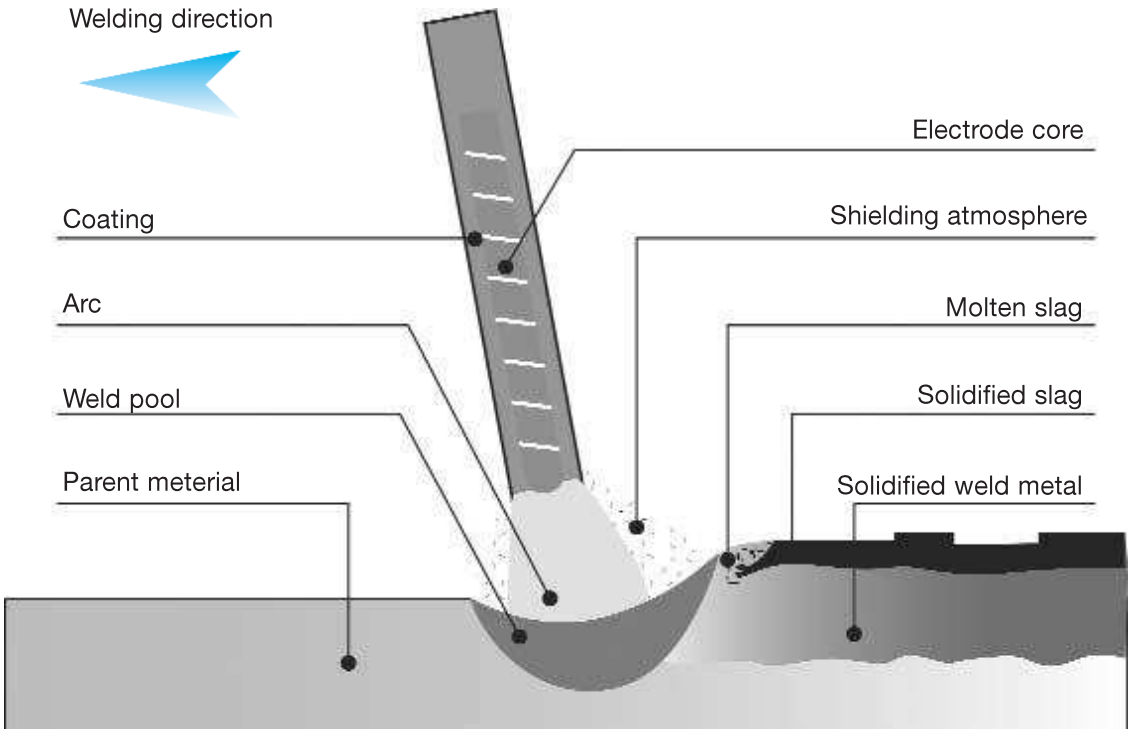
Shielded Metal Arc Welding / Stick (M.M.A.) Welding



In this welding process, an electric arc is created between a coated consumable electrode and the work piece to be welded, causing the parent material to be fused together and the electrode to melt. The electrode is of similar material as the parent material, and by melting provides the weld (or joint) with a reinforcing filler material. The electrode may be coated with basic, rutile or cellulose material, and as the coating burns it protects the arc and weld pool from the atmosphere with a gaseous shroud, the slag which solidifies over the newly deposited weld also protects it from the atmosphere.

Cellulosic electrode

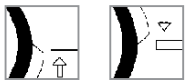
Classification

AWS A5.1 : E6010
ISO 2560-A : E 42 3 C 25

General description

Cellulosic coated electrode for pipe and general welding
Gives high ductility root welds
Very deep penetration ensures sound root pass
Easy striking, easy slag release
High volume of generated gas eliminates porosity
Reduces problems from dirt and oil on surface

Welding positions



ISO/ASME PF/5Gup PG/5Gdown

Current type

DC +

Approvals

LR	TÜV
3	+

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

C	Mn	Si
0.15	0.50	0.25

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C	-29°C	-30°C
Required: AWS A5.1		min. 331	min. 414	min. 22		27	
ISO 2560-A		min. 420	500-640	min. 20			47
Typical values	AW	440	520	26	70		65

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	350
Unit: metal can	Pieces / unit	325	205	130	83
	Net weight/unit (kg)	5.0	5.2	5.1	5.1

Identification Imprint: 6010-FW5P+ Tip Color: none

Fleetweld® 5P+: rev. EN 22

Materials to be welded

Steel grades/Code	Type
Pipe material	
EN 10208-1	L 210, L 240
EN 10208-2	L 240 , L 290, L 360
EN 10216-1 / 10217-1	P 235, P 275, P 355
API 5LX	X42, X46, X52
Gaz de France	X42, X46, X52

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
2.5x350	40-70	DC+				15.8		
3.2x350	65-130	DC+				26.2		
4.0x350	90-175	DC+				40.0		
5.0x350	140-225	DC+				61.5		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PF/5G up	PG/5G down
2.5	55A	65A
3.2	90A	110A
4.0	130A	150A
5.0	150A	165A

Remarks/ Application advice

Preheating pipe material L360 (X52) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass

Rutile electrode

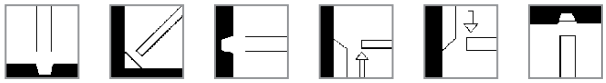
Classification

AWS A5.1 : E6012
ISO 2560-A : E 38 0 RC 11

General description

All position rutile electrode with excellent vertical down welding properties
Shipbuilding repairs
Excellent on painted or rustcovered steel
Recommended for bridging wide gaps
Weldable in all positions with one current setting

Welding positions



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

Current type

AC / DC -

Approvals

ABS	BV	DNV	FORCE	GL	LR	RMRS	TÜV
2	2	2	+	2	2	2	+

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

C	Mn	Si
0.12	0.5	0.6

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 331	min. 414	min. 17	not required
ISO 2560-A		min. 380	470-600	min. 20	min. 47
Typical values	AW	470	550	23	56

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	180	120	80
	Net weight/unit (kg)	2.8	5.0	5.0	5.2

Identification Imprint: 6012 / SUPRA Tip Color: none

Supra®: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275
Ship plates	
ASTM A 131	Grade A, B, D
Fine grained steel	
EN 10113-2	S275
EN 10113-3	S275

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	70 - 90	AC	47	109	0.8	17.5	90	1.58
3.2 x 350	95 - 130	AC	64	175	1.1	27.6	53	1.45
4.0 x 350	130 - 170	AC	66	330	1.4	41.1	39	1.61
5.0 x 350	170 - 250	AC	77	534	1.8	63.6	26	1.63

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PG/3G down	PE/4G
2.5	85A	80A	80A	80A	80A	80A
3.2	115A	115A	120A	120A	120A	120A
4.0	155A	170A	155A	160A	180A	155A
5.0	190A	220A			240A	190A

Remarks/ Application advice

Weldable in all positions with one current setting

Rutile electrode

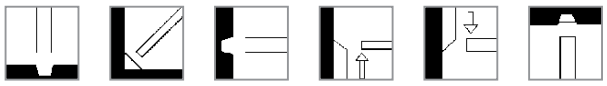
Classification

AWS A5.1 : E6013
ISO 2560-A : E 42 0 RC 11

General description

Rutile general purpose, all position electrode, including vertical down
Vertical down only applicable for "clean" structural steel
Also weldable with low Open Circuit Voltage transformers (min. OCV 42V)

Welding positions



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

Current type

AC / DC -

Approvals

ABS	BV	DNV	FORCE	GL	LR	TÜV
2	2	2	+	2	2	+

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

C	Mn	Si
0.07	0.5	0.5

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 331	min. 414	min. 17	not required
ISO 2560-A		min. 420	500-640	min. 20	min. 47
Typical values	AW	520	550	26	60

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: box	Pieces / unit	145	155	120
	Net weight/unit (kg)	2.8	4.8	5.4

Identification Imprint: 6013 / PANTA Tip Color: none

Panta®: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275
Ship plates	
ASTM A 131	Grade A, B, D
Cast steel	
EN 10213-2	G P 240R
Pipe material	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/ EN 10217-1	P235, P275
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295
Fine grained steel	
EN 10113-2	S275
EN 10113-3	S275

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	70 - 90	AC	47	109	0.8	17.5	90	1.58
3.2 x 350	110 - 130	AC	59	198	1.1	29.5	54	1.58
4.0 x 350	130 - 160	AC	59	301	1.7	42.4	37	1.57

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PG/3G down	PE/4G
2.5	80A	75A	75A	75A	75A	75A
3.2	120A	115A	125A	115A	125A	115A
4.0	175A	165A	160A	160A	170A	160A

Remarks/ Application advice

Vertical down only applicable for “clean” structural steel

Rutile electrode

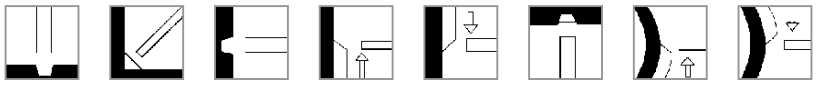
Classification

AWS A5.1 : E6013
ISO 2560-A : E 38 0 RC 11

General description

Rutile general purpose, all position electrode, including vertical down
Soft arc therefore suitable for relative thin plates and bridging wide gaps
Excellent in pipe welding and construction
Good start and restart behaviour
Also weldable with low Open Circuit Voltage transformers (min. OCV 42V)
Good X-ray soundness

Welding positions



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

Current type

AC / DC -

Approvals

TÜV
+

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

C	Mn	Si
0.09	0.5	0.4

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 331	min. 414	min. 17	not required
ISO 2560-A		min. 380	470-600	min. 20	min. 47
Typical values	AW	500	540	24	60

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	4.0
	Length (mm)	300	350	350	350
Unit: box	Pieces / unit	235	145	155	120
	Net weight/unit (kg)	2.4	2.8	4.8	5.4

Identification Imprint: 6013 / PANTAFIX Tip Color: none

Pantafix: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275
Ship plates	
ASTM A 131	Grade A, B, D
Cast steel	
EN 10213-2	G P 240R
Pipe material	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/ EN 10217-1	P235, P275
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295
Fine grained steel	
EN 10113-2	S275
EN 10113-3	S275

