Arosta® 304L

Stainless steel electrode

Classification

AWS A5.4	: E308L-16
EN 1600	: E 19 9 L R 12

Temperature range

pressurized parts : -196...+350°C
oxidation resistance : to 800°C

General description

Rutile basic all position stainless steel electrode for 304L or equivalent steels
Excellent corrosion resistance in oxidizing environments such as nitric acid
High resistance to intergranular corrosion
Smooth bead appearance
Easy slag release
Strong electrode coating
Weldable on AC and DC
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Approvals

BV	TÜV
304L	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.02	0.80	0.80	19.5	9.7	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-196°C
Required: AWS A5.4		not required	min. 520	min. 35	not required		
EN 1600		min. 320	min. 510	min. 30	not required		
Typical values	AW	440	580	43	70	60	24

Packaging and available sizes

	Diameter (mm)	1.5	2.0	2.5	3.2	4.0	5.0
	Length (mm)	250	300	350	350	350	350
Unit: Box	Pieces / unit	125	225	135	150	85	65
	Net weight/unit (kg)	0.7	2.3	2.6	4.8	4.9	4.8
Unit: SRP	Pieces / unit	-	-	69	56	29	-
	Net weight/unit (kg)	-	-	1.4	1.9	1.5	-
Unit: Linc Can™	Pieces / unit	-	-	222	141	84	-
	Net weight/unit (kg)	-	-	4.6	4.5	4.3	-

Identification Imprint: 308L-16 / AROSTA 304 L Tip Color: light blue

Arosta® 304L: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNi 19 11		1.4306	(TP)304L	S30403
				CF-3	J92500
	X2 CrNiN 18 10		1.4311	(TP)304LN	S30453
				302,304	S30400
Medium carbon (C >0.03%)					
	X4 CrNi 18 10		1.4301	(TP)304	S30409
		GX5 CrNi 19 10	1.4308	CF 8	J92600
Ti-, Nb stabilized					
	X6 CrNiTi 18 10		1.4541	(TP)321	S32100
				(TP)321H	S32109
	X6 CrNiNb 18 10		1.4550	(TP)347	S34700
				(TP)347H	S34709
		GX5 CrNiNb 19 10	1.4552	CF-8C	J92710

SMAW

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
1.5 x 250	20 - 40	DC+	25	19	0.44	5.5	330	1.82
2.0 x 300	30 - 50	DC+	43	45	0.55	10.4	154	1.59
2.5 x 350	40 - 75	DC+	51	88	0.86	19.2	82	1.59
3.2 x 350	60 - 110	DC+	57	158	1.3	32.2	49	1.59
4.0 x 350	80 - 150	DC+	65	245	1.7	47.3	32	1.52
5.0 x 350	140 - 220	DC+	66	390	2.7	76.7	20	1.56

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
1.5		35A	35A			
2.0		45A	45A	40A	40A	40A
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		
5.0	180A	180A	180A			

For root passes DC- is recommended.

EMR SAHARA®

Limarosta® 304L

Stainless steel electrode

SMAW

Classification

AWS A5.4 : E308L-17
EN 1600 : E 19 9 L R 12

Temperature range

pressurized parts : -196...+350°C
oxidation resistance : to 800°C

General description

A rutile-basic all position stainless steel electrode for 304L or equivalent steels
Mirror like bead appearance
Self releasing slag
Excellent side wall wetting, no undercut
High resistance to porosity
Weldable on AC and DC
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Approvals

DNV	GL	LR	RMRS	TÜV
308LH10	4550	304L	304L	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.025	0.75	0.95	19.0	9.7	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 520	min. 35	not required	
EN 1600		min. 320	min. 510	min. 30	not required	
Typical values	AW	440	600	45	75	60

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	4.0	5.0
	Length (mm)	300	350	350	450	450
Unit: Box	Pieces / unit	125	125	135	85	55
	Net weight/unit (kg)	2.3	2.7	4.7	5.8	5.8
Unit: SRP	Pieces / unit	60	65	52	28	22
	Net weight/unit (kg)	0.6	1.4	1.8	2.0	2.4
Unit: Linc Can™	Pieces / unit	-	203	124	78	-
	Net weight/unit (kg)	-	4.4	4.3	5.3	-

Identification Imprint: 308L-17 / LIMAROSTA 304 L Tip Color: light blue

Limarosta® 304L: rev. EN 21

LINCOLN® ELECTRIC

Limarosta® 304L

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNi 19 11		1.4306	(TP)304L	S30403
				CF-3	J92500
	X2 CrNiN 18 10		1.4311	(TP)304LN	S30453
				302,304	S30400
Medium carbon (C >0.03%)					
	X4 CrNi 18 10		1.4301	(TP)304	S30409
		GX5 CrNi 19 10	1.4308	CF 8	J92600
Ti-, Nb stabilized					
	X6 CrNiTi 18 10		1.4541	(TP)321	S32100
				(TP)321H	S32109
	X6 CrNiNb 18 10		1.4550	(TP)347	S34700
				(TP)347H	S34709
		GX5 CrNiNb 19 10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.0 x 300	35 - 50	DC+	40	51	0.59	11.6	151	1.75
2.5 x 350	45 - 80	DC+	51	103	0.88	21.7	81	1.75
3.2 x 350	80 - 115	DC+	57	177	1.3	34.3	48	1.64
4.0 x 450	100 - 155	DC+	83	373	1.8	68.0	24	1.64
5.0 x 450	150 - 220	DC+	85	577	2.7	106.2	16	1.67

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.0		45A	45A	40A	40A	40A
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A			
5.0	180A	180A				

Vertarosta® 304L

Stainless steel electrode

Classification

AWS A5.4 : E308L-15
EN 1600 : E 19 9 L R 21

Temperature range

pressurized parts : -196...+350°C
oxidation resistance : to 800°C

General description

A rutile-basic all position stainless steel electrode for 304L or equivalent steels
Specially developed for vertical down welding on DC
Root passes in grooves with root opening
High corrosion resistance in oxidizing environments

Welding positions

ISO/ASME PG/3Gdown

Current type

DC +

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.02	0.8	0.7	20.0	9.8	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 520	min. 35	not required	
EN 1600		min. 320	min. 510	min. 30	not required	
Typical values	AW	440	600	40	70	50

Packaging and available sizes

	Diameter (mm)	2.5	3.2
	Length (mm)	300	300
Unit: Box	Pieces / unit	190	130
	Net weight/unit (kg)	2.9	3.1

Identification Imprint: 308L-15 / VERTAROSTA 304 L Tip Color: grey

Vertarosta® 304L: rev. EN 21

Vertarosta® 304L

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNi 19 11		1.4306	(TP)304L	S30403
				CF-3	J92500
	X2 CrNiN 18 10		1.4311	(TP)304LN	S30453
				302,304	S30400
Medium carbon (C >0.03%)					
	X4 CrNi 18 10		1.4301	(TP)304	S30409
		GX5 CrNi 19 10	1.4308	CF 8	J92600
Ti-, Nb stabilized					
	X6 CrNiTi 18 10		1.4541	(TP)321	S32100
				(TP)321H	S32109
	X6 CrNiNb 18 10		1.4550	(TP)347	S34700
				(TP)347H	S34709
		GX5 CrNiNb 19 10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 300	60 - 70	DC+	44	65	0.81	15.0	101	1.52
3.2 x 300	80 - 110	DC+	51	117	1.2	23.5	59	1.39

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	3G down
2.5	70A
3.2	100A

Stainless steel electrode

Classification

AWS A5.4 : E308L-15
EN 1600 : E 19 9 L B 22

Temperature range

pressurized parts : -196...+350°C
oxidation resistance : to 800°C

General description

Basic coated electrode for low temperature applications
Low carbon content, good impact properties down to -196°C
Good weldability and smooth bead appearance
High resistance against oxidation up to 800°C
Welding on DC electrode + is recommended

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

DC +

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.025	1.8	0.4	19.0	10.0	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -196°C
Required: AWS A5.4		not required	min. 520	min. 35	not required	
EN 1600		min. 320	min. 510	min. 30	not required	
Typical values	AW	450	600	40	80	40

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	120	150	100
	Net weight/unit (kg)	2.4	4.8	4.8

Identification Imprint: 308L-15 / JUNGO 304 L Tip Color: dark blue

Jungo® 304L: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNi 19 11		1.4306	(TP)304L	S30403
				CF-3	J92500
	X6 CrNiNb 18 10		1.4311	(TP)304LN	S30453
				302,304	S30400
Medium carbon (C >0.03%)					
	X4 CrNi 18 10		1.4301	(TP)304	S30409
		GX5 CrNi 19 10	1.4308	CF 8	J92600
Ti-, Nb stabilized					
	X6 CrNiTi 18 10		1.4541	(TP)321	S32100
				(TP)321H	S32109
	X6 CrNiNb 18 10		1.4550	(TP)347	S34700
				(TP)347H	S34709
		GX5 CrNiNb 19 10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	55 - 65	DC+	50	86	0.82	19.1	88	1.89
3.2 x 350	70 - 90	DC+	51	135	1.3	31.6	53	1.72
4.0 x 350	90 - 120	DC+	66	206	1.7	47.0	32	1.56

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	60A	60A	60A	60A	60A	60A
3.2	95A	90A	90A	75A	75A	75A
4.0	125A	110A	125A	100A	100A	100A

EMR SAHARA®

Limarosta® 304L-130

Stainless steel electrode

Classification

AWS A5.4 : E308L-17
EN 1600 : E 19 9 L R 53

Temperature range

pressurized parts : -120...+350°C
oxidation resistance : to 800°C

SMAW

General description

A rutile-basic all position stainless steel electrode for 304L or equivalent steels
High recovery (130%) providing high welding speed
Good side wall wetting, no undercut, self releasing slag
Only for down hand position
Excellent for fillet welds and filling V- and X-grooves
Weldable on AC and DC+ polarity
Only available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME PA/1G PB/2F

