloying
<b>Density:</b>	nom: 1.1 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.1
<b>Grain Size (met):</b>	0.2-1.6 mm (10x65 mesh)

## Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.6 kg	0.5 kg
30 V	0.9 kg	0.7 kg
34 V	1.2 kg	1.0 kg
38 V	1.5 kg	1.3 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.10	A5.17:EL12/ 14171-A:S1	S 38 0 CS S1	A5.17: F7A2-EL12	A5.17: F6P0-EL12
OK Autrod 12.20	A5.17:EM12/ 14171-A:S2	S 42 0 CS S2	A5.17: F7A2-EM12	A5.17: F6P0-EM12
OK Autrod 12.22	A5.17:EM12K/ 14171-A:S2Si	-	A5.17: F7A2-EM12K	A5.17: F6P0-EM12K

## Approvals

Wire	DB	CE	VdTÜV
OK Autrod 12.10	•	•	•
OK Autrod 12.20	•	•	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

## OK Flux 10.80

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.10	As Welded AWS DC+	410 MPa	520 MPa	28 %	110 J @ 20°C 80 J @ 0°C 45 J @ -20°C 40 J @ -29°C
OK Autrod 12.20	As Welded AWS DC+	440 MPa	550 MPa	29 %	90 J @ 20°C 70 J @ 0°C 40 J @ -29°C
OK Autrod 12.22	As Welded AWS DC+	440 MPa	550 MPa	30 %	60 J @ -18°C 45 J @ -29°C

Typical Weld Metal Analysis %		
C	Mn	Si
<b>OK Autrod 12.10 DC+ , 580A, 29V</b>		
0.07	1.4	0.7
<b>OK Autrod 12.20 DC+, 580A, 29V</b>		
0.09	1.7	0.6
<b>OK Autrod 12.22 DC+, 525 A, 29 V</b>		
0.07	1.5	1.0

# OK Flux 10.81

OK Flux 10.81 is an agglomerated, low-basicity flux. The benefits of this flux are the smooth surface finish and excellent slag detachability. It is intended for a limited number of passes and plate thickness up to approx. 25 mm. It is used for single and multi-wire procedures such as tandem and twin-arc welding. Concave fillet welds with an excellent washing on the sidewalls are created with this flux as well as attractive butt and overlap welds. It works equally well on DC and AC current and the high alloying of Si makes it well suited for high speed welding. Due to its good weldability, OK Flux 10.81 is often used in the production of pressure vessels and spiral welded water pipes. The excellent sidewall wetting, which is preferred for dynamic loads in horizontal fillet welds is made use of in general construction, beam fabrication, the automotive industry and tube to fin welding in the production of membrane wall panels. In many applications where the appearance of the weld bead or the nice washing on the sidewalls in fillet welds are the main requirements, OK Flux 10.81 is chosen.

<b>Classifications:</b>	EN ISO 14174:S A AR 1 97 AC
<b>Approvals:</b>	CE EN 13479, NAKS/HAK RD 03-613-03, DB 51.039.04

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

<b>Slag Type:</b>	Aluminate-rutile
<b>Alloy Transfer:</b>	Very high Silicon and moderately Manganese alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 0.6
<b>Grain Size (met):</b>	0.2-1.6 mm (10x65 mesh) or 0.2-1.25 mm (14x65 mesh)

## Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	1.0 kg	0.9 kg
34 V	1.3 kg	1.2 kg
38 V	1.6 kg	1.4 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.10	A5.17:EL12/ 14171-A:S1	S 42 A AR S1	A5.17: F7AZ-EL12	A5.17: F7PZ-EL12
OK Autrod 12.20	A5.17:EM12/ 14171-A:S2	S 46 0 AR S2	A5.17: F7A0-EM12	A5.17: F7PZ-EM12
OK Autrod 12.22	A5.17:EM12K/ 14171-A:S2Si	S 50 A AR S2Si	A5.17: F7AZ-EM12K	A5.17: F7PZ-EM12K
OK Autrod 12.24	A5.23:EA2/ 14171-A:S2Mo; 24598-A:S S Mo	S 50 A AR S2Mo	A5.23: F9AZ-EA2-A4	A5.23: F9PZ-EA2-A4
OK Autrod 12.30	14171-A:S3	S 50 0 AR S3	-	-
OK Autrod 13.10 SC	A5.23:EB2R/ 24598-A:S S CrMo1	-	-	A5.23: F9PZ-EB2R-G
OK Autrod 13.36	A5.23:EG/ 14171-A:S2Ni1Cu	S 50 A AR S2Ni1Cu	A5.23: F9A0-EG-G	-

# OK Flux 10.81

## Approvals

Wire	ABS	BV	DNV	GL	LR	DB	CE	VdTÜV
OK Autrod 12.10	-	-	-	-	-	•	•	•
OK Autrod 12.20	•	•	•	•	•	•	•	•
OK Autrod 12.22	-	-	-	-	-	-	•	-
OK Autrod 12.24	-	-	-	-	-	-	-	•
OK Autrod 12.30	-	-	-	-	-	•	•	•
OK Autrod 13.10 SC	-	-	-	-	-	-	-	•
OK Autrod 13.36	-	-	-	-	-	-	•	-

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

## Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.10	As Welded AWS DC+	450 MPa	540 MPa	25 %	50 J @ 20°C 30 J @ 0°C
OK Autrod 12.20	As Welded AWS DC+	510 MPa	610 MPa	25 %	80 J @ 20°C 60 J @ 0°C 40 J @ -18°C
OK Autrod 12.22	As Welded AWS DC+	530 MPa	610 MPa	24 %	60 J @ 20°C
OK Autrod 12.24	As Welded AWS DC+	565 MPa	660 MPa	23 %	65 J @ 20°C 45 J @ 0°C
OK Autrod 12.30	As Welded EN DC+	550 MPa	640 MPa	25 %	80 J @ 20°C 60 J @ 0°C
OK Autrod 13.10 SC	PWHT 575A DC 29V 690°C 1h	650 MPa	730 MPa	22	30 J @ 20°C
OK Autrod 13.36	As Welded AWS DC+	570 MPa	680 MPa	23 %	55 J @ 20°C 40 J @ 0°C 35 J @ -18°C

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Cu
<b>OK Autrod 12.10 DC+, 580A, 29V</b>						
0.06	1.2	0.8	-	-	-	-
<b>OK Autrod 12.20 DC+, 580A, 29V</b>						
0.07	1.5	0.8	-	-	-	-
<b>OK Autrod 12.22 DC+, 580A, 29V</b>						
0.07	1.5	0.9	-	-	-	-
<b>OK Autrod 12.24 DC+, 580A, 29V</b>						
0.07	1.5	0.8	-	-	0.5	-
<b>OK Autrod 12.30 DC+, 580A, 29V</b>						
0.08	1.75	0.7	-	-	-	-
<b>OK Autrod 13.10 SC DC+, 575A, 29V</b>						
0.06	1.4	0.9	-	1.0	0.5	-
<b>OK Autrod 13.36 DC+, 580A, 29V</b>						
0.07	1.4	0.9	0.7	0.3	-	0.5

# OK Flux 10.88

OK Flux 10.88 is an agglomerated, low-basicity flux for submerged arc welding. If welding is to be done without removing the heavy mill scale or rust from the welding area then this flux is the correct one to choose. Furthermore it produces a weld metal with toughness values down to -20°C when combined with a standard, non-alloyed wire. The flux is designed for single layer and multi-layer welding of up to 30 mm plate thickness. It works equally well on DC and AC current and is designed for butt, fillet and overlap welds. It can be used over a wide parameter range giving excellent slag removal and smooth weld bead surfaces. OK Flux 10.88 is used in all market segments where severe plate surface conditions are found. This includes general constructions, beam fabrications, pressure vessels, shipbuilding and transport industries. Additionally, this flux is appreciated on clean plates for its high resistance against porosity and its wide application field due to the toughness of the weld metal down to -20°C.

<b>Classifications:</b>	EN ISO 14174:S A AR 1 89 AC
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<b>Slag Type:</b>	Aluminate-rutile
<b>Alloy Transfer:</b>	High Silicon and very high Manganese alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 0.7
<b>Grain Size (met):</b>	0.2-1.6 mm (10x65 mesh)

## Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.6 kg	0.5 kg
30 V	0.9 kg	0.7 kg
34 V	1.2 kg	1.0 kg
38 V	1.5 kg	1.3 kg

Dimensions	Amps	Travel Speed
Ø 4.0 mm	580 A	55 cm/min

Classifications	Wire	Weld Metal		
Wire	AWS/EN	EN - As Welded	AWS - As Welded	AWS - PWHT
OK Autrod 12.10	A5.17:EL12/ 14171-A:S1	S 38 0 AR S1	A5.17: F6AZ-EL12	-
OK Autrod 12.20	A5.17:EM12/ 14171-A:S2	S 42 2 AR S2	A5.17: F7A0-EM12	-
OK Autrod 12.22	A5.17:EM12K/ 14171-A:S2Si	S 42 2 AR S2Si	A5.17: F7A0-EM12K	A5.17: F6P0-EM12K

## Approvals

Wire	ABS	BV	DNV	GL	LR
OK Autrod 12.22	•	•	•	•	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

# OK Flux 10.88

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 12.10	As Welded AWS DC+	400 MPa	470 MPa	30 %	-
OK Autrod 12.20	As Welded AWS DC+	430 MPa	520 MPa	25 %	70 J @ 0°C 50 J @ -18°C
OK Autrod 12.22	As Welded AWS DC+	440 MPa	510 MPa	26 %	70 J @ 0°C 50 J @ -18°C

Typical Weld Metal Analysis %		
C	Mn	Si
OK Autrod 12.10 DC+, 580A, 29V		
0.05	1.7	0.6
OK Autrod 12.20 DC+, 580A, 29V		
0.05	1.8	0.6
OK Autrod 12.22 DC+, 580A, 29V		
0.05	1.8	0.7

## OK Flux 10.92

OK Flux 10.92 is a neutral, agglomerated Cr-compensating flux designed for strip cladding, butt and fillet welding of stainless and corrosion resistant steel types. Good welding characteristics and easy slag removal.

<b>Classifications:</b>	EN ISO 14174:S A CS 2 57 53 DC
<b>Approvals:</b>	NAKS/HAKC RD 03-613-03

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

<b>Slag Type:</b>	Calcium silicate SiO <sub>2</sub> -MgO-Al <sub>2</sub> O <sub>3</sub> -(CaF <sub>2</sub> )
<b>Alloy Transfer:</b>	Chromium compensating
<b>Density:</b>	nom: 1.0 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.0

### Flux Consumption

Volts	kg Flux / kg Wire DC+
26 V	0.4 kg
30 V	0.55 kg
34 V	0.7 kg
38 V	0.9 kg

Dimensions	Amps	Travel Speed
4.0 mm	580 A	33 m/h

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Autrod 16.97	14343-A:S 18 8 Mn
OK Autrod 308L	A5.9:ER308L/ 14343-A:S 19 9 L
OK Autrod 309L	A5.9:ER309L/ 14343-A:S 23 12 L
OK Autrod 316L	A5.9:ER316L/ 14343-A:S 19 12 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

### Approvals

Wire	VdTÜV
OK Autrod 308L	•
OK Autrod 316L	•
OK Autrod 318	•
OK Autrod 347	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.



## OK Flux 10.92

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 16.97	As Welded DC+	450 MPa	630 MPa	42 %	60 J @ 20°C 55 J @ -20°C 45 J @ -60°C
OK Autrod 308L	As Welded DC+	365 MPa	580 MPa	38 %	60 J @ -60°C 50 J @ -110°C
OK Autrod 309L	As Welded DC+	420 MPa	560 MPa	32 %	40 J @ -20°C
OK Autrod 316L	As Welded DC+	385 MPa	590 MPa	36 %	55 J @ -70°C
OK Autrod 318	As Welded DC+	440 MPa	600 MPa	42 %	100 J @ 20°C 90 J @ -60°C 40 J @ -110°C
OK Autrod 347	As Welded DC+	470 MPa	640 MPa	35 %	65 J @ 20°C 55 J @ -60°C 40 J @ -110°C

Typical Weld Metal Analysis %						
C	Mn	Si	Ni	Cr	Mo	Nb
<b>OK Autrod 16.97</b>						
0.04	5.0	0.95	8.5	18.8	-	-
<b>OK Autrod 308L Current: DC+, 420A, 27V</b>						
0.02	1.0	0.9	10.0	20.0	-	-
<b>OK Autrod 309L Current: DC+, 420A, 27V</b>						
0.02	1.1	0.8	12.9	24.1	-	-
<b>OK Autrod 316L Current: DC+, 420A, 27V</b>						
0.02	1.0	0.8	11.9	19.1	2.7	-
<b>OK Autrod 318</b>						
0.035	1.2	0.5	12.0	18.5	2.6	0.3
<b>OK Autrod 347 Current: DC+, 420 A, 27 V</b>						
0.040	0.9	0.75	9.7	19.8	-	0.5

# OK Flux 10.93

Basic, agglomerated flux for butt welding of stainless steels. A suitable flux for welding of high alloyed CrNi-steels like e.g. duplex stainless steel. The low Si addition during welding provides good mechanical properties in the weld metal.

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

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

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

## Flux Consumption

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

Dimensions	Amps	Travel Speed
4.0 mm	580 A	33 m/h

Classifications	Wire
Wire	AWS/EN
OK Autrod 16.97	14343-A:S 18 8 Mn
OK Autrod 308L	A5.9:ER308L/ 14343-A:S 19 9 L
OK Autrod 308H	A5.9:ER308H/ 14343-A:S 19 9 H
OK Autrod 309L	A5.9:ER309L/ 14343-A:S 23 12 L
OK Autrod 309MoL	A5.9:ER309LMo (mod)/ 14343-A:S 23 12 2 L
OK Autrod 310MoL	14343-A:S 25 22 2 N L
OK Autrod 312	A5.9:ER312/ 14343-A:S 29 9
OK Autrod 316L	A5.9:ER316L/ 14343-A:S 19 12 3 L
OK Autrod 316H	A5.9:ER316H/ 14343-A:S 19 12 3 H
OK Autrod 16.38	14343-A:S 20 16 3 Mn 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
OK Autrod 385	A5.9:ER385/ 14343-A:S 20 25 5 Cu L
OK Autrod 2209	A5.9:ER2209/ 14343-A:S 22 9 3 N L
OK Autrod 2307	14343-A:S 23 7 N L

# OK Flux 10.93

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Autrod 2509	A5.9:ER2594/ 14343-A:S 25 9 4 N L
OK Autrod 410NiMo	14343-A:S 13 4

Approvals								
Wire	ABS	BV	DNV	GL	LR	DB	CE	VdTÜV
OK Autrod 16.97	-	-	•	-	-	-	-	-
OK Autrod 308L	•	•	•	-	-	•	•	•
OK Autrod 309L	•	-	•	-	•	-	•	•
OK Autrod 316L	•	-	•	-	-	•	•	•
OK Autrod 318	-	-	-	-	-	•	•	•
OK Autrod 385	-	-	-	-	-	-	-	•
OK Autrod 2209	•	•	•	•	•	-	•	•
OK Autrod 2509	-	-	-	-	-	-	•	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 16.97	As Welded DC+	400 MPa	600 MPa	45 %	60 J @ -20°C
OK Autrod 308L	As Welded DC+	400 MPa	560 MPa	38 %	100 J @ 20°C 75 J @ -40°C 65 J @ -60°C 55 J @ -110°C 40 J @ -196°C
OK Autrod 309L	As Welded DC+	430 MPa	570 MPa	33 %	90 J @ 20°C 70 J @ -60°C 60 J @ -110°C 35 J @ -196°C
OK Autrod 309MoL	As Welded DC+	400 MPa	600 MPa	38 %	120 J @ 20°C
OK Autrod 310MoL	As Welded DC+	335 MPa	575 MPa	42 %	120 J @ 20°C
OK Autrod 316L	As Welded DC+	390 MPa	565 MPa	42 %	100 J @ 20°C 95 J @ -40°C 90 J @ -60°C 75 J @ -110°C 40 J @ -196°C
OK Autrod 16.38	As Welded DC+	410 MPa	600 MPa	44 %	70 J @ -60°C 60 J @ -110°C 40 J @ -196°C
OK Autrod 317L	As Welded DC+	440 MPa	615 MPa	28 %	80 J @ 20°C 50 J @ -60°C
OK Autrod 318	As Welded DC+	440 MPa	600 MPa	42 %	100 J @ 20°C 90 J @ -60°C 40 J @ -110°C

# OK Flux 10.93

## Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 347	As Welded DC+	455 MPa	635 MPa	36 %	105 J @ 20°C 85 J @ -60°C 60 J @ -110°C 30 J @ -196°C
OK Autrod 385	As Welded DC+	310 MPa	530 MPa	35 %	80 J @ 20°C
OK Autrod 2209	As Welded DC+	630 MPa	780 MPa	30 %	140 J @ 20°C 125 J @ -20°C 110 J @ -40°C 80 J @ -60°C
OK Autrod 2307	As Welded DC+	560 MPa	730 MPa	32 %	140 J @ 20°C 125 J @ -20°C 90 J @ -40°C 60 J @ -60°C
OK Autrod 2509	As Welded DC+	640 MPa	840 MPa	28 %	85 J @ 20°C 60 J @ -40°C
OK Autrod 410NiMo	As Welded DC+, 450A, 28V	900 MPa	1000 MPa	15.5 %	30 J @ 0°C 30 J @ -20°C
OK Autrod 410NiMo	Stress Relieved DC+, 450A, 28V Stress relieved 600°C, 2h	770 MPa	850 MPa	19 %	55 J @ 0°C 55 J @ -20°C
OK Autrod 410NiMo	Stress Relieved DC+, 500A, 30V Stress relieved 580°C, 4h	785 MPa	860 MPa	18 %	55 J @ 0°C 50 J @ -20°C

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Cu	N	Nb	Ferrite FN
<b>OK Autrod 16.97</b>									
0.06	6.3	1.2	8.0	18.0	-	-	-	-	-
<b>OK Autrod 308L Current: DC+, 420A, 27V</b>									
0.02	1.4	0.6	10.0	19.5	-	-	0.1	-	8
<b>OK Autrod 308H DC+</b>									
0.05	1.5	0.6	9.9	19.9	-	-	-	-	-
<b>OK Autrod 309L Current: DC+, 420 A, 27 V</b>									
0.02	1.3	0.5	12.5	23.0	-	-	-	-	-
<b>OK Autrod 309MoL DC+, 420 A, 27 V</b>									
0.02	1.5	0.5	14.5	20.8	2.8	-	-	-	-
<b>OK Autrod 310MoL Current: DC+, 420A, 27V</b>									
0.02	4.0	0.1	22.0	24.5	2.1	-	0.12	-	0
<b>OK Autrod 312 Current: DC+, 420A, 27V</b>									
0.1	1.5	0.5	9.5	29.0	-	-	-	-	-
<b>OK Autrod 316L</b>									
0.02	1.4	0.5	12.5	18.0	2.6	-	-	-	8

## OK Flux 10.93

Typical Weld Metal Analysis %									
C	Mn	Si	Ni	Cr	Mo	Cu	N	Nb	Ferrite FN
<b>OK Autrod 316H DC+</b>									
0.05	1.5	0.6	12.5	19.0	2.2	-	-	-	-
<b>OK Autrod 16.38 Current: DC+, 420A, 30V, 30m/h</b>									
0.02	5.4	0.7	15.5	20.0	2.5	-	0.13	-	0
<b>OK Autrod 317L Current: DC+, 420 A, 27 V</b>									
0.02	1.5	0.5	13.5	18.5	3.2	-	-	-	-
<b>OK Autrod 318 Current: DC+, 440A, 30V</b>									
0.035	1.2	0.5	12.0	18.5	2.6	-	-	0.3	-
<b>OK Autrod 347 Current: DC+, 420A, 27V</b>									
0.035	1.1	0.5	9.6	19.2	-	-	-	0.5	8
<b>OK Autrod 385 Current: DC+, 420A, 27V</b>									
0.02	1.5	0.5	25.0	19.0	4.0	1.5	0.02	-	-
<b>OK Autrod 2209 Current: DC+, 420A, 27V</b>									
0.02	1.3	0.5	9.0	22.5	3.1	-	0.17	-	45
<b>OK Autrod 2307 DC+, 420A, 31V</b>									
0.015	1.1	0.65	7.5	22.5	0.3	-	0.12	-	40
<b>OK Autrod 2509 Current: DC+, 420A, 27V</b>									
0.02	0.4	0.5	10.0	23.5	3.5	-	0.19	-	40
<b>OK Autrod 410NiMo DC+, 450A, 28V</b>									
0.02	0.4	0.5	4.1	11.7	0.51	-	-	-	-

# OK Flux 10.94

Basic, chromium-compensating, agglomerated flux for butt welding of stainless steels. Specially recommended for welding of stainless steels of the super duplex type. Low Si addition during welding provides good mechanical properties in the weld metal.

<b>Classifications:</b>	EN ISO 14174:S A AF 2 56 64 DC
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<b>Slag Type:</b>	Fluoride basic CaF <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>
<b>Alloy Transfer:</b>	Chromium compensating
<b>Density:</b>	nom: 1.0 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.9

## Flux Consumption

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

Dimensions	Amps	Travel Speed
4.0 mm	580 A	33 m/h

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Autrod 308L	A5.9:ER308L/ 14343-A:S 19 9 L
OK Autrod 347	A5.9:ER347/ 14343-A:S 19 9 Nb
OK Autrod 2509	A5.9:ER2594/ 14343-A:S 25 9 4 N L

## Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 308L	As Welded DC+	400 MPa	560 MPa	40 %	85 J @ 20°C 70 J @ -40°C 60 J @ -60°C
OK Autrod 347	As Welded DC+	455 MPa	620 MPa	38 %	100 J @ 20°C 70 J @ -60°C 50 J @ -110°C 30 J @ -196°C
OK Autrod 2509	As Welded DC+	625 MPa	830 MPa	28 %	90 J @ 20°C 50 J @ -60°C

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	N	Nb	Ferrite FN
<b>OK Autrod 308L DC+</b>								
0.02	1.4	0.5	9.5	20	-	-	-	-
<b>OK Autrod 347 DC+</b>								
0.04	1.0	0.5	9.6	19.6	-	-	0.5	-
<b>OK Autrod 2509 DC+, 420A, 27V</b>								
0.02	0.4	0.5	10.1	24.5	3.5	0.15	-	54

## OK Flux 10.99

OK Flux 10.99 is an agglomerated basic flux designed for the submerged arc welding process of austenitic and ferritic-austenitic stainless steels, either using AC or DC current. Welding in AC usually provides good mechanical properties and better impact properties (when compared to DC current). This flux can be also used in DC to weld Ni-based alloys with Ni-based wires. The high basicity of OK Flux 10.99 gives better impact values, regardless of the current being used. It also has very good weldability in 1G and 2G position. The slag is self-lifting or easily detached leaving clean and nice bead appearance.

<b>Classifications:</b>	EN ISO 14174:S A FB 2 55 53 AC
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Approvals are based on factory location. Please contact ESAB for more information.

<b>Slag Type:</b>	Fluoride basic CaF <sub>2</sub> - MgO - Al <sub>2</sub> O <sub>3</sub>
<b>Alloy Transfer:</b>	Non alloying
<b>Density:</b>	nom: 1.0 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 2.5

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
26 V	0.7 kg	0.6 kg
30 V	0.8 kg	0.8 kg
34 V	0.9 kg	1.1 kg
38 V	1.1 kg	1.3 kg

Dimensions	Amps	Travel Speed
3.2 mm	400 A	50 cm/min

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Autrod 16.38	14343-A:S 20 16 3 Mn L
OK Autrod 308L	A5.9:ER308L/ 14343-A:S 19 9 L
OK Autrod 309L	A5.9:ER309L/ 14343-A:S 23 12 L
OK Autrod 316L	A5.9:ER316L/ 14343-A:S 19 12 3 L

### Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 308L	As Welded AC	400 MPa	560 MPa	36 %	105 J @ -20°C 100 J @ -40°C 90 J @ -60°C 55 J @ -196°C
OK Autrod 308L	As Welded DC+	400 MPa	560 MPa	36 %	85 J @ -20°C 80 J @ -40°C 75 J @ -60°C 50 J @ -196°C

# OK Flux 10.99

## Typical Mechanical Properties

Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod 309L	As Welded AC	410 MPa	575 MPa	36 %	105 J @ -20°C 100 J @ -40°C 95 J @ -60°C 85 J @ -110°C
OK Autrod 316L	As Welded AC	410 MPa	570 MPa	35 %	110 J @ -20°C 105 J @ -40°C 100 J @ -60°C 70 J @ -196°C
OK Autrod 16.38	As Welded AC	420 MPa	630 MPa	40 %	105 J @ -60°C 90 J @ -110°C 55 J @ -196°C

## Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo	Fe	N	Nb+Ta	Ferrite FN
<b>OK Autrod 308L AC</b>									
0.025	1.9	0.3	9.8	19.2	0.1	-	6	0.07	-
<b>OK Autrod 308L DC+</b>									
0.02	1.9	0.3	9.8	19.2	0.1	-	6	0.07	-
<b>OK Autrod 309L AC</b>									
0.030	1.9	0.4	13.0	22.0	0.1	-	-	0.09	-
<b>OK Autrod 316L AC</b>									
0.025	1.7	0.4	12.0	18.3	2.6	-	6	0.05	-
<b>OK Autrod 16.38 AC</b>									
0.03	7.0	0.5	16.0	20.0	3.0	-	0	0.17	-



## OK Flux 10.05

An agglomerated flux designed for strip cladding on unalloyed or low alloyed steels with high-alloyed Cr or Cr-Ni strips.