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	40 - 75	AC	41	58	0.5	10.4	178	1.98
2.5 x 350	50 - 90	AC	60	130	0.7	17.8	88	1.57
3.2 x 350	70 - 130	AC	66	206	1.0	29.5	53	1.58
4.0 x 350	130 - 175	AC	72	333	1.3	43.6	37	1.61
4.0 x 450	130 - 175							
5.0 x 450	185 - 230							

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PG/3G down	PE/4G
2.5	80A	75A	75A	75A	75A	75A
3.2	120A	115A	125A	115A	125A	115A

Remarks/ Application advice

Vertical down only applicable for “clean” structural steel

Rutile electrode

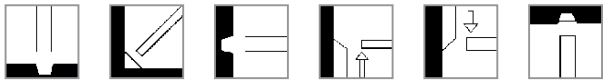
Classification

AWS A5.1 : E6013
ISO 2560-A : E 42 0 RC 11

General description

Rutile general purpose, all position electrode, including vertical down
Applicable for "clean" structural steel
Smaller diameters excellent for hobby market
Very suitable for low open circuit voltage transformers

Welding positions



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

Current type

AC / DC -

Approvals

ABS	BV	DNV	GL	LR	RMRS
2	2	2	2	2	2

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

C	Mn	Si
0.07	0.5	0.5

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 331	min. 414	min. 17	not required
ISO 2560-A		min. 420	500-640	min. 20	min. 47
Typical values	AW	520	550	26	60

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: box	Pieces / unit	155	155	120
	Net weight/unit (kg)	2.8	4.8	5.4

Identification Imprint: 6013 / OMNIA Tip Color: none

Omnia®: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275
Ship plates	
ASTM A 131	Grade A, B, D
Cast steel	
EN 10213-2	G P 240R
Pipe material	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/	P235, P275
EN 10217-1	
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295
Fine grained steel	
EN 10113-2	S275
EN 10113-3	S275

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
1.8 x 300	40 - 60	AC	40	38	0.4	8.4	210	1.75
2.5 x 350	65 - 90	AC	52	108	0.8	18.5	85	1.59
3.2 x 350	95 - 130	AC	65	229	1.0	31.1	53	1.67
4.0 x 350	130 - 160	AC	72	333	1.3	43.6	37	1.61
5.0 x 450	170 - 240	AC	106	740	2.1	92.2	16	1.47

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PG/3G down	PE/4G
1.8					45A	
2.5	80A	75A	75A	75A	75A	75A
3.2	120A	115A	125A	115A	125A	115A
4.0	175A	165A	160A	160A	170A	160A
5.0	240A	240A			250A	

Remarks/ Application advice

Vertical down only applicable for “clean” structural steel

Rutile electrode

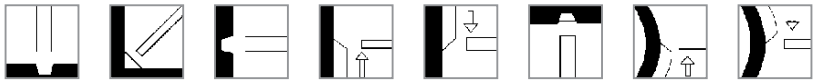
Classification

AWS A5.1 : E6013
ISO 2560-A : E 38 0 R 11

General description

Rutile general purpose, all positions electrode
Applicable for "clean" structural steel
Smaller diameters excellent for hobby market
Very suitable for low open circuit voltage transformers

Welding positions



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

Current type

AC / DC -

Approvals

ABS	BV	DNV	GL	LR	TÜV
2	2	2	2	2	+

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

C	Mn	Si
0.06	0.5	0.45

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 331	min. 414	min. 17	not required
ISO 2560-A		min. 380	470-600	min. 20	min. 47
Typical values	AW	430	480	26	60

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	3.2	4.0	4.0
	Length (mm)	300	350	350	450	350	450
Unit: box	Pieces / unit	370	250	175	150	110	95
	Net weight/unit (kg)	4.2	4.8	5.3	6.2	5.0	5.9
Unit: Linc Pack	Pieces / unit	89	54	33		22	
	Net weight/unit (kg)	1.0	1.0	1.0		1.0	

Identification	Imprint: 6013-Omnia 46	Tip Color: yellow	**Omnia® 46: rev. EN 22**

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275
Ship plates	
ASTM A 131	Grade A, B, D
Cast steel	
EN 10213-2	G P 240R
Pipe material	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/ EN 10217-1	P235, P275
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295
Fine grained steel	
EN 10113-2	S275
EN 10113-3	S275

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
2.0x300	50-60	AC	43	57	0.5	11.4	154	1.68
2.5x350	70-90	AC	68	134	0.6	19.2	84	1.60
3.2x350	90-125	AC	80	220	0.9	30.3	50	1.51
3.2x450	100-135	AC	102	303	0.9	41.3	38	1.56
4.0x350	140-190	AC	74	323	1.5	45.5	33	1.49
4.0x450	150-200	AC	95	456	1.5	62.1	26	1.58
5.0x450	180-240	AC	115	662	1.8	105.5	17	1.75

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PG/3G down	PE/4G	PF/5G up	PG/5G down
2.0	55A	55A	55A	50A	55 A		50A	55 A
2,5	80A	85A	85A	80A	85A	85A	80A	85A
3,2	110A	115A	115A	110A	115A	110A	110A	115A
4.0	170A	175A	175A	175A	180A	175A	175A	180A
5.0	220A	230A		230 A				

Rutile electrode

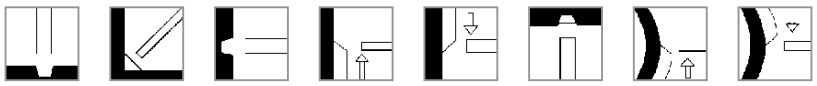
Classification

AWS A5.1 : E6013
ISO 2560-A : E 38 0 R 11

General description

Rutile general purpose electrode
Excellent for downhand and vertical up welding; not advised for vertical down welding
Very smooth arc, virtually no spatter
Excellent bead appearance, flat beads and self releasing slag
Very suitable for thin plates

Welding positions



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

Current type

AC / DC + / -

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

C	Mn	Si
0.08	0.5	0.3

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 331	min. 414	min. 17	not required
ISO 2560-A		min. 380	470-600	min. 20	min. 47
Typical values	AW	430	480	26	60

Packaging and available sizes

	Diameter (mm)	2.5	3.2
	Length (mm)	350	350
Unit: box	Pieces / unit	250	190
	Net weight/unit (kg)	4.8	5.5

Identification	Imprint: 6013	Tip Color: none	**Omnia® 46+: rev. EN 21**

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275
Ship plates	
ASTM A 131	Grade A, B, D
Cast steel	
EN 10213-2	G P 240R
Pipe material	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/ EN 10217-1	P235, P275
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295
Fine grained steel	
EN 10113-2	S275
EN 10113-3	S275

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
2.5x350	60-95	AC				19.2		
3.2x350	90-135	AC				28.9		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PG/3G down	PE/4G	PF/5G up	PG/5G down
2,5	80A	85A	85A	80A	85A	85A	80A	85A
3,2	110A	115A	115A	110A	115A	110A	110A	115A

Rutile electrode

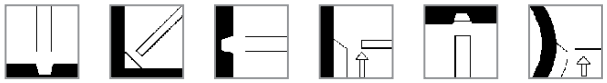
Classification

AWS A5.1 : E6013
ISO 2560-A : E 38 0 R 12

General description

Rutile, all position electrode (except vertical down)
Excellent for pipe welding and construction work
Smooth side wall wetting
Good X-ray soundness

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	TÜV
2	2	2	2	2,2Y	+

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

C	Mn	Si
0.1	0.5	0.4

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 331	min. 414	min. 17	not required
ISO 2560-A		min. 380	470-600	min. 20	min. 47
Typical values	AW	500	540	25	55

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	4.0
	Length (mm)	300	350	350	350
Unit: box	Pieces / unit	230	150	175	115
	Net weight/unit (kg)	2.3	2.9	5.2	5.3

Identification Imprint: 6013 / CUMULO Tip Color: none

Cumulo®: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275
Ship plates	
ASTM A 131	Grade A, B, D
Cast steel	
EN 10213-2	G P 240R
Pipe material	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/ EN 10217-1	P235, P275
Boiler & pressure vessel steel	
EN 10028-2	P235, P295
Fine grained steel	
EN 10113-2	S275
EN 10113-3	S275

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	40 - 65	AC	51	69	0.4	10.0	164	1.64
2.5 x 350	65 - 90	AC	52	120	0.8	18.7	86	1.61
3.2 x 350	85 - 130	AC	66	181	1.1	29.7	51	1.53
4.0 x 350	130 - 180	AC	62	345	1.6	46.5	36	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	55A					
2.5	95A	85A	85A	75A	75A	75A
3.2	135A	135A	120A	120A	120A	120A
4.0	160A	160A	155A	140A	140A	

Rutile electrode

Classification

AWS A5.1 : E6013
ISO 2560-A : E 42 0 RR 12

General description

Rutile electrode, especially for down hand welding in structural steel
Smaller sizes most versatile for thin plate material
Very smooth appearance
Self releasing slag

Welding positions

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

Current type

AC / DC -

Approvals

ABS	BV	DNV	FORCE	GL	LR	TÜV
2	2	2	+	2	2	+

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

C	Mn	Si
0.1	0.6	0.4

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 331	min. 414	min. 17	not required
ISO 2560-A		min. 420	500-640	min. 20	min. 47
Typical values	AW	480	560	26	50

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	3.2	4.0
	Length (mm)	300	350	350	450	450
Unit: box	Pieces / unit	200	130	140	125	80
	Net weight/unit (kg)	2.4	2.8	4.8	5.8	5.9

Identification Imprint: 6013 / UNIVERSALIS Tip Color: none

Universalis®: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A 131	Grade A, B, D, AH32 to DH36
Cast steel	
EN 10213-2	G P 240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360.
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235, P275
EN 10217-1	P355
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295, P355
Fine grained steel	
EN 10113-2	S275, S355
EN 10113-3	S275, S355