Current type

AC / DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.02	0.6	0.9	19.0	10.0	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 520	min. 35	not required	
EN 1600		min. 320	min. 510	min. 30	not required	
Typical values	AW	440	600	40	70	50

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
Unit: SRP	Pieces / unit	31	23	19
	Net weight/unit (kg)	1.6	2.0	2.3

Identification Imprint: 308L-17 / LIMAROSTA 304 L-130 Tip Color: light blue

Limarosta® 304L-130: rev. EN 21

LINCOLN® ELECTRIC

Limarosta® 304L-130

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNi 19 11		1.4306	(TP)304L	S30403
				CF-3	J92500
	X2 CrNiN 18 10		1.4311	(TP)304LN	S30453
				302,304	S30400
Medium carbon (C >0.03%)					
	X4 CrNi 18 10		1.4301	(TP)304	S30409
		GX5 CrNi 19 10	1.4308	CF 8	J92600
Ti-, Nb stabilized					
	X6 CrNiTi 18 10		1.4541	(TP)321	S32100
				(TP)321H	S32109
	X6 CrNiNb 18 10		1.4550	(TP)347	S34700
				(TP)347H	S34709
		GX5 CrNiNb 19 10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
3.2 x 450	90 - 120	DC+	69	241	1.8	59.0	28	1.67
4.0 x 450	120 - 160	DC+	76	378	2.5	87.4	19	1.64
5.0 x 450	160 - 230	DC+	84	616	3.6	135.0	12	1.64

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F
3.2	110A	105A
4.0	155A	150A
5.0	175A	175A

Arosta® 347

Stainless steel electrode

Classification

AWS A5.4	: E347-16
EN 1600	: E 19 9 Nb R 12

Temperature range

pressurized parts : -120...+400°C
oxidation resistance : to 800°C

General description

Rutile-basic all position stainless steel electrode
For Ti or Nb stabilized 304 or equivalent steels
Excellent resistance in oxidizing environments such as nitric acid
High resistance to intergranular corrosion
Easy slag release and smooth bead appearance
Strong electrode coating
Weldable on AC and DC
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Nb	FN (acc. WRC 192)
0.03	0.8	0.8	19.5	9.8	0.35	06-12

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-60°C
Required: AWS A5.4		not required	min. 550	min. 25	not required		
EN 1600		min. 350	min. 550	min. 25	not required		
Typical values	AW	500	630	35	70	50	35

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	120	130	90
	Net weight/unit (kg)	2.6	4.7	4.9
Unit: SRP	Pieces / unit	69	52	28
	Net weight/unit (kg)	1.4	1.8	1.4

Identification	Imprint: 347-16 / AROSTA 347	Tip Color: gold	**Arosta® 347: rev. EN 21**

Arosta® 347

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Ti-, Nb stabilized					
	X6CrNiTi 18-10		1.4541	(TP)321	S32100
				(TP)321H	S32109
	X6CrNiNb 18-10		1.4550	(TP)347	S34700
				(TP)347H	S34709
		GX5CrNiNb 19-10	1.4552	CF-8C	J92710
				302	
Non stabilized					
	X4CrNi 18-10		1.4301	(TP)304	S30400
	X2CrNi 19-11		1.4306	(TP)304L	S30403
		GX5CrNi 19-10	1.4308	CF-8	J92600
			1.4312		
				(TP)304H	S30409

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 75	DC+	52	78	0.87	20.7	80	1.66
3.2 x 350	60 - 110	DC+	54	119	1.4	34.9	48	1.67
4.0 x 350	80 - 150	DC+	64	210	1.7	49.0	33	1.61

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		

For root passes DC- is recommended.

Jungo® 347

Stainless steel electrode

Classification

AWS A5.4 : E347-15
EN 1600 : E 19 9 Nb B 22

Temperature range

pressurized parts : -120...+400°C
oxidation resistance : to 800°C

General description

Basic coated all position stainless steel electrode
For Ti or Nb stabilized 304 or equivalent steels
Excellent resistance in oxidizing environments such as nitric acid
High resistance to intergranular corrosion
Easy slag release and smooth bead appearance
Strong electrode coating

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

DC +

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Nb	FN (acc. WRC 192)
0.02	1.6	0.5	20.0	10.0	0.40	06-12

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-120°C
Required: AWS A5.4		not required	min. 520	min. 30	not required		
EN 1600		min. 350	min. 550	min. 25	not required		
Typical values	AW	500	630	35	80	50	40

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	450
Unit: Box	Pieces / unit	150	100	75
	Net weight/unit (kg)	4.8	4.4	6.8

Identification	Imprint: 347-15 / JUNGO 347	Tip Color: brown	**Jungo® 347: rev. EN 21**

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Ti-, Nb stabilized					
	X6 CrNiTi 18-10		1.4541	(TP)321	S32100
				(TP)321H	S32109
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
				(TP)347H	S34709
		GX5CrNiNb19-10	1.4552	CF-8C	J92710
				302	
Non stabilized					
	X4 CrNi 18-10		1.4301	(TP)304	S30400
	X2 CrNi 19-11		1.4306	(TP)304L	S30403
		GX5 CrNi 19-10	1.4308	CF-8	J92600
			1.4312		
				(TP)304H	S30409

SMAW

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
3.2 x 350	80 - 100	DC+	51	135	1.3	32.4	53	1.72
4.0 x 350	100 - 130	DC+	66	206	1.7	44.4	32	1.56
5.0 x 450	130 - 160	DC+	69	378	2.3	90.9	23	1.92

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
3.2	95A	90A	90A	75A	75A	75A
4.0	125A	110A	125A	100A	100A	100A
5.0	150A	150A				

Arosta® 316L

Stainless steel electrode

Classification

AWS A5.4	: E316L-16
EN 1600	: E 19 12 3 L R 12

Temperature range

pressurized parts : -120....+350°C
oxidation resistance : n.a.

General description

Rutile-basic all position stainless steel electrode for 316L or equivalent steels
Molybdenum level min. 2.7 %
High resistance to general and intergranular corrosion
Smooth weld appearance
Easy slag release
Strong electrode coating
Weldable on AC and DC
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Approvals

ABS	BV	DNV	GL	LR	RINA	RMRS	TÜV
+	316L	316L	4571	316L	316L	316L	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.02	0.8	0.8	18.0	11.5	2.85	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C	Impact ISO-V(J) -120°C
Required: AWS A5.4		not required	min. 490	min. 30	not required	
EN 1600		min. 320	min. 510	min. 25	not required	
Typical values	AW	450	580	39	60	40

Packaging and available sizes

	Diameter (mm)	1.5	2.0	2.5	3.2	4.0	5.0
	Length (mm)	250	300	350	350	350	350
Unit: Box	Pieces / unit	160	225	135	150	90	65
	Net weight/unit (kg)	0.8	2.4	2.7	4.9	4.8	5.0
Unit: SRP	Pieces / unit		84	69	56	29	-
	Net weight/unit (kg)		0.9	1.4	1.8	1.5	-
Unit: Linc Can™	Pieces / unit		-	217	134	80	-
	Net weight/unit (kg)		-	4.7	4.4	4.2	-

Identification Imprint: 316L-16 / AROSTA 316 L Tip Color: pink

Arosta® 316L: rev. EN 22

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
Medium carbon (C >0.03%)					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
Ti-, Nb stabilized					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
1.5 x 250	20 - 40	DC+	25	19	0.44	5.8	330	1.92
2.0 x 300	30 - 50	DC+	42	44	0.58	10.7	150	1.61
2.5 x 350	40 - 75	DC+	50	86	0.88	19.9	82	1.61
3.2 x 350	60 - 110	DC+	57	157	1.3	32.9	49	1.61
4.0 x 350	80 - 150	DC+	64	240	1.7	49.2	32	1.59
5.0 x 350	140 - 220	DC+	67	396	2.6	77.1	20	1.59

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
1.5		35A	35A			
2.0		45A	45A	40A	40A	40A
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		
5.0	180A	180A	180A			

For root passes DC- is recommended.

Arosta® 316LP

Stainless steel electrode

Classification

AWS A5.4 : E316L-16
EN 1600 : E 19 12 3 L R 12

Temperature range

pressurized parts : -120....+350°C
oxidation resistance : n.a.

General description

Rutile-basic all position stainless steel electrode for 316L or equivalent steels
Specially for welding stainless steel pipes with diameters of over 50 mm with wall thickness of about 2 mm
Welding on site in the pulp and paper industry
Easy welding in all positions, easy weld pool control, full penetration, good slag release
Molybdenum level min. 2.7 %

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PG/3Gdown	PG/5Gdown

Current type

AC / DC + / -

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.02	0.7	0.85	18.1	11.5	2.85	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 490	min. 30	not required
EN 1600		min. 320	min. 510	min. 25	not required
Typical values	AW	450	580	39	60

Packaging and available sizes

	Diameter (mm)	2.0	2.5
	Length (mm)	250	250
Unit: Box	Pieces / unit	215	150
	Net weight/unit (kg)	1.9	2.0

Identification Imprint: 316L-16 Tip Color: pink

Arosta® 316LP: rev. EN 22

Arosta® 316LP

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
Medium carbon (C >0.03%)					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
Ti-, Nb stabilized					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.0 x 250	30 - 60	DC+						
2.5 x 250	30 - 70	DC+						

* stub end 35 mm

Limarosta® 316L

Stainless steel electrode

Classification

AWS A5.4 : E316L-17
EN 1600 : E 19 12 3 L R 12

Temperature range

pressurized parts : -120...+350°C
oxidation resistance : n.a.