<b>Classifications:</b>	EN ISO 14174:S A AAS 2B 56 34 DC
<b>Approvals:</b>	VdTÜV , NAKS/HAKC RD 03-613-03

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

<b>Welding Current:</b>	1000 A (60 x 0.5 mm strip)
<b>Slag Type:</b>	Acid-aluminium-silicate Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub> -CaF <sub>2</sub> -MgO
<b>Alloy Transfer:</b>	Non alloying
<b>Density:</b>	nom: 0.7 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.1

Flux Consumption	
Volts	kg Flux / kg Wire DC+
25 V	0.4 kg
28 V	0.5 kg
32 V	0.6 kg

Dimensions	Amps	Travel Speed
60 x 0.5 mm	750 A	7 m/h

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Band 308L	A5.9:EQ308L/ 14343-A:B 19 9 L
OK Band 316L	A5.9:EQ316L/ 14343-A:B 19 12 3 L
OK Band 347	A5.9:EQ347/ 14343-A:B 19 9 Nb
OK Band 309LNb	14343-A:B 23 12 L Nb

Approvals	
<b>Wire</b>	<b>VdTÜV</b>
OK Band 316L	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

## OK Flux 10.05

Typical Weld Metal Analysis %								
C	Mn	Si	Ni	Cr	Mo	N	Nb	Ferrite FN
<b>OK Band 308L</b>								
0.02	1.0	0.6	10.5	19.0	-	0.03	-	6
<b>OK Band 316L</b>								
0.02	1.1	0.7	13.0	18.0	2.5	0.02	-	7
<b>OK Band 347</b>								
0.02	1.1	0.7	10.5	19.0	-	0.03	0.35	8
<b>OK Band 309LNb DC+</b>								
0.03	1.1	0.6	10.0	19.0	-	0.04	0.35	5

## OK Flux 10.10

High basic, all mineral, agglomerated flux designed for electro slag strip surfacing. The flux is particularly suitable for strip cladding with stainless strip of the Cr-, Cr-Ni- and Cr-Ni-Mo-steel types, with or without Nb.

<b>Classifications:</b>	EN ISO 14174:ES A FB 2B 56 44 DC
<b>Approvals:</b>	NAKS/HAKC RD 03-613-03

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

<b>Welding Current:</b>	1700 A (60 x 0.5 mm strip)
<b>Slag Type:</b>	Fluoride basic CaF <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub>
<b>Alloy Transfer:</b>	Moderately silicon alloying
<b>Density:</b>	nom: 1.0 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 4.0

Flux Consumption	
Volts	kg Flux / kg Wire DC+
25 V	0.5 kg

Dimensions	Amps	Travel Speed
60 x 0.5 mm	1250 A	9 m/h

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Band 309L ESW	14343-A:B 22 11 L
OK Band 309LMo ESW	A5.9:EQ309LMo (Mod)/ 14343-A:B 21 13 3 L
OK Band 309LNb ESW	14343-A:B 22 12 L Nb
OK Band 310MoL	14343-A:B 25 22 2 N L

Approvals	
<b>Wire</b>	<b>VdTÜV</b>
OK Band 309LNb ESW	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

# OK Flux 10.10

Typical Weld Metal Analysis %								
C	Mn	Si	Ni	Cr	Mo	N	Nb	Ferrite FN
OK Band 309L ESW								
0.03	1.2	0.4	10.0	19.0	-	0.05	-	4
OK Band 309LMo ESW								
0.02	1.1	0.4	12.5	18.0	2.8	0.04	-	6
OK Band 309LNb ESW								
0.03	1.3	0.5	10.0	19.0	-	0.05	0.4	4
OK Band 310MoL								
0.02	3.2	0.4	22	24	2	0.14	-	-

## OK Flux 10.14

High basic agglomerated flux for electro slag strip cladding. The flux is suitable for cladding with austenitic Cr-, CrNi- and CrNiMo-strips at higher travel speeds.

<b>Classifications:</b>	EN ISO 14174:ES A FB 2B 56 44 DC
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Approvals are based on factory location. Please contact ESAB for more information.

<b>Welding Current:</b>	approx. 2500 A
<b>Slag Type:</b>	Fluoride basic CaF <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub>
<b>Alloy Transfer:</b>	Moderately silicon alloying
<b>Density:</b>	nom: 1.0 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 4.4

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Band 309LMo ESW	A5.9:EQ309LMo (Mod)/ 14343-A:B 21 13 3 L
OK Band 309LNb	14343-A:B 23 12 L Nb

Typical Weld Metal Analysis %								
C	Mn	Si	Ni	Cr	Mo	N	Nb	Ferrite FN
<b>OK Band 309LMo ESW</b>								
0.030	1.38	0.37	11.7	17.4	2.43	0.03	-	4
<b>OK Band 309LNb</b>								
0.04	1.6	0.5	10.0	19.0	-	0.02	0.6	5

## OK Flux 10.17

High basic, agglomerated flux designed for welding nickel based alloys. The flux is particularly suitable for submerged arc strip cladding with all grades of Ni-based strips. OK Flux 10.17 used for internal overlay welding on mild or low alloyed steel. It has very good welding characteristics gives a smooth bead appearance and easy slag removal. For chemical and petrochemical plants, offshore constructions, marine equipments, pressure vessels, storage tanks, etc.

<b>Classifications:</b>	EN ISO 14174:S A FB 2B 57 24 DC
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<b>Welding Current:</b>	900 A (60 x 0.5 mm strip)
<b>Slag Type:</b>	Aluminate-fluoride-basic, Al <sub>2</sub> O <sub>3</sub> -CaF <sub>2</sub>
<b>Alloy Transfer:</b>	Moderately silicon alloying
<b>Density:</b>	nom: 1,1 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 2,5

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Band NiCr3	A5.14:EQNiCr-3/ 18274 B Ni 6082
OK Band NiCrMo3	A5.14: EQNiCrMo-3/ 18274 B Ni 6625 (NiCr22Mo9Nb)

Typical Weld Metal Analysis %							
C	Mn	Si	Ni	Cr	Mo	Fe	Nb+Ta
<b>OK Band NiCr3 DC+, 750A, 28V, 12cm/min</b>							
0.02	2.3	0.7	67	18	-	8	2.2
<b>OK Band NiCrMo3 DC+, 850A, 28V, 12cm/min</b>							
0.03	0.1	0.6	61	19.6	8.0	9	2.7

## OK Flux 10.18

OK Flux 10.18 is an agglomerated flux designed for cladding with Monel strip. The flux is particularly suitable for strip cladding with NiCu7-strip giving shiny bead finish and smooth overlaps.

<b>Classifications:</b>	EN ISO 14174:S A CS 2B 58 13 DC
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<b>Welding Current:</b>	1000 A
<b>Slag Type:</b>	Calcium silicate SiO <sub>2</sub> -CaO-CaF <sub>2</sub> -(MnO-Al <sub>2</sub> O <sub>3</sub> )
<b>Alloy Transfer:</b>	Moderately silicon alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.0

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Band NiCu7	A5.14:EQNiCu-7/ 18274 B Ni 4060 (NiCu30Mn3Ti)

Typical Weld Metal Analysis %						
C	Mn	Si	Ni	Cu	Fe	Ti
<b>OK Band NiCu7</b>						
0.029	3.0	1.0	Bal.	23.0	17	0.25

## OK Flux 10.26

High basic, agglomerated Ni-, Cr- and Mo-adding flux designed for electrosag strip cladding with ESAB OK Band 316L strips gives 316L overlay in first layer. The flux has very good welding characteristics gives a smooth bead appearance and easy slag removal. For chemical industry, marine applications, paper industry digesters, evaporators and handling equipments, petroleum refining equipment, duct works, water tubes and heat exchangers.

<b>Classifications:</b>	EN ISO 14174:ES A FB 2B 54 91 NiMo DC
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<b>Slag Type:</b>	Fluoride basic
<b>Alloy Transfer:</b>	Nickel, chromium and molybdenum
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 3.0

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Band 316L	A5.9:EQ316L/ 14343-A B 19 12 3 L

Typical Weld Metal Analysis %							
C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
<b>OK Band 316L DC+, 1200A, 24V, 16-18 cm/min</b>							
0.02	1.2	0.2	12.8	19.0	2.7	0.05	7

## OK Flux 10.27

OK Flux 10.27 is an high basic, agglomerated Ni-, Cr- and Mo-adding flux designed for electrosag strip cladding with ESAB 309LMo ESW strips gives 317L overlay in first layer. It has a smooth bead appearance, very good welding properties and easy slag removal. Suitable for special applications like flue gas desulfurization scrubber systems chemical and petrochemical processing equipments and pulp and paper plants, etc.

<b>Classifications:</b>	EN ISO 14174:ES A FB 2B 54 62 NiMo DC
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<b>Slag Type:</b>	Fluoride basic
<b>Alloy Transfer:</b>	Nickel, chromium and molybdenum
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 3.1

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Band 309LMo ESW	A5.9:EQ309LMo (Mod)/ 14343-A B 21 13 3 L

Typical Weld Metal Analysis %							
C	Mn	Si	Ni	Cr	Mo	N	Ferrite FN
<b>OK Band 309LMo ESW DC+, 1200A, 24V, 16-18 cm/min</b>							
0.03	1.0	0.2	13.2	18.8	3.4	0.05	8



## OK Flux 10.16

High basic, all mineral, agglomerated flux designed for welding nickel and nickel based alloys. The flux is particularly suitable for strip cladding with Ni-based strip. The silicon transfer from the flux to the weld metal is strongly reduced by the well balanced flux composition and thus minimizing the risk for hot cracking in welding Ni-based alloys.

<b>Classifications:</b>	EN ISO 14174:S A FB 2 55 43 DC
<b>Approvals:</b>	NAKS/HAKC RD 03-613-03

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

<b>Slag Type:</b>	Fluoride basic $\text{CaF}_2\text{-Al}_2\text{O}_3\text{-(TiO}_2\text{)-(MnO)}$
<b>Alloy Transfer:</b>	Moderately manganese and silicon alloying
<b>Density:</b>	nom: 1.2 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 2.4

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Autrod NiCr-3	A5.14:ERNiCr-3/ 18274:S Ni 6082 (NiCr20Mn3Nb)
OK Autrod NiCrMo-3	A5.14:ERNiCrMo-3/ 18274:S Ni 6625 (NiCr22Mo9Nb)
OK Autrod NiCrMo-13	A5.14:ERNiCrMo-13/ 18274:S Ni 6059 (NiCr23Mo16)

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod NiCr-3	As Welded 325A DC+ Feed speed: 25m/h	360 MPa	600 MPa	41 %	140 J @ 20°C 100 J @ -196°C
OK Autrod NiCrMo-3	As Welded HI ~ 1.0-1.7 kJ/mm DC+	450 MPa	720 MPa	43 %	100 J @ -140°C 90 J @ -196°C
OK Autrod NiCrMo-13	As Welded 300A DC+ Feed speed: 25m/h	490 MPa	730 MPa	44 %	80 J @ 20°C 75 J @ -60°C 60 J @ -196°C

Typical Weld Metal Analysis %								
C	Mn	Si	Ni	Cr	Mo	Al	Fe	Nb+Ta
<b>OK Autrod NiCr-3 DC+ , 325A, 30V</b>								
0.01	3.2	0.3	Bal.	19.0	-	-	1.3	2.3
<b>OK Autrod NiCrMo-3 DC+, 320A, 30V</b>								
0.01	0.6	0.3	Bal.	19.5	8.5	-	2.0	3.0
<b>OK Autrod NiCrMo-13 Current Type: DC+ , 300A, 30V</b>								
0.02	0.7	0.2	Bal	18.0	16.5	0.1	2.0	0.1

# OK Flux 10.90

Agglomerated aluminate-fluoride-basic flux for welding of 9% Ni steels and other high alloyed steels with Ni based wires. The flux is manganese adding, which reduces the risk of hot cracking. Good slag detachability and nice bead appearance.

<b>Classifications:</b>	EN ISO 14174:S A AF 2 55 53 MnNi DC
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<b>Slag Type:</b>	Fluoride basic CaF <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>
<b>Alloy Transfer:</b>	Chromium compensating. Nickel- and manganese alloying.
<b>Density:</b>	nom: 1.0 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.7

## Flux Consumption

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

Dimensions	Amps	Travel Speed
4.0 mm	580 A	33 m/h

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Autrod NiCr-3	A5.14:ERNiCr-3/ 18274:S Ni 6082 (NiCr20Mn3Nb)
OK Autrod NiCrMo-3	A5.14:ERNiCrMo-3/ 18274:S Ni 6625 (NiCr22Mo9Nb)
OK Autrod NiCrMo-4	A5.14:ERNiCrMo-4/ 18274:S Ni 6276 (NiCr15Mo16Fe6W4)
OK Autrod NiCrMo-13	A5.14:ERNiCrMo-13/ 18274:S Ni 6059 (NiCr23Mo16)

## Approvals

<b>Wire</b>	<b>DNV</b>
OK Autrod NiCrMo-3	•
OK Autrod NiCrMo-4	•

\*Selected production units only. Please contact ESAB for more information.

Visit [esab.com](http://esab.com) to download specific flux/wire combination fact sheets for more details.

## OK Flux 10.90

Typical Mechanical Properties					
Wire	Condition	Yield Strength	Tensile Strength	Elongation	Charpy V-Notch
OK Autrod NiCr-3	As Welded ISO DC+	400 MPa	600 MPa	35 %	145 J @ -80°C 130 J @ -196°C
OK Autrod NiCrMo-3	As Welded HI ~ 1.0-1.7 kJ/mm DC+	440 MPa	720 MPa	42 %	100 J @ -196°C
OK Autrod NiCrMo-4	As Welded DC+	480 MPa	700 MPa	35 %	60 J @ -196°C
OK Autrod NiCrMo-13	As Welded 350 A, HI 1.3-1.7 kJ/mm DC+	470 MPa	675 MPa	46 %	70 J @ -196°C

Typical Weld Metal Analysis %								
C	Mn	Si	Ni	Cr	Mo	Fe	Nb+Ta	W
<b>OK Autrod NiCr-3</b>								
0.004	4.4	0.35	Bal.	19.3	0.1	1.7	2.6	-
<b>OK Autrod NiCrMo-3 DC+, 350A, 29V</b>								
0.01	1.7	0.2	Bal.	21.0	8.5	2.0	3.0	-
<b>OK Autrod NiCrMo-4 DC+, 350A, 29V</b>								
0.01	2.2	0.2	Bal.	15.0	15.5	6.0	-	3.4
<b>OK Autrod NiCrMo-13 Current Type: DC+ , 350A, 29V</b>								
0.01	2.8	0.2	Bal.	22.0	15.0	2.0	-	-

## OK Flux 10.07

Neutral, agglomerated, nickel- and molybdenum alloying flux, specially designed for strip cladding with a 17Cr-strip, producing a weld metal with 14Cr-4Ni-1Mo and a hardness of 370-420 HB. Can also be used for cladding with a 17Cr-wire producing the same weld metal.

<b>Classifications:</b>	EN ISO 14174:S A GS 3 Ni4 Mo1 DC
<b>Welding Current:</b>	1000 A
<b>Slag Type:</b>	Calcium silicate SiO <sub>2</sub> -MgO-Al <sub>2</sub> O <sub>3</sub> -(CaF <sub>2</sub> )
<b>Alloy Transfer:</b>	Nickel and molybdenum alloying
<b>Density:</b>	nom: 1.0 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.0

### Flux Consumption

Volts	kg Flux / kg Wire DC+
26 V	0.65 kg
28 V	0.65 kg

Dimensions	Amps	Travel Speed
60 x 0.5 mm	750 A	7 m/h

Classifications	Wire
<b>Wire</b>	<b>AWS/EN</b>
OK Band 430	14343-A B 17

### Typical Weld Metal Analysis %

C	Mn	Si	Ni	Cr	Mo
<b>OK Band 430 Current: DC+, 770A, 25V, 22 cm/min</b>					
0.05	0.15	0.6	4.0	13.0	1.0

## OK Flux 10.31

Neutral, agglomerated, slightly molybdenum alloyed flux for strip cladding with unalloyed CMn-steel strips.

<b>Classifications:</b>	EN ISO 14174:S A CS 3 Mo1 DC
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<b>Slag Type:</b>	Calcium silicate SiO <sub>2</sub> -MgO-Al <sub>2</sub> O <sub>3</sub> -(CaF <sub>2</sub> )
<b>Alloy Transfer:</b>	Molybdenum alloying
<b>Density:</b>	nom: 1.0 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.0

Typical Weld Metal Analysis %		
C	Mn	Si
<b>OK Band 7018 DC+, 850A, 24V, 13cm/min</b>		
0.07	0.30	0.4

## OK Flux 10.33

Agglomerated fluoride-basic flux designed primarily for surfacing of continuous casting rollers, using cored wires with single- or twin-arc technique with oscillating procedure. The flux has excellent slag removal and can tolerate high interpass temperatures.

<b>Classifications:</b>	EN ISO 14174:S A FB 2 56 53 DC
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<b>Slag Type:</b>	Fluoride-basic MgO-CaF <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub> -SiO <sub>2</sub>
<b>Alloy Transfer:</b>	Non-alloying
<b>Density:</b>	nom: 1.1 %
<b>Basicity Index:</b>	nom: 2.9 %

## OK Flux 10.96

A neutral, agglomerated chromium alloying flux for hardsurfacing purpose producing a weld metal with a hardness of about 35 HRC with a mild steel electrode.

<b>Classifications:</b>	EN ISO 14174:S A CS 3 Cr3 DC
<b>Slag Type:</b>	Calcium silicate SiO <sub>2</sub> -MgO-Al <sub>2</sub> O <sub>3</sub> -Cr
<b>Alloy Transfer:</b>	Chromium alloying
<b>Basicity Index:</b>	nom: 0.7

### Flux Consumption

Volts	kg Flux / kg Wire DC+	kg Flux / kg Wire AC
30 V	0.7 kg	0.6 kg
34 V	0.9 kg	0.8 kg
38 V	1.2 kg	1.0 kg

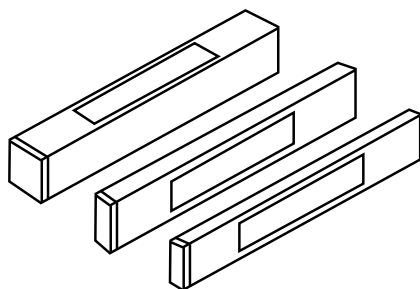
Dimensions	Amps	Travel Speed
4.0 mm	580 A	33 m/h

## OK Flux 10.97

A neutral, agglomerated chromium alloying flux for hardsurfacing purpose producing a weld metal with a hardness of about 35 HRC with a mild steel electrode.

<b>Classifications:</b>	EN ISO 14174:S A CS 3 C0.3 Mn1 Cr1 DC
<b>Slag Type:</b>	Calcium silicate SiO <sub>2</sub> -MgO-Al <sub>2</sub> O <sub>3</sub> -Cr
<b>Alloy Transfer:</b>	Chromium alloying
<b>Density:</b>	nom: 1.1 kg/dm <sup>3</sup>
<b>Basicity Index:</b>	nom: 1.4

## Packaging for Coated Electrodes



### Standard Packaging

The standard electrode packaging consists of cardboard in PE shrink film for the inner package; the outer carton is also made of recyclable cardboard.

The amounts contained depend on:

1. Full package (cross-sectional square)
2. Half package ( $\frac{1}{2}$  of the full package)
3. Quarter package ( $\frac{1}{4}$  of the full package)

#### ESAB Part Number (suffix):

- 00 Full package cardboard in PE film
- 10 Half package cardboard in PE film,  
6 packets/box

## Packaging for Coated Electrodes



### VacPac

The vacuum-packed VacPac protects electrodes in the box during transport.

VacPac saves time and money by simplifying storage and elimination of re-drying.

The vacuum-packed VacPac is:

1. Optional for stick electrodes for unalloyed steels and fine grain steels
2. For all electrodes for heat-resistant and high-strength steels (low alloy electrodes)
3. For high-alloy and nickel-based electrodes with diameters of  $\varnothing \geq 4.0$  mm  
( $\frac{1}{2}$  - VacPac, type -G0 )

#### ESAB Part Number (suffix):

- K0 Quarter package  
( $\frac{1}{4}$  VacPac, 9 packages/box)
- G0 Half package  
( $\frac{1}{2}$  - VacPac, 6 packets/box)
- V0 Three quarter package  
( $\frac{3}{4}$  VacPac, 4 packets/box)

### Mini VacPac

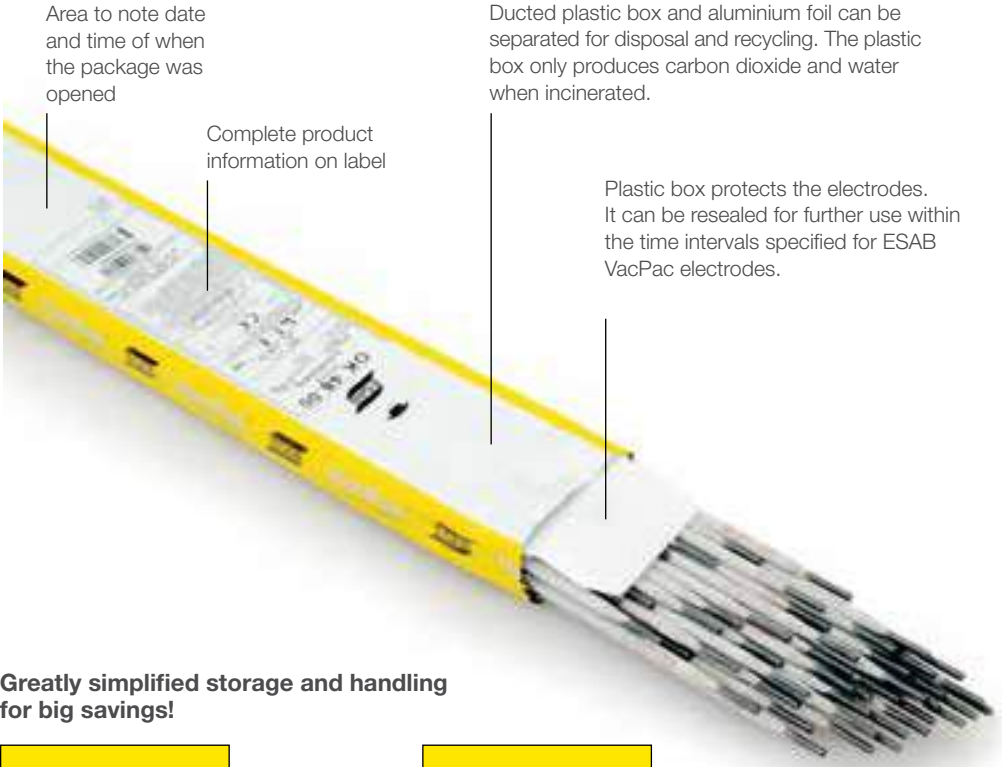
The vacuum-packed Mini VacPac is used for:

1. Type L for small diameter ( $\varnothing 1,6 - 2,5$  mm) high alloyed stick electrodes, nickel-based electrodes, and stick electrodes for welding cast iron.
2. Type T for high-alloyed stick electrodes  $\varnothing 3,2$  mm.
3. Type G for high-alloy and nickel-based electrodes from  $\varnothing \geq 4.0$  mm.

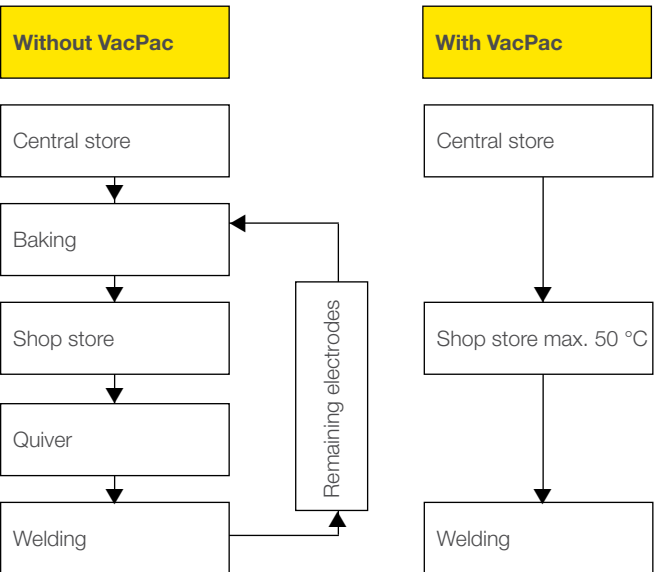
#### ESAB Part Number (suffix):

- L0 Quarter package,  $\frac{1}{4}$  - VacPac, 6 packets/box
- T0 Half package,  $\frac{1}{2}$  - VacPac, 3 packets/box
- G0 Half package,  $\frac{1}{2}$  - VacPac, 6 packets/box





**Greatly simplified storage and handling for big savings!**



## Packaging for Coated Electrodes



### Plastic

The plastic packaging is for high-quality electrodes for repair and hardfacing use. It consists of resealable plastic quivers to remove electrodes as needed.

ESAB Part Number (suffix):

- 20 Full package, plastic quiver, resealable
- 30 Half package, Plastic quiver, resealable

### Pipeweld Metal Canister (not shown)

The metal canister packaging is used exclusively for cellulose electrodes. Unlike other electrodes, cellulose electrodes must not be too dry or too wet, they are therefore “climate-controlled” in cans.

Suitable for rough construction site application and for steady supplies.

Pipeweld electrodes cannot be re-dried.

ESAB Part Number (suffix):

- 3640 Bottle packaging, depending on the diameter, 12-14 kg/box
- 3B40 Canned packaging with 20 kg/box

### TIG Rods

Tig rods are packed in strong, air-tight fibre cylinders with a resealable plastic lid.

### Strip Electrodes

OK Band welding strip is normally supplied in 50 kg coils, 60 x 0.5 mm. However, other widths such as 30 or 90 mm or larger coil weights are available on request.





Paper Bag - 25 kg



Bucket - generally 25 kg



BigBag - 1,000 kg



BlockPac - 25 kg

## Flux Packaging

ESAB fluxes are normally supplied in paper bags of 20 or 25 kg each. An inner bag of polythene provides extra protection from moisture pick-up from the surrounding atmosphere. ESAB fluxes for submerged arc welding can also be supplied in steel buckets of 25 kg. This packaging type is very strong and is used for demanding handling conditions. The resealable metal lid has a rubber seal to prevent the flux from absorbing moisture.