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	40 - 65	AC	41	58	0.5	11.4	178	2.00
2.5 x 350	70 - 100	AC	51	134	0.8	21.1	93	1.96
3.2 x 350	100 - 140	AC	57	281	1.3	39.3	47	1.85
3.2 x 450	100 - 140	AC	69	341	1.5	49.6	36	1.79
4.0 x 350	150 - 200	AC	55	399	2.0	56.3	33	1.85
4.0 x 450	150 - 200	AC	69	483	2.1	66.9	25	1.67
5.0 x 450	180 - 250	AC	83	882	2.9	112.0	15	1.69

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PE/4G
2.0	50A			
2.5	100A	95A	85A	85A
3.2	130A	120A	115A	105A
4.0	185A	185A	160A	130A
5.0	260A	260A		

Remarks/ Application advice

Best choice for welding thin plates.
High yield strength steels such as S355, L360, P355 and X60 preheat according EN 1011-1

Ferrod 165A

High recovery rutile electrode

Classification

AWS A5.1 : E7024-1
ISO 2560-A : E 42 2 RA 73

General description

Rutile coated electrode with brittle slag, for fillet welds and horizontal V- and X-welds
160% recovery, high welding speed
Good X-ray soundness
Even in narrow gaps and rusty materials easy slag release
Class 3 approved

Welding positions

ISO/ASME PA/1G PB/2F PC/2G

Current type

AC / DC + / -

Approvals

ABS	DNV	GL	LR	TÜV
3,3Y	3	3	3,3Y	+

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

C	Mn	Si
0.07	0.95	0.3

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -10°C	-18°C	-20°C
Required: AWS A5.1		min. 400	min. 483	min. 22		min. 27	
ISO 2560-A		min. 420	500-640	min. 20			min. 47
Typical values	AW	475	520	26	70		67

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
Unit: box	Pieces / unit	99	60	41
	Net weight/unit (kg)	6.1	5.6	6.0

Identification Imprint: 7024-1 / FERROD 165A Tip Color: none

Ferrod 165A: rev. EN 21

Ferrod 165A

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A 131	Grade A, B, D, AH32 to DH36
Cast steel	
EN 10213-2	G P 240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360.
API 5LX	X42, X46, X52
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295
Fine grained steel	
EN 10113-2	S275, S355
EN 10113-3	S275, S355

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	125 - 155	AC	75	326	1.9	62.9	25	1.39
4.0 x 450	140 - 235	AC	65	527	3.6	96.5	15	1.39
5.0 x 450	210 - 330	AC	68	853	5.3	144.9	10	1.39
6.0 x 450	280 - 430	AC	73	1271	7.0	209.8	7	1.35

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G
3.2	160A	150A	150A
4.0	220A	200A	195A
5.0	310A	290A	
6.0	390A	360A	

Remarks/ Application advice

High yield strength steels such as S355, L360, P355 and X60 preheat according EN 1011-1

Ferrod 135T

High recovery rutile electrode

Classification

AWS A5.1 : E7024
ISO 2560-A : E 38 0 RR 53

General description

Rutile electrode for fillet welds and horizontal V- and X-welds
High welding speed
Smooth weld appearance
Self releasing slag
High recovery (140%)

Welding positions

ISO/ASME PA/1G PB/2F PC/2G

Current type

AC / DC -

Approvals

ABS	BV	DNV	FORCE	GL	LR	RMRS	TÜV
2	2,2Y	2	+	2Y	2,2Y	2Y	+

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

C	Mn	Si
0.08	0.5	0.35

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 400	min. 483	min. 17	not required
ISO 2560-A		min. 380	470-600	min. 20	47
Typical values	AW	460	530	25	54

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
Unit: box	Pieces / unit	90	65	45
	Net weight/unit (kg)	5.5	5.7	5.9

Identification Imprint: 7024 / FERROD 135T Tip Color: none

Ferrod 135T: rev. EN 21

Ferrod 135T

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to DH36
Cast steel	
EN 10213-2	G P 240R
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295, P355
Fine grained steel	
EN 10113-2	S275, S355
EN 10113-3	S275, S355

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	130 - 150	AC	85	344	1.6	61.3	27	1.67
4.0 x 450	180 - 200	AC	92	515	2.2	87.7	18	1.67
5.0 x 450	275 - 300	AC	86	735	3.7	129.9	11	1.43

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G
3.2	150A	140A	140A
4.0	200A	190A	190A
5.0	290A	280A	

Remarks/ Application advice

High yield strength steels such as S355, L360, P355 and X60 preheat according EN 1011-1

Ferrod 160T

High recovery rutile electrode

Classification

AWS A5.1 : E7024
ISO 2560-A : E 42 0 RR 73

General description

Rutile electrode for fillet welds and horizontal V- and X-welds
Very high welding speed
Smooth weld appearance, very good slag release
High recovery (160% for 3.2 and 4.0 mm electrodes, and 180% for 5.0 mm electrodes)

Welding positions

ISO/ASME PA/1G PB/2F PC/2G

Current type

AC / DC -

Approvals

ABS	BV	DNV	FORCE	GL	LR	TÜV
2	2,2Y	2	+	2Y	2,2Y	+

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

C	Mn	Si
0.07	0.9	0.6

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 400	min. 483	min. 17	not required
ISO 2560-A		min. 420	500-640	min. 20	min. 47
Typical values	AW	450	570	26	70

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0	6.0
	Length (mm)	450	450	450	450
Unit: box	Pieces / unit	85	60	35	xx
	Net weight/unit (kg)	6.4	6.3	5.8	xx

Identification Imprint: 7024 / FERROD 160T Tip Color: none

Ferrod 160T: rev. EN 21

Ferrod 160T

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to DH36
Cast steel	
EN 10213-2	G P 240R
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295, P355
Fine grained steel	
EN 10113-2	S275, S355
EN 10113-3	S275, S355

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	130 - 160							
4.0 x 450	180 - 220	AC	90	554	2.6	92.7	15	1.43
5.0 x 450	280 - 300	AC	78	897	5.4	166.7	9	1.43

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F
4.0	210A	200A
5.0	300A	280A

Remarks/ Application advice

High yield strength steels such as S355, L360, P355 and X60 preheat according EN 1011-1

High recovery rutile electrode

Classification

AWS A5.1 : E7024
ISO 2560-A : E 42 0 RR 73

General description

Rutile electrode for fillet welds and horizontal V- and X-welds
190% recovery
Very high welding speed
Smooth weld appearance
Self releasing slag

Welding positions

ISO/ASME PA/1G PB/2F PC/2G

Current type

AC / DC -

Approvals

ABS	BV	CRS	DNV	FORCE	GL	LR	RINA	RMRS
2	2Y	2Y	2	+	2Y	2	2	2

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

C	Mn	Si
0.07	1.0	0.35

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1		min. 399	min. 482	min. 17	not required
ISO 2560-A		min. 420	500-640	min. 20	min. 47
Typical values	AW	450	525	27	75

Packaging and available sizes

	Diameter (mm)	4.0	5.0	6.3
	Length (mm)	450	450	450
Unit: box	Pieces / unit	55	35	23
	Net weight/unit (kg)	5.8	5.8	5.7

Identification Imprint: 7024 / GONIA 180 Tip Color: blue

Gonia 180: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to DH36
Boiler & pressure vessel steel	
EN 10028-2	P235, P265, P295, P355
Fine grained steel	
EN 10113-2	S275, S355
EN 10113-3	S275, S355

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
4.0 x 450	200 - 240	AC	78	515	3.4	100.0	14	1.35
5.0 x 450	280 - 300	AC	85	816	4.9	157.7	9	1.35
6.3 x 450	350 - 375	AC	102	1320	6.5	248.0	6	1.35

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G
4.0	210A	200A	200A
5.0	300A	280A	
6.3	390A	360A	

Remarks/ Application advice

High yield strength steels such as S355, L360, P355 and X60 preheat according EN 1011-1

Basic electrode

Classification

AWS A5.1 : E7018-1 H8
ISO 2560-A : E 46 3 B 32 H10

General description

Rutile basic coated electrode with excellent start- and restart properties
Weldable on AC and DC
Stable arc, also at low amperage
Popular at welding schools
Min. 60 Volt is recommended
Good mechanical and impact properties down to -30°C (47 J)
Low hydrogen content (H_{DM} < 8 ml/100g)

Welding positions

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

Current type

ø 2.5 AC / DC + / -
ø 3.2 AC / DC +
ø 4.0 AC / DC +
ø 5.0 AC / DC +

Approvals

ABS	BV	DNV	LR	TÜV
3YH10	HHH	3YH5	3,3YH10	+

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

C	Mn	Si	H_{DM}
0.075	1.4	0.65	7 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C	-30°C	-46°C
Required: AWS A5.1		min. 400	min. 483	min. 22			min. 27
ISO 2560-A		min. 460	530-680	min. 20		min. 47	
Typical values	AW	590	640	25	90	60	

Packaging and available sizes

	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
Unit: box	Pieces / unit	125	78	78	50	50	50
	Net weight/unit (kg)	2.5	2.6	3.3	2.5	3.4	5.5
Unit: SRP	Pieces / unit	44	51		27		
	Net weight/unit (kg)	0.9	1.8		1.4		

Identification Imprint: 7018-1 / BASO 48SP Tip Color: green

Baso® 48 SP: rev. EN 21

Baso® 48 SP

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH36.
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S355, S420
EN 10113-3	S275, S355, S420, S460

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 - 85	AC	48	104	0.9	19.4	82	1.6
3.2 x 450	85 - 135	AC	75	273	1.1	41.0	42	1.72
4.0 x 450	135 - 190	AC	95	487	1.6	64.6	24	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
2.5	80A	85A	85A	85A	80A
3.2	120A	115A	115A	115A	110A
4.0	170A	180A	180A	180A	160A

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Basic electrode

Classification

AWS A5.1 : E7018 H4
ISO 2560-A : E 46 3 B 32 H5

General description

Basic very low hydrogen electrode (H_{DM} < 5 ml/100g)
Very good weldability, in all positions
Almost no spatter, nice wetting and full weld pool control
Good impact values down to -30°C
Excellent X-ray soundness