General description

A rutile-basic all position stainless steel electrode for 316L or equivalent steels
Molybdenum level min. 2.7 %
Mirror like bead appearance
Self releasing slag
Good side wall fusion, no undercut
High resistance to porosity
Weldable on AC and DC
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Approvals

DNV	LR	RMRS	TÜV
316LH10	316L	316L	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.02	0.8	1.0	18.0	11.5	2.8	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C	Impact ISO-V(J) -105°C
Required: AWS A5.4		not required	min. 490	min. 30	not required		
EN 1600		min. 320	min. 510	min. 25	not required		
Typical values	AW	450	580	40	70	60	40

Packaging and available sizes

	Diameter (mm)	1.5	2.0	2.5	3.2	4.0	5.0
	Length (mm)	250	300	350	350	450	450
Unit: Box	Pieces / unit	140	200	125	135	85	55
	Net weight/unit (kg)	0.7	2.3	2.7	4.8	5.9	5.9
Unit: SRP	Pieces / unit		57	65	52	28	22
	Net weight/unit (kg)		0.6	1.5	1.8	2.0	2.4
Unit: Linc Pack	Pieces / unit		-	47	28	-	-
	Net weight/unit (kg)		-	1.0	1.0	-	-
Unit: Linc Can™	Pieces / unit		-	202	124	79	-
	Net weight/unit (kg)		-	4.4	4.3	5.3	-

Identification Imprint: 316L-17 / LIMAROSTA 316 L Tip Color: pink

Limarosta® 316L: rev. EN 21

Limarosta® 316L

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
Medium carbon (C >0.03%)					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
Ti-, Nb stabilized					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
1.5 x 250	20 - 40							
2.0 x 300	35 - 50	DC+	39	49	0.59	11.4	155	1.79
2.5 x 350	45 - 80	DC+	46	92	0.95	21.5	83	1.79
3.2 x 350	80 - 115	DC+	51	157	1.5	35.3	48	1.69
4.0 x 450	100 - 155	DC+	75	339	1.9	69.2	24	1.69
5.0 x 450	150 - 220	DC+	85	577	2.7	107.8	16	1.69

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.0		45A	45A	40A	40A	40A
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A			
5.0	180A	180A				

Vertarosta® 316L

Stainless steel electrode

Classification

AWS A5.4 : E316L-15
EN 1600 : E 19 12 3 L R 21

Temperature range

pressurized parts : -60...+400°C
oxidation resistance : n.a.

General description

A rutile-basic all position stainless steel electrode for 316L or equivalent steels
Molybdenum level min. 2.7 %
Specially developed for vertical down welding on DC
Root passes in grooves with root opening
High general corrosion resistance

Welding positions

ISO/ASME PG/3Gdown

Current type

AC / DC +

Approvals

ABS	BV	DNV	GL	LR	TÜV
+	316L	316L	4429	316L	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.02	0.7	0.85	18.0	11.5	2.8	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-60°C
Required: AWS A5.4		not required	min. 490	min. 30	not required		
EN 1600		min. 320	min. 510	min. 25	not required		
Typical values	AW	500	620	35	50	45	35

Packaging and available sizes

	Diameter (mm)	2.5	3.2
	Length (mm)	300	300
Unit: Box	Pieces / unit	190	130
	Net weight/unit (kg)	2.9	3.1

Identification Imprint: 316L-15 / VERTAROSTA 316 L Tip Color: brown

Vertarosta® 316L: rev. EN 21

LINCOLN® ELECTRIC

Vertarosta® 316L

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
Medium carbon (C >0.03%)					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
Ti-, Nb stabilized					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 300	60 - 70	DC+	44	71	0.83	14.9	98	1.47
3.2 x 300	80 - 110	DC+	47	118	1.3	23.9	59	1.41

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	3G (down)
2.5	70A
3.2	100A

Stainless steel electrode

Classification

AWS A5.4 : E316L-15
EN 1600 : E 19 12 3 L B 22

Temperature range

pressurized parts : -120...+350°C
oxidation resistance : n.a.

General description

Basic coated electrode for low temperature applications
Good impact values down to -196°C
Good weldability and smooth bead appearance
Low carbon content
Service temperature up to 400°C
High resistance against general and intercristalline corrosion

Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

Current type

DC +

Approvals

BV
316LBT

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.025	1.6	0.4	18.5	11.0	2.7	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -196°C
Required: AWS A5.4		not required	min. 490	min. 30	not required	
EN 1600		min. 320	min. 510	min. 25	not required	
Typical values	AW	450	650	35	100	35

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	135	150	100	65
	Net weight/unit (kg)	2.7	4.8	4.8	6.6
Unit: SRP	Pieces / unit	48	56	30	
	Net weight/unit (kg)	1,4	1,8	1,4	

Identification Imprint: 316L-15 / JUNGO 316 L Tip Color: red

Jungo® 316L: rev. EN 22

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
Medium carbon (C >0.03%)					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
Ti-, Nb stabilized					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	50 - 70	DC+	50	86	0.82	19.2	88	1.89
3.2 x 350	60 - 90	DC+	51	135	1.3	31.3	53	1.72
4.0 x 350	80 - 120	DC+	66	206	1.7	47.6	32	1.56

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	60A	60A	60A	60A	60A	60A
3.2	95A	90A	90A	75A	75A	75A
4.0	125A	110A	125A	100A	100A	100A

Limarosta® 316L-130

Stainless steel electrode

Classification

AWS A5.4 : E316L-17
EN 1600 : E 19 12 3 L R 53

Temperature range

pressurized parts : -120...+350°C
oxidation resistance : n.a.

General description

A rutile-basic all position stainless steel electrode for 316L or equivalent steels
Molybdenum level min. 2.7 %
High recovery (130%) providing high welding speed
Excellent side wall fusion, no undercut
Only for down hand position
Excellent for fillet welds and filling V- and X-grooves
Weldable on AC and DC+ polarity
Only available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME PA/1G PB/2F

Current type

AC / DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.02	0.65	1.0	18.0	11.5	2.8	04-10

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-105°C
Required: AWS A5.4		not required	min. 490	min. 30	not required		
EN 1600		min. 320	min. 510	min. 25	not required		
Typical values	AW	450	580	40	70	60	40

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
Unit: SRP	Pieces / unit	29	23	19
	Net weight/unit (kg)	1.7	2.0	2.3

Identification Imprint: 316L-17 / LIMAROSTA 316 L-130 Tip Color: pink

Limarosta® 316L-130: rev. EN 21

Limarosta® 316L-130

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
Medium carbon (C >0.03%)					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
Ti-, Nb stabilized					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
3.2 x 450	90 - 120	DC+	68	227	1.9	60.4	28	1.67
4.0 x 450	120 - 160	DC+	78	376	2.5	91.0	18	1.67
5.0 x 450	160 - 200	DC+	81	577	3.7	143.7	12	1.72

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F
3.2	110A	105A
4.0	155A	150A
5.0	175A	175A

Stainless steel electrode

Classification

AWS A5.4 : E318-16
EN 1600 : E 19 12 3 Nb R 12

Temperature range

pressurized parts : -60...+400°C
oxidation resistance : n.a.

General description

Rutile basic all position stainless steel electrodes for welding Ti or Nb stabilized 316 or equivalent steels
High resistance to general and intergranular corrosion
Smooth bead appearance
Easy slag release
Strong electrode coating
Weldable on AC and DC

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	Nb	FN (acc. WRC 192)
0.03	0.8	0.85	18.0	11.5	2.7	0.35	06-12

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-60°C
Required: AWS A5.4		not required	min. 550	min. 25	not required		
EN 1600		min. 350	min. 550	min. 25	not required		
Typical values	AW	500	630	38	60	50	35

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	4.0	5.0
	Length (mm)	300	350	350	350	450
Unit: Box	Pieces / unit	225	135	140	90	65
	Net weight/unit (kg)	2.4	2.8	5.0	4.8	6.7

Identification Imprint: 318-16 / AROSTA 318 Tip Color: white

Arosta® 318: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
Medium carbon (C >0.03%)					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
Ti-, Nb stabilized					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.0 x 300	30 - 60	DC+	36	36	0.65	10.7	152	1.64
2.5 x 350	40 - 90	DC+	46	82	0.98	20.3	80	1.64
3.2 x 350	70 - 110	DC+	52	137	1.4	32.1	48	1.54
4.0 x 350	90 - 140	DC+	61	212	1.9	48.6	31	1.49

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.0		45A	45A	40A	40A	40A
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		

For root passes DC- is recommended.

Stainless steel electrode

Classification

AWS A5.4 : E318-15*
EN 1600 : E 19 12 3 Nb B 22

*: Deviation, see remarks

General description

Basic coated electrode for stabilized CrNiMo-steels
Service temperature up to 400°C
Good bridging properties
Specially developed for highly restrained structures

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

DC + / -

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	Nb	FN (acc. WRC 192)
0.025	1.5	0.4	18.0	11.0	2.7	0.5	06-12

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.4		not required	min. 550	min. 25	not required
EN 1600		min. 350	min. 550	min. 25	not required
Typical values	AW	430	650	30	90

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	135	150	100
	Net weight/unit (kg)	2.6	4.8	4.6

Identification Imprint: JUNGO 318 Tip Color: red

Jungo® 318: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
Medium carbon (C >0.03%)					
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
		GX5 CrNiMo 19-11	1.4408	CF 8M	J92900
Ti-, Nb stabilized					
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	50 - 70	DC+	50	86	0.82	17.6	88	1.89
3.2 x 350	80 - 100	DC+	51	135	1.3	28.5	53	1.72
4.0 x 350	100 - 130	DC+	66	206	1.7	43.8	32	1.56

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	60A	60A	60A	60A	60A	60A
3.2	95A	90A	90A	75A	75A	75A
4.0	125A	110A	125A	100A	100A	100A

Remarks/ Application advice

Deviations: chemical composition:

Ni = 10.0 - 13.0% AWS: Ni = 11.0 - 14.0%

Arosta® 4439

Stainless steel electrode

Classification

EN 1600 : E 18 16 5 N L R 32

Temperature range

pressurized parts : -120...+400°C
oxidation resistance : n.a.