BigBag is intended for bulk usage. Fluxes, including OK Flux 10.71, are available in 1,000 kg content. BigBag offers six-fold security in terms of weight and has base dimensions of 85 x 85 cm. The height of a one tonne BigBag is 88 cm, enabling two bags to be stacked in a truck or container for transport.

BigBag is made of strong woven polypropylene material that has an internal multi-layered aluminium lining, keeping the flux "factory dry". There is a discharge spout with a diameter of 150 mm. It can easily be resealed so that only some of the flux is taken out at a time. BigBag has four strong straps allowing it to be lifted by a forklift truck or overhead crane and emptied directly into a flux container.

BlockPac™ provides full protection from moisture absorption during transport and storage. The bag is made of a laminated, multi-layer aluminium foil which creates a 100% moisture barrier. The flux is delivered in block shape with most of the bags having a low air pressure.

Fluxes delivered in BlockPac can be used without re-drying. Especially on hydrogen sensitive applications, such as welding of high strength steels thus significant handling times and costs can be saved on customer side. BlockPac allows more severe storage conditions and an unlimited shelf life as long as the foil is not damaged.



## MARATHON PAC™ — endless feedability

For many customers, Marathon Pac™ bulk drums for MIG/MAG and FCAW are key in maximising production efficiency and quality in manual welding and especially in mechanised and robotic welding.

Marathon Pac can cut the time taken by spool changes and maintenance by almost 95%. Marathon Pac comes in three sizes – the standard version, the jumbo version and the mini version – and is available for non- and low-alloyed MAG wires, stainless MIG wires, aluminium MIG wires, MAG-brazing wires, cored wires, and SAW wires up to 2 mm diameter.

In addition, there is an "endless version", which makes it possible to combine the content of a series of Marathon Pacs to form a continuous in-line supply source, thereby necessitating no stops whatsoever for wire exchange.

This is ideal for multi-robot stations. A special wire resistance welder is available from ESAB for this purpose. Availability and content weight are given in the table below.

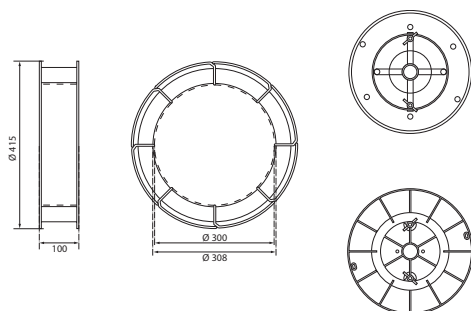
## Perfect delivery to the welding head

The special coiling technique that is used when packing the drum ensures that the wire is never twisted or warped, which would otherwise cause arc wander. Welds are well positioned and perfectly straight. The unwinding process from the drum is automatic, so no separate de-coiling equipment is needed and no additional forces are required, like those that are needed when pulling a traditional revolving spool. This translates into a lower wear rate for the wire feeder.

## Easy Recycling

Marathon Pac comes in cardboard drums that are fully recyclable. They can be folded flat after use to save on storage space.

Marathon Pac		
Marathon Pac Version	Wire Types	Filling Content
Standard - w x h: 513 x 830 mm	Non-/low-alloyed Stainless MAG-brazing Cored wires	250 kg (ø 0.8 mm : 200 kg) 250 kg (ø 0.8 mm : 200 kg) 200 kg depending on the wire type
Jumbo - w x h: 595 x 1000 mm	Non-/low-alloyed Stainless Aluminium Cored wires Submerged arc wires	500 kg (min. ø 1.0 mm) 500 kg (min. ø 1.0 mm) 141 kg depending on the wire type 450 kg (ø 2.0 mm)
Mini - w x h: 513 x 500 mm	Stainless	100 kg
Endless - 2x standard or jumbo	Non-/low-alloyed Stainless	2x 250 kg or 2x 500 kg 2x 250 kg or 2x 500 kg

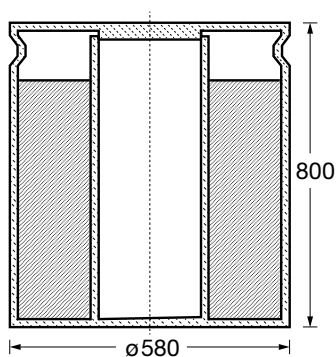


### Spool 03

03-0	25 kg
------	-------

Random-wound wire basket.

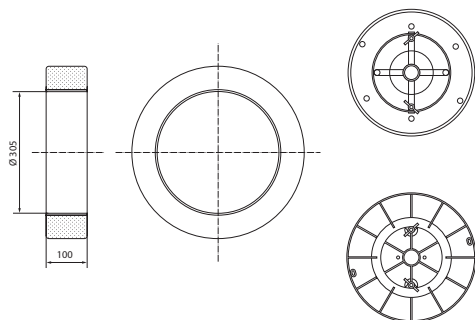
The spool is also suitable for coil holders with crossed arms. The empty basket is non-returnable.



### Spool 04

04-0	280 kg
------	--------

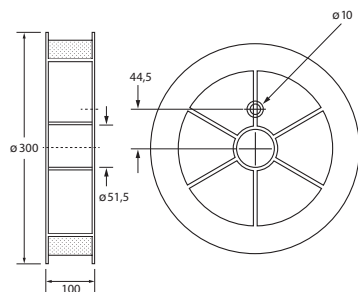
Random-wound pay-off drum. The empty spool is non-returnable.



### Spool 08

08-0	30 kg
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Layer-wound spool without cardboard former. The spool is not suitable for coilholders with crossed arms.



### Spool 24

24-7	15 kg
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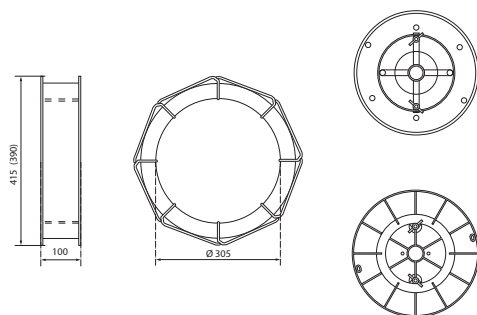
Plastic spool. Layer wound.  
EN ISO 544: S 300

### Spool 25

25-0	15 kg
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25-2	10 kg
------	-------

Plastic spool. Random wound.  
EN ISO 544: S 300

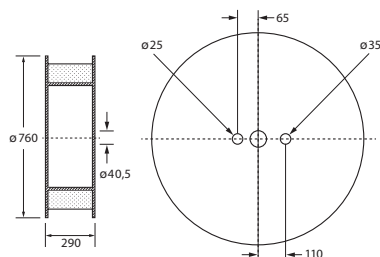


### Spool 28/31 Eurospool

28-0	30 kg
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28-1	25 kg
------	-------

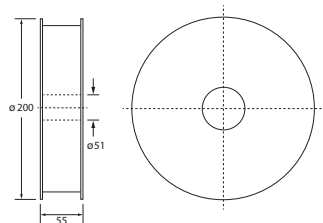
Precision-wound octagonal wire basket.  
This spool is also suitable for coil holders with crossed arms. The empty basket is non-returnable, but fully recyclable.



### Spool 34

34-0	300 kg
------	--------

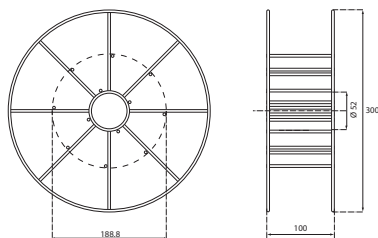
Random-wound wooden bobbin.  
Decoiling stand required. The empty bobbin is non-returnable.



### Spool 46

46-0	5 kg
46-2	2 kg

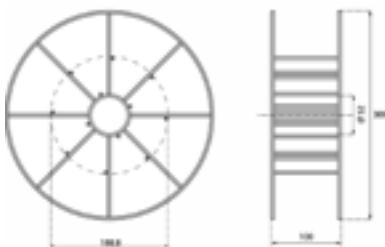
Plastic spool. Random wound  
EN ISO 544: S 200



### Spool 67

67-0	15 kg
67-3	18 kg
66-3	16 kg

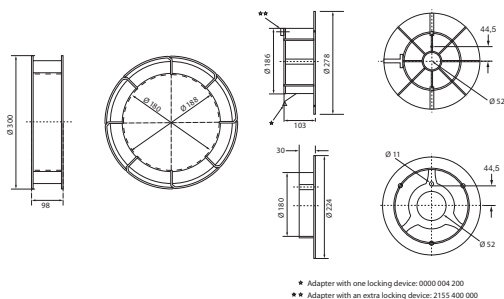
Wire basket. Layer wound.  
EN ISO 544: BS 300  
67-copper-coated



### Spool 69

67-0	15 kg
66-3	16 kg

Wire basket. Layer wound.  
EN ISO 544: KS 300  
69-bare



## Spool 76

76-0	15 kg
76-1	18 kg
76-3	16 kg

Wire basket. Random wound.

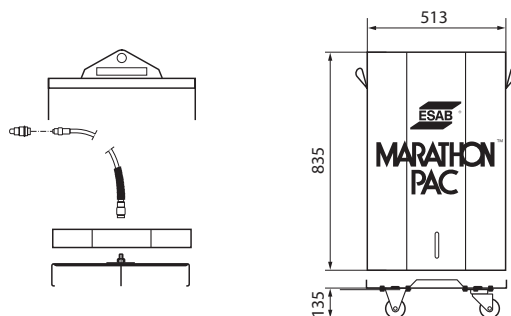
EN ISO 544: B 300

## Spool 77

77-0	15 kg
77-1	18 kg
77-3	16 kg

Wire basket. Layer wound.

EN ISO 544: B 300

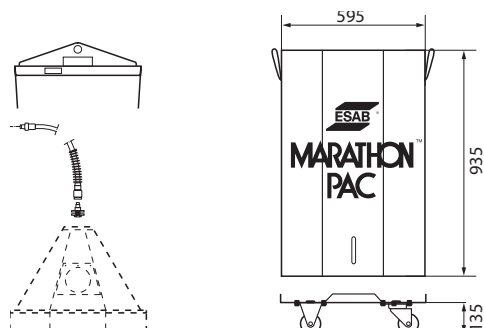


## Spool 93 MARATHON PAC

93-0	200 kg
93-2	250 kg
93-X	catch weight

Accessories:

1. Wire conduit attachment
2. Wire conduits
3. Connector wire feed unit
4. Lifting yoke
5. Trolley



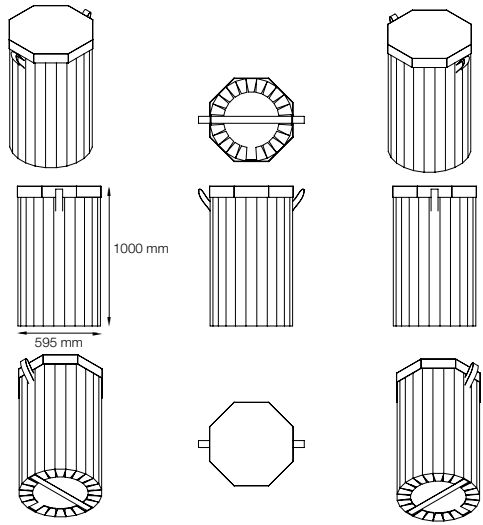
## Spool 94 MARATHON PAC

94-0	475 kg
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Accessories:

1. Plastic hood
2. Quick connector
3. Wire conduits
4. Connector wire feed unit
5. Lifting yoke
6. Trolley



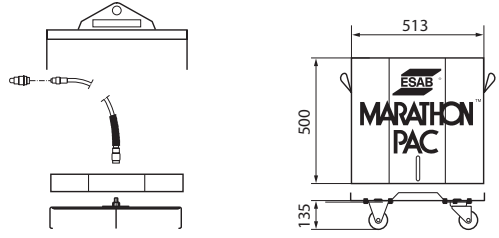


### Spool 9A MARATHON PAC 2

9A-0	500 kg
9A-7	500 kg Endless

Accessories:

1. Plastic hood
2. Quick connector
3. Wire conduits
4. Connector wire feed unit
5. Lifting yoke
6. Trolley

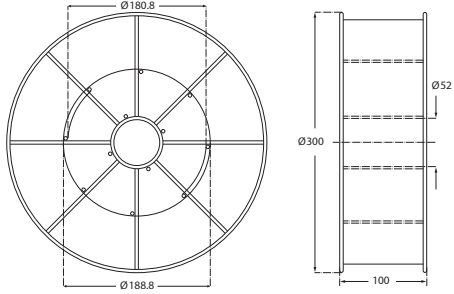


### Spool 95 MARATHON PAC

95-0	100 kg
------	--------

Accessories:

1. Quick connector
2. Wire conduits
3. Connector wire feed unit
4. Lifting yoke
5. Trolley



### Spool 98

98-2	15 kg
98-3	18 kg
98-4	16 kg
98-6	6 kg
98-7	7 kg

EN ISO 544: BS 300

Layer-wound wire basket, plastic coated, which is used without adapter. Fitting to hub with diam.= 51 mm. Empty spool is recyclable.

## Recommendations for the storage, re-drying and handling of ESAB covered electrodes

### General Information

All covered electrodes are sensitive to moisture re-absorption to a greater or lesser degree. Care must be taken during storage and handling to prevent moisture being re-absorbed.

### Storage

Covered electrodes of any type will pick up moisture only very slowly if they are stored in the following climatic conditions.

Temperature	Relative Humidity
5-15°C	< 60%
15-25°C	< 50%
above 25°C	< 40%

During the winter, it is possible to have low relative humidity by keeping the temperature in the storeroom at least 10°C above the outdoor temperature. During certain periods in the summer and in a tropical climate, sufficiently low relative humidity can be maintained by air dehumidification.

If the electrodes have been stored in a cold place, allow them to reach ambient temperature before breaking the package.

### Re-drying

Low-hydrogen basic electrodes should be re-dried before use whenever there are application requirements relating to weld metal hydrogen content and/or radiographic soundness (not needed for VacPac).

Acid rutile stainless electrodes and all types of basic electrode may produce pores in the weld if they have not been stored in sufficiently dry conditions. Re-drying the electrodes will restore their usability.

Mild steel rutile and acid electrodes normally require no re-drying.

Cellulose electrodes must not be re-dried.

Electrodes which are seriously damaged by moisture can normally not be re-dried with first-class results. These electrodes should be scrapped.

### Re-Drying Conditions

Re-drying temperatures and holding times are specified on the label and in the product specification. The re-drying temperature is the temperature in the bulk of the electrodes. The re-drying time is measured from the point at which the re-drying temperature has been reached. Do not stack more than four layers of electrodes in the re-drying oven. It is recommended not to re-dry covered electrodes more than three times.

### Holding Oven

The holding oven is used for intermediate storage to avoid moisture pick-up in the coating of low-hydrogen electrodes and acid rutile stainless electrodes. The electrodes which should be stored in the holding oven are:

1. Electrodes that have been re-dried
2. Electrodes that have been removed from their hermetically-sealed container
3. Electrodes that are considered to be in good condition and are transferred directly from the storeroom after unpacking

Holding oven temperature: 120-150°C.

### Precautions On Site

Keep the electrodes in electrically-heated quivers at a minimum temperature of 70°C. After work, return the remaining electrodes to the holding oven.

### Discoloration in the Coating

If the colour of the electrodes changes during storage, they should be scrapped or the electrode manufacturer should be contacted.

### Damaged Coating

Mechanically damaged electrodes on which parts of the coating are missing will not perform correctly and should be scrapped.

### VacPac

Electrodes in VacPac will not pick up any moisture during storage. They require no re-drying before use, provided the package is undamaged. This is indicated by the vacuum in the package.

### Handling VacPac Electrodes

Protect VacPac from damage at all times. The outer board packaging offers extra protection from mechanical damage to the metal foil. Handle the single inner, metal foil, VacPac with special care.

Do not use a knife or any other sharp object to open the outer board packaging.

### Before Using VacPac Electrodes

Check if the protective foil still contains a vacuum. If the vacuum has been lost, re-dry the electrodes before use.

Cut open the protective foil at one end.

Do not take out more than one electrode at a time, thereby ensuring that the remaining electrodes are still protected inside the package. Put the top back on the plastic capsule.

Discard or re-dry electrodes that have been exposed to the atmosphere in an opened Vac-Pac for more than 9 hours.

## Storage and Handling Recommendations for OK Tubrod Cored Wires

Cored wire should be stored in conditions which prevent the accelerated deterioration of products or packaging. All cored wires should avoid direct contact with water or moisture. This could take the form of rain or the condensation of moisture on a cold wire.

Cored wires must be stored in dry conditions. The relative humidity and temperature should be monitored and the temperature should not fall below the dew point.

To avoid condensation, the wire should be kept in the original packaging and, if necessary, left to warm up to at least the ambient temperature before opening the package.

Other hydrogen-containing substances, such as oil, grease and corrosion, or substances that could absorb moisture must also be avoided on the wire surface.

Products must be stored in such a way as to avoid damage during storage.

## Easy and Efficient Storage and Handling of Fluxes

ESAB agglomerated fluxes have a guaranteed as-manufactured moisture content from production. This moisture content is controlled by internal ESAB specifications. Before transport, each pallet is shrinked or wrapped in plastic foil. This precautionary action is done in order to maintain the as-manufactured moisture content for as long as possible. Flux should never be exposed to wet conditions, such as rain or snow.

### Storage

- Unopened flux bags must be stored in maintained storage conditions as follows:  
Temperature: 20 +/- 10°C  
Relative humidity: As low as possible, not exceeding 60%.
- Fluxes delivered in aluminium lined 25 kg bags (BlockPac™) or BigBags can be stored under more severe climatic conditions, because the packaging protects the flux reliably from moisture pick-up, as long as it is unopened and undamaged.
- Fluxes shall not be stored longer than 3 years (except BlockPac).
- Fluxes in BlockPac have unlimited shelf life as long as the foil is not damaged.
- The content of unprotected flux hoppers must, after an 8 hours shift, be placed in a drying cabinet or heated flux hopper at a temperature of 150 +/- 25°C.
- Remaining flux from opened bags must be placed at a temperature of 150 +/- 25°C.

### Recycling

- Moisture and oil must be removed from the compressed air used in the re-cycling system.
- Addition of new flux must be done with the proportion of at least one part new flux to three parts re-cycled flux.
- Foreign material, such as millscale and slag, must be removed by a suitable system, such as sieving.

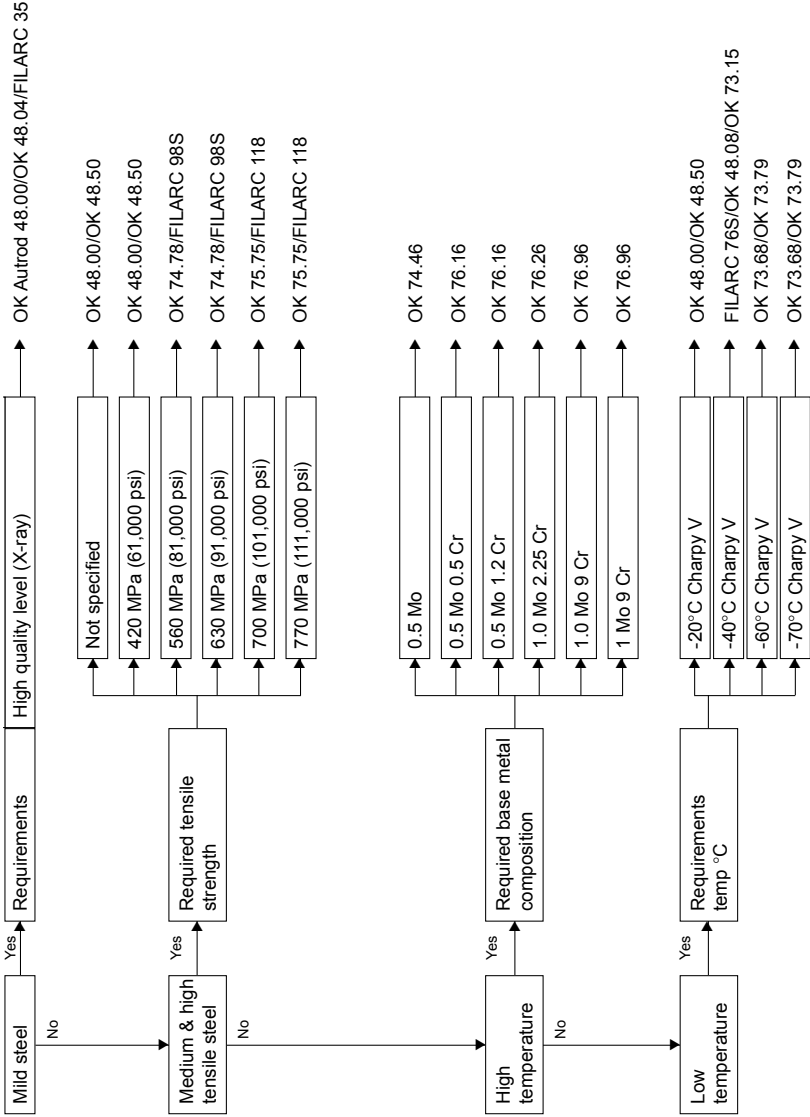
### Re-drying

- When handled and stored as above, the ESAB fluxes can normally be used straight away.
- In severe applications, stipulated by the applicable material specification or if the flux has somehow picked up moisture, re-drying of the flux is recommended.
- Re-drying shall be performed as follows:  
300 +/- 25°C for about 2-4 hours.
- Redrying must be done either in equipment that turns the flux so that the moisture can evaporate easily or in an oven on shallow plates with a flux height not exceeding 5 cm.
- Re-dried flux, not immediately used, must be kept at 150 +/- 25°C before use.

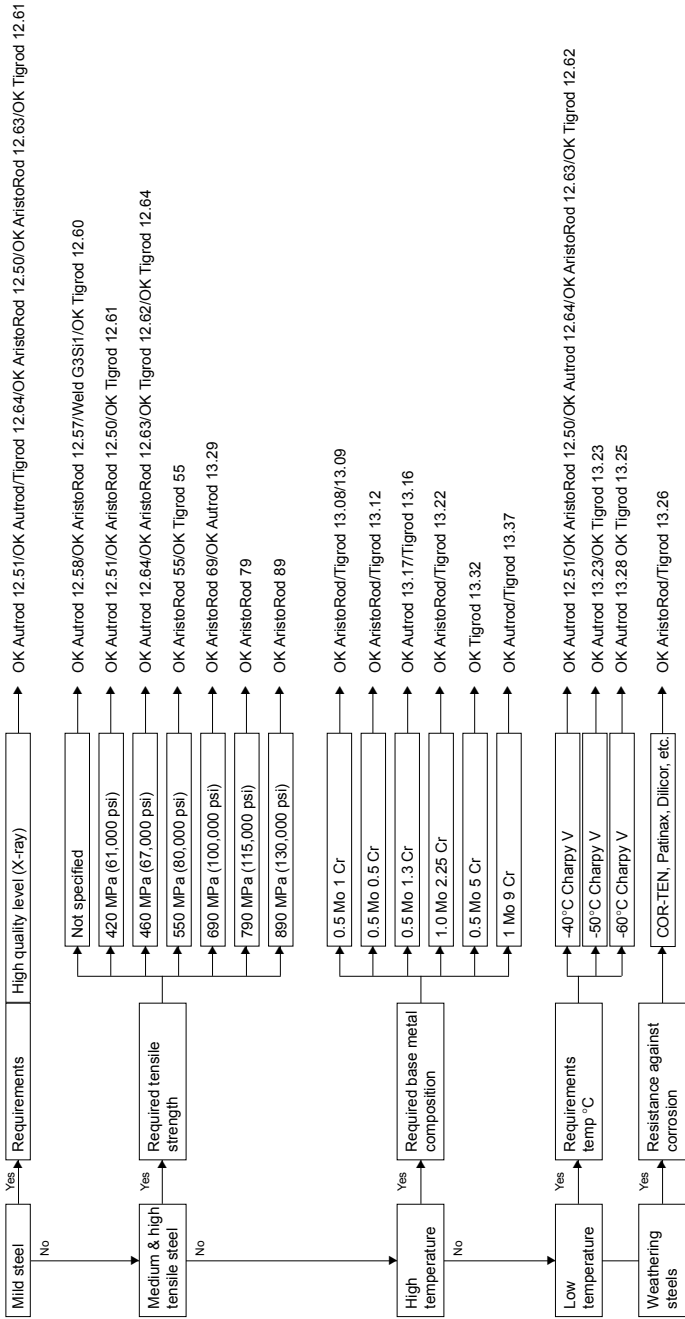
### Disposal

- Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal and local regulations.
- Please address your local disposal company for prescribed disposal.
- Information on product and residues are given in the Safety Data Sheets available through [www.esab.com](http://www.esab.com).