Welding positions

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

Current type

DC + / -

Approvals

ABS	BV	DNV	GL	LR	RINA	TÜV
3H, 3Y	3, 3YHH	3YH5	3YH	3, 3YH5	3YH5	+

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

C	Mn	Si	H_{DM}
0.09	1.1	0.6	5 ml/100

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -20 °C	-29 °C	-30°C	-40°C
Required: AWS A5.1		min. 400	min. 483	min. 22		min. 27		
ISO 2560-A		min. 460	530-680	min. 20			min. 47	
Typical values	AW	550	635	25	115		85	65

Packaging and available sizes

	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
Unit: box	Pieces / unit	175	115	115	85	85	55
	Net weight/unit (kg)	3.9	4.0	5.2	4.6	5.7	6.0

Identification Imprint: 7018 / BASO 49 Tip Color: none

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type (s)*	Arc time - per electrode at max. current - E(kJ)	Energy - per electrode at max. current - H(kg/h)	Dep.rate - per electrode at max. current - (kg)	Weight/ 1000 pcs. B	Electrodes/ kg weldmetal 1/N	kg Electrodes/ kg weldmetal
2.5 x 350	70 - 80	DC+	58	120	0.85	23.1	73	1.7
3.2 x 350	110 - 130	DC+	68	194	1.3	36.8	41	1.5
4.0 x 450	140 - 180	DC+	98	429	1.8	69.5	20	1.4
5.0 x 450	160 - 240	DC+	117	619	2.3	107.3	13	1.4

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
2.5	95A	95A	90A	90A	85A
3.2	140A	130A	130A	120A	120A
4.0	180A	180A	180A	160A	150A
5.0	230A	230A	230A	180A	

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Basic electrode

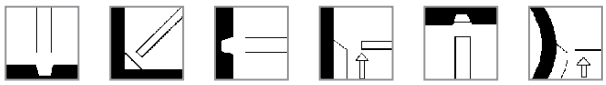
Classification

AWS A5.1 : E7018-1
ISO 2560-A : E 46 3 B 32

General description

Basic low hydrogen electrode
Excellent for tube welding and root passes
Very good weldability, in all positions
Stable arc, also at low amperage
Easy puddle control and wetting
Good slag release and flat bead appearance
Good mechanical and impact properties down to -30°C
Excellent X-ray soundness

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	P	S	H_{DM}
0.06	1.3	0.5	0.015	0.01	5 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield Strength (N/mm^2)	Tensile Strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -20 °C	-30 °C	-46°C
Required: AWS A5.1		min. 400	min. 483	min. 22			min. 27
ISO 2560-A		min. 460	530-680	min. 20		min. 47	
Typical values	AW	510	600	27	90	70	

Packaging and available sizes

	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
Unit: box	Pieces / unit	215	130	120	80	80	55
	Net weight/unit (kg)	4.2	4.2	5.1	4.0	5.2	5.5

Identification Imprint: 7018-1 / BASO 51P Tip Color: none

Baso® 51P: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420, S460

Calculation data

Sizes Diam. x length (mm)	Current range (A)	Current type (s)*	Arc time - per electrode at max. current - E(kJ)	Energy H(kg/h)	Dep.rate (kg)	Weight/ 1000 pcs. B	Electrodes/ kg weldmetal 1/N	kg Electrodes/ kg weldmetal
2.5 x 350	50 - 100	DC+	48	104	0.9	19.4	82	1.6
3.2 x 450	75 - 140	DC+	75	273	1.1	41.0	42	1.72
4.0 x 450	140 - 190	DC+	95	487	1.6	64.6	24	1.55
5.0 x 450	180 - 280	DC+						

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	5G
2.5	90A	90A	80A	85A	80A	85A
3.2	130A	130A	130A	115A	110A	115A
4.0	180A	175A	170A	160A		
5.0	230A	240A	230A			

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Baso® 100

Basic electrode

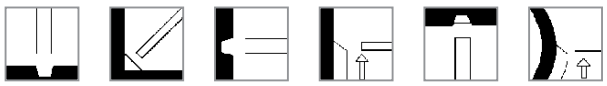
Classification

AWS A5.1 : E7016 H4R
ISO 2560-A : E 42 3 B 12 H5

General description

Basic very low hydrogen electrode (H_{DM} < 5 ml/100g)
Excellent for general purpose welding
Will run on low open circuit voltage (min. OCV 55 V)
Good side wall wetting
Impact toughness at -20°C
Popular at welding schools

Welding positions



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

Current type

AC / DC + / -

Approvals

ABS	BV	DNV	FORCE	GL	LR	TÜV
3H,3Y	3,3YHH	3YH5	+	3YH10	3,3YH5	+

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

C	Mn	Si	H_{DM}
0.08	1.0	0.5	4 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C	-29°C	-30°C
Required: AWS A5.1		min. 400	min. 483	min. 22		min. 27	
ISO 2560-A		min. 420	500-640	min. 20			min. 47
Typical values	AW	555	600	26	120		

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	120	90	65
	Net weight/unit (kg)	2.5	4.3	4.8	6.3

Identification Imprint: 7016 / BASO 100 Tip Color: Light blue

Baso® 100: rev. EN 21

Baso® 100

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH36.
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P274T1,
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S355, S420,
EN 10113-3	S275, S355, S420, S460

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 - 80	AC	53	116	0.8	19.1	85	1.63
3.2 x 350	75 - 115	AC	62	229	1.2	36.1	50	1.81
4.0 x 350	120 - 160	AC	64	337	1.6	50.1	34	1.72
5.0 x 450	160 - 240	AC	91	578	2.4	96.7	16	1.58
5.0 x 450	160 - 240	DC+	93	591	2.6	96.7	15	1.44

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	5G
2.5	80A	80A	80A	90A	85A	85A
3.2	130A	125A	140A	120A	115A	120A
4.0	165A	160A	165A	150A	140A	
5.0	230A	220A	210A	200A		

Root run lower setting!

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Baso® 120

Basic electrode

Classification

AWS A5.1 : E7018 H4R
ISO 2560-A : E 42 3 B 32 H5

General description

Basic very low hydrogen electrode (H_{DM} < 4ml/100g)
Recovery 120%
Excellent weldability even on AC in all positions
Good impact values at -30°C
Excellent X-ray soundness

Welding positions

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

Current type

AC / DC + / -

Approvals

ABS	BV	DNV	FORCE	GL	LR	TÜV
3H,3Y	3,3YH	3YH5	+	3YH	3,3YH5	+

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

C	Mn	Si	H_{DM}
0.08	1.2	0.5	4 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -20°C	-29°C	-30°C
Required: AWS A5.1		min. 400	min. 483	min. 22		min. 27	
ISO 2560-A		min. 420	500-640	min. 20			min. 47
Typical values	AW	540	600	26	150		

Packaging and available sizes

	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
Unit: box	Pieces / unit	135	120	120	85	85	55
	Net weight/unit (kg)	2.5	4.5	6.0	4.6	5.9	6.0

Identification Imprint: 7018 / BASO 120 Tip Color: silver

Baso® 120: rev. EN 21

Baso® 120

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH36.
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S355, S420
EN 10113-3	S275, S355, S420

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 - 80	AC	55	121	0.8	19.1	85	1.61
3.2 x 350	90 - 140	AC	62	229	1.3	37.1	44	1.64
3.2 x 450	90 - 140	AC	74	275	1.5	50.1	33	1.67
4.0 x 350	120 - 160	AC	63	338	1.8	54.4	32	1.72
4.0 x 450	120 - 160	DC+	85	391	1.9	69.5	22	1.52
5.0 x 450	160 - 240	AC	99	616	2.6	108.8	14	1.54
5.0 x 450	160 - 240	DC+	100	625	2.6	108.8	14	1.52

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	1 G	PB/2F	PC/2G	PF/3G up	PE/4G
2.5	80A	80A	85A	85A	80A
3.2	145A	120A	140A	120A	125A
4.0	175A	155A	170A	165A	145A
5.0	235A	220A	210A	195A	

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Basic electrode

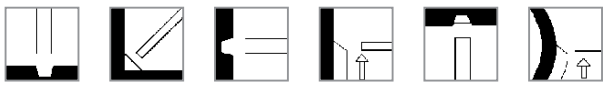
Classification

AWS A5.1 : E7018-1 H4R
ISO 2560-A : E 42 5 B 32 H5

General description

Basic all position extremely low hydrogen electrode
115 - 120% recovery
AC/DC welding in all positions especially pipe
Excellent for site welding applications
Good pipe welding
Good impact values at -50°C
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
3H,3Y	3,3YH	3YH5	3YH10	3,3YH5	4YH5	3-3YH5	+

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

C	Mn	Si	H_{DM}
0.05	1.3	0.4	2 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -20°C	-40°C	-46°C	-50°C
Required: AWS A5.1		min. 400	min. 483	min. 22			min. 27	
ISO 2560-A		min. 420	500-640	min. 20				min. 47
Typical values	AW	490	575	28	200	130		100

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	300	350	350	450	350	450	450
Unit: box	Pieces / unit	180	135	120	120	85	85	55
	Net weight/unit (kg)	2.1	2.8	4.4	5.8	4.7	5.9	6.0
Unit: SRP	Pieces / unit	53	69	50	50	28	28	23
	Net weight/unit (kg)	0.6	1.4	2.0	2.5	1.6	2.0	2.6

Identification Imprint: 7018-1 / BASO G Tip Color: blue

Baso® G: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420,

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+	50	61	0.5	11.7	149	1.75
2.5 x 350	55 - 90	DC+	59	107	0.8	20.3	78	1.59
3.2 x 350	75 - 120	DC+	70	234	1.2	36.5	42	1.54
3.2 x 450	75 - 120	DC+	79	265	1.4	45.4	33	1.47
4.0 x 350	120 - 180	DC+	75	358	1.7	50.9	28	1.45
4.0 x 450	120 - 180	DC+	96	473	1.7	69.3	22	1.52
5.0 x 450	160 - 240	DC+	114	671	2.2	106.2	14	1.54