General description

Rutile-basic fully austenitic 4.5% Mo-containing stainless steel electrode
Electrode for welding AISI 317LN or equivalent stainless steels
High resistance to pitting corrosion, intergranular corrosion and stress corrosion
Good impact values at low temperature
Easy slag release and smooth bead appearance

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Approvals

BV	DNV	GL	TÜV
UP	+	4439	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	N	FN (acc. WRC 192)
0.02	1.3	0.8	18.0	17.0	4.6	0.18	<0.3

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-196°C
Required: EN 1600		min. 300	min. 480	min. 25	not required		
Typical values	AW	460	650	40	70	70	50

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	140	140	100
	Net weight/unit (kg)	2.8	4.7	5.1

Identification Imprint: AROSTA 4439 Tip Color: red

Arosta® 4439: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI	UNS
Fully austenitic CrNiMo corrosion resistant steels					
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429	(TP)316LN	S31653
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMo 18-15-4		1.4438	317L	S31725
	X2 CrNiMoN 17-13-5		1.4439	317LN	S31726
	G-X2 CrNiMoN 17-13-4	GX2 CrNiMo 17-13-4	1.4446		
	G-X6 CrNiMo 17-13	GX6 CrNiMo 17-13	1.4448		

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 75	DC+	78	153	0.58	19.8	79	1.56
3.2 x 350	60 - 110	DC+	55	152	1.3	33.8	49	1.67
4.0 x 350	90 - 145	DC+	67	291	1.8	51.6	29	1.47

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	90A	100A	65A	65A	65A
4.0	130A	125A	130A	80A		

For root passes DC- is recommended.

Remarks/ Application advice

Welding with Heat-Input max. 1.5 kJ/mm
Interpass temperature max. 150°C

Jungo® 4455

Stainless steel electrode

Classification

AWS A5.4 : E316LMn-15
EN 1600 : E 20 16 3 Mn N L B 22

Temperature range

pressurized parts : -269 ... +350°C
oxidation resistance : n.a.

General description

Basic coated electrode for fully austenitic CrNiMo-steels
Service temperature from -269°C to 350°C
Cryogenic austenitic stainless steels
Cryogenic nickel steels and their joining
Non magnetic stainless steels

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	N	FN (acc. WRC 192)
0.03	7.3	0.4	20.0	16.0	3.0	0.16	0

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -196°C
Required: AWS A5.4		not required	min. 550	min. 20	not required	
EN 1600		min. 320	min. 510	min. 25	not required	
Typical values	AW	460	650	35	80	50

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	135	150	100	70
	Net weight/unit (kg)	2.7	4.7	4.8	6.5

Identification Imprint: 316LMn-15 / JUNGO 4455 Tip Color: purple

Jungo® 4455: rev. EN 21

Materials to be welded

Steel grades	Standard	Type	Mat. Nr	ASTM/ACI	UNS
Austenitic nitrogen alloyed CrNi and CrNiMo steels					
	EN 10088-1/-2	X2 CrNiN 18-10	1.4311	(TP)304LN	S30453
		X2 CrNiMoN 17-11-2	1.4406	(TP)316LN	S31653
		X2 CrNiMoN 17-13-3	1.4429		
		X2 CrNiMoN 17-13-5	1.4439	317LN	S31726
Austenitic anti-magnetic steels					
	SEW 390	X2 CrNiMoN 22-15	1.3951		
		X2 CrNiMoN18-14-3	1.3952		
		X2 CrNiMo 18-15	1.3953		
		X8 CrMnNi 18-8	1.3965		
Low temperature steels					
	SEW 685	GX6 CrNi 18-10	1.6902		
		GX5 CrNiNb 18-10	1.6905		
	EN 10028-4	12 Ni 14	1.5637		
		X12 Ni 5	1.5680		

SMAW

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	45 - 70	DC+	44	71	0.96	19.0	85	1.52
3.2 x 350	70 - 105	DC+	53	132	1.4	31.0	48	1.39
4.0 x 350	100 - 130	DC+	86	264	1.7	47.6	25	1.41
5.0 x 450	120 -155	DC+	82	388	2.7	92.8	16	1.39

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	60A	60A	60A	60A	60A	60A
3.2	90A	90A	90A	70A		
4.0	140A	115A	130A	95A		
5.0	160A	165A				

Remarks/ Application advice

Welding with Heat-Input max. 1.5 kJ/mm
Interpass temperature max. 150°C

Jungo® 4465

Stainless steel electrode

Classification

AWS A5.4 : E310Mo-15*
EN 1600 : E 25 22 2 N L B 22*

*: Deviation, see remarks

Temperature range

pressurized parts : -40 ... +400°C
oxidation resistance : n.a.

General description

A basic high CrNiMo-alloyed fully austenitic all position electrode
Excellent corrosion resistance in strong oxydizing and slightly reducing media
Especially developed for urea and nitric acid plants
High resistance to intergranular corrosion
Excellent performance in the Huey-test
Weldable on DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

DC +

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	N	FN (acc. WRC 192)
0.03	4.5	0.4	25.0	22.0	2.2	0.13	0

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -196° C
Required: AWS A5.4		not required	min. 550	min. 30	not required	
EN 1600		min. 320	min. 510	min. 25	not required	
Typical values	AW	400	620	35	90	50

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	135	150	100
	Net weight/unit (kg)	2.8	4.8	4.9

Identification Imprint: JUNGO 4465 Tip Color: yellow

Jungo® 4465: rev. EN 21

Jungo® 4465

Materials to be welded

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM / ACI A240/A312/A351	UNS
Fully austenitic CrNiMo corrosion resistant steels				
	X1 CrNiMoN 25-25-2	1.4465		
	X3 CrNiMoTi 25-25	1.4577		
	X2 CrNi 19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X2 CrNiN 18-10	1.4311	(TP)304LN	S30453
			310S	S31008

Also very well applicable for build-up welding on low alloyed steel, such as pipe plates
Bufferlayers for applications from -196°C to +350°C

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	50 - 75	DC+	50	86	0.82	21.5	88	1.89
3.2 x 350	70 - 105	DC+	51	135	1.3	32.5	53	1.72
4.0 x 350	100 - 135	DC+	66	206	1.7	48.5	32	1.56

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	60A	60A	60A	60A	60A	60A
3.2	95A	90A	90A	75A	75A	75A
4.0	125A	110A	125A	100A	100A	100A

Remarks/ Application advice

Deviations: chemical composition:

Cr = 24.5 - 26.0%
AWS: Cr = 25.0 - 28.0%

Ni = 21.5 - 22.5%
AWS: Ni = 20.0 - 22.0%

Mn = 4.5 - 5.3%
AWS: Mn = 1.0 - 2.5%
EN: Mn = 1.0 - 5.0%

Welding with Heat-Input max. 1.5 kJ/mm
Interpass temperature max. 150°C

Stainless steel electrode

Classification

AWS A5.4 : E385-16*
EN 1600 : E 20 25 5 Cu N L R 12

*: Deviation, see remarks

Temperature range

pressurized parts : -60 ... +400°C
oxidation resistance : n.a.

General description

A rutile-basic fully austenitic all position electrode
Smooth bead appearance
Easy slag release
Especially developed for applications in phosphoric acid and sulphuric acid and paper mill equipment
Designed for welding alloy 904L
World wide reputation for reliability
Weldable on DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

DC +

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	Cu	FN (acc. WRC 192)
0.02	1.2	0.9	20.0	25.0	5.0	1.5	0

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-10°C	-60°C
Required: AWS A5.4		not required	min. 520	min. 30	not required		
EN 1600		min. 320	min. 510	min. 25	not required		
Typical values	AW	410	620	40	80	100	50

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	145	185	125
	Net weight/unit (kg)	2.9	5.7	5.9

Identification Imprint: JUNGO 4500 Tip Color: black

Jungo® 4500: rev. EN 22

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr
Fully austenitic NiCrMoCu and CrNiMoCu steels			
		GX7 NiCrMoCuNb 25-20	1.4500
	X5 NiCrMoCuTi 20-18		1.4506
		GX2 NiCrMoCuN 20-18	1.4531
		GX2 NiCrMoCuN 25-20	1.4536
	X1 NiCrMoCu 25-20-5	(Alloy 904L)	1.4539
		GX7 CrNiMoCuNb 18-18	1.4585
	X5 NiCrMoCuNb 22-18		1.4586

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 75	DC+	43	72	0.96	19.9	79	1.59
3.2 x 350	60 - 105	DC+	53	133	1.3	32.1	52	1.69
4.0 x 350	80 - 145	DC+	61	220	1.8	48.0	32	1.56

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		

Remarks/ Application advice

Deviations: chemical composition:
Si = max. 1.0% AWS: Si = max. 0.9%
Welding with Heat-Input max. 1.5 kJ/mm
Interpass temperature max. 150°C

Arosta® 4462

Stainless steel electrode

Classification

AWS A5.4	: E2209-16
EN 1600	: E 22 9 3 N L R 32

Temperature range

pressurized parts : -40 ... +250°C
oxidation resistance : n.a.