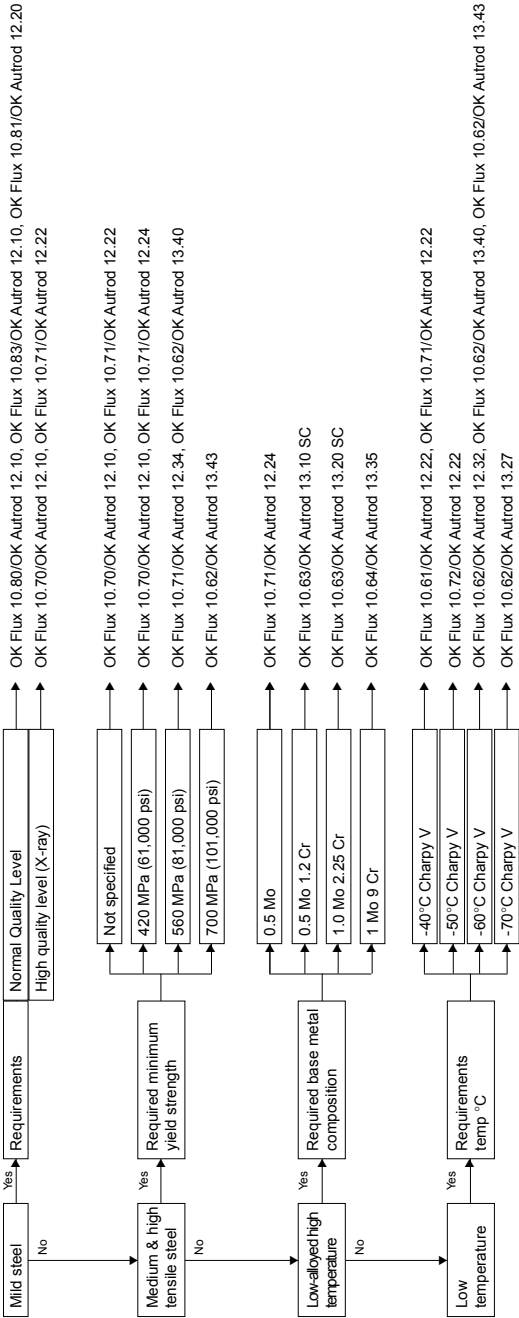
1. MMA electrodes for mild and low-alloyed steels



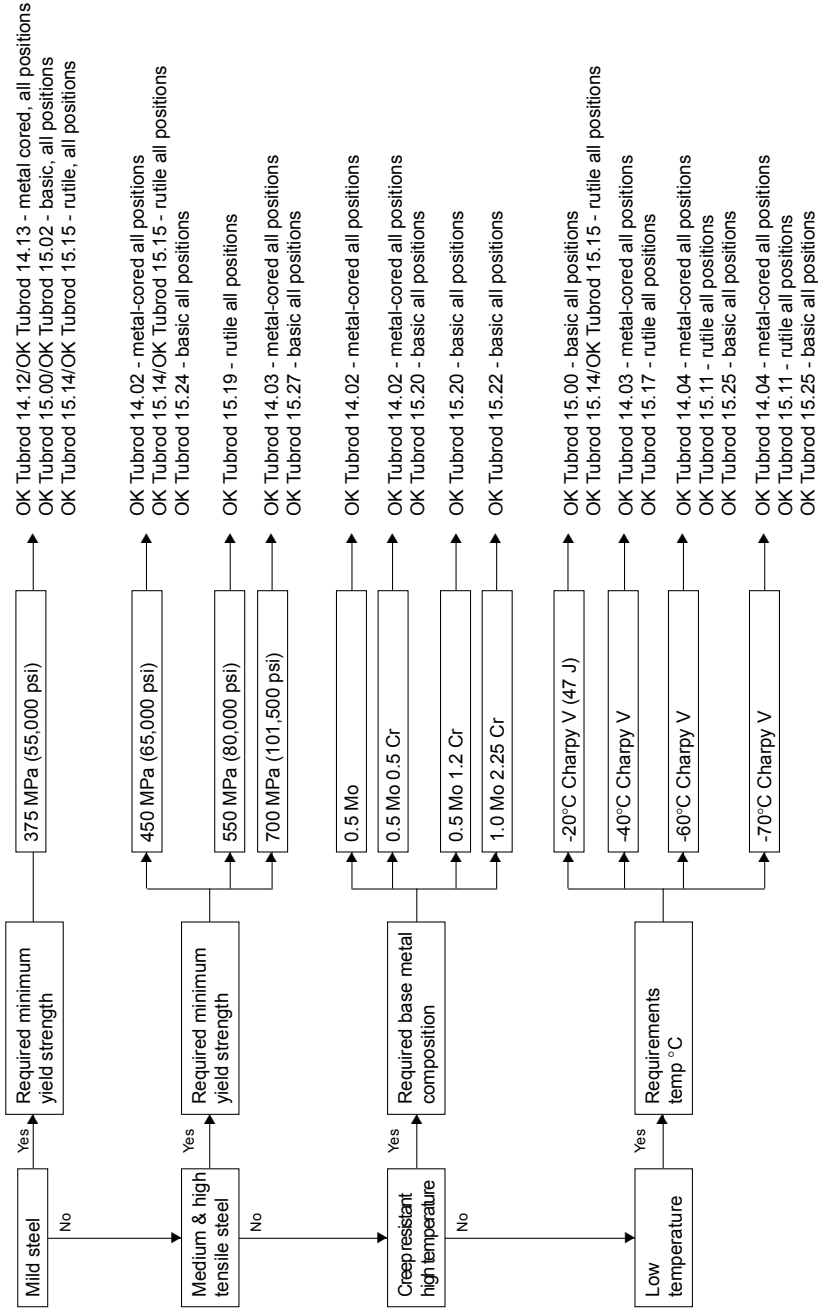
2. Solid wires



3. Submerged arc fluxes and wires

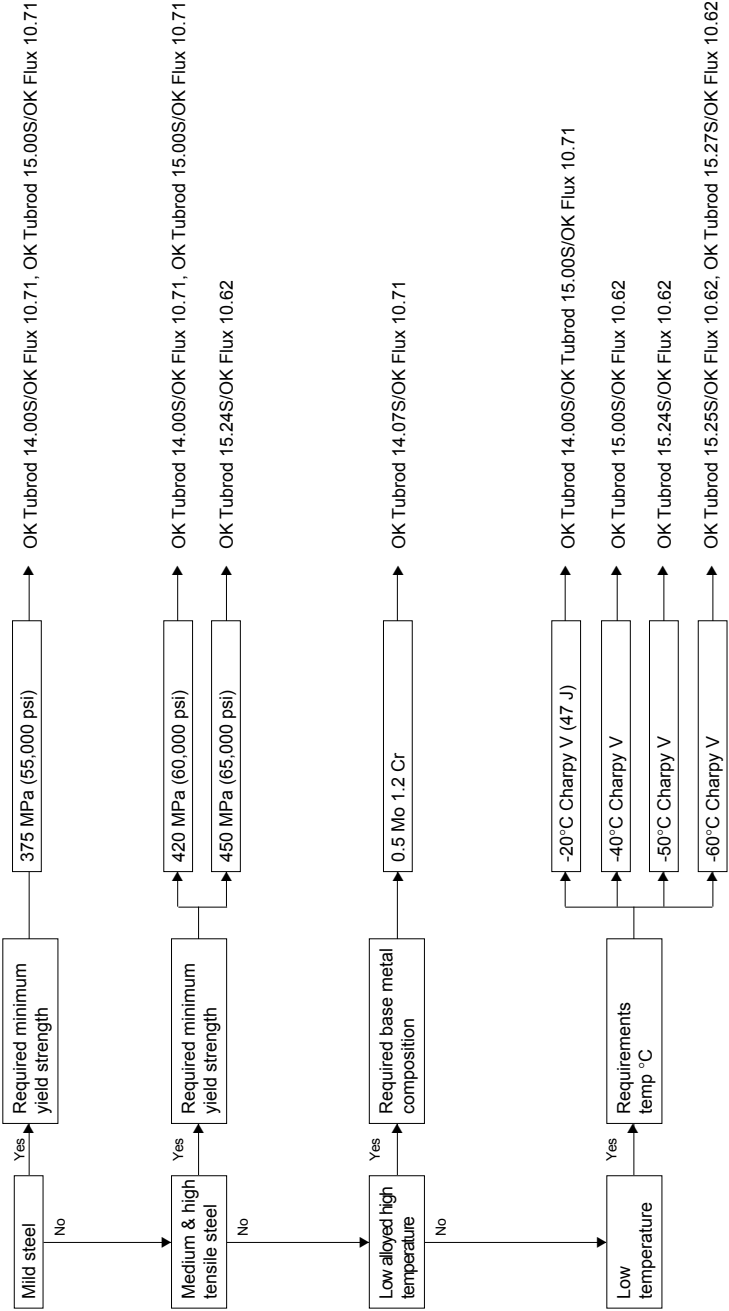


#### 4. Cored wires





4. Submerged arc cored wires and fluxes



## 6. Wires for stainless steels - selection by wire classification

EN 10088-1 Designation	Werkst. Nr.	USA AISI	C	Cr	Ni	Mo	Other elements	MIG OK Autrod	TIG OK Tigrod
<b>Austenitic</b>									
X10CrNi18-8	1.4310	302	< 0.12	18	8	-	-	308LSi	308L, 308LSi
X5CrNi18-10	1.4301	304	< 0.07	18	10	-	-	308LSi	308L, 308LSi
X6CrNiTi18-10	1.4541	321	< 0.08	18	11	-	Ti 0.7	347Si, (308LSi)	347, 347Si, (308LSi)
X6CrNiNb18-10	1.4550	347	< 0.08	18	11	-	Nb 0.7	347Si, (308LSi)	347, 347Si, (308LSi)
X8CrNiS18-9	1.4305	303	< 0.12	18	9	-	S 0.2	308LSi, 309LSi	308L, 308LSi, 309L
X2CrNi18-9	1.4307	304L	< 0.03	18	10	-	-	308LSi	308L, 308LSi
X2CrNiN18-10	1.4311	304LN	< 0.03	18	10	-	N 0.15	308LSi	308L, 308LSi
-	-	304N	< 0.08	18	9	-	N 0.15	308LSi	308L, 308LSi
X3CrNiMo17-13-3	1.4436	316	< 0.05	18	12	2.5	-	316LSi	316L, 316LSi
X5CrNiMo17-12-2	1.4401	316	< 0.05	18	12	2.5	-	-	-
X2CrNiMo17-12-2	1.4404	316L	< 0.03	18	12	2.5	-	-	-
X2CrNiMo18-14-3	1.4435	316L	< 0.03	18	13	2.5	-	16.38	16.38
X6CrNiMoTi17-13-2	1.4571	316Ti	< 0.08	18	12	2.5	Ti 0.7	318Si, (316LSi)	318Si, (316LSi)
X2CrNiMoN17-13-3	1.4429	316LN	< 0.03	18	12	2.5	N 0.5	316LSi	316L, 316LSi
X12CrMnNiN	1.4372	202	< 0.15	18	5	-	Mn 8	16.95	16.95
X2CrNiMo18-15-4	1.4438	S31703	< 0.03	18	16	3.5	-	317L	317L
X1NiCrMoCuN25-20-5	1.4539	N08904	< 0.03	20	25	4.5	Cu 1.5	385	385
X1CrNiMoCuN20-18-7	1.4547	S31254	< 0.02	20	18	6.2	Cu 0.8, N 0.2	19.81, 19.82	19.81, 19.82
X1NiCrMoCu31-27-4	1.4563	N08028	< 0.02	27	31	3.5	Cu 1.5	19.81, 19.82	19.81, 19.82
-	1.4652	S32654	< 0.02	24	22	7.3	Cu 0.5, N 0.5	19.81	19.81
X9CrNiSiN21-11-2	1.4835	S30815	< 0.10	21	11	-	N 0.17 + Ce	310	310
<b>Austenitic-ferritic (Duplex)</b>									
-	1.4162	S32101	0.03	21.5	1.5	-	Mn 5	2209	2209
X2CrNiN23-4	1.4362	S32304	< 0.03	23	4	-	N 0.10	2209	2209
X2CrNiMoN22-5-3	1.4462	S31803	< 0.03	22	5	3	N 0.10	2209	2209
X2rNiMoN25-7-4	1.4410	S32750	< 0.03	25	7	4	N 0.25	2509	2509
X2CrNiMoCuWN25-7-4	1.4501	S32760	< 0.03	25	6	3	N 0.25 W 0.7	2509	2509

EN 10088-1 Designation	Werkst. Nr.	USA AISI	C	Cr	Ni	Mo	Other elements	MIG OK Autrod	TIG OK Tigrod
<b>Ferritic-martensitic</b>									
X6Cr13	1.4000	403	< 0.08	13	-	-	-	308LSi	308L, 308LSi
X2CrNi12	1.4003	S41050	< 0.03	12	0.7	-	-	308LSi	308L, 308LSi
X12Cr13	1.4006	410	0.1	13	-	-	-	309LSi	309L, 309LSi
<b>Ferritic</b>									
X6Cr17	1.4016	430	< 0.08	16.5	-	-	-	430Ti, 430LNb, 308LSi	430Ti, 308L, 308LSi
X6CrTiNb18	1.4509	441	< 0.03	18	-	-	Ti, Nb	430Ti, 430LNb	430Ti
X6CrTi17	1.4510	439	< 0.8	17	-	-	Ti	430Ti	430Ti
X2CrMoTi18-2	1.4521	S44400	< 0.03	18	-	2	-	316LSi	316L, 316LSi
-	-	446	<0.20	26	-	-	-	310	310

## 7. The most common fluxes and wires for SAW stainless steel

European standard EN 10088-1 Designation	No	Werkst. Nr.	SS steel No	USA AISI	Recommended SAW consumables OK Flux + OK Autrod
X 6 Cr 13	1.4000	1.4000	2301	403	10.93+308L or 308H/10.92+308L
X 12 Cr 13	1.4006	1.4006	2302	410	10.93+308L or 308H/10.92+308L
X 20 Cr 13	1.4021	1.4021	2303	420	10.93+308L or 308H/10.92+308L
X 30 Cr 13	1.4028	1.4028	2304	-	10.93+308L or 308H/10.92+308L
X 6 Cr 17	1.4016	1.4016	2320	430	10.93+308L or 308H/10.92+308L
X 17 Cr Ni 16-2	1.4057	1.4057	2321	431	10.93+347 or 10.92+347
-	-	1.4749 <sup>1</sup>	2322	446	10.92+310
-	-	1.4460 <sup>1</sup>	2324	329	10.93+2209/10.94+2209
X 2 Cr Ni N 23-4	1.4362	-	2327	S32304	10.93+2209/10.94+2209
X 2 Cr Ni Mo N 22-5-3	1.4462	-	2377	S31803	10.93+2209/10.94+2209
X 2 Cr Ni Mo N 25-7-4	1.4410	-	2328	S32750	10.94+2509
X 2 Cr Ni Mo Ca WN 25-7-4	1.4501	-	-	S32760	10.94+2509
X 10 Cr Ni 18-8	1.4310	-	2331	302	10.93+308L /10.92+308L
X 5 Cr Ni 18-10	1.4301	1.4301	2332	304	10.93+308L /10.92+308L
X 5 Cr Ni 18-10	(1.4301)	(1.4301)	2333	(304)	10.93+308L /10.92+308L
X 6 Cr Ni Ti 18-10	1.4541	1.4541	2337	321	10.93+347 or 10.92+347
X 6 Cr Ni Nb 18-10	1.4550	1.4550	2338	347	10.93+347 or 10.92+347
X 3 Cr Ni Mo 17-13-3	1.4436	1.4436	2343	(316)	10.93+316L or 10.92+316L
X 5 Cr Ni Mo 17-12-2	(1.4401)	(1.4401)	2347	(316)	10.93+316L or 10.92+316L
X 2 Cr Ni Mo 17-12-2	1.4404	1.4404	2348	316 L	10.93+316L or 10.92+316L
X 6 Cr Ni Mo Ti 17-12-2	1.4571	1.4571	2350	316 Ti	(10.93+316L) or (10.92+316L)
X 2 Cr Ni 18-9	1.4307	1.4306	2352	304 L	10.93+308L or 308H/10.92+308L
X 2 Cr Ni Mo 18-14-3	1.4435	1.4435	2353	316 L	10.93+316L or 10.92+316L
(EN 10095) X 8 Cr Ni 25-21	1.4845	1.4845 <sup>1</sup>	2361	310 S	10.92+310
X 2 Cr Ni Mo 18-15-4	1.4438	1.4438	2367	317 L	10.93+317L or 10.92+317L
X 2 Cr Ni N 18-10	1.4311	1.4311	2371	304 LN	(10.93+308L) or (10.92+308L)
X 2 Cr Ni Mo N 17-13-3	1.4429	1.4429	2375	316 LN	(10.93+316L) or (10.92+316L)

<sup>1</sup> not standard

## 8. Comparison table for stainless steels and MMA electrodes, part 1

European standard EN 10088-1/EN 10095 Designation	Werkst. Nr.	SS steel No	England BS 970; 1=Part 1 BS 1449; 2=Part 2
X 6 Cr 13	1.4000	2301	403 S 17
X 12 Cr 13	1.4006	2302	410 S 21
X 20 Cr 13	1.4021	2303	420 S 37
X 30 Cr 13	1.4028	2304	420 S 45
X 6 Cr 17	1.4016	2320	430 S 17
X 17 Cr Ni 16-2	1.4057	2321	431 S 29
X 18 Cr N 28	1.4749 <sup>1</sup>	2322	-
X 4 Cr Ni Mo N 27-5-2	1.4460 <sup>1</sup>	2324	-
X 10 Cr Ni 18-8	1.4310	2331	302 S 31
X 5 Cr Ni 18-10	1.4301	2332	304 S 31
X 5 Cr Ni 18-10	1.4301	2333	(304 S 15)
X 6 Cr Ni Ti 18-10	1.4541	2337	321 S 31
X 6 Cr Ni Nb 18-10	1.4550	2338	347 S 31
X 3 Cr Ni Mo 17-13-3	1.4436	2343	(316 S 33)
X 8 Cr Ni S 18-9	1.4305	2346	303 S 31
X 5 Cr Ni Mo 17-12-2	(1.4401)	2347	(316 S 31)
X 2 Cr Ni Mo 17-12-2	1.4404	2348	316 S 11
X 6 Cr Ni Mo Ti 17-12-2	1.4571	2350	320 S 31
X 2 Cr Ni 18-9	1.4307	2352	304 S 11
X 2 Cr Ni Mo 18-14-3	1.4435	2353	316 S 3
X 8 Cr Ni 25-21	1.4845	2361	(310 S 24)
X 2 Cr Ni Mo 18-15-4	1.4438	2367	-
X 2 Cr Ni N 18-10	1.4311	2371	-
X 2 Cr Ni Mo N 17-13-3	1.4429	2375	-
X 12 Cr S 13	1.4005	2380	416 S 21
X 14 Cr Mo S 17	1.4104	2383	-
X 2 Cr Ni N 23-4	1.4362	2327	-
X 2 Cr Ni Mo N 22-5-3	1.4462	2377	-
X 2 Cr Ni Mo N 25-7-4	1.4410	2328	-
X 2 Cr Ni Mo Cu WN 25-7-4	1.4501	-	-

## 8. Comparison table for stainless steels and MMA electrodes, part 2

France AFNOR NFA 35-572 to NFA 35-578	USA AISI	Japan JIS G4303-4318 SUS	Italy UNI 6900-71	MMA electrode OK
Z 6 C 13	403	403	X 6 Cr 13	61.30, 61.35, 68.15
Z 12 C 13	410	410	X 10 Cr 13	61.30, 61.35, 68.15
Z 20 C 13	420	420 J1	X 20 Cr 13	61.30, 61.35, 68.15
Z 30 C 13	-	420 J2	X 38 Cr 13	61.30, 61.35, 68.15
Z 8 C 17	430	430	X 8 Cr 17	61.30, 61.35, 61.80
Z 15 CN 16.02	431	431	X 16 Cr Nr 16	61.30, 61.35, 61.80
Z 10 C 24	446	-	X 16 Cr 26	67.15
-	329	329 J1	-	67.50, 68.60
Z 10 CN 18.09	302	302	-	61.30, 61.35
Z 6 CN 18.09	304	304	X 5 Cr Ni 18 10	61.30, 61.35
(Z 6 CN 18.09)	(304)	(304)	(X 5 Cr Ni 18 10)	61.30, 61.35
Z 6 CNT 18.10	321	321	X 6 Cr Ni Ti-18 11	(63.34), 61.80, 61.85
Z 6 CNNb 18.10	347	347	X 8 Cr Ni Nb 1811	(63.34), 61.80, 61.85
(Z 6 CND 17.12)	(316)	(316)	(X 5 Cr Ni Mo 17 13)	63.30, 63.34, 63.41
Z 10 CNF 18.09	303	303	X 10 Cr Ni 18 09	68.81
(Z 6 CND 17.11)	(316)	(316)	X 5 Cr Ni Mo 17 12	63.30, 63.34, 63.41
Z 2 CND 17.12	316 L	316 L	X 2 Cr Ni Mo 17 2	63.30, 63.34, 63.41
Z 6 CNDT 17.12	316 Ti	-	X 6 Cr Ni Mo Ti 17 12	63.80
Z 2 CN 18.10	304 L	304 L	X 2 Cr Ni 18 11	61.30, 61.35
Z 2 CND 17.13	316 L	316 L	X 2 Cr Ni Mo 17 13	63.30, 63.34, 63.41
(Z 12 CN 25-20)	310 S	310 S	X 6 Cr Ni 2520	67.15
Z 2 CND 19.15	317 L	317 L	X 2 Cr Ni Mo 18 16	64.30
Z 2 CN 18.10 Az	304 LN	304 LN	X 2 Cr Ni N 18 11	61.30, 61.35
Z 2CND 18.10 Az	316 LN	316 LN	X 2 Cr Ni Mo N 17 13	63.30, 63.41, 69.25
Z 12 CF 13.4 M	416	416	X 12 Cr S 13	61.30, 61.35, 68.15
Z 10 CF 17	430 F	430 F	X 10 Cr S 17	61.30, 61.35
-	S32304	-	-	67.50, 67.55
-	S31803	-	-	67.50, 67.55
-	S32750	-	-	68.53, 68.55
-	S32760	-	-	68.53, 68.55

## 9. MIG and TIG wires for aluminium

EN 573 Alloy designation Numerical	Chemical symbols	The Aluminum Association	ESAB filler metal OK Autrod/Tigrod
EN AW-1050A	EN AW-Al 99,5	AA 1050A	1070, 1100, 1450
EN AW-1070A	EN AW-Al 99,7	AA 1070A	1070, 1100, 1450
EN AW-1100	EN AW-Al 99,0Cu	AA 1100	1070, 1100
EN AW-1200	EN AW-Al 99,0	AA 1200	1070, 1100
EN AW-3003	EN AW-Al Mn1Cu	AA 3003	4043, 4047
EN AW-3103	EN AW-Al Mn1	AA 3103	4043, 5356
EN AW-3004	EN AW-Al Mn1Mg1	AA 3004	4043, 5356
EN AW-4045	EN AW-Al Si10	AA 4045	4043, 4047
EN AW-5005	EN AW-Al Mg1(B)	AA 5005	5356
EN AW-5019	EN AW-Al Mg5	AA 5019	5356
EN AW-5050	EN AW-Al Mg1,5(C)	AA 5050	5356
EN AW-5052	EN AW-Al Mg2,5	AA 5052	5356
EN AW-5083	EN AW-Al Mg4,5Mn0,7	AA 5083	5183
EN AW-5086	EN AW-Al Mg4	AA 5086	5356
EN AW-5454	EN AW-Al Mg3Mn	AA 5454	5554
EN AW-6013	EN AW-Al Mg1Si0,8CuMn	AA 6013	4043, 5356
EN AW-6060	EN AW-Al MgSi	AA 6060	4043, 5356
EN AW-6061	EN AW-Al Mg1SiCu	AA 6061	5356
EN AW-6063	EN AW-Al Mg0,7Si	AA 6063	5356
EN AW-6082	EN AW-Al Si1MgMn	AA 6082	4043, 5356
EN AW-7005	EN AW-Al Zn4,5Mg1,5Mn	AA 7005	5356
EN AW-7021	EN AW-Al Zn5,5Mg1,5	AA 7021	5356
EN AW-7029	EN AW-Al Zn4,5Mg1,5Cu	AA 7029	5356
EN AW-7039	EN AW-Al Zn4Mg3	AA 7039	5356
EN AW-7050	EN AW-Al Zn6CuMgZr	AA 7050	5356

Since their introduction for shipbuilding, the use of ceramic weld metal supports for fast root pass deposition has spread to bridge building, pressure vessels, general steel component construction and other areas of fabrication. This has been accompanied by an increase in the use of flux- and metal-cored wires to obtain optimum productivity.

**The process advantages can be summarised as follows:**

- Higher welding currents are possible, thereby substantially increasing the root pass deposition rate
- High-quality root runs with dependable penetration and smooth profile
- Applicable in the 1G, 2G, 3G up positions
- Gouging, grinding and sealing of the back side are avoided
- Welder qualification easier to obtain

FILARC ceramic weld metal supports have no adverse effect on weld metal composition and mechanical properties. They are dry and insensitive to moisture absorption, leaving the low-hydrogen performance of consumables unaffected.

The FILARC range presented here comprises the most commonly used types, covering the majority of applications in any type of industry. The range comprises grey and brown ceramic blocks/strips.

The grey types are of a harder ceramic, with a higher melting point and lower slag production than the brown types. The grey types are more prone to cracking by thermal expansion and therefore always require a carrier in the form of a rail or adhesive strip.

The brown types can be applied without a carrier and they can also be cut.

Types with a concave groove are used for processes producing no or relatively small amounts of slag, such as GMAW with solid wire and FCAW with basic flux-cored or metal-cored wires.

Rectangular grooves are required to accommodate the higher slag production from special basic stick electrodes, such as FILARC 35B, rutile flux-cored wires, and SAW fluxes.

Both types are supplied in the form of loose ceramic blocks, blocks mounted in rigid metal rails for straight joints, or blocks on self-adhesive aluminium tape or fitted on wire. Blocks on tape are available in semi-rigid form for straight joints and in flexible form for curved joints, like those used in ship's hulls, tanks, vessels, and pipes.

**Centreline cracking on ceramic backing**

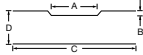
When welding root runs on ceramic backing strips, centreline cracking may occur at high heat inputs. This is a characteristic aspect of all rutile cored wires.