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G	5G
2.0						45A
2.5	80A	80A	85A	90A	80A	80A
3.2	145A	120A	150A	120A	115A	120A
4.0	160A	145A	170A	150A	145A	145A
5.0	220A	210A	215A	170A		

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Basic electrode

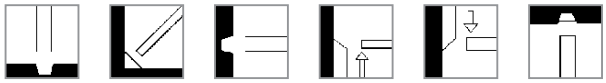
Classification

AWS A5.1 : E 7048 H8
ISO 2560-A : E 42 3 B 15 H10

General description

Basic low hydrogen electrode
Specially developed for vertical down welding on shipyards
Complete fusion in open root passes
Good tack weldability
Good slag removal, smooth bead appearance

Welding positions



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

Current type

AC / DC + / -

Approvals

ABS	BV	DNV	FORCE	GL	LR	RMRS
3Y	3Y	3YH10	+	3YH10	3,3YH10	3-3YH10

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

C	Mn	Si	H_{DM}
0.09	1.1	0.7	6 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -20°C	-29°C	-30°C
Required: AWS A5.1		min. 400	min. 483	min. 22		min. 27	
ISO 2560-A		min. 420	500-640	min. 20			min. 47
Typical values	AW	580	630	26	130		

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	450	450
Unit: box	Pieces / unit	150	100	70
	Net weight/unit (kg)	6.1	6.2	6.7
Unit: SRP	Pieces / unit		33	26
	Net weight/unit (kg)		2.0	2.5

Identification Imprint: 7048 / BASO 26V Tip Color: dark green

Baso® 26V: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH36.
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420,

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	110 - 140	DC+	51	181	1.5	34.0	48	1.62
4.0 x 450	155 - 185	DC+	70	315	2.1	59.7	24	1.44
5.0 x 450	195 - 225	DC+	86	435	2.7	92.9	15	1.43
5.6 x 450	200 - 260							

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PG/3G down
3.2	130A	130A
4.0	145A	175A
5.0	220A	220A

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Conarc® 48

Basic electrode

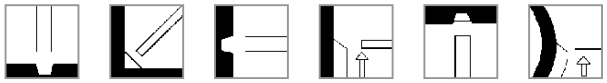
Classification

AWS A5.1 : E7018-1 H4R
ISO 2560-A : E 46 4 B 42 H5

General description

Basic very low hydrogen electrode (H_{DM} < 5 ml/100g)
Recovery 130%
Excellent weldability on DC+ in all positions, especially overhead and vertical up
Excellent impact toughness down to -40°C
Excellent X-ray soundness

Welding positions



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

Current type

DC +

Approvals

DNV
4YH5

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

C	Mn	Si	H_{DM}
0.05	1.3	0.3	4 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	Impact ISO-V(J) -46°C
Required: AWS A5.1		min. 400	min. 483	min. 22		min. 27
ISO 2560-A		min. 460	530-680	min. 20	min. 47	
Typical values	AW	470	570	27	103	

Packaging and available sizes

	Diameter (mm)	2.0	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	300	350	350	450	350	450	450
Unit: box	Pieces / unit	146	110	126	110	95	82	58
	Net weight/unit (kg)	1.9	2.5	5.0	5.7	5.4	6.0	6.3

Identification Imprint: 7018-1 / CONARC 48 Tip Color: orange

Conarc® 48: rev. EN 21

Conarc® 48

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S355, S420
EN 10113-3	S275, S355, S420

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	50 - 80	DC+	53		0.6	14.3	123	1.76
2.5 x 350	80 - 110	DC+	64		0.8	23.1	67	1.55
3.2 x 350	95 - 150	DC+	67		1.3	40.0	40	1.60
3.2 x 450	95 - 150	DC+	-		-	-	-	-
4.0 x 350	125 - 210	DC+	83		1.7	57.6	26	1.50
4.0 x 450	125 - 210	DC+	95		1.8	73.4	21	1.54
5.0 x 450	190 - 270							

* stub end 35 mm

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Conarc® 49

Basic electrode

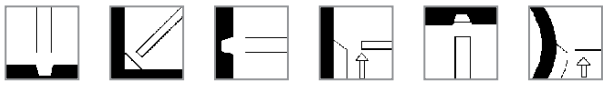
Classification

AWS A5.1 : E7018 H4R
ISO 2560-A : E 46 3 B 32 H5

General description

Basic very low hydrogen electrode (H_{DM} < 5 ml/100g)
Most suitable universal basic electrode for shipbuilding and light general construction work
Welding characteristics come very close to the welders ideal electrode
Almost no spatter, nice wetting and full weld pool control
One current setting for all positions possible
Perfect welding and 120% recovery contributes to high productivity

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
3H,3Y	3,3YHH	3YH5	3YH10	3,3YH5	3YH5	3-3YH5	+

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

C	Mn	Si	P	S	H_{DM}
0.09	1.1	0.6	0.015	0.010	4 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C	-29°C	-30°C
Required: AWS A5.1		min. 400	min. 483	min. 22		min. 27	
ISO 2560-A		min. 460	530-680	min. 20			min. 47
Typical values	AW	480	560	28	140		

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	4.0	5.0	6.0
	Length (mm)	350	350	350	450	450	450
Unit: box	Pieces / unit	118	120	85	85	55	46
	Net weight/unit (kg)	2.7	4.5	4.6	5.9	6.0	6.5
Unit: Linc Pack	Pieces / unit	44	27	18			
	Net weight/unit (kg)	1.0	1.0	1.0			

Identification Imprint: 7018 / CONARC 49 Tip Color: green

Conarc® 49: rev. EN 21

Conarc® 49

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420,

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+	58	120	0.85	23.1	73	1.7
3.2 x 350	110 - 130	DC+	68	194	1.3	36.8	41	1.5
4.0 x 450			98	429	1.8	69.5	20	1.4
5.0 x 450	160 - 240	DC+	117	619	2.3	107.3	13	1.4
6.0 x 450	250 - 300	DC+	106	976	3.5	136.9	10	1.33

* 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	95A	95A	90A	90A	85A	85A
3.2	140A	130A	130A	120A	120A	110A
4.0	180A	180A	180A	160A	150A	160A
5.0	230A	230A	230A	180A		
6.0	300A	290A				

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Conarc® 49C

Basic electrode

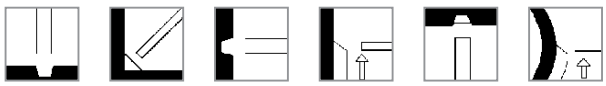
Classification

AWS A5.1 : E7018-1 H4R
ISO 2560-A : E 46 4 B 32 H5

General description

Basic extremely low hydrogen electrode
Reliable impact toughness -40°C, good CTOD at -10°C
The off-shore electrode when Ni-alloying is not allowed
100 - 120% recovery
Good pipe welding properties
Excellent X-ray soundness
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	FORCE	GL	LR	RMRS	TÜV
3H,3Y	3YHH	3YH5	+	3YH10	3,3YH5	3-3YH5	+

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

C	Mn	Si	P	S	H_{DM}
0.06	1.4	0.3	0.015	0.010	2 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -20°C	-40°C	-46°C
Required: AWS A5.1		min. 400	min. 483	min. 22			min. 27
ISO 2560-A		min. 460	530-680	min. 20		min. 47	
Typical values	AW	480	580	28	200	170	

Packaging and available sizes

	Diameter (mm)	2.5	3.0	3.2	3.2	4.0	4.0	5.0	6.0
	Length (mm)	350	350	350	450	350	450	450	450
Unit: box	Pieces / unit	135	80	120	120	85	85	55	46
	Net weight/unit (kg)	2.7	2.4	4.2	5.8	4.5	5.7	6.0	6.5
Unit: SRP	Pieces / unit	70	54	50	50	28	28	23	21
	Net weight/unit (kg)	1.4	1.5	2.0	2.5	1.6	2.0	2.6	3.0

Identification Imprint: 7018-1 / CONARC 49C Tip Color: grey

Conarc® 49C: rev. EN 21

Conarc® 49C

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420,

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 - 80	DC+	55	99	0.78	19.6	84	1.65
3.0 x 350	70 - 110	DC+	53	193	1.2	30.4	58	1.77
3.2 x 350	80 - 130	DC+	65	217	1.2	37.9	45	1.69
4.0 x 350	120 - 160	DC+	75	348	1.6	54.2	30	1.61
4.0 x 450	120 - 160	DC+	100	444	1.7	70.4	21	1.47
5.0 x 450	180 - 240	DC+	90	632	2.6	105.6	15	1.60
6.0 x 450	250 - 330	DC+	106	976	3.5	136.9	10	1.33

* 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	85A	80A	80A
3.0	110A	110A	115A	110A	105A	110A
3.2	140A	120A	145A	120A	120A	120A
4.0	150A	140A	150A	140A	135A	140A
5.0	220A	210A	210A	170A		
6.0	300A	290A				

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C
Best choice: 3.0 x 350 mm for rootlayer welding in pipes
Best choice: 3.2 x 350 mm for pipewelding

Conarc® 51

Basic electrode

Classification

AWS A5.1 : E7016-1 H4R
ISO 2560-A : E 42 4 B 12 H5

General description

Basic extremely low hydrogen electrode
Good impact values at -40 °C
Good CTOD at -10°C, meets offshore requirements
Excellent root pass electrode (diam. 2.5 and 3.2 mm)
Also available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

Welding positions

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

Current type

AC / DC + / -

Approvals

ABS	BV	DNV	FORCE	GL	LR	TÜV
3H,3Y	3,3YHH	3YH5	+	3YH10	3,3YH5	+

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

C	Mn	Si	P	S	H_{DM}
0.06	1.4	0.5	0.015	0.010	2 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C	-40°C	-46°C
Required: AWS A5.1		min. 400	min. 483	min. 22			min. 27
ISO 2560-A		min. 420	500-640	min. 20		min. 47	
Typical values	AW	520	575	28	115		