General description

A rutile-basic all position electrode for duplex stainless steel welding
Excellent weldability for filling as well as for root runs
Applicable up to a service temperature of 250°C
High resistance to general corrosion, pitting and stress corrosion (PREN ~35)
High yield strength > 500 N/mm²
Weldable on AC and DC
EMR-Sahara product
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Approvals

BV	DNV	GL	RINA	TÜV
2209	+	4462	2209	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	N	FN (acc. WRC 192)
0.02	0.8	1.0	22.5	9.5	3.2	0.16	30-55

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-30°C	-40°C
Required: AWS A5.4		not required	min. 690	min. 20	not required		
EN 1600		min. 450	min. 550	min. 20	not required		
Typical values	AW	650	800	27	60	50	40

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	350
Unit: Box	Pieces / unit	120	152	95	55
	Net weight/unit (kg)	2.6	5.0	4.8	4.6
Unit: SRP	Pieces / unit	69	52	29	24
	Net weight/unit (kg)	1.5	1.8	1.6	2.0

Identification Imprint: 2209-16 / AROSTA 4462 Tip Color: white

Arosta® 4462: rev. EN 22

Arosta® 4462

Materials to be welded

Steel grades	EN 10088-1/-2/-4	Mat. Nr	ASTM / ACI A240	UNS
Duplex stainless steels				
	X2 CrNiMoN 22 -5-3	1.4462		S31803
		1.4417		S31500
	X3 CrNiMoN 27-5-2	1.4460		S31200
	X2 CrNiN 23-4	1.4362		S32304
	X2 CrMnNi21-5-1	1.4162		S32101

Dissimilar joints such as un- and low alloyed steel to duplex stainless steel

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 75	DC+	61	127	0.73	20.6	81	1.67
3.2 x 350	80 - 110	DC+	56	184	1.4	34.3	46	1.59
4.0 x 350	80 - 150	DC+	59	205	2.0	51.5	30	1.52
5.0 x 350	140 - 220	DC+	65	357	2.8	77.4	20	1.61

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		
5.0	180A	180A	180A			

For root passes DC- is recommended.

Remarks/ Application advice

Welding with Heat-Input max. 2.5 kJ/mm
Interpass temperature max. 150°C

Jungo® 4462

Stainless steel electrode

Classification

AWS A5.4 : E2209-15
EN 1600 : E 22 9 3 N L B 22

Temperature range

pressurized parts : -40 ... +250°C
oxidation resistance : n.a.

General description

A basic electrode for 22% Cr duplex stainless steel welding
Excellent weldability for filling as well as for root runs
Applicable up to a service temperature of 250°C
High resistance to general corrosion, pitting and stress corrosion (PREN ~35)
High yield strength > 500 N/mm²
Weldable on DC+ polarity
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

DC +

Approvals

DNV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	N	FN (acc. WRC 192)
0.025	1.6	0.5	23.5	9.0	3.0	0.15	30-60

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-40°C	-50°C
Required: AWS A5.4		not required	min. 690	min. 20	not required			
EN 1600		min. 450	min. 550	min. 20	not required			
Typical values	AW	650	800	28	80	75	70	45

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	250	350	350
Unit: SRP	Pieces / unit	69	55	30
	Net weight/unit (kg)	1.4	1.8	1.5
Unit: Box	Pieces / unit	112	152	103
	Net weight/unit (kg)	2.3	5.0	5.0

Identification Imprint: 2209-15 / JUNGO 4462 Tip Color: red

Jungo® 4462: rev. EN 22

Jungo® 4462

Materials to be welded

Steel grades	EN 10088-1/-2/-4	Mat. Nr	ASTM / ACI A240	UNS
Duplex stainless steels				
	X2 CrNiMoN 22 -5-3	1.4462		S31803
		1.4417		S31500
	X3 CrNiMoN 27-5-2	1.4460		S31200
	X2 CrNiN 23-4	1.4362		S32304
	X2 CrMnNiN21-5-1	1.4162		S32101

Dissimilar joints such as un- and low alloyed steel to duplex stainless steel

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	50 - 80	DC+	74	101	0.62	21	78	1.64
3.2 x 350	70 - 110	DC+	84	219	0.88	33.8	49	1.64
4.0 x 350	100 - 140	DC+	80	304	1.4	50.8	32	1.61

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	60A	60A	60A	60A	60A	60A
3.2	85A	80A	90A	80A	80A	80A
4.0	120A					

Remarks/ Application advice

Interpass temperature depends on construction (max. 150°C)

Jungo® Zeron 100X

Stainless steel electrode

Classification

AWS A5.4 : E2595-15
EN 1600 : E 25 9 4 N L B 42

Temperature range

pressurized parts : -50 ... +250°C
oxidation resistance : n.a.

General description

A fully basic all position "super duplex" electrode
For welding Zeron 100 and other "super duplex" stainless steel grades
Fully cored wire alloyed electrode (including W+Cu)
High resistance to pitting and crevice corrosion, e.g. in seawater; PREN > 40
High strength and reliable impact toughness
Good weldability on DC+ polarity
Only available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

Current type

DC + / -

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	Cu	W	N	FN (acc. WRC 192)
0.03	0.8	0.3	25.0	9.5	3.6	0.8	0.7	0.2	30-60

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -20°C	Impact ISO-V(J) -46°C
Required: AWS A5.4		not required	min. 760	min. 15	not required	
EN 1600		min. 550	min. 620	min. 18	not required	
Typical values	AW	740	920	24	50	45

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: SRP	Pieces / unit	69	52	15
	Net weight/unit (kg)	1.4	1.8	0.8

Identification Imprint: 2595-15 / JUNGO ZERON 100 X Tip Color: purple

Jungo® Zeron 100X: rev. EN 23

Jungo® Zeron 100X

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM / ACI A276/A351/A473	UNS
Regular and super duplex stainless steels					
	X2CrNiMoN 25-7-4		1.4410		
	X4 CrNiMoN 27-5-2		1.4460		
	X2 CrNiMoN 22-5-3		1.4462	2205	S31803
		GX6 CrNiMo 24-8-2	1.4463		
				CD-4MCu	S32550
				Zeron 100	S32760

Super duplex stainless steel grades: chemical composition approximately:
24-27% Cr, 6-9% Ni, 3-4% Mo, 0.10-0.25% N alloyed also with Cu and/or W

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy (kJ)	Dep.rate (kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	45 - 70	DC+	74	101	0.62	21.0	78	1.64
3.2 x 350	70 - 100	DC+	84	219	0.88	33.8	49	1.64
4.0 x 350	100 - 130	DC+	80	304	1.4	50.8	32	1.61

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	60A	60A	60A	60A	60A	60A
3.2	85A	80A	90A	80A	80A	80A
4.0	120A	120A	120A	100A	100A	100A

Remarks/ Application advice

Welding with Heat-Input max. 1.5 kJ/mm
Interpass temperature max. 150°C

Jungo® 309L

Stainless steel electrode

Classification

AWS A5.4 : E309L-15
EN 1600 : E 23 12 L B 22

Temperature range

pressurized parts : -196...+350°C
scaling resistance : n.a.

General description

A basic high CrNi alloyed buffer electrode
For welding stainless steel to mild steel and root passes in clad steel
Applicable for root passes in N alloyed AISI 304LN steels
Outstanding mechanical properties
High resistance to embrittlement
Weldable on AC and DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.025	1.5	0.4	23.0	13.0	8-20

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -196°C
Required: AWS A5.4		not required	min. 520	min. 30	
EN 1600		min. 320	min. 510	min. 25	
Typical values	AW	470	570	40	40

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	142		60
	Net weight/unit (kg)	4.7	4.8	4.8

Identification Imprint: 309L-15 / JUNGO 309 L Tip Color:

Jungo® 309L: rev. EN 02

Materials to be welded

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Corrosion resistant cladsteels				
	X2 CrNiN 18-10	1.4311	(TP)304LN	S30453
	X2 CrNi 19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X4 CrNi 18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloyed steel to CrNi or CrNiMo stainless steel)
Build-up welding on mild and low alloyed steel
Bufferlayer CrNi-cladsteel

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 75	DC+	50	88	0.93	21.0	77	1.61
3.2 x 350	60 - 110	DC+	58	160	1.3	32.5	46	1.49
4.0 x 350	80 - 150	DC+	64	241	1.8	48.3	31	1.49

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		

Arosta® 309S

Stainless steel electrode

Classification

AWS A5.4 : E309L-16
EN 1600 : E 23 12 L R 32

Temperature range

pressurized parts : -120...+350°C
scaling resistance : n.a.

General description

A rutile-basic high CrNi alloyed buffer electrode
For welding stainless steel to mild steel and root passes in clad steel
Applicable for root passes in N alloyed AISI 304LN steels
Excellent weldability and self releasing slag
High resistance to embrittlement
Weldable on AC and DC+ polarity
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Approvals

ABS	BV	RMRS	TÜV
+	309L	SS/CMn	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.02	0.8	0.8	23.5	12.5	12-20

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-120°C
Required: AWS A5.4		not required	min. 520	min. 30	not required		
EN 1600		min. 320	min. 510	min. 25	not required		
Typical values	AW	480	560	40	60	50	40

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	350
Unit: Box	Pieces / unit	135	150	100	65
	Net weight/unit (kg)	2.8	5.0	5.0	5.0
Unit: SRP	Pieces / unit	69	56	31	-
	Net weight/unit (kg)	1.4	1.9	1.5	-

Identification Imprint: 309L-16 / AROSTA 309 S Tip Color: sea green

Arosta® 309S: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Corrosion resistant cladsteels				
	X2 CrNiN 18-10	1.4311	(TP)304LN	S30453
	X2 CrNi 19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X4 CrNi 18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloyed steel to CrNi or CrNiMo stainless steel)
Build-up welding on mild and low alloyed steel
Bufferlayer CrNi-cladsteel

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 75	DC+	50	88	0.93	21.0	77	1.61
3.2 x 350	60 - 110	DC+	58	160	1.3	32.5	46	1.49
4.0 x 350	80 - 150	DC+	64	241	1.8	48.3	31	1.49
5.0 x 350	140 - 220	DC+	68	372	2.8	78.0	19	1.49

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		
5.0	180A	180A	180A			

Limarosta® 309S

Stainless steel electrode

Classification

AWS A5.4 : E309L-17
EN 1600 : E 23 12 L R 32

Temperature range

pressurized parts : -120 ... +350°C
scaling resistance : n.a.