The concave bead shape promotes unfavourable solidification, making the weld prone to hot cracking, especially when shrinkage forces are high. For crack-free welding, the following guidelines should be observed:

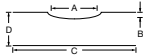
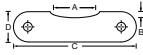
- Use a joint angle of 45-60°C and a root opening of approx. 5 mm
- Use ceramic strips with a rectangular groove to accommodate the slag; the groove width must be around 15 mm
- Use welding currents below 180A (Ø1.2 mm). This produces a more or less oval weld pool, instead of the unfavourable arrow shape
- Minimise weaving to avoid excessive bead thickness, while keeping the arc in front of the weld pool to obtain sufficient penetration



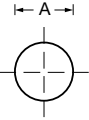
**Rectangular groove type for all-positional welding suitable for flux-cored wires, submerged arc welding, and stick electrodes**

	Type	Dimensions, mm				Length, mm	Assembly	Colour
		A	B	C	D			
	PZ1500/33	16	0.9	35	9	100	Loose block	Grey
	PZ1500/81	13	1.5	30	7	600	Tape/block 25 mm	Grey
	PZ1500/54	16	0.9	35	9	600	Tape	Grey
	OK Backing Rectangular 13	13	1.5	26.5	7.3	600	Tape/block 25 mm	Brown

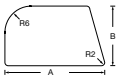
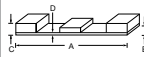
**Concave groove type for all-positional welding. Suitable for metal-cored wires, low-slag, flux-cored wires, and solid wires**

	Type	Dimensions, mm				Length, mm	Assembly	Colour
		A	B	C	D			
	PZ1500/30	11.5	0.7	25	7	150	Loose block	Brown
	PZ1500/32	13.5	1.3	25	7	150	Loose block	Grey
	PZ1500/70	13.2	1.3	25	7	500	Tape	Grey
	PZ1500/87	5.6	0.9	28	6.5	500	Tape/block 25 mm	Grey
	PZ1500/72	9.5	1.5	25	7	500	Tape/block 25 mm	Grey
	PZ1500/73	12.5	1	25	7	500	Tape/block 25 mm	Brown
	PZ1500/80	16	1.5	30	7	600	Tape/block 25 mm	Grey
	OK Backing Concave 13	13	1.5	26.5	7.3	600	Tape/block 25 mm	Brown
	PZ1500/02	13.2	0.8	30	7	1000	Wire/block 20 mm	Brown

**Round type for all-positional welding, flexible for straight or curved plates.  
Suitable for cored wires, solid wires, and stick electrodes for T, K, and X joints.**

	Type	Dimensions, mm				Length, mm	Assembly	Colour
		A	B	C	D			
	PZ1500/01	12	-	-	-	150	Loose block	Brown
	PZ1500/50	7	-	-	-	500	Tape/block 20 mm	Brown
	PZ1500/56	9	-	-	-	500	Tape/block 25 mm	Grey
	PZ1500/51	9.5	-	-	-	500	Tape/block 25 mm	Brown
	PZ1500/57	11.3	-	-	-	500	Tape/block 25 mm	Grey
	PZ1500/52	12	-	-	-	500	Tape/block 25 mm	Brown
	OK Backing Pipe 9	9	-	-	-	600	Tape	Brown
	OK Backing Pipe 12	12	-	-	-	600	Tape	Brown

**Special types for all-positional welding straight or curved plates. Suitable for cored wires, solid wires and electrodes**

	Type	Dimensions, mm				Length, mm	Assembly	Colour
		A	B	C	D			
For T joints with large root gap								
	PZ1500/29	14.2	9.5	-	-	500	Tape/block 25 mm	Grey
Magnetic clamp for fixing rails or wire-held ceramic block								
	PZ1504/01	250	50	7	1	-	-	-

## Packing Data

FILARC Type No.	No/Box	Gross Weight, kg/Box	Box/Pallet
<b>Loose Blocks</b>			
PZ1500/01	200	7	48
PZ1500/32	175	10	48
PZ1500/33	160	12	48
PZ1500/30	175	9	48
<b>Semi-rigid on Adhesive Tape</b>			
PZ1500/70	56	11	42
<b>Flexible on Adhesive Tape or Wire</b>			
PZ1500/02	24	11	36
PZ1500/29	48	9	42
PZ1500/50	100	5	42
PZ1500/51	72	6.5	42
PZ1500/52	60	8.5	42
PZ1500/54	30	13.5	35
PZ1500/56	72	7	42
PZ1500/57	60	9	42
PZ1500/72	56	13	42
PZ1500/73	56	10	42
PZ1500/80	48	12.2	42
PZ1500/81	48	12.2	42
PZ1500/87	54	12.5	42
OK Backing Rectangular 13	56	13.5	35
OK Backing Concave 13	56	13.4	35
OK Backing Pipe 9	72	8	35
OK Backing Pipe 12	56	10	35
<b>Magnetic Clamps</b>			
PZ1504/01	66	10	48

## Hand Welding Electrodes

### Official Approval

In addition to the official approval given in this catalogue, many OK electrodes are approved by foreign authorities, railway boards, private companies and so on. Information about the different types of approval is available on request.

### Tensile Properties

Unless otherwise stated, tensile properties refer to all weld metal test pieces prepared according to the rules of the classification societies using 4 and 6 mm diameter electrodes.

### Welding Current

Maximum and minimum values are given. The most suitable welding current depends largely on the size of the workpiece, the welding position, and the type of joint.

Small workpieces require a lower current, larger workpieces a higher current, depending on the dissipation of heat from the joint.

### Cold Cracking

Cold cracking will only occur if the following three factors are present at the same time:

1. Hard phases in the weld, preferably martensite
2. Sufficient stress
3. Hydrogen dissolved in the weld metal

Hard phases form when the weld is cooled rapidly from melting temperature to room temperature. Alloying elements, mostly carbon, are forced to dissolve in the weld metal and make it brittle. The following formula describes this process in the case of standard carbon-manganese steel.

$$E_C = \%C + \frac{\%Mn}{6} + \frac{\%(Cr+Mo+V)}{5} + \frac{\%(Ni+Cu)}{15}$$

Steels with  $E_C = 0.35$  and below are usually weldable without any problems at normal steel sizes. For the more highly alloyed steels and steels with thicker dimensions, an elevated working temperature is necessary in order to reduce the cooling rate.

The elevated temperature also allows the hydrogen to diffuse.

To determine elevated working temperatures, please consult BS EN 1011-2 (2011). If the  $E_C$  dimension of the plates and heat input are known, these standards will state whether heating is necessary and the level at which it should take place.

Tension cannot be avoided when welding, as steel expands when heated, although correct planning and heat treatment can reduce tension considerably.

Hydrogen forms from water in the surroundings and from the electrode coating. The water is divided into oxygen and hydrogen in the arc and the hydrogen in particular has a strong tendency to dissolve in the weld metal and initiate cold cracking.

Conclusion: Dry basic electrodes when there is risk of cold cracking.

### Labelling

The electrode type is clearly marked on the coating of each electrode near the grip end, e.g. OK 48.00.

## Choice of Suitable Electrode

The OK electrodes in this catalogue are placed into groups according to the type of alloy deposited. Within each group of electrodes for welding mild, low alloy and stainless steels, there are several cases in which many different electrodes are designed for welding the same type of steel. So, for each steel grade, there are often a large number of electrode types to choose from, all of which produce similar weld metal compositions but have different coatings, welding properties, welding speeds and weld metal quality. This large choice makes it possible to choose the electrode which produces the right weld metal quality at the lowest cost.

When selecting an electrode, the first rule is to select one which produces a weld metal quality equal to or better than that of the base material and, when necessary, is approved for the material in question. Welding position and type of joint are other factors which influence the choice of electrode, as different electrodes have different properties in different welding positions and types of joint.

### Influence of coating type on welding properties, welding speed and weld metal quality

Rutile electrodes giving about 100% weld metal recovery are easy to strike and use and are particularly suitable for short welds in mild steel, for fillet welds, welding sheet steels and for bridging large joint gaps. The welds have a fine finish and spatter losses are negligible. The welding speed is moderate.

### Unalloyed Electrodes

Unalloyed rutile electrodes are not normally recommended for welding steel with a nominal tensile strength exceeding 440 MPa (45 kp/mm<sup>2</sup>). Rutile electrodes are relatively insensitive to moisture.

### High-Efficiency Rutile Electrodes

High-efficiency rutile electrodes generally produce a higher welding speed, which increases as the weld metal recovery increases, up to a maximum of about 140 g/min for 6 mm diameter OK Femax 33.80.

They are all easy to use, produce excellent slag detachability, fine bead appearance and are particularly suitable for welding horizontal/vertical fillets. The weld metal has tensile properties which are as high as, or somewhat higher than, those of the weld metal from unalloyed basic electrodes but have lower elongation and impact strength.

The evenness of the weld and the smooth transition of the base material make joints produced with rutile electrodes at least as good in terms of fatigue strength as unmachined joints produced using basic electrodes. Unalloyed rutile electrodes, irrespective of their efficiency, can be recommended for welding mild steel with a nominal tensile strength of 440 MPa (45 kp/mm<sup>2</sup>). When it comes to the tensile strength of the deposit, rutile electrodes can also be used for welding steels with a nominal tensile strength of more than 440 MPa (45 kp/mm<sup>2</sup>), but as a general rule, only electrodes producing a weld metal with a low hydrogen content, e.g. basic, rutile-basic or zircon-basic electrodes, should be used to weld these steels.

### Acid Electrodes

Acid electrodes without iron powder in the covering are easier to strike than basic electrodes, but more difficult to strike and re-strike than rutile electrodes. The welding speed is moderate. The weld beads are smooth and shiny. The slag is inflated and easy to remove. The weld metal has a lower yield stress and tensile strength compared with that produced by rutile electrodes, but it has higher elongation and impact strength.

This type of electrode, which completely dominated the market a few decades ago, has gradually been replaced by rutile electrodes for welding in the flat position and basic electrodes for positional welding. Unalloyed acid electrodes are suitable for welding steels with a nominal tensile strength of up to 440 MPa (45 kp/mm<sup>2</sup>).

### High-Efficiency Acid Electrodes

High-efficiency acid electrodes have a considerably higher welding speed than normal electrodes, up to a maximum of about 120 g/min for 6 mm diameter OK Femax 39.50. The beads are smooth and shiny. The slag is inflated and easy to remove. High-efficiency acid electrodes are particularly suitable for making butt joints and fillet welds in the flat position. OK Femax 39.50 in long lengths is suitable for gravity welding with short-neck equipment.

The weld metal has the same strength as that produced by normal acid electrodes and the range of applications is therefore similar, i.e. they are suitable for welding mild steels with a nominal tensile strength of no more than 440 MPa (45 kg/mm<sup>2</sup>).

## Unalloyed Basic Electrodes

Unalloyed basic electrodes give moderate welding speed in the flat position but are faster than other types when welding vertically upwards. The reason for this is that basic electrodes can be deposited at a higher current in the vertical position than other types of electrodes. In addition, the amount of weld metal deposited per electrode is greater than that of other electrodes which can be used in this position. This results in a smaller number of electrode changes. The normal result is therefore a higher fusion rate and higher arc-time factor when welding vertically upwards with basic electrodes compared with other types.

The slag is normally not quite as easy to remove as the slag from acid or rutile electrodes, but in spite of this, it can be classed as easily detachable. The slag from basic electrodes has a lower melting point than that from rutile or acid electrodes. The risk of slag inclusions during normal production welding is therefore unusually small when basic electrodes are used, even if the slag is not completely removed between beads during multi-run welding.

The weld metal from basic electrodes has a low hydrogen content and usually has good toughness even at low temperatures. Basic electrodes are less likely to produce either hot cracks or cold cracks compared with other types of electrode. The superiority of basic electrodes from this point of view appears when welding manganese-alloyed structural steels, pressure vessel steels and ship's plate with a nominal tensile strength of 490-530 MPa (50-54 kp/mm<sup>2</sup>). The higher the hardenability of the steel to be welded, the greater the necessity to use basic electrodes and the greater the need for low moisture content in the coating.

## Zircon-Basic, High-Efficiency Electrodes

Zircon-basic, high-efficiency electrodes are the fastest of all and are preferably deposited in the flat position. OK Femax 38.95 deposits a maximum of 250 g/min with 6 mm diameter electrodes. Zircon-basic, high-efficiency electrodes can be used for welding the same steels as unalloyed basic electrodes. OK Femax 38.65 is suitable for welding butt joints and fillet joints in the horizontal, vertical, and flat positions.

OK Femax 38.95 is recommended for welding butt joints and fillet joints.

## Rutile-Basic, High-Efficiency Electrodes

Rutile-basic, high-efficiency electrodes combine the good welding properties of rutile electrodes with the high weld metal quality of basic electrodes. They are therefore the best electrodes for performing horizontal-vertical fillet welds in high strength steels, where ordinary rutile, high-efficiency electrodes are not permitted. They can be used for welding the same steels as standard unalloyed basic electrodes or unalloyed zircon-basic, high efficiency electrodes.

OK Femax 38.85 is the fastest low-hydrogen electrode for horizontal fillet welds.

## Cellulose Electrodes

Cellulose electrodes are easy to use in all welding positions and are particularly good for vertical and overhead welding. Cellulose electrodes are recommended for all-positional welding where the mechanical properties of the deposit are of the greatest importance and radiographic requirements must be met. Vertical and overhead welding often require an electrode one size larger in comparison to electrodes with other types of coating. Cellulose electrodes are extremely good for vertical-down welding.

Higher tensile steel requires preheating and higher interpass temperatures than when the welding is done with low-hydrogen electrodes.

## Choose the Correct OK Electrodes, Wires and Fluxes for Hardfacing and Maintenance

Recommendations for the right choice of electrodes for joining dissimilar materials can be found in Figs 1 and 2 on the next page.

The conditions to be considered when choosing the correct electrode, wire and flux for hardfacing and maintenance are summarised in the following outline.

A classification of weld metal resistance to different kinds of working condition can be found in Table 1.

The working conditions for an object that is going to be repaired are often known. The table provides information about suitable electrodes and the different kinds of attack which must be taken into account.

The recommended OK electrodes, wires and fluxes for some of the most common objects for hardfacing and maintenance by welding can be found in Table 2.

Short rules for choosing the correct type of weld metal alloy for hardfacing and cladding with regard to:

1. Type of wear
2. Working conditions
3. Machinability requirements

### Useful information when choosing the correct type of alloy

1. The composition of the material to be welded when deciding:
  - Which types of welding alloy are usable and suitable
  - If preheating is favourable
  - If welding a buffer layer is necessary
2. Conditions for welding:
  - Is preheating possible or not? If it is not possible, hardenable welding alloys can only be used to a very limited extent.

For steel and cast iron weldments, austenitic or non-ferrous alloys are preferable:

- OK 67.45, OK 67.75 – austenitic
- OK 68.81 and OK 68.82 – austenitic-ferritic
- OK NiFe-CI, OK NiFe-CI-A,
- OK NiCrMo-5 – non-ferrous

- The welding position
- Can submerged arc welding or gas metal arc welding be applied?
- For which of the applicable welding processes is suitable filler material available?

### 3. Working conditions for the repaired workpiece:

- Type of wear: abrasive, erosive or cavitation. To resist abrasive wear by sharp-edged blast stone and ore, a hard surface or a work-hardening surface is required or desirable.

Recommended:

OK Weartrade 60T, OK Weartrade 65T  
OK Weartrade 55 HD, OK Weartrade 60  
OK 13Mn, OK 14MnNi

- To resist erosive wear, a hard surface and a fine-grained microstructure in the weld metal is required.

Recommended:

OK Weartrade 65T, OK Weartrade 60T  
OK Tooltrade 60, OK Weartrade 55HB  
OK Weartrade 60, remove OK 84.52

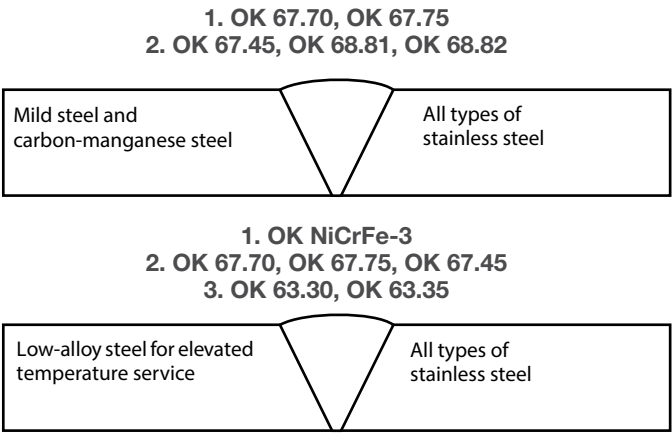
Cavitation attacks in water turbines can usually be prevented by cladding with austenitic electrodes. OK 63.35 is the most frequently used electrode for this purpose, but the following are also suitable: OK 67.70, OK 67.71

### 4. Environment:

- Corrosive or non-corrosive?
- The temperature, high or low?
- To resist wear in a corrosive environment, the weld metal must be resistant to both corrosion and wear. So, depending on the severity of the corrosion attacks, an alloy with some degree of corrosion resistance is required.

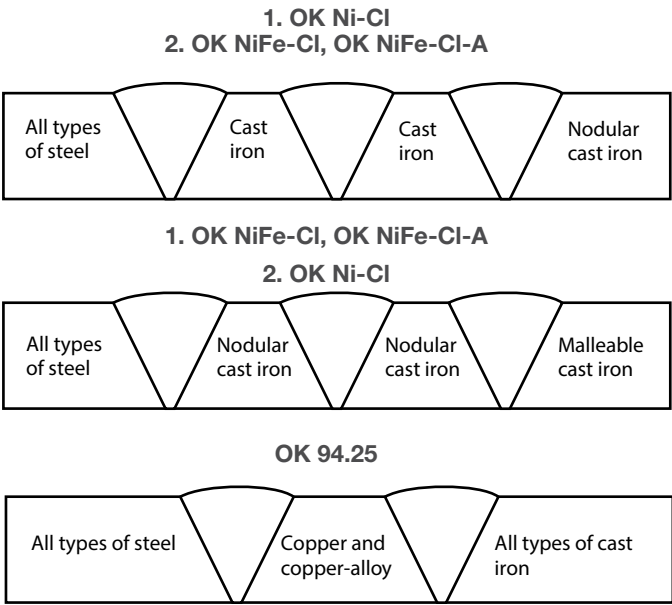
Choose the right OK Electrodes for joining dissimilar materials

Fig. 1



Never use unalloyed electrodes for these joints:

Fig. 2



- 1. First choice
- 2. Second choice
- 3. Third choice



**Table 1. Hardfacing and cladding**

Choose the right OK electrode for different working conditions.

Environment	Resistance-Suitability 5. Superior 3. Good 1. Limited Usability
<b>Corrosive Environment</b> Requirements: Corrosion Resistance	<b>5.</b> OK NiCrFe-3, OK NiCrMo-5, OK NiCu-7 OK 94.25, Stoodite 1 <b>4.</b> OK 68.81, OK 68.82, OK 67.45 <b>3.</b> OK Weartrode 65 T, OK Weartrode 60T <b>2.</b> OK Weartrode 55 HD, OK Weartrode 50 <b>1.</b> OK Weartrode 30, OK Weartrode 60, OK Tooltrode 50, OK Tooltrode 60, OK 13Mn
<b>High Temperature Oxidizing</b> Requirements: Scaling Resistance	<b>5.</b> OK NiCrFe-3, OK NiCrMo-5 <b>4.</b> OK 68.81, OK 68.82, OK Weartrode 60 T, OK 67.45, OK Weartrode 60, OK Weartrode 65 T <b>3.</b> OK Weartrode 55 HD, OK Weartrode 50, OK Weartrode 60 <b>2.</b> OK Weartrode 50, OK NiCu-7 <b>1.</b> OK Weartrode 30, OK 13Mn, OK 14MnNi
<b>Annealing, Softening</b> Requirements: Hardness at high temperature, annealing resistance	<b>5.</b> OK NiCrMo-5 <b>4.</b> OK Weartrode 60 T, OK Tooltrode 50, OK Tooltrode 60 <b>3.</b> OK 84.42, OK 84.52, OK 84.58, OK 83.50, OK 83.65 <b>2.</b> OK Weartrode 30, OK 13Mn, OK 14MnNi, OK 68.81, OK 68.82 <b>1.</b> OK 67.45
<b>Low Temperature</b> Requirements: Cold Toughness	<b>5.</b> OK NiCrFe-3, OK NiCrMo-5, OK NiCu-7, OK 67.45, OK 94.25 <b>4.</b> OK 14MnNi, OK 13Mn <b>3.</b> OK Weartrode 30, OK 68.81, OK 68.82 <b>2.</b> OK Weartrode 50 <b>1.</b> OK Weartrode 60, OK Weartrode 55 HD, OK Weartrode 60 T, OK Tooltrode 60
<b>Type of Wear Impact, high surface pressure</b> Requirements: Impact resistance and resistance to crushing	<b>5.</b> OK NiCrMo-5, OK 13Mn, OK 14MnNi, OK 68.81, OK 68.82 <b>4.</b> OK 67.45, OK Weartrode 30 <b>2.</b> OK Tooltrode 60 <b>1.</b> OK Weartrode 50, OK Weartrode 60, OK Weartrode 55 HD, OK Weartrode 60 T, OK 94.25, Stoodite 1
<b>Wear by Blast Stone and Ore</b> Requirements: High surface-hardness or cold-work hardening weld metal	<b>5.</b> OK Weartrode 60 T, OK Weartrode 62, OK Weartrode 65 T, Stoodite 1 <b>4.</b> OK 13Mn, OK 14MnNi, OK Weartrode 60, OK Tooltrode 60 <b>3.</b> OK Weartrode 50, OK Weartrode 55 HD, Stoodite 6 <b>2.</b> OK Tooltrode 50, OK 68.81, OK 68.82, OK 67.45 <b>1.</b> OK Weartrode 30
<b>Wear by Fine Grained Materials</b> Sand and Clay Requirements: High surface hardness	<b>5.</b> OK Weartrode 62, OK Weartrode 60 T, OK Weartrode 65 T, Stoodite 1 <b>4.</b> OK Weartrode 60, OK Tooltrode 60 <b>3.</b> OK Weartrode 55 HD, OK Weartrode 50, Stoodite 6 <b>2.</b> OK 68.81, OK 68.82 <b>1.</b> OK 67.45, OK Weartrode 30, OK 13Mn, OK 14MnNi
<b>Cavitation</b>	<b>5.</b> OK 63.35, OK 67.71, Stoodite 6 <b>4.</b> OK 67.45, OK 94.25 <b>2.</b> OK Weartrode 55 HD, Stoodite 1 <b>1.</b> OK Weartrode 30

**Table 2. Application range electrodes, wires and fluxes for hardfacing and maintenance**

Object	Required Weld Hardness	Consumables for MMA	Consumables for MAG, MIG, FCAW, SAW	Recommended Post Weld Treatment
Shafts NB! Stress relief is recommended for shafts subject to fatigue	< 250 HV 200-300 HV 30-35 HRC 35-40 HRC 44-49 HRC 50-56 HRC	OK 48.xx, OK 55.00 OK 74.78, OK 74.79 OK Weartrode 30/30 HD OK Weartrode 45 OK Weartrode 50/55	OK Flux 10.96/OK Autrod 12.10 OK Flux 10.71/OK Tubrodur 35 S M  OK Flux 10.61/OK Tubrodur 13Cr S	Stress relief Stress relief Stress relief Stress relief
Caterpillar tracks Links	30-35 HRC 35-40 HRC	OK Weartrode 30/30 HD	OK Flux 10.96/OK Autrod 12.10 OK Flux 10.71/OK Tubrodur 35 S M	-
Plates and rollers	31-35 HRC 45-50 HRC	OK Weartrode 30/30 HD OK 14MnNi, work hardening	OK Tubrodur 15CrMn O/G OK Tubrodur 13Mn O/G	-
Brake shoes	30-35 HRC 45-50 HRC	OK Weartrode 30/30 HD OK 14MnNi, work hardening	-	-
Mixer arms, etc	50-56 HRC  55-63 HRC > 62 HRC > 62 HRC	OK Weartrode 55 OK Weartrode 55 HD OK Weartrode 60 T OK Weartrode 65 T OK Weartrode 62	OK Tubrodur 13Cr G OK Tubrodur 55 O A	-
Impellers for mills and crushers	50-58 HRC 58-63 HRC  63 HRC	OK Weartrode 55 HB OK Weartrode 60 OK Weartrode 60 T OK Weartrode 62	OK Tubrodur 58 OG M OK Tubrodur 55 O A	-
Excavator teeth, forged: Joining Hardfacing	55-58 HRC  58-63 HRC	OK 48.xx, OK 55.00 OK Femax 38.65 OK 48.xx + OK Weartrode 55/55 HB OK 48.xx + OK Weartrode 60 OK Weartrode 60 T OK Weartrode 65 T	OK AristoRod 12.50, OK Autrod 12.51 OK Tubrodur 30 O M + OK Tubrodur 58 O/G M OK Tubrodur 55 O A	-
Excavator teeth, 13% Mn steel Joining	-	OK 63.34, OK 67.45	OK Tubrodur 200 O D	-
Hardfacing	≈ 50 HRC 55-58 HRC > 62 HRC	OK 48.xx OK 48.xx + OK Weartrode 55/55 HB OK Weartrode 62	OK Tubrodur 30 O M OK Tubrodur 58 O/G M	-
Excavator buckets, 13% Manganese steel: Joining Hardfacing	55-58 HRC 58-63 HRC	OK 63.35, OK 67.45 OK 67.75 OK 48.xx + OK Weartrode 55 HD OK Weartrode 60 T + OK Weartrode 65 T	OK Tubrodur 200 O D OK Tubrodur 58 O/G M OK Tubrodur 55 O A	-
Wheel beds for cranes, lorries and loading wagons	< 250 HV 200-300 HV 30-35 HRC 40-45 HRC	OK 48.xx OK 74.78 OK Weartrode 30, OK Weartrode 30 HD OK Weartrode 30	OK Flux 10.96/OK Autrod 12.10 OK Flux 10.71/OK Tubrodur 35 S M OK Tubrodur 13Mn O/G OK Tubrodur 15CrMn O/G	Stress relief Stress relief