CTOD value at -10°C > 0.25 mm

Packaging and available sizes

	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
Unit: box	Pieces / unit	135	150	151	100	96	55
	Net weight/unit (kg)	2.7	4.7	6.0	4.6	6.0	6.0
Unit: SRP	Pieces / unit	70	56	56	30	30	23
	Net weight/unit (kg)	1.4	1.8	2.3	1.4	1.8	2.6

Identification Imprint: 7016-1 / CONARC 51 Tip Color: gold

Conarc® 51: rev. EN 21

Conarc® 51

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420

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 - 80	DC+	53	123	0.8	19.6	86	1.68
3.2 x 350	70 - 120	DC+	62	178	1.0	30.8	57	1.74
3.2 x 450	70 - 120							
4.0 x 350	100 - 160	DC+	71	306	1.4	48.0	37	1.78
4.0 x 450	100 - 160							
5.0 x 450	180 - 240	DC+	104	702	2.6	103.0	13	1.36

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PC/2G	PF/3G up	PE/4G	PF/5G up
2.5	75A	70A	75A	70A	75A
3.2	100A	110A	100A	100A	100A
4.0	150A	140A	130A	125A	125A
5.0	220A	220A	180A		

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Basic electrode

Classification

AWS A5.1 : E7018-1
ISO 2560-A : E 42 4 B 22 H5

General description

Basic very low hydrogen electrode
Excellent for general purpose welding
Good impact values at -46°C

Welding positions

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

Current type

DC + / -

Approvals

ABS	BV	DNV	GL	LR	RINA	TÜV
4Y40H5	4Y40HHH	4Y40H5	+	4Y40H5	4Y40H5	+

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

C	Mn	Si
0.05	1.0	0.3

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	Impact ISO-V(J) -46°C
Required: AWS A5.1		min. 400	min. 483	min. 22		min. 27
ISO 2560-A		min. 420	500-640	min. 20	min. 47	
Typical values	AW	436	533	29	100	90

Packaging and available sizes

	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
Unit: box	Pieces / unit	175	115	115	80	80	55
	Net weight/unit (kg)	3.9	4.0	5.2	4.1	5.3	5.6

Identification Imprint: LINCOLN 7018-1 Tip Color: none

LINCOLN® 7018-1

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420

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
2.5x350	70-90	DC+	59	132	0.9	22.3	71	1.59
3.2x350	100-130	DC+	65	221	1.2	34.8	48	1.66
3.2x450	100-135	DC+	75	272	1.4	45.2	36	1.61
4.0x350	130-180	DC+	64	313	1.9	51.3	29	1.51
4.0x450	130-190	DC+	77	410	2.2	66.3	21	1.41
5.0x450	220-260	DC+	84	657	3.0	101.8	14	1.43

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
2,5	80A	85A	85A	85A	80A
3,2	120A	115A	115A	115A	110A
4.0	170A	180A	180A	180A	160A
5.0	240A	250A	250A	250A	230A

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Conarc® L150

High recovery basic electrode

Classification

AWS A5.1 : E7028 H4R
ISO 2560-A : E 42 2 B 53 H5

General description

Basic low hydrogen electrode (H_{DM} < 5 ml/100g)
150% recovery
Easy slag release
Fillet welds and horizontal V- and X-welds
Excellent weldability on AC and DC
Transformers with OCV > 70V recommended
Also available in vacuum sealed Sahara ReadyPack® (SRP)

Welding positions

ISO/ASME PA/1G PB/2F PC/2G

Current type

AC / DC + / -

Approvals

ABS	BV	DNV	FORCE	GL	LR	TÜV
3H,3Y	3,3YH	3YH5	+	3YH10	3,3YH15	+

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

C	Mn	Si	H_{DM}
0.07	0.95	0.4	4 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -18°C	Impact ISO-V(J) -20°C
Required: AWS A5.1		min. 400	min. 483	min. 22	min. 27	
ISO 2560-A		min. 420	500-640	min. 20		min. 47
Typical values	AW	540	580	27		75

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0	6.0
	Length (mm)	450	450	450	450
Unit: box	Pieces / unit		55	35	25
	Net weight/unit (kg)		5.3	5.2	5.3
Unit: SRP	Pieces / unit	28	23	18	8
	Net weight/unit (kg)	1.9	2.6	2.7	1.6

Identification Imprint: 7028 / CONARC L150 Tip Color: yellow

Conarc® L150: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420

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	140 - 160	AC/DC+	84	375	1.7	64.8	26	1.67
4.0 x 450	175 - 220	AC/DC+	80	555	2.6	97.8	17	1.69
5.0 x 450	275 - 325	AC/DC+	75	838	4.4	155.7	11	1.72
6.0 x 450	325 - 350	AC/DC+	85	1260	5.4	209.4	8	1.64

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G
3.2	150A	150A	140A
4.0	210A	200A	190A
5.0	310A	280A	
6.0	360A	300A	

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C
Transformers with OCV > 70 V recommended

Conarc® V180

High recovery basic electrode

Classification

AWS A5.1 : E7028 H4R
ISO 2560-A : E 42 4 B 73 H5

General description

Basic extremely low hydrogen electrode
175% recovery and easy slag release
Fillet welds and horizontal V- and X-welds
Reliable impact toughness -40°C, good CTOD at -10°C
Excellent X-ray quality
Also available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

Welding positions

ISO/ASME PA/1G PB/2F PC/2G

Current type

AC / DC + / -

Approvals

ABS	BV	DNV	GL	LR	RINA	RMRS
3YH5	3,3YHH	3YH5	3YH10	3,3YH5	3YH5	3-3YH5

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

C	Mn	Si	H_{DM}
0.08	1.2	0.3	2 ml/100g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -18°C	-20°C	-40°C
Required: AWS A5.1		min. 400	min. 483	min. 22	min. 27		
ISO 2560-A		min. 420	500-640	min. 20			min. 47
Typical values	AW	440	510	30		130	

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0	6.3
	Length (mm)	450	450	450	450
Unit: box	Pieces / unit	85	60	40	23
	Net weight/unit (kg)	5.7	6.0	6.1	5.4
Unit: SRP	Pieces / unit	27	23	19	8
	Net weight/unit (kg)	2.0	2.4	2.8	1.9

Identification Imprint: 7028 / CONARC V180 Tip Color: white

Conarc® V180: rev. EN 21

Conarc® V180

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420

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
3.2 x 450	130 - 160	AC	73	337	2.3	68.9	21	1.47
4.0 x 450	170 - 240	AC	70	538	3.6	101.0	14	1.45
5.0 x 450	275 - 330	AC	75	780	4.9	149.7	10	1.45
6.3 x 450	280 - 425	AC	83	1171	7.0	230.4	6	1.43

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G
3.2	160A	140A	140A
4.0	230A	190A	190A
5.0	300A	230A	230A
6.3	390A	280A	

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C
Transformers with OCV > 70 V recommended

Conarc® V250

High recovery basic electrode

Classification

AWS A5.1 : E7028 H4R
ISO 2560-A : E 42 4 B 73 H5

General description

Basic low hydrogen electrode (H_{DM} < 5 ml/100g)
245% recovery and easy slag release
Fillet welds and horizontal V- and X-welds
Good impact values at -40 °C
Excellent X-ray soundness
Deposition rate is comparable with submerged arc welding

Welding positions

ISO/ASME PA/1G PB/2F*

Current type

AC / DC + / -

Approvals

ABS	BV	DNV	GL	LR	RINA	RMRS	TÜV
4Y400H5	3,3YHH	4Y40H5	4Y40H5	4Y40H5	4YH5	3-3YH5	+

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

C	Mn	Si	H_{DM}
0.08	1.3	0.45	4 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -18°C	Impact ISO-V(J) -40°C
Required: AWS A5.1		min. 400	min. 483	min. 22	min. 27	
ISO 2560-A		min. 420	500-640	min. 20		min. 47
Typical values	AW	460	550	29		80

Packaging and available sizes

	Diameter (mm)	4.0	5.0	6.0
	Length (mm)	450	450	450
Unit: box	Pieces / unit	42	26	19
	Net weight/unit (kg)	5.9	5.8	5.8

Identification Imprint: 7028 / CONARC V250 Tip Color: red

Conarc® V250: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S185, S235, S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP240R
Pipe material	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52
EN 10216-1/	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
Boiler & pressure vessel steel	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
Fine grained steel	
EN 10113-2	S275, S275, S355, S420
EN 10113-3	S275, S355, S420

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
4.0 x 450	190 - 240	AC	70	621	4.8	141	10	1.40
5.0 x 450	260 - 360	AC	73	1017	7.1	217	7	1.39
6.0 x 450	300 - 470	AC	72	1324	10.1	300	4	1.37

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F
4.0	230A	200A
5.0	300A	260A
6.0	390A	

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C
Transformers with OCV > 70 V recommended

Low strength basic electrode

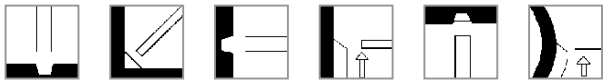
Classification

AWS A5.1 : E6018 [1)]
ISO 2560-A : E 35 2 B 32 H5
[1)] according classification 1966

General description

Basic extremely low hydrogen electrode
Repairs and tie-ins in oil and gas transport pipe lines
Low yield and ultimate tensile strength, high impact toughness
Buffer layer electrode for internally cladded stainless steel
Only available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

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	H_{DM}
0.03	0.4	0.25	3 ml/100 g

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -18°C	Impact ISO-V(J) -20°C
Required: AWS A5.1		min. 331	min. 414	min. 22	min. 27	
ISO 2560-A		min. 355	440-570	min. 22		
Typical values	AW	390	450	28		>200

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: SRP	Pieces / unit	23	17	28
	Net weight/unit (kg)	0.5	0.7	1.5

Identification Imprint: KARDO Tip Color: black

Kardo®: rev. EN 22

Materials to be welded

Weld the buffer layer of CrNi- and CrNiMo-stainless clad steel with one side welding.
High strength fine grained steel as StE 460 for NH3 storage tanks, to weld very soft, ferritic cap layers
Pipe line steel grades, to weld low yield strength fillet welds in split-T-joints (system NederlandseGasunie)
API 5L: X52 - X65 (EN 10208: L360 to L460).