General description

A rutile-basic all position CrNi over-alloyed buffer electrode
Developed for welding stainless steel to mild steel and for clad steel
Self releasing slag
Excellent side wall wetting, no undercut, mirror like bead appearance
High resistance to porosity
Weldable on AC and DC+ polarity
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Approvals

DNV	GL	LR	RMRS	TÜV
309L	4432	SS/CMn	SS/CMn	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.02	0.8	1.0	23.0	12.5	10-20

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 520	min. 30	not required	
EN 1600		min. 320	min. 510	min. 25	not required	
Typical values	AW	480	560	40	55	50

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	4.0	5.0
	Length (mm)	300	350	350	450	450
Unit: Box	Pieces / unit	200	125	135	85	55
	Net weight/unit (kg)	2.3	2.8	4.9	5.9	6.0
Unit: SRP	Pieces / unit	60	65	50	28	-
	Net weight/unit (kg)	0.6	1.5	1.8	2.0	-
Unit: Linc Can™	Pieces / unit		197	127	79	-
	Net weight/unit (kg)		4.4	4.5	5.4	-

Identification Imprint: 309L-17 / LIMAROSTA 309 S Tip Color: sea green

Limarosta® 309S: rev. EN 21

Limarosta® 309S

Materials to be welded

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Corrosion resistant cladsteels				
	X2 CrNiN 18-10	1.4311	(TP)304LN	S30453
	X2 CrNi 19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X4 CrNi 18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloyed steel to CrNi or CrNiMo stainless steel)
Build-up welding on mild and low alloyed steel
Bufferlayer CrNi-cladsteel

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.0 x 300	35 - 55	DC+	38	49	0.66	11.3	142	1.59
2.5 x 350	45 - 80	DC+	48	95	0.99	22.1	77	1.69
3.2 x 350	80 - 115	DC+	56	160	1.4	35.1	46	1.59
4.0 x 450	100 - 155	DC+	76	317	2.0	69.9	23	1.64
5.0 x 450	150 - 220	DC+	84	575	2.9	108.0	15	1.59

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.0		45A	45A	40A	40A	40A
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A			
5.0	180A	180A				

Arosta® 309Nb

Stainless steel electrode

Classification

AWS A5.4	: E309Cb-16*
EN 1600	: E 23 12 Nb R 32

*: Deviation, see remarks

Temperature range

pressurized parts : -10 ... +460°C
scaling resistance : n.a.

General description

A high CrNiNb-alloyed rutile-basic all position buffer electrode
Specially developed for buffering mild and low alloyed steels for nuclear applications
Also to be used as buffer electrode in AISI 321 and AISI 347 claddings
Weldable on AC and DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Nb	FN (acc. WRC 192)
0.02	0.8	0.8	23.0	12.0	0.5	15-25

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 550	min. 30	not required	
EN 1600		min. 350	min. 550	min. 25	not required	
Typical values	AW	490	660	35	60	50

Packaging and available sizes

	Diameter (mm)	3.2	4.0
	Length (mm)	350	350
Unit: Box	Pieces / unit	150	100
	Net weight/unit (kg)	5.2	5.0

Identification	Imprint: AROSTA 309 Nb	Tip Color: gold	**Arosta® 309Nb: rev. EN 22**

Arosta® 309Nb

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
Extra low carbon (C <0.03%)					
	X2 CrNi 19-11		1.4306	(TP)304L	S30403
				CF-3	J92500
	X2 CrNiN 18-10		1.4311	(TP)304LN	S30453
				302	
Medium carbon (C >0.03%)					
	X4 CrNi 18-10		1.4301	(TP)304	S30400
		GX5 CrNi 19-10	1.4308	CF-8	J92600
Ti-, Nb stabilized					
	X6 CrNiTi 18-10		1.4541	(TP)321	S32100
				(TP)321H	S32109
	X6 CrNiNb 18-10		1.4550	(TP)347	S34700
				(TP)347H	S34709
		GX5 CrNiNb 19-10	1.4552	CF-8C	J92710

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
3.2 x 350	60 - 130	DC+	62	171	1.3	34.5	45	1.54
4.0 x 350	80 - 150	DC+	67	273	1.9	49.7	30	1.47

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		

Remarks/ Application advice

Deviations: chemical composition

Nb + Ta = min. 0.40%, max. 1.00%

AWS: Nb + Ta = min. 0.70%, max. 1.00%

Arosta® 309Mo

Stainless steel electrode

Classification

AWS A5.4 : E309LMo-16
EN 1600 : E 23 12 2 L R 32

Temperature range

pressurized parts : -60 ... +400°C
scaling resistance : n.a.

General description

A high CrNiMo alloyed all position rutile-basic electrode
High corrosion resistance
Specially developed for welding stainless steel to mild steel and root runs in cladding
max. plate thickness in butt welds ~ 12mm
Suitable for repair welding in dissimilar joints and steels difficult to weld
Weldable on AC and DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Approvals

ABS	BV	DNV	GL	LR	RINA	RMRS	TÜV
+	309Mo	309Mo	4459	SS/CMn	309Mo	SS/CMn	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.02	0.8	0.8	23.0	12.5	2.7	15-25

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	-20°C	-60°C
Required: AWS A5.4		not required	min. 520	min. 30	not required		
EN 1600		min. 350	min. 550	min. 25	not required		
Typical values	AW	580	700	30	57	50	45

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	4.0	5.0
	Length (mm)	300	350	350	350	450
Unit: Box	Pieces / unit	180	110	120	85	55
	Net weight/unit (kg)	2.4	2.6	4.7	4.8	5.4

Identification Imprint: 309LMo-16 / AROSTA 309 Mo Tip Color: light blue

Arosta® 309Mo: rev. EN 21

Arosta® 309Mo

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
First layer in CrNiMo claddings					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X10 CrNiMoTi 17-3		1.4573	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
		GX5 CrNiMo 19-11	1.4408		

Welding dissimilar metals: mild steel or low alloyed steel to stainless CrNiMo-steel up to max. thickness of 12 mm.
Build-up welding on mild and low alloyed steel

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.0 x 300	30 - 60	DC+	44	46	0.54	10.8	149	1.61
2.5 x 350	40 - 80	DC+	52	90	0.91	20.4	76	1.54
3.2 x 350	60 - 80	DC+	58	122	1.4	33.2	45	1.49
4.0 x 350	80 - 150	DC+	64	259	1.9	51.6	30	1.54
5.0 x 450	140 - 190	DC+	99	549	2.6	98.7	14	1.38

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.0		45A	45A	40A	40A	40A
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		
5.0	180A	180A	180A			

Nichroma

Stainless steel electrode

Classification

ASW A5.4 : E308LMo-16
EN 1600 : E 20 10 3 R 32

Temperature range

pressurized parts : -20 ... +350°C
scaling resistance : n.a.

General description

A rutile-basic all position electrode for welding dissimilar joints
The general purpose electrode for repair welding
Suitable for hobby and professional applications
Easy slag release and smooth bead appearance
Also applicable for joining steels difficult to weld
Weldable on AC and DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Approvals

BV	DNV	GL	TÜV
UP	308Mo	4431	+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.025	0.8	1.0	20.0	9.5	2.3	20

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 520	min. 35	not required	
EN 1600		min. 400	min. 620	min. 20	not required	
Typical values	AW	500	720	30	70	60

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	4.0	5.0
	Length (mm)	300	350	350	350	350
Unit: Box	Pieces / unit	225	135	150	100	65
	Net weight/unit (kg)	2.5	2.7	4.9	5.0	5.0
Unit: Linc Pack	Pieces / unit		50	31		
	Net weight/unit (kg)		1.0	1.0		

Identification Imprint: 308LMo-16 / NICHROMA Tip Color: Mauve

Nichroma: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
First layer in CrNiMo claddings					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
				CF-3M	J92800
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X2 CrNiMoN 17-11-2		1.4406	(TP)316LN	S31653
	X2 CrNiMoN 17-13-3		1.4429		
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X10 CrNiMoTi 17-3		1.4573	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
		GX5 CrNiMo 19-11	1.4408		

Welding dissimilar metals: mild steel and low alloyed steel to stainless CrNi and CrNiMo-steel
Build-up welding on mild and low alloyed steel

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.0 x 300	30 - 50	DC+	44	46	0.57	11.0	144	1.59
2.5 x 350	40 - 75	DC+	54	99	0.86	19.8	78	1.54
3.2 x 350	60 - 110	DC+	52	132	1.5	33.4	46	1.54
4.0 x 350	80 - 150	DC+	62	234	1.9	49.6	30	1.49
5.0 x 350	140 - 220	DC+	66	365	2.8	78.4	19	1.52

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.0		45A	45A	40A	40A	40A
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		
5.0	180A	180A	180A			

Nichroma 160

Stainless steel electrode

Classification

AWS A5.4 : E309Mo-26
EN 1600 : E 23 12 2 LR 53*

*: Deviation, see remarks

Temperature range

pressurized parts : -20 ... +350°C
scaling resistance : n.a.