**Table 2. Application range electrodes, wires and fluxes for hardfacing and maintenance**  
**Continued**

Object	Required Weld Hardness	Consumables for MMA	Consumables for MAG, MIG, FCAW, SAW	Recommended Post Weld Treatment
Guillotine blades	50-56 HRC	OK Weartrode 55	OK Tubrodur 13Cr G	-
Cold die and cutting tools	60-65 HRC	OK Weartrode 60	-	-
Cog wheels and bars	< 250 HV 200-300 HV 30-35 HRC 44-49 HRC 51-56 HRC 55-58 HRC	OK 48.xx OK 74.78 OK Weartrode 30 OK Weartrode 30 DH OK Weartrode 45 OK Weartrode 50	OK AristoRod 12.50, OK Autrod 12.51 OK AristoRod 13.12 OK Flux 10.71/OK Tubrodur 35 S M OK Tubrodur 15.73 + OK Autrod 13.91 OK Flux 10.71/OK Tubrodur 58 S M	-
Feed gears	50-56 HRC 55-63 HRC  30-40 HRC	OK Weartrode 50 OK Weartrode 55 OK Weartrode 55 HD OK Weartrode 60 T OK Weartrode 65 T	OK Tubrodur 58 O/G M OK Tubrodur 55 O A OK Tubrodur 200 O D	Hammering
Dredger buckets 13% Mn steel	200-230 HV* 30-50 HRC* 50 HRC 55-58 HRC > 62 HRC	OK Weartrode 30 OK 67.45 OK 48.xx OK 48.xx + OK Weartrode 55/55 T OK Weartrode 60 T OK Weartrode 65 T OK Weartrode 62	OK Tubrodur 15CrMn O/G OK Tubrodur 200 O D OK Tubrodur 58 O/G M, OK Autrod 13.91 OK Tubrodur 55 O A	-
Links and pins 13% Mn steel	-	See buckets, Mn steel	-	-
Buckets, links and pins of carbon steel or low alloyed steel	< 250 HV 200-300 HV 200-300 HV 31-35 HRC 44-50 HRC	OK 48.xx OK 74.78 OK 67.45 OK Weartrode 30 OK Weartrode 30 HD OK Weartrode 45 OK 14MnNi	OK AristoRod 12.50, OK Autrod 12.51 OK AristoRod 13.12 OK Tubrodur 200 O D OK Tubrodur 30 O M OK Tubrodur 40 O M OK Tubrodur 15CrMn O/G	-
Chequer-net wearing plates	50-58 HRC 58-63 HRC  > 62 HRC	OK Weartrode 55 HD OK Weartrode 60 OK Weartrode 60 T OK Weartrode 65 T OK Weartrode 62	OK Tubrodur 58 O/G M OK Tubrodur 55 O A	-
Unalloyed and low alloyed C steel	< 250 HV 250-300 HV 31-35 HRC 45-50 HRC** 50-58 HRC	OK 48.xx OK 74.78, OK 74.79 OK Weartrode 30 OK Weartrode 30 HD OK 14MnNi OK Weartrode 55	OK Flux 10.96/OK Autrod 12.10 OK Tubrodur 15CrMn O/G OK Flux 10.71/OK Tubrodur 58 S M OK Autrod 13.91	-
13% Mn steel	200-230 HV 400 HV**	OK 14MnNi OK 67.45	OK Tubrodur 200 O D OK Tubrodur 15CrMn O/G	-

**Table 2. Application range electrodes, wires and fluxes for hardfacing and maintenance****Continued**

Object	Required Weld Hardness	Consumables for MMA	Consumables for MAG, MIG, FCAW, SAW	Recommended Post Weld Treatment
Forging tools	31-35 HRC ≈ 40 HRC** ≈ 45 HRC 40-52 HRC	OK Weartrade 30 OK NiCrMo-5 OK Weartrade 45 Stoodite 1, Stoodite 6	OK Tubrodur 30 O M OK Tubrodur 13Cr G	Tempering 550°C
Stone and ore crushers 13% Mn steel: Plates, cones, spindles, casings, rollers, etc.	200-230 HV 45-50 HRC  55-58 HRC 58-63 HRC	Stoodite 1 Stoodite 6 OK 48.xx + OK Weartrade 55 HD/55 OK 48.xx + OK Weartrade 60 OK Weartrade 60 T	OK Tubrodur 15CrMn O/G OK Tubrodur 58 O/G M	-
High speed tools	60-65 HRC	OK Tooltrade 60	-	Tempering 625°C
Hot bar shears steel	≈ 45 HRC** 50-56 HRC	OK Tooltrade 50		Tempering 625°C
Hot rollers, C steel and low alloyed steel	250-300 HV 30-35 HRC 40-50 HRC 44-50 HRC 40-52 HRC	OK 74.78, OK 74.79 OK Weartrade 30 OK Weartrade 30 HD OK NiCrMo-5 OK Weartrade 45 Stoodite 1, Stoodite 6	OK Tubrodur 30 O M OK Flux 1071/OK Tubrodur 40 S M  OK Flux 10.61/OK Tubrodur 13Cr S	Stress relief 500°C Stress relief 500°C Stress relief 500°C

\*Chromium-carbide ≈ 1500 HV

\*\*Work-hardened

OK 48.xx = all electrodes of the OK 48-series

## General Recommendations GMAW

### GMAW – Gas Metal Arc Welding

The electrodes and joint faces should be clean. This is particularly important when welding aluminium and aluminium alloys. The shielding gases which are used must be of a purity suitable for welding. Moisture in the gas can produce porous welds.

### Shielding Gas for Mild and Low-Alloy Steels

Carbon dioxide,  $\text{CO}_2$ , is the cheapest and most commonly used gas and, in most cases, it produces satisfactory welds in both mild and low-alloy steel.

Mixed gas, of which the most commonly used consists of 80% Ar + 20%  $\text{CO}_2$ , is more expensive than pure  $\text{CO}_2$ , but produces a softer arc, quieter welding, better bead appearance and less spatter. It is therefore often used, in spite of its higher price, for welding sheet steel 0.8-1.5 mm thick, which is more difficult to weld with pure  $\text{CO}_2$ . A further advantage of mixed gas is the higher quality, in particular notch toughness, compared with  $\text{CO}_2$ . For this reason, mixed gas is often recommended for welding low-alloy steels, such as creep-resistant steels, even in thicknesses greater than 1.5 mm. Mixed gas of the 80/20 type, in which the argon is of a lower purity, is also available. These gases are less expensive than those based on pure argon and can often be used with equally good results.

One drawback of Ar/ $\text{CO}_2$  mixtures is that they lead to increased ozone formation, compared with pure  $\text{CO}_2$ , when used as shielding gas in arc welding.

Another drawback when using the mixture is that the current load capacity of the welding gun is reduced by about 30% compared with welding with  $\text{CO}_2$ .

### Shielding Gas for Stainless and Heat-Resistant Steels

Argon containing 1% oxygen is normally used for welding stainless and heat-resistant steels, but argon containing 2%  $\text{O}_2$  or 5%  $\text{O}_2$  is also available. The latter produces a more fluid weld pool. A shielding gas which consists of 98% argon + 2%  $\text{CO}_2$  has gained favour for MIG welding stainless steels. It can often replace argon/helium mixtures, which are used to help fusion when welding thick stainless steel, and can very often replace argon/oxygen mixtures.

## Choice of Welding Process:

### Short Arc or Spray Arc

The electrodes for gas metal arc welding listed in these pages are suitable for short arc welding in the smallest diameters and for spray arc welding in diameters 1.2-2.4 mm. Short arc welding (welding with short circuiting droplet transfer) can be carried out in all positions and is the best process for welding sheet material approximately 0.8-3 mm thick and for making the root run in prepared butt joints. Spray arc welding (welding with finely divided free flight drop transfer) is carried out at higher currents and voltages than short arc welding and is, therefore generally faster and more economical than short arc welding for plate thicknesses exceeding 2-3 mm. It is only used for welding in the horizontal or horizontal/vertical positions. The gas consumption is 6-10 litres/min for short arc welding and 12-20 litres/min for spray arc welding. The higher the welding current, the higher the gas flow required.

### Welding Technique

The welding gun is normally held in the right hand, which means that the weld is made from right to left with the gun directed away from the deposited weld at an angle of 75-80° between the electrode and the workpiece, thereby giving the operator a good view of the weld pool and the joint. This produces a smoother weld bead than if the gun is directed towards the finished weld.

### Abbreviations

MIG welding = metal inert gas welding  
Metal arc welding in an atmosphere consisting mainly of an inert gas such as argon.

MAG welding = metal active gas welding  
Metal arc welding in an atmosphere consisting of an active gas, usually carbon dioxide.  
Gas mixtures containing 20% or more  $\text{CO}_2$  are usually classified as active.

## General Recommendations for Submerged Arc Welding

1. **The flux must be dry.** Agglomerated fluxes must be protected from moisture pick-up.

**In tropical, humid areas,** re-drying agglomerated fluxes at 250-350°C before use is recommended. The remaining flux in the welding machine container should be removed and stored in a dry cabinet and should therefore not be left in the open container during the night.

During the transport of fluxes, a maximum of two pallets should be stacked to prevent the grains being crushed.

2. The fusion faces and the plate in the vicinity of the joint should be clean and dry. The cleaner the joint, the better the chances of obtaining a satisfactory weld. Rust, mill scale, paint, oil and residue from arc-air gouging or grinding can adversely affect the quality of the weld metal. The more impurities on the fusion faces, the greater the risk of weld metal defects.

3. The arc voltage must be kept constant. Increased arc voltage results in higher flux consumption. If the flux contains alloying elements, the amount transferred to the weld metal will increase as the arc voltage increases.
4. As a general rule, multi-run deposits made at moderate welding currents have better mechanical properties than one- or two-layer deposits made at high currents in similar plate thicknesses.

The mechanical properties are obtained according to the welding conditions given in applicable standards such as EN ISO or AWS.

Other welding conditions may produce weld metal analyses and mechanical properties which differ from those given in the handbook.

## Approval in Accordance with Classification Society Rules

Welding materials are normally classified by ESAB in accordance with a standard, e.g. AWS and EN ISO. To verify mechanical properties they are also approved in accordance with the rules of the classification societies.

### Classification

The classification of welding products refers to standards and, when a welding product is classified, its type, properties and field of application are given. The manufacturer verifies the correct classification of a product by internal testing and/or by witness of an outside organisation.

### Approval

Ship owners and partners in offshore enterprises require welding consumables to be approved in accordance with the rules of the classification societies. Approval is also required by clients in accordance with national or international standards for boiler and pressure vessels as well as other standards to be verified by an authorized approval institute.

Approved welding products are entered on the "List of Approved Welding Consumables" distributed annually by the societies and other institutes.

The ESAB Welding Handbook provides information about the welding position, current/polarity, low hydrogen and grading.

### Non-Alloyed and Low-Alloyed Steels

Consumables are divided into three categories based on their tensile strength level:

**Normal strength steel:** indicated by the numbers 1, 2 or 3 (e.g. 3 3M) that the electrode is to be used in steel with a minimum yield strength (ReH) of 305 and a tensile strength of 400-560 MPa.

**High strength steel:** indicated by 2Y, 3Y, 4Y, 5Y (ReH min 375 and Rm 490-660 MPa) and 2Y40, 3Y40, 4Y40 (ReH min 400 and Rm 510-690 MPa).

**Extra high strength steel:** indicated by 3Y42, 4Y42, 5Y42 up to 5Y69 and so on for the different strength steel categories, where the numbers 42...69 symbolize a yield strength in MPa indicating that the electrodes can be used for extra high tensile steels.

## Toughness Level

Each steel category is divided into three to five toughness levels represented by the first digit in the grade (1, 2, 3, 4 or 5)

- 1 suitable for grade A steel (impact tested at 20°C)
- 2 suitable for grade A, B and C steels (impact tested at 0°C)
- 3 suitable for grade A, B, D and E steels (impact tested at -20°C)
- 4 suitable for grade A, B, D, E and F steels (impact tested at -40°C)
- 5 suitable for grades A, B, D, E and F steels (impact tested at -60°C)

### Other Frequently Used Abbreviations

- T** two-run welding (submerged arc welded with one run from eachside)
- M** multi-run welding (submerged arc or automatic gas-shielded arc welding)
- S** semi-automatic, gas-shielded and flux-cored arc welding

**H5, H10, H15** low-hydrogen welding consumables

**DP** deep penetration

### Stainless Steel and Other High-Content Alloyed Steels

Grades of stainless steel for which the welding consumable is approved are indicated with respect to one or more of the types of stainless steels: 304L, 304LN, 316LN and so on.

The abbreviation SS/CMn indicates approval for joining any of the austenitic types of stainless steel to any of the normal strength or higher tensile ship steels. Dup/CMn indicates approval for joining any of the duplex types of stainless steel to any of the normal strength or higher tensile ship steels.

The system described for grading the consumables in accordance with the rules of the classification societies changes as new steels appear on the market and sometimes there are changes to the approval ratings which might mean that the handbook may not be currently up-to-date. To ensure that valid information is used, please request the latest issued Product Data Sheet for the filler material or please look into the list of product type approvals of the marine society you need the approval from.

# EN ISO 2560-A: for covered electrodes for manual arc welding of non-alloyed and fine grain steels

**E 46 3 1Ni B 5 4 H5**

## Symbol for strength and elongation

Symbol	Min. Yield Strength <sup>1</sup> , MPa	Tensile Strength, MPa	Min. Elongation <sup>2</sup> , %
35	355	440-570	22
38	380	470-600	20
42	420	500-640	20
46	460	530-680	20
50	500	560-720	18

1 - For the yield strength the lower yield ( $R_L$ ) shall be used when yielding occurs, otherwise the 0.2% proof stress ( $R_{p0.2}$ ) shall be used. 2 -  $L_0 = 5d$

## Symbol for impact properties

Symbol	Min. average impact energy 32 J °C
Z	no requirements
A	+20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60

## Symbol for chemical composition of all weld metal

Alloy Symbol	Chemical Composition <sup>123</sup> %		
	Mn	Mo	Ni
no symbol	2.0	-	-
Mo	1.4	0.3-0.6	-
MnMo	1.4-2.0	0.3-0.6	-
1Ni	1.4	-	0.6-1.2
2Ni	1.4	-	1.8-2.6
3Ni	1.4	-	2.6-3.8
Mn1Ni	1.4-2.0	-	0.6-1.2
Mn2Ni	1.4-2.0	1.2-2.6	1.2-2.6
1NiMo	1.4	0.3-0.6	0.6-1.2
Z	any other agreed composition		

1 - If not specified: Mo <0.2, Ni <0.3, Cr <0.2, V <0.05, Nb <0.05, Cu <0.3 (electrodes without gas shield only)

2 - Single values shown in the table mean maximum values

3 - The results shall be rounded to the same number of significant figures as in the specified value using the rules according to ISO 31-0, annex B Rule A.

## Symbol for diffusible hydrogen

Symbol	Max. hydrogen content, ml/100g deposited weld metal
H 5	5
H 10	10
H 15	15

## Symbol for the welding position

Welding positions in accordance with ISO 6947.

- 1: all positions
- 2: all positions, except vertical down
- 3: flat butt weld, flat fillet weld, horizontal/vertical weld
- 4: flat butt weld, flat fillet weld
- 5: as 3 and recommended vertical down welding

## Symbol for recovery and type of current

Symbol	Weld metal recovery %	Type of current <sup>12</sup>
1	≤105	AC + DC
2	≤105	DC
3	>105 ≤125	AC + DC
4	>105 ≤125	DC
5	>125 ≤160	AC + DC
6	>125 ≤160	DC
7	>160	AC + DC
8	>160	DC

1 - In order to demonstrate operability on ac, tests shall be carried out with no load voltage not higher than 65V.

2 - AC = alternation current DC = direct current

## Symbol for the type of electrode covering

A	Acid
C	Cellulosic
R	Rutile
RC	Rutile-cellulosic
RA	Rutile-acid
RB	Rutile-basic
RR	Rutile-thick
B	Basic



# EN ISO 18275 – A: for covered electrodes for manual metal arc welding of high-strengths steels.

**E 55 4 MnMo B 3 2 H5**

## Symbol for strength and elongation

Symbol	Min. Yield Strength <sup>1</sup> , MPa	Tensile Strength, MPa	Min. Elongation <sup>2</sup> , %
55	550	610-780	18
62	620	690-890	18
69	690	760-960	17
79	790	880-1080	16
89	890	980-1180	15

1 - For the yield strength the lower yield ( $R_{eL}$ ) shall be used when yielding occurs, otherwise the 0.2% proof stress ( $R_{p0.2}$ ) shall be used.

2 - The gauge length is equal to five times the test specimen diameter

## Symbol for impact properties

Symbol	Min. average impact energy 32 J °C
Z	no requirements
A	+20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60
7	-70
8	-80

## Symbol for chemical composition of all weld metal

Alloy Symbol	Chemical Composition <sup>1,2</sup> %			
	Mn	Ni	Cr	Mo
MnMo	1.4-2.0	-	-	0.3-0.6
Mn1Ni	1.4-2.0	0.6-1.2	-	-
1NiMo	1.4	0.6-1.2	-	0.3-0.6
1.5NiMo	1.4	1.2-1.8	-	0.3-0.6
2NiMo	1.4	1.8-2.6	-	0.3-0.6
Mn1NiMo	1.4-2.0	0.6-1.2	-	0.3-0.6
Mn2NiMo	1.4-2.0	1.8-2.6	-	0.3-0.6
Mn2NiCrMo	1.4-2.0	1.8-2.6	0.3-0.6	0.3-0.6
Mn2Ni1CrMo	1.4-2.0	1.8-2.6	0.6-1.0	0.3-0.6
Z <sup>3</sup>	any other agreed composition			

1 - If not specified: Mo <0.2, Ni <0.3, Cr <0.2, V <0.05, Nb <0.05, Cu <0.3, C ≤ 0.10, P < 0.025, S < 0.020, Si < 0.80

2 - Single values shown in the table mean maximum values

3 - Consumables for which the chemical composition is not listed shall be symbolized similarly and prefixed by the letter Z. The chemical composition ranges are not specified and it is possible that two electrodes with the same Z classification are not interchangeable.

## Symbol for diffusible hydrogen

Symbol	Max. hydrogen content, ml/100g deposited weld metal
H 5	5
H 10	10
H 15	15

## Symbol for the welding position

### Welding positions in accordance with ISO 6947.

- 1: all positions
- 2: all positions, except vertical down
- 3: flat butt weld, flat fillet weld, horizontal/vertical weld
- 4: flat butt weld, flat fillet weld
- 5: as 3 and recommended vertical down welding

## Symbol for recovery and type of current

Symbol	Weld metal recovery %	Type of current <sup>1,2</sup>
1	≤105	AC + DC
2	≤105	DC
3	>105 ≤125	AC + DC
4	>105 ≤125	DC
5	>125 ≤160	AC + DC
6	>125 ≤160	DC
7	>160	AC + DC
8	>160	DC

1 - In order to demonstrate operability on ac, tests shall be carried out with no load voltage not higher than 65V.

2 - AC = alternation current DC = direct current

## Symbol for the type of electrode covering

B	Basic
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For other electrodes covering, consult ISO 2560-A.

The letter T indicates that strength, elongation and impact properties in the classification of the deposited weld metal are obtained after a post-weld heat treatment between 560 °C and 600 °C for 1 h. The test piece shall be left in the furnace to cool down to 300 °C.

## EN ISO 14171-A: for flux/wire combinations

S				38				5				AB				S2Si			
S		Submerged arc welding																	
Symbol for tensile properties																			
Grade Designation	Min. Yield Strength <sup>1</sup> , MPa	Tensile Strength, MPa	Elongation <sup>2</sup> , %																
35	355	440-570	22																
38	380	470-600	20																
42	420	500-640	20																
46	460	530-680	20																
50	500	560-720	18																
Symbol	Minimum parent material yield strength, MPa	Minimum tensile strength of the welded joint, MPa																	
2T	275	370																	
3T	355	470																	
4T	420	520																	
5T	500	600																	
All-weld chemical composition of FCAW																			
Symbol	Chemical Composition %																		
	Mn	Ni	Mo	Cu															
T3	1.4-2.0	-	-	0.3															
T3Ni1	1.4-2.0	0.6-1.2	-	0.3															
Type of wire according to EN ISO 14171-A and chemical composition of wire electrode																			
Grade Designation	C	Si	Mn	Ni	Mo	Cr	Other Elements												
SZ	Any other agreed analysis																		
S1	0.05-0.15	-0.15	0.35-0.60	-0.15	-0.15	-0.15	*												
S2	0.07-0.15	-0.15	0.80-1.30	-0.15	-0.15	-0.15	*												
S3	0.07-0.15	-0.15	1.30-1.75	-0.15	-0.15	-0.15	*												
S4	0.07-0.15	-0.15	1.75-2.25	-0.15	-0.15	-0.15	*												
S1Si	0.07-0.15	0.15-0.40	0.35-0.60	-0.15	-0.15	-0.15	*												
S2Si	0.07-0.15	0.15-0.40	0.80-1.30	-0.15	-0.15	-0.15	*												
S2Si2	0.07-0.15	0.40-0.60	0.80-1.20	-0.15	-0.15	-0.15	*												
S3Si	0.07-0.15	0.15-0.40	1.30-1.85	-0.15	-0.15	-0.15	*												
S4Si	0.07-0.15	0.15-0.40	1.85-2.25	-0.15	-0.15	-0.15	*												
S1Mo	0.05-0.15	0.05-0.25	0.35-0.60	-0.15	0.45-0.65	-0.15	*												
S2Mo	0.07-0.15	0.05-0.25	0.80-1.30	-0.15	0.45-0.65	-0.15	*												
S2MoTiB	0.05-0.15	0.15-0.35	1.00-1.35	-	0.40-0.65	-	**												
S3Mo	0.07-0.15	0.05-0.25	1.30-1.75	-0.15	0.45-0.65	-0.15	*												
S4Mo	0.07-0.15	0.05-0.25	1.75-2.25	-0.15	0.45-0.65	-0.15	*												
S2Ni1	0.07-0.15	0.05-0.25	0.80-1.30	0.80-1.20	-0.15	-0.15	*												
S2Ni1.5	0.07-0.15	0.05-0.25	0.80-1.30	1.20-1.80	-0.15	-0.15	*												
S2Ni2	0.07-0.15	0.05-0.25	0.80-1.30	1.80-2.40	-0.15	-0.15	*												
S2Ni3	0.07-0.15	0.05-0.25	0.80-1.30	2.80-3.70	-0.15	-0.15	*												
S2Ni1Mo	0.07-0.15	0.05-0.25	0.80-1.30	0.80-1.20	0.45-0.65	-0.20	*												
S3Ni1.5	0.07-0.15	0.05-0.25	1.30-1.70	1.20-1.80	-0.15	-0.20	*												
S3Ni1Mo	0.07-0.15	0.05-0.25	1.30-1.80	0.80-1.20	0.45-0.65	-0.20	*												
S3Ni1Mo0,2	0.07-0.15	0.10-0.35	1.20-1.60	0.80-1.20	0.15-0.30	-0.15		P, S: -0.015											
S3Ni1.5Mo	0.07-0.15	0.05-0.25	1.20-1.80	1.20-1.80	0.30-0.50	-0.20	*												
S2Ni1Cu	0.06-0.12	0.15-0.35	0.70-1.20	0.65-0.90	0.15	-0.40		Cu: 0.40-0.65											
S3Ni1Cu	0.05-0.15	0.15-0.40	1.20-1.70	0.60-1.20	0.15	-0.15		Cu: 0.30-0.60											

\* Cu: -0.30 P, S: 0.025 or 0.020 Al: -0.030 \*\* Ti: 0.10-0.20 B: 0.005-0.020

## EN ISO 17632: for Cored Wires

**T 46 3 1Ni B M 4 H5**

## Symbol for strength and elongation

Symbol	Min. Yield Strength <sup>1</sup> , MPa	Tensile Strength, MPa	Min. Elongation <sup>2</sup> , %
35	355	440-570	22
38	380	470-600	20
42	420	500-640	20
46	460	530-680	20
50	500	560-720	18

1 - For the yield strength the lower yield ( $R_{p0.2}$ ) shall be used when yielding occurs, otherwise the 0.2% proof stress ( $R_{p0.2}$ ) shall be used. 2 -  $L_0 = 5d$

## Symbol for impact properties

Symbol	Min. average impact energy 47J °C
Z	no requirements
A	+20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60

## Symbol for chemical composition of all weld metal

Alloy Symbol	Chemical Composition <sup>1,2,3</sup> %		
	Mn	Mo	Ni
no symbol	2.0	-	-
Mo	1.4	0.3-0.6	-
MnMo	> 1.4-2.0	0.3-0.6	-
1Ni	1.4	-	0.6-1.2
2Ni	1.4	-	1.8-2.6
3Ni	1.4	-	> 2.6-3.8
Mn1Ni	> 1.4-2.0	-	0.6-1.2
1NiMo	1.4	0.3-0.6	0.6-1.2
Z	any other agreed composition		

1 - If not specified: Mo <0.2, Ni <0.3, Cr <0.2, V <0.05,

Nb <0.05, Cu <0.3 (electrodes without gas shield only)

2 - Single values shown in the table mean maximum values

3 - The results shall be rounded to the same number of significant figures as in the specified value using the rules according to ISO 31-0, annex B Rule A.