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	60 - 80	DC+	81	173	0.5	19.7	81	1.60
3.2 x 350	90 - 120	DC+	84	252	1.0	36.5	43	1.58
4.0 x 350	120 - 160	DC+	79	448	1.6	53.0	29	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	80A	80A	80A	85A	80A	80A
3.2	140A	120A	145A	120A	120A	120A
4.0	150A	140A	150A	140A	135A	140A

Remarks/ Application advice

Use electrodes directly from Sahara ReadyPack.
Restrict dilution on stainless steel root runs.

Shield Arc® HYP+

High strength cellulosic electrode

Classification

AWS A5.5 : E 7010-P1
ISO 2560-A : E 42 2 Mo C 25*

General description

Cellulosic electrode for vertical do wn pipe welding
Suitable for pipe with strengths X52 trough X65
Cleaner weld puddle
Very low tendency to peel or flake off under high electrode pressure in tight joints
Low susceptibility to wagon tracks, windows and pinholes
Very low spatter and smoother arc action

Welding positions

ISO/ASME PG/5Gdown

Current type

DC +

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

C	Mn	Si	Mo	V
0.12	0.40	0.15	0.50	0.01

Mechanical properties, 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) -29°C
Required: AWS A5.5		min. 415	min. 480	min. 22		27
ISO 2560-A		min. 420	500-640	min. 20	min. 47	
Typical values	AW	450	540	24	65	45

Packaging and available sizes

	Diameter (mm)	3.2	4.0	4.8
	Length (mm)	350	350	350
Unit: Metal can	Pieces / unit	210	135	89
	Net weight/unit (kg)	5.4	5.4	5.1

Identification Imprint: 7010-G Tip Color: none

Shield Arc® HYP+: rev. EN 02

Materials to be welded

Steel grades/Code	Type
Pipe material	
EN 10208-2	L360, L415, L445
EN 10216-1 / 10217-1	P 355
API 5LX	X52, X56, X60, X65
Gaz de France	X52, X63

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
3.2x350	75-130	DC+				25.8		
4.0x350	90-185	DC+				39.5		
4.8x350	140-185	DC+				57.1		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PG/5G down
3.2	110A
4.0	150A
4.8	165A

Remarks/ Application advice

Preheating pipe material from L380 to L450 (X56 to X65) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans
Use Fleetweld 5P+ for lower hardness in the root pass

Shield Arc® 70+

High strength cellulosic electrode

Classification

AWS A5.5 : E8010-G
ISO 2560-A : E 46 4 1Ni C 25

General description

Cellulosic coated electrode for vertical down pipe welding
Suitable for pipe with strengths in the range of X56 - X70
Can be used for root, fill and capping passes
Low susceptibility to wagon tracks, windows and pinholes
Good impact values
Can be used for silicon-killed steels

Welding positions

ISO/ASME PG/5Gdown

Current type

DC +

Approvals

TÜV
+

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

C	Mn	Si	Ni	Cr	V	P	S
0.12	0.90	0.20	0.85	0.10	0.03	0.012	0.013

Mechanical properties, 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) -40°C
Required: AWS A5.5		min. 460	min. 550	min. 19	not required	
ISO 2560-A		min. 460	530-680	min. 20		min. 47
Typical values	AW	510	570	24	75	

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	350
Unit: Metal can	Pieces / unit	320	195	125
	Net weight/unit (kg)	8.3	7.7	7.8

Identification Imprint: 8010-G SA70+ Tip Color: none

Shield Arc® 70+: rev. EN 21

Materials to be welded

Steel grades/Code	Type
Pipe material	
EN 10208-2	L 360, L 415, L 445, L 480
EN 10216-1 / 10217-1	P 355
API 5LX	X 56, X60, X65, X70
Gaz de France	X52, X63

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	75 - 130	DC+				25.8		
4.0 x 350	90 - 185	DC+				39.5		
5.0 x 350	140 - 225	DC+				62.3		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PG/5G down
3.2	110A
4.0	150A
5.0	165A

Remarks/ Application advice

Preheating pipe material from L360 to L480 (X56 to X70) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans
Use Fleetweld 5P+ for lower hardness in the root pass

Shield Arc® 90

High strength cellulosic electrode

Classification

AWS A5.5 : E 9010-G
ISO 2560-A : E 50 4 1NiMo C 25

General description

Cellulosic electrode, 0.5% Mo and Ni-alloyed, for vertical down welding in pipes
Suitable for pipe material API 5LX-70 and X-80, EN 10208-2, or L480 and L550
Applicable for root, filling- and capping pass
Not sensitive for wagon tracks, windows and pinholes

Welding positions

ISO/ASME PG/5Gdown

Current type

DC +
DC- (root)

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

C	Mn	Si	Ni	Mo
0.13	0.60	0.15	0.7	0.6

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	Impact ISO-V(J) -46°C
Required: AWS A5.5		min. 530	min. 620	min. 17	not required	
ISO 2560-A		min. 500	560-720	min. 18	min. 47	
Typical values	AW	550	640	22	50	45

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	350
Unit: Metal can	Pieces / unit	300	185	125
	Net weight/unit (kg)	7.7	7.3	7.9

Identification Imprint: 9010-G Tip Color: none

Shield Arc® 90: rev. EN 21

Materials to be welded

Steel grades/Code	Type
Pipe material	
EN 10208-2	L 480 , L 550
API 5LX	X70, X80

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	75-130	DC+				26.3		
4.0 x 350	80-185	DC+				40.8		
5.0 x 350	140-225	DC+				63.6		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PG/5G down
3.2	120A
4.0	170A
5.0	180A

Remarks/ Application advice

Preheating pipe material required (acc. EN 1011-1)
Rootlayer preferable to weld with lower yield electrodes (Fleetweld 5P+ or Shield Arc 70+.)
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans

Cellulosic electrode

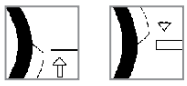
Classification

AWS A5.1 : E6010
ISO 2560-A : E 42 3 C 25

General description

Cellulosic electrode for pipe welding
Smooth arc
Soft and ductile root welds
Suitable for root, fill and cap passes up to X52 grades

Welding positions



ISO/ASME PF/5Gup PG/5Gdown

Current type

DC + / -

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

C	Mn	Si	P	S
0.11	0.55	0.18	0.009	0.009

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -29°C	Impact ISO-V(J) -30°C
Required: AWS A5.1		min. 331	min. 414	min. 22	27	
ISO 2560-A		min. 420	500-640	min. 20		47
Typical values	AW	420-524	503-594	24-33	51-85	

Packaging and available sizes

	Diameter (mm)	3.2	4.0
	Length (mm)	350	350
Unit: metal can	Pieces / unit	205	130
	Net weight/unit (kg)	5.2	5.1

Identification Imprint: 6010 Shield Arc 6P+ Tip Color: none

Materials to be welded

Steel grades/Code	Type
Pipe material	
API 5LX	X42, X46, X52

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
3.2x350	65-130	DC+/-	46			25.3		
4.0x350	90-175	DC+/-	52			39.2		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	5G up	5G down
3.2	90A	110A
4.0	130A	150A

Remarks/ Application advice

Preheating pipe material L360 (X52) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans

High strength Cellulosic electrode

Classification

AWS A5.5	E7010-P1/E7010-G
ISO 2560-A	: E 42 3 Z C 25

General description

Cellulosic electrode for pipe welding
Suitable for root, fill and cap passes up to X65 grades
High resistance to porosity
Easy welding puddle control
High stacking efficiency: fill joints in fewer passes
Micro-alloyed to ensure consistent mechanical properties

Welding positions

ISO/ASME PG/5Gdown

Current type

DC + (Also DC- for dia.4mm)

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

C	Mn	Si	Ni	Mo	P	S
0.12-0.23	0.5-0.9	0.14-0.32	0.62-0.95	0.12-0.3	0.015	0.015

Mechanical properties, all weld metal

	Condition	Yield strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -20°C	-29°C	-40°C
Required: AWS A5.1		min.414	min480	min. 22		min.27	
ISO 2560-A		min. 420	500-640	min. 20	47		
Typical values	AW	427-520	496-635	23-30	34-102		27-85

Packaging and available sizes

	Diameter (mm)	4.0	5.0
	Length (mm)	350	350
Unit: metal can	Pieces / unit	120	80
	Net weight/unit (kg)	4.7	5.0

Identification	Imprint: 7010-P1 Shield Arc 7P+	Tip Color: none

Shield Arc® 7P+: rev. EN 02

Materials to be welded

Steel grades/Code	Type
Pipe material	
API 5LX	X42, X46, X52, X56, X60, X65

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
4.0x350	90-175	DC+/-				39.1		
5.0x350	130-210	DC+				62.5		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	5G down
4.0	150A
5.0	165A

Remarks/ Application advice

Preheating pipe material from L360 to L450 (X52 to X65) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans

Shield Arc® 8P+

High strength cellulosic electrode

Classification

AWS A5.5	E8010-P1
ISO 2560-A	: E 46 4 1Ni C 25

General description

Cellulosic electrode for pipe welding
Suitable for root, fill and cap passes up to X70 grades
High resistance to porosity
Easy welding puddle control
High stacking efficiency: fill joints in fewer passes
Micro-alloyed to ensure consistent mechanical properties

Welding positions

ISO/ASME PG/5Gdown

Current type

DC + (Also DC- for dia.4mm)

Approvals

DNV	TÜV
+	+

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

C	Mn	Si	Ni	Cr	Mo	P	S
0.17	0.7	0.25	0.8	0.2	0.2	0.01	0.01

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -29°C	-40°C	-46°C
Required: AWS A5.5		min. 460	min. 550	min. 19	27		
ISO 2560-A		min. 460	530-680	min. 20		min. 40	
Typical values	AW	460-559	550-676	20-27	62-99		46-84

Packaging and available sizes

	Diameter (mm)	4.0	5.0
	Length (mm)	350	350
Unit: metal can	Pieces / unit	120	80
	Net weight/unit (kg)	4.7	5.0