General description

A rutile-basic synthetic high recovery (160%) electrode for shipbuilding
For welding carbon steel to stainless steel in the down hand position
Excellent for fillet welding
High resistance to porosity on primed plate
Higher welding current can be used
High deposition rates
Smooth bead appearance and easy slag release
Weldable on AC and DC+ polarity

Welding positions

ISO/ASME PA/1G PB/2F

Current type

AC / DC +

Approvals

ABS	BV	DNV	GL	RINA	RMRS
+	UP	309Mo	4431	309Mo	SS/CMn

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	Mo	FN (acc. WRC 192)
0.05	0.7	1.0	23.7	12.8	2.4	15

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 550	min. 30	not required	
EN 1600		min. 350	min. 550	min. 25	not required	
Typical values	AW	550	740	28	50	45

Packaging and available sizes

	Diameter (mm)	3.2	4.0	4.5	5.0
	Length (mm)	450	450	600	450
Unit: Box	Pieces / unit	90	55	40	35
	Net weight/unit (kg)	6.1	5.9	7.3	5.8

Identification Imprint: 309Mo-26 / NICHROMA 160 Tip Color: sea green

Nichroma 160: rev. EN 21

Nichroma 160

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
First layer in CrNiMo claddings					
	X2 CrNiMo 17-12-2		1.4404	(TP)316L	S31603
	CF-3M	J92800			
	X2 CrNiMo 18-14-3		1.4435	(TP)316L	S31603
	X4 CrNiMo 17-12-2		1.4401	(TP)316	S31600
	X4 CrNiMo 17-13-3		1.4436		
	X6 CrNiMoTi 17-12-2		1.4571	316Ti	S31635
	X10 CrNiMoTi 17-3		1.4573	316Ti	S31635
	X6 CrNiMoNb 17-12-2		1.4580	316Cb	S31640
		GX5 CrNiMo 19-11	1.4408		

Welding dissimilar metals: mild steel or low alloyed steel to stainless CrNiMo-steel up to max. thickness of 12 mm.
Build-up welding on mild and low alloyed steel

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
3.2 x 450	140 - 170	DC+	86	409	1.9	68.1	22	1.52
4.0 x 450	180 - 230	DC+	80	644	3.0	105.5	15	1.59
4.5 x 600	200 - 250	DC+						
5.0 x 450	230 - 300	DC+	90	1084	4.1	162.0	10	1.59

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F
3.2	175A	140A
4.0	200A	180A
5.0	230A	230A

Remarks/ Application advice

Deviations: chemical composition
C = max. 0.05% EN: C = max. 0.04%

Arosta® 329

Stainless steel electrode

Classification

EN 1600 : E 25 4 R 12*

*: Deviation, see remarks

Temperature range

pressurized parts : -10 ... +350°C
scaling resistance : +1100°C

General description

A rutile-basic all position stainless steel electrode
Typical applications:
- **Buffer electrode, hardfacing on mild steels**
- **Welding Cr-steels**
- **High corrosion resistance**
- **high proof stress and Tensile strength**

A ferritic/austenitic structure
Good weldability and easy slag release
Weldable on AC and DC+ polarity

Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

Current type

AC / DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni
0.08	0.7	1.2	25.0	4.5

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: EN 1600		min. 400	min. 600	min. 15	not required
Typical values	AW	500	700	15	30

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	135	150	100	65
	Net weight/unit (kg)	2.7	4.8	4.8	6.1

Identification Imprint: AROSTA 329 Tip Color: orange

Arosta® 329: rev. EN 21

LINCOLN® ELECTRIC

Arosta® 329

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI
Base metals for high temperature applications				
		GX30 CrSi 6	1.4710	
	X10 CrSi 6		1.4712	502
	X10 CrAl 7		1.4713	502 403/405-TP405-CA15
	X10 CrAl 13		1.4724	410/414-TP405-CA15
		GX40 CrSi 17	1.4740	
	X10 CrAl 18		1.4742	430B-TP430-CB30
		GX40 CrSi 23	1.4745	TP433
	X10 CrAl 24		1.4762	TP443
	X20 CrNiSi 25-4		1.4821	TP329
		GX40 CrNi 24-5	1.4822	TP329
		GX40 CrNiSi 27-4	1.4823	TP329HC

Applications at high temperature when high Ni-content is unacceptable
Also very well suitable for hard surfacing in sea water corrosion resisting Application

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 70	DC+	59	94	0.73	19.5	85	1.64
3.2 x 350	60 - 110	DC+	58	122	1.2	31.4	50	1.56
4.0 x 350	80 - 140	DC+	72	273	1.5	46.5	34	1.59
5.0 x 450	140 - 190	DC+	98	542	2.2	94.4	17	1.59

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		
5.0	180A	180A	180A			

Remarks/ Application advice

Deviations: chemical composition
Si = max. 1.5% EN: Si = max. 1.2%

Limarosta® 312

Stainless steel electrode

Classification

AWS A5.4 : E312-17
EN 1600 : E 29 9 R 12

Temperature range

pressurized parts : -10 ... +350°C
scaling resistance : n.a.

General description

A rutile-basic high CrNi-alloyed all position electrode
Excellent for repair welding
Especially developed for steels difficult to weld, such as armour plates, austenitic Mn-steels and high C-steels
Excellent weldability and self releasing slag
Weldable on AC and DC+ polarity
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

Current type

AC / DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni
0.11	0.9	1.0	29.0	9.0

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.4		not required	min. 660	min. 22	not required
EN 1600		min. 450	min. 650	min. 15	not required
Typical values	AW	700	800	20	50

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	4.0	5.0
	Length (mm)	300	350	350	350	350
Unit: Box	Pieces / unit	175	125	150	100	72
	Net weight/unit (kg)	2.2	2.6	5.0	5.0	5.2
Unit: SRP	Pieces / unit	53	69	52	31	24
	Net weight/unit (kg)	0.6	1.5	1.8	1.5	1.7
Unit: Linc Pack	Pieces / unit	-	48	30	-	-
	Net weight/unit (kg)	-	1.0	1.0	-	-

Identification Imprint: 312-17 / LIMAROSTA 312 Tip Color: black

Limarosta® 312: rev. EN 21

Limarosta® 312

Materials to be welded

Various steel grades, such as:

- Armour plate
- Hardenable steels including steels difficult to weld
- Non-magnetic austenitic steels
- Work hardening austenitic manganese steels
- Dissimilar steel grades (CMn-steels to stainless steel) up to max. thickness of 12 mm

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.0 x 300	40 - 55	DC+	41	45	0.59	12.0	150	1.80
2.5 x 350	50 - 70	DC+	57	91	0.73	20.7	87	1.79
3.2 x 350	70 - 100	DC+	60	126	1.1	33.0	52	1.72
4.0 x 350	100 - 130	DC+	72	273	1.4	49.7	35	1.72
5.0 x 350	130 - 140	DC+	79	313	2.4	71.5	19	1.36

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	90A	100A	65A	65A	65A
4.0	130A	125A	130A	80A		
5.0						

Arosta® 307

Stainless steel electrode

Classification

AWS A5.4	: E307-16*
EN 1600	: E 18 8 Mn R 12

*: Deviation, see remarks

Temperature range

pressurized parts : -60 ... +350°C
scaling resistance : n.a.

General description

A rutile- basic all position 5%Mn-alloyed stainless steel electrode
Especially developed for steels difficult to weld, such as armour lates and austenitic high Mn-steels
Often used as a buffer layer in hardfacing applications
Weldable on AC and DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Approvals

TÜV
+

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.09	5.0	0.6	18.5	8.5	0

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -60°C
Required: AWS A5.4		not required	min. 590	min. 30	not required	
EN 1600		min. 350	min. 500	min. 25	not required	
Typical values	AW	450	650	35	110	75

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	125	135	85
	Net weight/unit (kg)	2.6	4.7	4.6

Identification Imprint: AROSTA 307 Tip Color: dark blue

Arosta® 307: rev. EN 21

Arosta® 307

Materials to be welded

Various steel grades, such as:

- Armour plate
- Hardenable steels including steels difficult to weld
- Non-magnetic austenitic steels
- Work hardening austenitic manganese steels
- Dissimilar steel grades (CMn-steels to stainless steel) up to max. thickness of 12 mm
- Problem steels

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	70 - 80	DC+	52	108	0.74	20.4	94	1.92
3.2 x 350	90 - 120	DC+	56	148	1.2	34.7	54	1.87
4.0 x 350	110 - 140	DC+	84	251	1.3	53.6	33	1.77

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	80A	80A	80A	80A	80A	80A
3.2	100A	100A	100A	90A		
4.0	140A	115A	130A	110A		

Remarks/ Application advice

Deviations: chemical composition

Mn = 4.5 - 6.0% AWS: Mn = 3.30 - 4.75%

Arosta® 307-160

Stainless steel electrode

Classification

ASW A5.4	: E307-26*
EN 1600	: E 18 8 Mn R 53

* Nearest classification, see remarks

General description

A rutile 6%Mn-alloyed stainless steel electrode
Especially developed for steels difficult to weld, such as armour lates and austenitic high Mn-steels
Often used as a buffer layer in hardfacing applications
Weldable on DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F

Current type

AC / DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni
0.06	5.0	1.0	18.0	8.0

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -10°C
Required: AWS A5.4		not required	min. 590	min. 30	not required	
EN 1600		min. 350	min. 500	min. 25	not required	
Typical values	AW	425	650	35	85	60

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	450	450
Unit: PE tube	Pieces / unit	116	94	62	49
	Net weight/unit (kg)	2.5	4.7	6.0	6.0

Identification	Imprint: AROSTA 307-160	Tip Color: red	**Arosta® 307-160: rev. EN 01**

Materials to be welded

Various steel grades, such as:

- Armour plate
- Hardenable steels including steels difficult to weld
- Non-magnetic austenitic steels
- Work hardening austenitic manganese steels
- Dissimilar steel grades (CMn-steels to stainless steel)

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	80 - 100	DC+	44	71	0.96	17.8	85	1.52
3.2 x 350	110 - 150	DC+	53	132	1.4	29.1	48	1.39
4.0 x 450	140 - 200	DC+	86	264	1.7	55.9	25	1.41
5.0 x 450	210 - 260	DC+	82	388	2.7	85.3	16	1.39

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G
2.5	90A	90A	90A
3.2	150A	140A	140A
4.0	200A	180A	160A
5.0	230A	230A	

Remarks/ Application advice

Deviations: chemical composition

Mn = 4.5 - 7.5%	AWS: Mn = 3.30 - 4.75%
Cr = 17.0 - 20.0%	AWS: Cr = 18.0 - 21.5%
Ni = 7.0 - 10.0%	AWS: Ni = 9.0 - 10.7%

Jungo® 307

Stainless steel electrode

Classification

AWS A5.4 : E307-15*
EN 1600 : E 18 8 Mn B 22

*: Deviation, see remarks

Temperature range

pressurized parts : -120 ... +400°C
scaling resistance : n.a.