## Symbol for diffusible hydrogen

Symbol	Max. hydrogen content, ml/100g deposited weld metal
H 5	5
H 10	10
H 15	15

## Symbol for the welding position

The welding positions are symbolised by a digit designating the positions for which the electrode is tested according to prEN-3 (00121205)

- 1: all positions
- 2: all positions, except vertical down
- 3: flat butt weld, flat fillet weld, horizontal/vertical weld
- 4: flat butt weld, flat fillet weld
- 5: as 3 and recommended vertical down welding

## Shielding gas

EN 758 symbol	
M	Argon mixture
C	CO <sub>2</sub>
N	No shielding gas

## Description of core

Gas-Shielded	
R	Rutile base, slow freezing slag
P	Rutile base, fast freezing slag
B	Basic slag
M	Metal powder core
Self-Shielded	
U	
V	Rutile of basic/fluoride
W	Basic/fluoride, slow freezing slag
X	
Y	Basic/fluoride, fast freezing slag
Z	Other types
S	

## EN ISO 14174: for fluxes

S A		AB		1		67		AC		H5																																																																																							
S	Submerged arc welding	<div>Method of manufacture</div> <table><tr><th colspan="2">Symbol</th></tr><tr><td>F</td><td>Fused flux</td></tr><tr><td>A</td><td>Agglomerated flux</td></tr><tr><td>M</td><td>Mixed flux</td></tr></table>				Symbol		F	Fused flux	A	Agglomerated flux	M	Mixed flux	<div>Hydrogen content of deposited metal</div> <table><tr><th>Symbol</th><th>Max. hydrogen content, ml/100g deposited weld metal</th></tr><tr><td>H 2</td><td>2</td></tr><tr><td>H 4</td><td>4</td></tr><tr><td>H 5</td><td>5</td></tr><tr><td>H 10</td><td>10</td></tr></table>				Symbol	Max. hydrogen content, ml/100g deposited weld metal	H 2	2	H 4	4	H 5	5	H 10	10	<div>Type of current</div> <table><tr><th colspan="2">Symbol</th></tr><tr><td>DC</td><td>Direct current only</td></tr><tr><td>AC</td><td>Alternating and direct current</td></tr></table>				Symbol		DC	Direct current only	AC	Alternating and direct current																																																												
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ES	Electroslag welding	<div>Chemical composition of flux</div> <table><tr><th>Symbol</th><th>Type of flux</th></tr><tr><td>MS</td><td>Manganese-silicate</td></tr><tr><td>CS</td><td>Calcium-silicate</td></tr><tr><td>ZS</td><td>Zirconium-silicate</td></tr><tr><td>RS</td><td>Rutile-silicate</td></tr><tr><td>AR</td><td>Aluminate-rutile</td></tr><tr><td>AB</td><td>Aluminate-basic</td></tr><tr><td>AS</td><td>Aluminate-silicate</td></tr><tr><td>AF</td><td>Aluminate-fluoride-basic</td></tr><tr><td>FB</td><td>Fluoride-basic</td></tr><tr><td>GS</td><td>Magnesium-silicate</td></tr><tr><td>Z</td><td>Any other composition</td></tr></table>				Symbol	Type of flux	MS	Manganese-silicate	CS	Calcium-silicate	ZS	Zirconium-silicate	RS	Rutile-silicate	AR	Aluminate-rutile	AB	Aluminate-basic	AS	Aluminate-silicate	AF	Aluminate-fluoride-basic	FB	Fluoride-basic	GS	Magnesium-silicate	Z	Any other composition	<div>Metallurgical behaviour, flux class 1</div> <table><tr><th>Symbol</th><th>Metallurgical behaviour</th><th>Contribution from flux</th></tr><tr><td>1</td><td>Burn-out</td><td>&gt;0.7</td></tr><tr><td>2</td><td>Burn-out</td><td>0.5-0.7</td></tr><tr><td>3</td><td>Burn-out</td><td>0.3-.05</td></tr><tr><td>4</td><td>Burn-out</td><td>0.1-0.3</td></tr><tr><td>5</td><td>Neutral</td><td>0.0-0.1</td></tr><tr><td>6</td><td>Pick-up</td><td>0.1-0.3</td></tr><tr><td>7</td><td>Pick-up</td><td>0.3-0.5</td></tr><tr><td>8</td><td>Pick-up</td><td>0.5-.07</td></tr><tr><td>9</td><td>Pick-up</td><td>&gt;0.7</td></tr><tr><td>Sequence</td><td>Si, then Mn</td><td></td></tr></table>				Symbol	Metallurgical behaviour	Contribution from flux	1	Burn-out	>0.7	2	Burn-out	0.5-0.7	3	Burn-out	0.3-.05	4	Burn-out	0.1-0.3	5	Neutral	0.0-0.1	6	Pick-up	0.1-0.3	7	Pick-up	0.3-0.5	8	Pick-up	0.5-.07	9	Pick-up	>0.7	Sequence	Si, then Mn																																
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		<div>Application</div> <table><tr><th colspan="2">Class</th></tr><tr><td>1</td><td>SA welding of non alloy and low alloy steels</td></tr><tr><td>2 and 2B</td><td>Fluxes for joining and surfacing of/with stainless and heat resisting Cr and Cr-Ni steels and/or Ni and Ni-based alloys. 2B for fluxes especially for strip cladding.</td></tr><tr><td>3</td><td>Fluxes for hardfacing overlay welding which alloy elements such as C, Cr or Mo to the weld metal.</td></tr><tr><td>4</td><td>Other fluxes which do not fit in class 1 to 3, e.g. fluxes for backing in one-side welding applications.</td></tr></table>				Class		1	SA welding of non alloy and low alloy steels	2 and 2B	Fluxes for joining and surfacing of/with stainless and heat resisting Cr and Cr-Ni steels and/or Ni and Ni-based alloys. 2B for fluxes especially for strip cladding.	3	Fluxes for hardfacing overlay welding which alloy elements such as C, Cr or Mo to the weld metal.	4	Other fluxes which do not fit in class 1 to 3, e.g. fluxes for backing in one-side welding applications.	<div>Metallurgical behaviour, flux class 2 and class 2B</div> <table><tr><th rowspan="2">Symbol</th><th rowspan="2">Metallurgical Behaviour</th><th colspan="4">Chemical Composition<sup>100</sup> %</th></tr><tr><th>C</th><th>Si</th><th>Cr</th><th>Nb</th></tr><tr><td>1</td><td>Burn-out</td><td>&gt;0.020</td><td>&gt;0.7</td><td>&gt;2.0</td><td>&gt;0.20</td></tr><tr><td>2</td><td>Burn-out</td><td>-</td><td>0.5-0.7</td><td>1.5-2.0</td><td>0.15-1.20</td></tr><tr><td>3</td><td>Burn-out</td><td>0.010-0.020</td><td>0.3-0.5</td><td>1.0-1.5</td><td>0.10-0.15</td></tr><tr><td>4</td><td>Burn-out</td><td>-</td><td>0.1-0.3</td><td>0.5-1.0</td><td>0.05-0.10</td></tr><tr><td>5</td><td>Neutral</td><td>0.000-0.010</td><td>0.0-0.1</td><td>0.0-0.5</td><td>0.00-0.05</td></tr><tr><td>6</td><td>Pick-up</td><td>-</td><td>0.1-0.3</td><td>0.5-1.0</td><td>0.05-0.10</td></tr><tr><td>7</td><td>Pick-up</td><td>0.010-0.020</td><td>0.3-0.5</td><td>1.0-1.5</td><td>0.10-0.15</td></tr><tr><td>8</td><td>Pick-up</td><td>-</td><td>0.5-0.7</td><td>1.5-2.0</td><td>0.15-0.20</td></tr><tr><td>9</td><td>Pick-up</td><td>&gt;0.020</td><td>&gt;0.7</td><td>&gt;2.0</td><td>&gt;2.0</td></tr><tr><td>Sequence</td><td colspan="5">C, Si, then Cr, Nb (then other elements if applicable)</td></tr></table>				Symbol	Metallurgical Behaviour	Chemical Composition <sup>100</sup> %				C	Si	Cr	Nb	1	Burn-out	>0.020	>0.7	>2.0	>0.20	2	Burn-out	-	0.5-0.7	1.5-2.0	0.15-1.20	3	Burn-out	0.010-0.020	0.3-0.5	1.0-1.5	0.10-0.15	4	Burn-out	-	0.1-0.3	0.5-1.0	0.05-0.10	5	Neutral	0.000-0.010	0.0-0.1	0.0-0.5	0.00-0.05	6	Pick-up	-	0.1-0.3	0.5-1.0	0.05-0.10	7	Pick-up	0.010-0.020	0.3-0.5	1.0-1.5	0.10-0.15	8	Pick-up	-	0.5-0.7	1.5-2.0	0.15-0.20	9	Pick-up	>0.020	>0.7	>2.0	>2.0	Sequence	C, Si, then Cr, Nb (then other elements if applicable)					<div>Metallurgical behaviour, flux class 3 and class 4</div> <table><tr><td>Class 3</td><td>Stating chemical symbols of alloying elements (e.g. C, Cr, Mo) and approximate amount (without the % symbol).</td></tr><tr><td>Class 4</td><td>Stating chemical symbols of alloying elements</td></tr></table>				Class 3	Stating chemical symbols of alloying elements (e.g. C, Cr, Mo) and approximate amount (without the % symbol).	Class 4	Stating chemical symbols of alloying elements
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## SFA/AWS A5.17: specification for carbon steel electrodes and fluxes for submerged arc welding

**F 7 A 5 - EM12K**

F	Submerged arc welding flux
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### Symbol for strength and elongation

Symbol	Min. Yield Strength, MPa	Tensile Strength, MPa	Min. Elongation, %
6	330	415 - 550	22
7	400	480 - 650	22

### Symbol for heat treatment

Symbol	
A	As Welded
P	Postweld heat treated (PWHT); 620°C / 1h

### Symbol for impact properties

Symbol	Min. average impact energy 27J °C
0	-18
2	-29
4	-40
5	-46
6	-51
8	-62
Z	no requirements

### Symbol for chemical composition of wire electrodes

Symbol	Chemical Composition %					
	C	Mn	Si	S	P	Cu (including Cu-coating)
EL12	0.04-0.14	0.25-0.60	0.10	0.030	0.030	0.35
EM12	0.06-0.15	0.80-1.25	0.10	0.030	0.030	0.35
EM12K	0.05-0.15	0.80-1.25	0.10-0.35	0.030	0.030	0.35
EH12K	0.06-0.15	1.50-2.00	0.25-0.65	0.025	0.025	0.35
EH14	0.10-0.20	1.70-2.20	0.10	0.030	0.030	0.35

Single values are maximum.

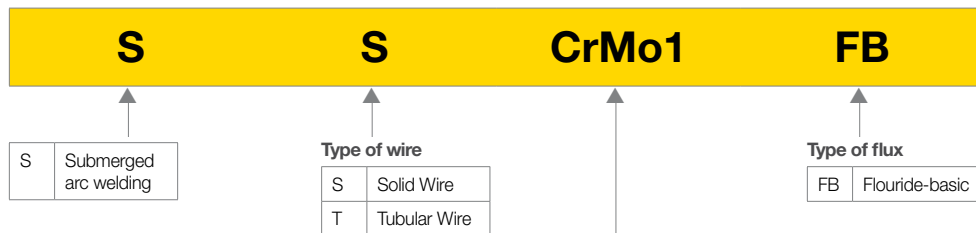
### Symbol for chemical composition for composite electrode weld metal

Symbol	Chemical Composition %					
	C	Mn	Si	S	P	Cu
EC1	0.15	1.80	0.90	0.035	0.035	0.35

Not specified

Single values are maximum.

## EN ISO 24598-A: welding consumables - solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of creep-resisting steels



**Chemical composition of solid wire electrodes for submerged arc welding (extract of table)**

Symbol	Chemical Composition <sup>100</sup> %										
	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	V	Other
Mo	0.08-0.15	0.05-0.25	0.80-1.20	0.025	0.025	0.2	0.3	0.45-0.65	0.030	0.3	Nb: 0.01
MnMo	0.08-0.15	0.05-0.25	1.30-1.70	0.025	0.025	0.2	0.3	0.45-0.65	0.030	0.3	Nb: 0.01
CrMo1	0.08-0.15	0.05-0.25	0.60-1.00	0.020	0.020	0.90-1.30	0.3	0.40-0.65	0.030	0.3	Nb: 0.01
CrMo2	0.08-0.15	0.05-0.25	0.30-0.70	0.020	0.020	2.2-2.8	0.3	0.90-1.15	0.025	0.3	Nb: 0.01
CrMo5	0.03-0.10	0.20-0.50	0.40-0.75	0.020	0.020	5.5-6.5	0.3	0.50-0.80	0.030	0.3	Nb: 0.01
CrMo91	0.07-0.15	0.60	0.4-1.5	0.020	0.020	8.0-10.5	0.4-1.0	0.80-1.20	0.025	0.15-0.30	Nb: 0.03-0.10 N: 0.02-0.07
Z	Any other agreed composition.										
Single values shown in the table are maximum values.											

**Chemical composition for all weld metal deposits (extract of table)**

Symbol	Chemical Composition <sup>100</sup> %										
	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	V	Other
Mo	0.15	0.80	1.4	0.030	0.030	0.2	0.3	0.45-0.65	0.35	0.3	Nb: 0.01
MnMo	0.15	0.80	2.0	0.030	0.030	0.2	0.3	0.45-0.65	0.35	0.3	Nb: 0.01
CrMo1	0.15	0.80	1.20	0.030	0.030	0.80-1.30	0.25	0.35-0.65	0.40	0.3	Nb: 0.01
CrMo2	0.15	0.80	1.20	0.030	0.030	2.2-2.8	0.3	0.80-1.15	0.35	0.3	Nb: 0.01
CrMo5	0.10	0.80	1.20	0.030	0.030	4.5-6.5	0.3	0.45-0.80	0.35	0.3	Nb: 0.01
CrMo91	0.15	0.80	1.80	0.030	0.030	8.0-10.5	1.0	0.70-1.20	0.35	0.10-0.30	Nb: 0.02-0.10 N: 0.02-0.07
Z	Any other agreed composition.										
Single values shown in the table are maximum values.											

**Mechanical properties of all weld metal deposits (Extract of table)**

Symbol	Min. Yield Strength <sup>1</sup> , MPa	Min. Tensile Strength, MPa	Min. Elongation <sup>2</sup> , %	Min. Toughness at 20°C		Heat Treatment		
				Average of 3, J	Single Value, J	Preheat interpass, °C	PWHT Temp °C	PWHT Time, minutes
Mo	355	510	22	47	38	<200	-	-
MnMo	355	510	22	47	38	<200	-	-
CrMo1	355	510	20	47	38	150-250	660-700	60
CrMo2	400	500	18	47	38	200-300	690-750	60
CrMo5	400	590	17	47	38	200-300	730-760	60
CrMo91	415	585	17	47	38	250-350	750-760	180
Z	Any other agreed composition.							

**SFA/AWS A5.23: specification for low-alloy steel electrodes and fluxes for submerged arc welding - two-run classification system**

F                      8T                      A                      6                      -                      EA2TiB

S	Submerged arc welding flux
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**Symbol for strength and elongation, two-run (T)**

Symbol	Yield Strength <sup>1</sup> , MPa	Tensile Strength, MPa	Min. Elongation <sup>2</sup> , %
6T	340	410	22
7T	410	480	22
8T	480	550	20
9T	550	620	17
10T	620	690	16
11T	690	760	15
12T	760	830	14
13T	830	900	14

*All values are minimum requirements.*

**Symbol for heat treatment**

Symbol	
A	As Welded
P	Postweld heat treated (PWHT); depending on alloy, 620°C, 690°C and other temp. / 1h

**Symbol for impact properties**

Symbol	Min. average impact energy 27J °C
0	-18
2	-29
4	-40
5	-46
6	-51
8	-62
10	-73
15	-101
Z	no requirements

**Chemical composition of solid wire electrodes for submerged arc welding (extract of table)**

Symbol	Chemical Composition <sup>123</sup> %									
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu (incl Cu-coating)	Other
EA2	0.05-0.17	0.95-1.35	0.20	0.025	0.025	-	-	0.45-0.65	0.35	-
EA2TiB	0.05-0.17	0.95-1.35	0.35	0.025	0.025	-	-	0.45-0.65	0.35	see 1
EA4	0.05-0.17	1.20-1.70	0.20	0.025	0.025	-	-	0.45-0.65	0.35	-
EB2R	0.07-0.15	0.45-1.00	0.05-0.30	0.010	0.010	1.00-1.75	-	0.45-0.65	0.15	see 2
EB3R	0.05-0.15	0.40-0.80	0.05-0.30	0.010	0.010	2.25-3.00	-	0.90-1.00	0.15	see 2
EB6	0.10	0.35-0.70	0.05-0.50	0.025	0.025	4.50-6.50	-	0.45-0.70	0.35	-
EB91	0.07-0.13	1.25	0.50	0.010	0.010	8.50-10.50	1.00	0.85-1.15	0.10	see 3
EN1	0.12	0.75-1.25	0.05-0.30	0.020	0.020	0.15	0.75-1.25	0.30	0.35	-
EN2	0.12	0.75-12.5	0.05-0.30	0.020	0.020	-	2.10-2.90	-	0.35	-
EN3	0.13	0.60-1.20	0.05-0.30	0.020	0.020	0.15	3.10-3.80	-	0.35	-
EN6	0.07-0.15	1.20-1.60	0.05-0.30	0.020	0.020	-	0.75-1.25	0.10-0.30	0.35	-
EG	not specified									
(EC)	(composite electrode)									
Single values are maximum.										
1.) Ti: 0.05-0.30; B: 0.005 - 0.030 2) As: 0.005; Sn: 0.005; Sb: 0.005 3) V: 0.15-0.25; Nb: 0.02-0.10; N: 0.03-0.07; Al: 0.04										

SFA/AWS A5.23: specification for low-alloy steel electrodes and fluxes for submerged arc welding - multiple pass classification system

**F      8      A      10      -      ENi6      -      Ni6**

S	Submerged arc welding flux
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Symbol for strength and elongation

Symbol	Min. Yield Strength <sup>1</sup> , MPa	Tensile Strength, MPa	Min. Elongation <sup>2</sup> , %
7	400	480-650	22
8	470	550-690	20
9	540	620-760	17
10	610	690-830	16
11	680	760-900	15
12	740	830-870	14
13	810	900-1030	14

Symbol for heat treatment

Symbol	
A	As Welded
P	Postweld heat treated (PWHT); depending on alloy, 620°C, 690°C and other temp. / 1h (B91: 2h)

Symbol for impact properties

Symbol	Min. average impact energy 27J °C
0	-18
2	-29
4	-40
5	-46
6	-51
8	-62
10	-73
15	-101
Z	no requirements



## Chemical composition of solid wire electrodes for submerged arc welding (extract of table)

Symbol	Chemical Composition <sup>12)</sup> %									
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu (incl Cu-coating)	Other
EA2	0.05-0.17	0.95-1.35	0.20	0.025	0.025	-	-	0.45-0.65	0.35	-
EA2TiB	0.05-0.17	0.95-1.35	0.35	0.025	0.025	-	-	0.45-0.65	0.35	see 1
EA4	0.05-0.17	1.20-1.70	0.20	0.025	0.025	-	-	0.45-0.65	0.35	-
EB2R	0.07-0.15	0.45-1.00	0.05-0.30	0.010	0.010	1.00-1.75	-	0.45-0.65	0.15	see 2
EB3R	0.05-0.15	0.40-0.80	0.05-0.30	0.010	0.010	2.25-3.00	-	0.90-1.00	0.15	see 2
EB6	0.10	0.35-0.70	0.05-0.50	0.025	0.025	4.50-6.50	-	0.45-0.70	0.35	-
EB91	0.07-0.13	1.25	0.50	0.010	0.010	8.50-10.50	1.00	0.85-1.15	0.10	see 3
ENi1	0.12	0.75-1.25	0.05-0.30	0.020	0.020	0.15	0.75-1.25	0.30	0.35	-
ENi2	0.12	0.75-12.5	0.05-0.30	0.020	0.020	-	2.10-2.90	-	0.35	-
ENi3	0.13	0.60-1.20	0.05-0.30	0.020	0.020	0.15	3.10-3.80	-	0.35	-
ENi6	0.07-0.15	1.20-1.60	0.05-0.30	0.020	0.020	-	0.75-1.25	0.10-0.30	0.35	-
EG	not specified									
(EC)	(composite electrode)									
Single values shown in the table are maximum values.										
1) Ti: 0.05-0.30; B: 0.005-0.030 2) As: 0.005; Sn: 0.005; Sb: 0.005 3) V: 0.15 - 0.25; Nb: 0.02 - 0.10; N: 0.03 - 0.07; Al: 0.04										

## Chemical composition of weld metal (extract of complete table)

Symbol	Chemical Composition™ %									
	C	Mn	Si	S	P	Cr	Ni	Mo	Cu (incl Cu-coating)	Other
A2	0.12	1.40	0.80	0.030	0.030	-	-	0.40-0.65	0.35	-
A3	0.15	2.10	0.80	0.030	0.030	-	-	0.40-0.65	0.35	-
A4	0.15	1.60	0.80	0.030	0.030	-	-	0.40-0.65	0.35	-
B2	0.05-0.15	1.20	0.80	0.030	0.030	1.00-1.50	-	0.40-0.65	0.35	-
B2R	0.05-0.15	1.20	0.80	0.010	0.010	1.00-1.50	-	0.40-0.65	0.15	see 1
B3	0.05-0.15	1.20	0.80	0.030	0.030	2.00-2.50	-	0.90-1.20	0.35	-
B3R	0.05-0.15	1.20	0.80	0.010	0.010	2.00-2.50	-	0.90-1.20	0.15	see 1
B91	0.08-0.13	1.20	0.80	0.010	0.010	8.0-10.5	0.80	0.85-1.20	0.25	see 2
Ni1	0.12	1.60	0.80	0.025	0.030	0.15	0.75-1.10	0.24	0.35	see 3
Ni2	0.12	1.60	0.80	0.025	0.030	-	2.00-2.90	-	0.35	-
Ni3	0.12	1.60	0.80	0.025	0.030	0.15	2.80-3.80	-	0.35	-
Ni6	0.14	1.60	0.80	0.025	0.030	-	0.70-1.10	0.10-0.35	0.35	-
F3	0.17	1.25-2.25	0.80	0.030	0.030	-	0.70-1.10	0.40-0.65	0.35	-
G	as agreed between supplier and purchaser									
(EC)	(composite electrode)									
Single values are maximum.										
Weld metals generated with a composite electrode have the prefix "EC" before the appropriate electrode description.										
1) As: 0.005; Sn: 0.005; Sb: 0.005 2) Mn+Ni = 1.40 max; Nb: 0.02 - 0.10; N: 0.02-0.07; V: 0.15-0.25; Al: 0.04 3) Ti+V+Zr: 0.05										

# EN ISO 26304-A: welding consumables – solid wire electrodes, tubular cored electrodes and electrode-flux-combinations for saw of high strength steels

**S 55 6 FB - S3Ni1Mo**

S  
Submerged  
arc welding  
flux

## Symbol for strength and elongation, two-run (T)

Symbol	Min. Yield Strength, MPa	Tensile Strength, MPa	Min. Elongation <sup>2</sup> , %
55	550	640-820	18
62	620	700-890	18
69	690	770-940	17
79	790	880-1080	16
89	890	940-1180	15

## Symbol for impact properties

Symbol	Min. average impact energy 47J °C
A	20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60
Z	no requirements

## Chemical composition of flux

Symbol	Type of flux
MS	Manganese-silicate
CS	Calcium-silicate
ZS	Zirconium-silicate
RS	Rutile-silicate
AR	Aluminate-rutile
AB	Aluminate-basic
AS	Aluminate-silicate
AF	Aluminate-fluoride-basic
FB	Fluoride-basic
GS	Magnesium-silicate
Z	Any other composition

## Chemical composition of solid wire electrodes for submerged arc welding (extract of table)

Symbol	Chemical Composition <sup>1,2,3</sup> %									
	C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Other
S2Ni1Mo	0.07-0.15	0.05-0.25	0.80-1.30	0.020	0.020	0.20	0.80-1.20	0.45-0.65	0.30	0.50
S3Ni1Mo	0.07-0.15	0.05-0.35	1.30-1.80	0.020	0.020	0.20	0.80-1.20	0.45-0.65	0.30	0.50
S2Ni2Mo	0.05-0.09	0.15	1.10-1.40	0.015	0.015	0.15	2.00-2.50	0.45-0.60	0.30	0.50
S2Ni3Mo	0.08-0.12	0.10-0.25	0.80-1.20	0.020	0.020	0.15	2.80-3.20	0.10-0.25	0.30	0.50
S1Ni2, 5CrMo	0.07-0.15	0.10-0.25	0.45-0.75	0.020	0.020	0.50-0.85	2.10-2.60	0.40-0.70	0.30	0.50
S3Ni2, 5CrMo	0.07-0.15	0.10-0.25	1.20-1.80	0.020	0.020	0.30-0.85	2.00-2.60	0.40-0.70	0.30	0.50
S3Ni1, 5CrMo	0.07-0.14	0.05-0.15	1.30-1.50	0.020	0.020	0.15-0.35	1.50-1.70	0.30-0.50	0.30	0.50
S3Ni1, 5Mo	0.07-0.15	0.05-0.25	1.20-1.80	0.020	0.020	0.20	1.20-1.80	0.30-0.50	0.30	0.50
S4Ni2CrMo	0.08-0.11	0.30-0.40	1.80-2.00	0.015	0.015	0.85-1.00	2.10-2.60	0.55-0.70	0.30	0.50
SZ	any other agreed composition									
(EC)	(composite electrode)									

1) Al, Sn, As and Sb <= 0.02% each and Ti, Pb and N <=0.01%

2) Cu: Including the cu-coating

3) Single vales shown in the table are maximum values.