General description

A fully basic all position 5%Mn-alloyed stainless steel electrode
Especially developed for steels difficult to weld, such as armour lates and austenitic high Mn-steels
Often used as a buffer layer in hardfacing applications
Weldable on DC+ polarity

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni
0.08	5.5	0.3	19.0	8.5

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -120°C
Required: AWS A5.4		not required	min. 590	min. 30	not required	
EN 1600		min. 350	min. 500	min. 25	not required	
Typical values	AW	500	650	35	100	35

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	450	450
Unit: Box	Pieces / unit	160	170	110	70
	Net weight/unit (kg)	2.8	5.0	6.5	6.5

Identification Imprint: JUNGO 307 Tip Color: silver

Jungo® 307: rev. EN 21

Jungo® 307

Materials to be welded

Various steel grades, such as:

- Armour plate
- Hardenable steels including steels difficult to weld
- Non-magnetic austenitic steels
- Work hardening austenitic manganese steels
- Dissimilar steel grades (CMn-steels to stainless steel) up to max. thickness of 12 mm
- Problem steels

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	50 - 70	DC+	44	71	0.96	17.8	85	1.52
3.2 x 350	70 - 100	DC+	53	132	1.4	29.1	48	1.39
4.0 x 450	100 - 130	DC+	86	264	1.7	55.9	25	1.41
5.0 x 450	160 - 170	DC+	82	388	2.7	85.3	16	1.39

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	60A	60A	60A	60A	60A	60A
3.2	90A	90A	90A	70A		
4.0	140A	115A	130A	95A		
5.0	160A	165A				

Remarks/ Application advice

Deviations: chemical composition

Mn = 4.5 - 6.5%
AWS: Mn = 3.30 - 4.75%

Ni = 5.7 - 9.5%
AWS: Ni = 9.0 - 10.7%

Arosta® 304H

Stainless steel electrode

Classification

AWS A5.4 : E308H-16
EN 1600 : E 19 9 H R 12

Temperature range

pressurized parts : -20 ... +730°C
scaling resistance : to 800°C

SMAW

General description

A rutile-basic all position stainless steel electrode
Specially developed for high temperature applications (up to 730°C) - e.g. AISI 304H or Mat. Nr 1.4948
Low sensitivity to precipitation of intermetallic phases
Weldable on AC and DC
Popular in petrochemical and nuclear industry

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.05	0.75	0.85	18.5	9.5	03-7

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C	Impact ISO-V(J) -20°C
Required: AWS A5.4		not required	min. 550	min. 35	not required	
EN 1600		min. 350	min. 550	min. 30	not required	
Typical values	AW	450	600	44	70	50

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	350
Unit: Box	Pieces / unit	145	150	100	65
	Net weight/unit (kg)	2.8	4.8	4.9	4.8

Identification Imprint: 308H-16 / AROSTA 304 H Tip Color: green

Arosta® 304H: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI	UNS
Medium carbon (C >0.03%)					302
	X4 CrNi 18-10		1.4301	(TP)304	S30400
				(TP)304H	S30409
		GX5 CrNi 19-10	1.4308	CF8	J92600
			1.4948		

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 75	DC+	51	89	0.99	19.4	79	1.54
3.2 x 350	60 - 110	DC+	58	121	1.3	31.5	48	1.52
4.0 x 350	80 - 150	DC+	64	258	1.8	48.0	32	1.54
5.0 x 350	140 - 220	DC+	72	493	2.3	72.6	22	1.56

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		
5.0	180A	180A	180A			

For root passes DC- is recommended.

Arosta® 309H

Stainless steel electrode

Classification

AWS A5.4 : E309H-16*
EN 1600 : E 23 12 R 32*

*: Deviation, see remarks

Temperature range

pressurized parts : -10 ... +400°C
scaling resistance : 1100°C

General description

A rutile basic all position stainless steel electrode
Specially developed for high temperature applications like industrial furnaces (ovens)
High resistance to oxidation up to 1050°C
Weldable on AC and DC

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC + / -

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.10	0.8	1.6	22.0	11.0	03-8

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.4		not required	min. 550	min. 30	not required
EN 1600		min. 350	min. 550	min. 25	not required
Typical values	AW	500	700	30	50

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	120	130	90
	Net weight/unit (kg)	2.6	4.8	4.9

Identification Imprint: AROSTA 309 H Tip Color: yellow

Arosta® 309H: rev. EN 21

Arosta® 309H

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI	UNS
		GX30 CrSi 6	1.4710		
	X10 CrAl 7		1.4713	502	
	X10 CrAl 13		1.4724	410/414-TP405-CA15	
		GX40 CrSi 13	1.4729		
		GX40 CrSi 17	1.4740		
	X10 CrAl 18		1.4742	430-TP430-CB30	
	X10 CrAl 24		1.4762	TP443	
		GX25 CrNiSi 18-9	1.4825		J92502
		GX40 CrNiSi 22-9	1.4826		
	X15 CrNiSi 20-12		1.4828	TP309	S30900
		GX25 CrNiSi 20-14	1.4832		
	X12 CrNiTi 18-9				

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	40 - 110	DC+	47	71	1.1	19.7	73	1.44
3.2 x 350	60 - 120	DC+	58	140	1.5	31.9	42	1.33
4.0 x 350	80 - 140	DC+	58	226	2.2	53.7	29	1.55

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		

For root passes DC- is recommended.

Remarks/ Application advice

Deviations: chemical composition

Si = max. 2.0%
Cr = 20.0 - 23.0%
Ni = 10.0 - 13.0%

AWS: Si = max. 1.0%
AWS: Cr = 22.0 - 25.0%
AWS: Ni = 12.0 - 14.0%

EN: Si = max. 1.2%

Intherma® 310

Stainless steel electrode

Classification

AWS A5.4	: E310-16
EN 1600	: E 25 20 R 12

Temperature range

pressurized parts : -20 ... +400°C
scaling resistance : 1100°C

General description

Rutile basic electrode for all position welding except vertical down
Fully austenitic weld metal with high Cr and Ni content for very high service temperature
High resistance against oxidation and scaling up to 1100°C
Avoid service temperatures between 650 - 850°C
Weldable on AC and DC

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup

Current type

AC / DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.12	2.5	0.5	26.0	20.5	0

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.4		not required	min. 550	min. 30	not required
EN 1600		min. 350	min. 550	min. 20	not required
Typical values	AW	440	600	30	80

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	350
Unit: Box	Pieces / unit	145	150	100	62
	Net weight/unit (kg)	3.0	5.1	5.1	5.0

Identification Imprint: 310-16 / INTHERMA 310 Tip Color: dark green

Intherma® 310: rev. EN 21

Intherma® 310

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A351	UNS
Heat resisting steels					
	X10 CrAl 24		1.4762		
		GX25 CrNiSi 18-9	1.4825		
		GX40 CrNiSi 22-9	1.4826		
	X15 CrNiSi 20-12		1.4828		
		GX25 CrNiSi 20-14	1.4832		
	X15 CrNiSi 25-20		1.4841	310S	S31008
				CK20	J94202
	X12 CrNi 25-21		1.4845		
		GX40 CrNiSi 25-20	1.4848	HK40	

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy E(kJ)	Dep.rate H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
3.2 x 350	90 - 140	DC+	56	155	1.31	31.8	49	1.56
4.0 x 350	130 - 175	DC+	72	233	1.55	50.7	32	1.64
5.0 x 350	165 - 200							

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	PF/5G up
3.2	130A	120A	130A	110A	110A	110A
4.0	160A	160A	160A	140A		

Remarks/ Application advice

Welding with Heat-Input max. 1.5 kJ/mm
Interpass temperature max. 100°C

Intherma® 310B

Stainless steel electrode

Classification

AWS A5.4 : E310-15*
EN 1600 : E 25 20 B 12

*: Deviation, see remarks

Temperature range

pressurized parts : -20 ... +400°C
scaling resistance : 1100°C

SMAW

General description

Basic coated electrode for all position welding except vertical down
Fully austenitic weld metal with high Cr and Ni content for very high service temperature
High resistance against oxidation and scaling up to 1100°C
Avoid service temperatures between 650 - 850°C
Weldable on DC only

Welding positions

ISO/ASME	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G

Current type

DC +

Chemical composition (w%), typical, all weld metal

C	Mn	Si	Cr	Ni	FN (acc. WRC 192)
0.1	3.0	0.3	25.0	21.0	0

Mechanical properties, typical, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.4		not required	min. 550	min. 30	not required
EN 1600		min. 350	min. 550	min. 20	not required
Typical values	AW	440	600	30	100

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	135	150	100
	Net weight/unit (kg)	2.4	4.3	4.3

Identification Imprint: INTHERMA 310 B Tip Color: light green

Intherma® 310B: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI	UNS
Heat resisting steels					
	X10 CrAl 24		1.4762		
		GX25 CrNiSi 18-9	1.4825		
		GX40 CrNiSi 22-9	1.4826		
	X15 CrNiSi 20-12		1.4828		
		GX25 CrNiSi 20-14	1.4832		
	X15 CrNiSi 25-20		1.4841	310S	S31008
				CK20	J94202
	X12 CrNi 25-21		1.4845		
		GX40 CrNiSi 25-20	1.4848	HK40	

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (s)*	Energy - per electrode at max. current - E(kJ)	Dep.rate - per electrode at max. current - H(kg/h)	Weight/ 1000 pcs. (kg)	Electrodes/ kg weldmetal B	kg Electrodes/ kg weldmetal 1/N
2.5 x 350	60 - 70							
3.2 x 350	80 - 90							
4.0 x 350	110 - 130							

* stub end 35 mm

Remarks/ Application advice

Deviations: chemical composition
Mn = max. 5.0%
AWS: Mn = 1.0 - 2.5%
Welding with Heat-Input max. 1.5 kJ/mm
Interpass temperature max. 100°C