# EN ISO 14343-A: welding consumables - wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat-resisting steels (extract)

## S 19 9 L (308L)

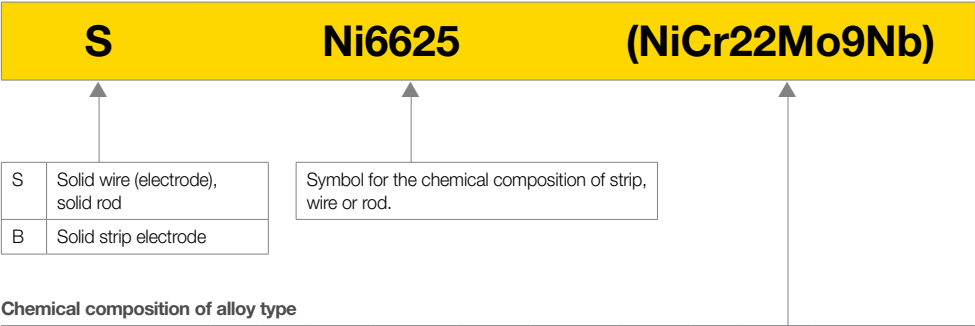
G	Gas metal arc welding
W	Gas tungsten arc welding
P	Plasma arc welding
S	Submerged arc welding
B	Strip cladding
L	Laser beam welding

The nominal chemical composition of wire or rod

### Chemical composition of alloy type

Nominal composition	Alloy Type	Chemical Composition in %										
		C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Other
19 9 L	308L	0.03	0.65	1.0-2.5	0.03	0.02	19.0-21.0	9.0-11.0	0.5	-	0.5	-
		0.03	0.65	1.0-2.5	0.03	0.03	19.5-22.0	9.0-11.0	0.75	-	0.75	-
19 9 H	308H	0.04-0.08	1.0	1.0-2.5	0.03	0.02	18.0-21.0	9.0-11.0	0.5	-	0.5	-
		0.04-0.08	0.65	1.0-2.5	0.03	0.03	19.5-22.0	9.0-11.0	0.5	-	0.75	-
18 8 Mn	309L	0.20	1.2	5.0-8.0	0.03	0.03	17.0-20.0	7.0-10.0	0.5	-	0.5	-
23 12 L		0.03	0.65	1.0-2.5	0.03	0.02	22.0-25.0	11.0-14.0	0.5	-	0.5	-
23 12 2 L	309LMo	0.03	0.65	1.0-2.5	0.03	0.03	23.0-25.0	12.0-14.0	0.75	-	0.75	-
		0.03	1.0	1.0-2.5	0.03	0.02	21.0-25.0	11.0-15.5	2.0-3.5	-	0.5	-
25 20	310	0.08-0.15	2.0	1.0-2.5	0.03	0.02	24.0-27.0	18.0-22.0	0.5	-	0.5	-
		0.08-0.15	0.65	1.0-2.5	0.03	0.03	25.0-28.0	20.0-22.5	0.75	-	0.75	-
29 9	312	0.15	1.0	1.0-2.5	0.03	0.02	28.0-32.0	8.0-12.0	0.5	-	0.5	-
		0.15	0.65	1.0-2.5	0.03	0.03	28.0-32.0	8.0-10.5	0.75	-	0.75	-
19 12 3 L	316L	0.03	0.65	1.0-2.5	0.03	0.02	18.0-20.0	11.0-14.0	2.5-3.0	-	0.5	-
		0.03	0.65	1.0-2.5	0.03	0.03	18.0-20.0	11.0-14.0	2.0-3.0	-	0.75	-
19 12 3 H	316H	0.04-0.08	1.0	1.0-2.5	0.03	0.02	18.0-20.0	11.0-14.0	2.0-3.0	-	0.5	-
		0.04-0.08	0.65	1.0-2.5	0.03	0.03	18.0-20.0	11.0-14.0	2.0-3.0	-	0.75	-
18 15 3 L	317L	0.03	1.0	1.0-4.0	0.03	0.02	17.0-20.0	13.0-16.0	2.5-4.0	-	0.5	-
		0.03	0.65	1.0-2.5	0.03	0.03	18.5-20.5	13.0-15.0	3.0-4.0	-	0.75	-
19 12 3 Nb	318	0.08	0.65	1.0-2.5	0.03	0.02	18.0-20.0	11.0-14.0	2.5-3.0	-	0.5	Nb=10xC to 1.0
		0.08	0.65	1.0-2.5	0.03	0.03	18.0-20.0	11.0-14.0	2.0-3.0	-	0.75	Nb=8xC to 1.0
19 9 Nb	347	0.08	0.65	1.0-2.5	0.03	0.02	19.0-21.0	9.0-11.0	0.5	-	0.5	Nb=10xC to 1.0
		0.08	0.65	1.0-2.5	0.03	0.03	19.0-21.5	9.0-11.0	0.75	-	0.75	Nb=10xC to 1.0
25 9 4 N L	385	0.03	1.0	2.5	0.03	0.02	24.0-27.0	8.0-10.5	2.5-4.5	0.2-0.3	1.5	W 1.0
20 25 5 Cu L		0.03	1.0	1.0-4.0	0.03	0.02	19.0-22.0	24.0-27.0	4.0-6.0	-	1.0-2.0	-
	2209	0.025	0.5	1.0-2.5	0.02	0.03	19.5-21.5	24.0-26.0	4.2-5.2	-	1.2-2.0	-
20 16 3 Mn L		0.03	1.0	5.0-9.0	0.03	0.02	19.0-22.0	15.0-18.0	2.5-4.5	-	0.5	-
25 22 2 N L	2594	0.03	1.0	3.5-6.5	0.03	0.02	24.0-27.0	21.0-24.0	1.5-3.0	0.1-0.2	0.5	-
22 9 3 N L		0.03	1.0	2.5	0.03	0.02	21.0-24.0	7.0-10.0	2.5-4.0	0.1-0.2	0.5	-
23 7 N L	410NIMo	0.03	0.90	0.5-2.0	0.03	0.03	21.5-23.5	7.5-9.5	2.5-3.5	0.08-0.2	0.75	-
		0.03	1.0	2.5	0.03	0.02	22.5-25.5	6.5-9.5	0.8	0.10-0.20	0.5	-
25 9 4 N L	410NIMo	0.03	1.0	2.5	0.03	0.02	24.0-27.0	8.0-10.5	2.5-4.5	0.20-0.30	1.5	W 1.0
		0.03	0.5	0.6	0.03	0.03	12.0-14.0	0.75	0.75	-	0.75	-

EN ISO 18274: welding consumables - wire and strip electrodes, wires and rods  
for arc welding of nickel and nickel alloys (extract)



Chemical composition of alloy type

Symbol	Chemical Composition in %									
	C	Si	Mn	Cr	Ni	Mo	Nb	Cu	Fe	Other
Ni6082 (NiCr20Mn3Nb)	0.1	0.5	2.5-3.5	18.0-22.0	Min. 67.0	-	2.0-3.0	0.5	3.0	Ti: 0.7 P: 0.03
Ni6625 (NiCr22Mo9Nb)	0.1	0.5	0.5	20.0-23.0	Min. 58.0	8.0-10.0	3.2-4.1	0.5	5.0	Ti: 0.4 Al: 0.4
Ni6276 (NiCr15Mo16Fe6W4)	0.02	0.08	1.0	14.5-16.5	Min. 50.0	15.0-17.0	-	0.5	4.0-7.0	Co: 2.5 W: 3.0-4.5
Ni6059 (NiCr23Mo16)	0.01	0.1	0.5	22.0-24.0	Min. 56.0	15.0-16.5	-	0.5	2.0-5.0	Ti: 0.5 Al: 0.1-0.4

## SFA/AWS A5.4: specification for stainless steel electrodes for shielded metal arc welding (extract)

**E****308L**

Electrode

### Nominal chemical composition of the filler metal

Symbol	Chemical Composition in %										
	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Other
E307	0.04-0.14	1.0	3.30-4.75	0.04	0.03	18.0-21.5	9.0-10.7	0.50-1.5	-	0.75	-
E308L	0.04	1.0	0.5-2.5	0.04	0.03	18.0-21.0	9.0-11.0	0.75	-	0.75	-
E308H	0.04-0.08	1.0	0.5-2.5	0.04	0.03	18.0-21.0	9.0-11.0	0.75	-	0.75	-
E309L	0.04	1.0	0.5-2.5	0.04	0.03	22.0-25.0	12.0-14.0	0.75	-	0.75	-
E309LMo	0.04	1.0	0.5-2.5	0.04	0.03	22.0-25.0	12.0-14.0	2.0-3.0	-	0.75	-
E310	0.08-0.20	0.75	1.0-2.5	0.03	0.03	25.0-28.0	20.0-22.5	0.75	-	0.75	-
E312	0.15	1.0	0.5-2.5	0.04	0.03	28.0-32.0	8.0-10.5	0.75	-	0.75	-
E316L	0.04	1.0	0.5-2.5	0.04	0.03	17.0-20.0	11.0-14.0	2.0-3.0	-	0.75	-
E316H	0.04-0.08	1.0	0.5-2.5	0.04	0.03	17.0-20.0	11.0-14.0	2.0-3.0	-	0.75	-
E317L	0.04	1.0	0.5-2.5	0.04	0.03	18.0-21.0	12.0-14.0	3.0-4.0	-	0.75	-
E318	0.08	1.0	0.5-2.5	0.04	0.03	17.0-20.0	11.0-14.0	2.0-3.0	-	0.75	Nb=6xCmin/1.0max
E347	0.08	1.0	0.5-2.5	0.04	0.03	18.0-21.0	9.0-11.0	0.75	-	0.75	Nb=8xCmin/1.0max
E385	0.03	0.9	1.0-2.5	0.03	0.02	19.5-21.5	24.0-26.0	4.2-5.2	-	1.2-2.0	-
E2209	0.04	1.0	0.5-2.0	0.04	0.03	21.5-23.5	8.5-10.5	2.5-3.5	0.08-0.20	0.75	-
E2594	0.04	1.0	0.5-2.0	0.04	0.03	24.0-27.0	8.0-10.5	3.5-4.5	0.20-0.30	0.75	-

## SFA/AWS A5.9: bare stainless steel welding electrodes and rods (extract)

**ER****316L**

ER	Solid wires (electrodes or rods)
EC	Cored wires
EQ	Strip electrodes

## Nominal chemical composition of the filler metal

AWS Classification	Chemical Composition in %										
	C	Si	Mn	P	S	Cr	Ni	Mo	N	Cu	Other
ER307	0.04-0.14	0.30-0.65	3.3-4.75	0.03	0.03	19.5-22.0	8.0-10.7	0.50-1.5	-	0.75	-
ER308L	0.03	0.30-0.65	1.0-2.5	0.03	0.03	19.5-22.0	9.0-11.0	0.75	-	0.75	-
ER308H	0.04-0.08	0.30-0.65	1.0-2.5	0.03	0.03	19.5-22.0	9.0-11.0	0.50	-	0.75	-
ER309L	0.03	0.30-0.65	1.0-2.5	0.03	0.03	23.0-25.0	12.0-14.0	0.75	-	0.75	-
ER309LMo	0.03	0.30-0.65	1.0-2.5	0.03	0.03	23.0-25.0	12.0-14.0	2.0-3.0	-	0.75	-
ER310	0.08-0.15	0.30-0.65	1.0-2.5	0.03	0.03	25.0-28.0	20.0-22.5	0.75	-	0.75	-
ER312	0.15	0.30-0.65	1.0-2.5	0.03	0.03	28.0-32.0	8.0-10.5	0.75	-	0.75	-
ER316L	0.03	0.30-0.65	1.0-2.5	0.03	0.03	18.0-20.0	11.0-14.0	2.0-3.0	-	0.75	-
ER316H	0.04-0.08	0.30-0.65	1.0-2.5	0.03	0.03	18.0-20.0	11.0-14.0	2.0-3.0	-	0.75	-
ER317L	0.03	0.30-0.65	1.0-2.5	0.03	0.03	18.5-20.5	13.0-15.0	3.0-4.0	-	0.75	-
ER318	0.08	0.30-0.65	1.0-2.5	0.03	0.03	18.0-20.0	11.0-14.0	2.0-3.0	-	0.75	Nb=8xCmin/1.0max
ER347	0.08	0.30-0.65	1.0-2.5	0.03	0.03	19.0-21.5	9.0-11.0	0.75	-	0.75	Nb=10xCmin/1.0max
ER385	0.025	0.50	1.0-2.5	0.02	0.03	19.5-21.5	24.0-26.0	4.2-5.2	-	1.2-2.0	-
ER2209	0.03	0.90	0.50-2.0	0.03	0.03	21.5-23.5	7.5-9.5	2.5-3.5	0.08-0.20	0.75	-
ER2594	0.03	1.0	2.5	0.03	0.02	24.0-27.0	8.0-10.5	2.5-4.5	0.20-0.30	1.5	W: 1.0
ER410NiMo	0.06	0.5	0.6	0.03	0.03	11.0-12.50	4.0-5.0	0.4-0.7	-	0.75	-

## SFA/AWS A5.14: specification for nickel and nickel alloy bare welding electrodes and rods (extract)

**ER****NiCrMo-13**

ER	Solid wires (electrodes or rods)
EQ	Strip electrodes

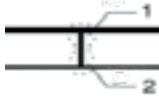


## Nominal chemical composition of the filler metal

AWS Classification	Chemical Composition in %									
	C	Si	Mn	P	S	Cr	Ni	Mo	Nb	Fe
ERNiCr-3	0.1	0.5	2.5-3.5	0.03	0.015	18.0-22.0	min. 67.0	-	2.0-3.0	0.5
ERNiCrMo-3	0.1	0.5	0.5	0.02	0.015	20.0-23.0	min. 58.0	8.0-10.0	3.15-4.15	0.5
ERNiCrMo-4	0.02	0.08	1.0	0.04	0.03	14.5-16.5	Bal.	15.0-17.0	-	0.5
ERNiCrMo-13	0.01	0.1	0.5	0.015	0.010	22.0-24.0	Bal.	15.0-16.5	-	0.5

## Submerged Arc Welding Joint Preparations

Typical welding data and recommended joint preparations for submerged arc welding.






### Non and low-alloyed steels

Type of joint	Plate thickness mm	Wire diameter mm	Run no	Welding current A	Arc voltage V	Welding speed cm/min
	6	3.0	1	320	32	80
	8	3.0	2	350	32	75
		4.0	1	450	32	
	10	4.0	2	500	32	70
		4.0	1	550	33	
	12	4.0	2	600	33	60
		4.0	1	600	33	
	14	4.0	2	650	33	55
		4.0	1	700	34	
	4.0	2	750	34		
  Gap: as small as possible; in locations where gap > 1 mm: MMA or MAG root run.	For all procedures: 1 run from back side:					
		4.0	1	680	32	50
	14	4.0	1	650	26	50
	16	4.0	1	580	26	60
		4.0	2	750	34	60
	18	4.0	1	580	26	60
		4.0	2	750	34	50
	20	4.0	1	580	26	60
		4.0	2	750	30	60
	25	4.0	3	750	34	60
		4.0	1	580	26	60
	30	4.0	2	750	30	60
		4.0	3	750	30	60
		4.0	4 - 5	750	32	50
		4.0	1	580	26	60
		4.0	2	750	30	60
		4.0	3	750	30	60
		4.0	4 - 5	750	32	50
		4.0	6 - 8	750	32	50
	Alternative parameters for first run (all thicknesses):					
		4.0	1	450	25	45
  Welded from 1 side root run: MMA or MAG. Thickness of root run ≥ 5 mm.	14	4.0	1	MAG or MMA	26	50
	16	4.0	2	550		50
		4.0	3	600		30
		4.0	4	680	32	50
	18	4.0	1	MAG or MMA	26	50
		4.0	2	550		50
		4.0	3	650		32
		4.0	4 - 5	680	32	50
	20	4.0	1	MAG or MMA	26	50
		4.0	2	550		50
		4.0	3 - 4	650		30
		4.0	5 - 6	680	32	50
		4.0	1	MAG or MMA	26	50
		4.0	2	550		50
		4.0	3 - 4	650		30
		4.0	5 - 6	750	32	50
	4.0	7	680	32	50	

## Submerged Arc Welding Joint Preparations

Typical welding data and recommended joint preparations for submerged arc welding.

### Non and low-alloyed steels

Type of joint	Throat thickness mm	Wire diameter mm	Run no	Welding current A	Arc voltage V	Welding speed cm/min
	3	1 x 3.0	1	500	28	80
	4	1 x 3.0	1	500	28	60
	5	1 x 4.0	1	650	30	60
	7	1 x 3.0	1	500	29	50
		1 x 3.0	2	620	32	60
	4	1 x 3.0	1	600	32	100
	5	1 x 3.0	1	600	32	60
	6	1 x 3.0	1	650	32	55
	7	1 x 3.0	1	750	32	45
	Twin Arc					
	4	2 x 1.6	1	750	32	115
	5	2 x 2.0	1	800	32	100
	Cored wire					
	5	2 x 2.4	1	800	30	120
	Tandem DC+, AC					
	4	4.0	1 (DC+)	800	32	140
		4.0	1 (AC)	700	36	
	Tandem DC+, AC					
	4	4.0	1 (DC+)	800	32	140
			4.0	1 (AC)	700	
	5	4.0	1 (DC+)	800	32	90
			4.0	1 (AC)	700	


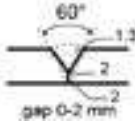

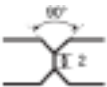
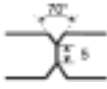
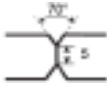
Note: If a cored wire is used, an extra 2 volts are required in the high current range (>600A) to spread the extra weld metal (25-30%).



## Submerged Arc Welding Joint Preparations

Typical welding data and recommended joint preparations for submerged arc welding.

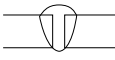
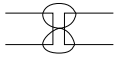


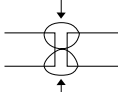
### Stainless Steel

Type of joint	Plate thickness mm	Wire diameter mm	Run No.	Welding current A	Arc voltage V	Welding speed cm/min
	6	2.4	1	300	33	40
		2.4	2	400	34	40
		3.2	1	400	34	100
		3.2	2	500	34	130
	8	2.4	1	350	33	40
		2.4	2	450	34	40
		3.2	1	450	34	55
		3.2	2	550	34	55
		4	1	450	34	100
		4	2	550	34	130
	10	2.4	1	420	30	45
		2.4	2	420	32	40
		2.4	3	420	32	40
		3.2	1	500	30	55
		3.2	2	500	32	55
		4	1	550	31	65
	12	4	2	550	34	100
		4	1	600	32	60
	20	4	2	600	34	80
		4	1	575	31	60
		4	2	600	32	60
		4	3-5	600	34	65
	25	4	1	550	32	60
		4	2	600	34	50
		4	3	600	34	50
		4	4-8	600	34	60
	6	2	1-n	300	31	60
	10	3.2	1-n	380	32	65
	16	3.2	1-n	450	34	70
	8	4	1	450	32	90
		4	2	550	34	85
	10	4	1	500	32	65
		4	2	600	34	85
	12	4	1	500	32	60
		4	2	600	34	70
	14	4	1	550	32	60
		4	2	600	34	60

## Calculation of Electrode Consumption






In the tables, joint cross section, theoretical joint volume and kg weld metal per metre length of welded joint are given. The electrode consumption per metre of welded joint is obtained by dividing the number of kg of weld metal by N, where N is the kg of weld metal per kg of electrode and is given for each electrode on their respective pages.

### Square butt joints: joint volumes and weld metal weights

Position	Plate Thickness, mm	Gap, mm	Volume/Length, cm <sup>3</sup> /m	Weight/Length weld metal, kg/m
 Flat	1	0	2	0.02
	1.5	0.5	3	0.03
	2	1	4	0.03
	3	1.5	7	0.05
 Flat	4	2	17	0.13
	5	2	21	0.16
	6	2.5	27	0.21
	7	3	36	0.28
 Horizontal-Vertical	1	0	2.5	0.02
	1.5	0.5	4	0.03
	2	1	5	0.04
	3	1.5	9.5	0.07
 Horizontal-Vertical	4	2	22	0.17
	5	2	25	0.20
	6	2.5	32	0.25
	7	3	42	0.33
 Overhead	4	2	9	0.07
	5	2	10.5	0.08
	6	2.5	13	0.10
	7	3	16	0.13
	4	2	10.5	0.08
	5	2	16	0.13
	6	2.5	18	0.14
	7	3	21	0.16

## Calculation of Electrode Consumption

### Square V-joints: volumes and weld metal weights

Plate Thickness mm	Gap mm	 Flat			 Flat			 Vertical			 Overhead			 Horizontal-Vertical		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
4	1	11.5	11	0.09	13	12.5	0.10	15	16.5	0.13	17.5	18	0.14	13	14.5	0.11
5	1	16.5	16	0.13	19.5	19	0.15	22.5	24.5	0.19	26	28	0.22	19.5	21	0.16
6	1	23	21.5	0.17	27	25.5	0.20	31	37	0.29	36	38.5	0.30	27	30	0.24
7	1.5	33.5	32.5	0.26	39	38	0.30	45	49	0.38	51.5	56	0.44	39	42	0.33
8	1.5	42	40	0.31	49	46.5	0.37	57	59.5	0.47	65.5	70	0.55	49	56	0.44
9	1.5	51	48	0.38	60.5	56	0.44	70	75.5	0.59	81.5	87.5	0.69	60.5	65	0.51
10	2	66.5	62	0.49	77.5	72	0.57	90	96.5	0.76	104	109	0.86	77.5	81	0.64
11	2	78.5	71.5	0.56	92	83.5	0.66	107	113	0.89	124	130	1.02	92	96.5	0.76
12	2	91	83	0.65	107	97.5	0.77	125	134	1.05	145	157	1.23	107	113	0.89
14	2	120	110	0.86	141	130	1.02	165	171	1.34	193	204	1.60	141	159	1.17
15	2	135	123	0.97	160	146	1.15	188	197	1.55	219	231	1.81	160	171	1.34
16	2	151	132	1.04	180	157	1.23	211	223	1.75	247	257	2.02	180	186	1.46
18	2	189	170	1.33	223	204	1.60	263	276	2.17	308	320	2.51	223	233	1.83
20	2	227	208	1.63	271	247	1.94	320	334	2.62	376	396	3.11	271	281	2.21
25	2	341	313	2.46	411	375	2.94	488	510	4.00	577	606	4.76	411	425	3.34

1 - Theoretical volume cm<sup>3</sup>/m





2 - Actual joint volume cm<sup>3</sup>/m (taking account of transverse shrinkage)

3 - Deposited weld metal kg/m





Position	Plate Thickness, mm	Weight/Length, kg/m	Electrode Diameter, mm
Flat	6-12	0.10	3.25
Flat	>2	0.15	4
Vertical	>8	0.15	3.25
Horizontal-Vertical	>8	0.15	3.25
Overhead	>10	0.10	3.25

## Calculation of Electrode Consumption

### Corner welds: actual joint volumes and weld metal weights

Plate Thickness	Section Size								
		Flat		Flat		Vertical		Overhead	
mm	mm <sup>2</sup>	cm <sup>3</sup> /m	kg/m	cm <sup>3</sup> /m	kg/m	cm <sup>3</sup> /m	kg/m	cm <sup>3</sup> /m	kg/m
2	2	3.5	0.03	3	0.02	3.5	0.03	3.5	0.03
3	4.5	7	0.05	7	0.5	7	0.05	7.5	0.06
4	8	9	0.07	9	0.07	9.5	0.07	10.5	0.08
5	12.5	13	0.10	13.5	0.11	14.5	0.11	16	0.13
6	18	18.5	0.15	19.5	0.15	21	0.16	22	0.17
7	24.5	25.5	0.20	26.5	0.21	27.5	0.22	31.5	0.25
8	32	33	0.26	34.5	0.27	36	0.28	40.5	0.32
9	40.5	41.5	0.33	43	0.34	45.5	0.36	51	0.40
10	50	51.5	0.40	53.5	0.42	56	0.44	64	0.50
11	60.5	63	0.49	67	0.53	72	0.57	78.5	0.62
12	72	74.5	0.58	79	0.62	84.5	0.66	93	0.73
15	113	116	0.91	123	0.97	132	1.04	141	1.11
18	162	167	0.31	174	1.37	190	1.49	204	1.60
20	200	206	1.62	206	1.62	227	1.78	252	1.98
22	242	248	1.95	255	2.00	275	2.16	204	2.39
25	323	329	2.58	331	2.60	370	2.90	405	3.18

### Fillet welds: actual joint volumes and weld metal weights

Throat Thickness	Section Size								
		Flat		Flat		Vertical		Overhead	
mm	mm <sup>2</sup>	cm <sup>3</sup> /m	kg/m	cm <sup>3</sup> /m	kg/m	cm <sup>3</sup> /m	kg/m	cm <sup>3</sup> /m	kg/m
2	4	5	0.04	6	0.05	5.5	0.04	5.5	0.04
2.5	6.5	7.5	0.06	8.5	0.07	8	0.06	8.5	0.07
3	9	10.5	0.08	12.5	0.10	11	0.09	12	0.09
3.5	12.5	14	0.11	16	0.13	15	0.12	16.5	0.13
4	16	18	0.14	21	0.16	19.5	0.15	22	0.17
4.5	20.5	22.5	0.18	26	0.20	24.5	0.19	26.5	0.21
5	25	27.5	0.22	31.5	0.25	30.5	0.24	33	0.26
5.5	30.5	33.5	0.26	37	0.29	36	0.28	40.5	0.32
6	36	40	0.31	42	0.33	43	0.34	47.5	0.37
6.5	42.5	46.5	0.37	49.5	0.39	51	0.40	56	0.44
7	49	54.5	0.43	57	0.45	56	0.44	65	0.51
7.5	56.5	60.5	0.47	65	0.51	64	0.50	73.5	0.58
8	64	70	0.55	73.5	0.58	76.5	0.60	82.5	0.65
9	81	88	0.69	94	0.74	95	0.75	109	0.86
10	100	108	0.85	114	0.89	116	0.91	130	1.02
11	121	131	1.03	138	1.08	143	1.12	157	1.23
12	144	155	1.22	162	1.27	169	1.33	188	1.48
13	169	179	1.41	190	1.49	195	1.53	220	1.73
14	196	207	1.62	224	1.76	227	1.78	257	2.02
15	225	237	1.86	248	1.95	264	2.07	294	2.31





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