Identification	Imprint: 8010-P1 Shield Arc 8P+	Tip Color: none

Materials to be welded

Steel grades/Code	Type
Pipe material	
API 5LX	X56, X60, X65, X70

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
4.0 x 350	90 - 185	DC+/-				39.1		
5.0 x 350	140 - 225	DC+				62.5		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	5G down
4.0	150A
5.0	165A

Remarks/ Application advice

Preheating pipe material from L360 to L480 (X56 to X70) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans
Use PIPELINER 6P+ for lower hardness in the root pass when required

Conarc® 55CT

High strength basic electrode

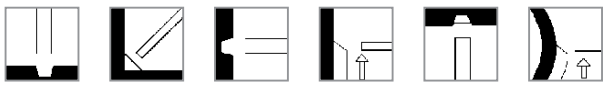
Classification

AWS A5.5 : E8018-W2-H4R [1)]
ISO 2560-A : E 46 5 Z Mn1Ni B 32 H5
[1)] and Z: Deviation, see remarks

General description

Basic extremely low hydrogen electrode
All position electrode for welding weather resistant steel
Very suitable for off- and on-shore constructions, high resistance to corrosion caused by seawater or combinations of oil, gas and seawater
Excellent mechanical properties (impact at -50°C)
Also available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

Welding positions



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

Current type

AC / DC + / -

Approvals

LR
4Y42H5

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

C	Mn	Si	P	S	Ni	Cu	H_{DM}
0.05	1.5	0.4	0.010	0.015	0.9	0.4	3ml/100g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -18°C	-20°C	-40°C	-50°C
Required: AWS A5.5		min. 460	min. 550	min. 19	min. 27			
ISO 2560-A		min. 460	530-680	min. 20				min. 47
Typical values	AW	540	610	25		115	100	60

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	xx	xx	xx	xx
	Net weight/unit (kg)	xx	xx	xx	xx
Unit: SRP	Pieces / unit	69	50	27	23
	Net weight/unit (kg)	1.4	1.9	1,5	2.5

Identification Imprint: CONARC 55CT Tip Color: black

Conarc® 55CT: rev. EN 21

Conarc® 55CT

Materials to be welded

Steel grades/Code	Type
Weather resisting steels	
EN 10155	S235 J0W
	S235 J2W
	S355 J0W
	S355 J2W
	S355 K2G1W

Weather resistant steels like Cor-Ten®, Patinax®-F, Patinax®-37 and similar Ni- and Cu-alloyed 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	55 - 85	DC+	53	81	0.77	19.7	88	1.74
3.2 x 350	80 - 145	DC+	70	223	1.2	36.9	43	1.60
4.0 x 350	120 - 185	DC+	77	355	1.6	54.1	29	1.59
5.0 x 450	180 - 270	DC+	104	784	2.4	105.2	15	1.53

* 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	110A	110A	115A	110A	105A	110A
3.2	140A	120A	145A	120A	120A	120A
4.0	150A	140A	150A	140A	135A	140A
5.0	220A	210A	210A	170A		

Remarks/ Application advice

Deviations: chemical composition:

Mn = 1.4 - 1.9%	AWS: Mn = 0.50 - 1.30%
Si = 0.15 - 0.60%	AWS: Si = 0.35 - 0.80%
Cr = 0.1%	AWS: Cr = 0.45 - 0.75%
Ni = 0.7 - 1.0%	AWS: Ni = 0.40 - 0.80%
Cu = 0.3 - 0.5%	EN: Cu max. 0.3%

Conarc® 60G

High strength basic electrode

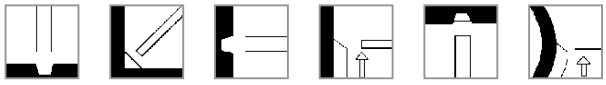
Classification

AWS A5.5 : E9018M-H4
EN 757 : E 55 4 Z B 32 H5

General description

Basic all position extremely low hydrogen electrode
For welding high strength steel grades (UTS 540-640 N/mm²)
Good impact values at -51°C
DC welding preferred
115 - 120% recovery
Also available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

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	TÜV
3Y	4Y50	4Y50H5	4YH10	+	+

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

C	Mn	Si	P	S	Ni	Mo	H_{DM}
0.06	1.0	0.4	0.015	0.010	1.6	0.3	2 ml/100g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C	-40°C	-51°C
Required: AWSA5.5		540-620*	min. 620	min. 24			min. 27
EN 757		min. 550	610-780	min. 18		min. 47	
Typical values	AW	600	670	25		98	
	SR: 1h/620°C	550	640	24	90		40

* Dia. 2.5 mm max 655 N/mm²

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	110	120	85	55
	Net weight/unit (kg)	2.5	4.6	4.6	5.8
Unit: SRP	Pieces / unit	65	50	28	23
	Net weight/unit (kg)	1.4	2.0	1.5	2.6

Identification Imprint: 9018-M / CONARC 60G Tip Color: red

Conarc® 60G: rev. EN 21

Conarc® 60G

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S355
Pipe material	
EN 10208-2	L360, L415, L445, L480
API 5 LX	X52, X56, X60, X65, X70
Creep resistant steels	
EN 10028-2	16 Mo 3
Fine grained steel	
EN 10113-3	S420 M (L), S460 M (L), S420 N (L), S460 N (L)
EN 10137-2	S460, S500
Weather resisting steels	
EN 10155	S235 J0W S235 J2W S355 J0W S355 J2W S 355 K2G1W

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	60 - 100	DC+	63	114	0.7	23.5	77	1.80
3.2 x 350	80 - 130	DC+	69	231	1.3	38.3	40	1.52
4.0 x 350	120 - 180	DC+	72	324	1.7	55.8	30	1.66
5.0 x 450	160 - 240	DC+	119	760	2.2	105.2	14	1.43

* 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	75A	80A	85A	75A	75A
3.2	130A	120A	135A	120A	115A	120A
4.0	155A	145A	160A	145A	140A	140A
5.0	225A	220A	210A			

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Conarc® 70G

High strength basic electrode

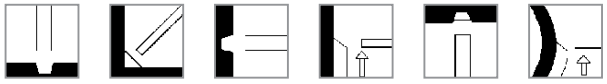
Classification

AWS A5.5 : E9018-G-H4
EN 757 : E 55 4 1NiMo B 32 H5

General description

Basic all position extremely low hydrogen electrode
For high strength steel grades (UTS 640-735 N/mm²), root passes in HY 100 steel
Good impact values at -40°C
DC welding preferred
115 - 120% recovery
Also available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

Welding positions



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

Current type

AC / DC + / -

Approvals

DNV	TÜV
4Y50H5	+

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

C	Mn	Si	P	S	Ni	Mo	H_{DM}
0.06	1.2	0.4	0.014	0.009	1.0	0.4	2 ml/100g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -20°C	-40°C	-46°C
Required: AWS A5.5		min. 530	min. 620	min. 17	not required		
EN 757		min. 550	610-780	min. 18		min. 47	
Typical values	AW	600	655	24		90	60

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	4.0	5.0
	Length (mm)	350	350	350	450	450
Unit: Box	Pieces / unit	110	120	85		55
	Net weight/unit (kg)	2.5	4.6	4.6		5.8
Unit: SRP	Pieces / unit	64	50	28	28	23
	Net weight/unit (kg)	1.5	2.0	1.5	2.0	2.4

Identification Imprint: 9018-G / CONARC 70G Tip Color: light green

Conarc® 70G: rev. EN 21

Conarc® 70G

Materials to be welded

Steel grades/Code	Type
Boiler & pressure vessel steel (Reactor steels incl. Q & T steels)	
DIN	20MnMoNi55, 22NiMoCr37, 15NiCuMoNb5-S1 GS-18NiMoCr37
ASTM	A508CL2, A508CL3, A533CL.1Gr.B / C, A533CL.2Gr.B / C
Creep resistant steels	
	15NiCuMoN65 (WB36), 17MnMoV64(WB35)
Pipe material	
API 5LX	X65, X70
EN 10208-2	L480, L550
Fine grained steel	
EN 10137-2	S460, S500, S550 Root runs and fillet welds in S620 and S690

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	60 - 100	DC+	67	121	0.7	19.5	75	1.47
3.2 x 350	80 - 130	DC+	70	234	1.3	37.5	41	1.56
4.0 x 350	120 - 180	DC+	74	343	1.7	55.4	29	1.59
5.0 x 450	160 - 240	DC+	106	573	2.5	106.4	14	1.43

* 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	75A	80A	85A	75A	75A
3.2	130A	120A	135A	120A	115A	120A
4.0	155A	145A	160A	145A	140A	140A
5.0	225A	220A	210A			

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Conarc® 80

High strength basic electrode

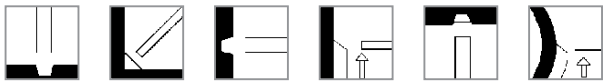
Classification

AWS A5.5 : E11018M-H4
EN 757 : E 69 5 Z B 32 H5

General description

Basic all position extremely low hydrogen electrode
Weldable on AC and DC
110 - 115% recovery
Good impact values at -51°C
Meets the requirements of military specifications
Suitable for welding submarines high strength steels (UTS up to 800 N/mm²)
Also available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

Welding positions



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

Current type

AC / DC + / -

Approvals

ABS	LR
+	4Y69H5

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

C	Mn	Si	P	S	Ni	Mo	H_{DM}
0.06	1.5	0.4	0.015	0.01	2.2	0.4	2 ml/100g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	-50°C	-51°C
Required: AWSA5.5		680-760*	min. 760	min. 20			min. 27
EN 757		min. 690	760-960	min. 17		min. 47	
Typical values	AW	750	785	22	100	80	

* Diam. 2.5 max. 795 N/mm²

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	225	120	90	60
	Net weight/unit (kg)	4.4	4.5	5.0	6.3
Unit: SRP	Pieces / unit	70	50	28	23
	Net weight/unit (kg)	1.4	1.9	1.5	2.5

Identification Imprint: 11018-M / CONARC 80 Tip Color: gold

Conarc® 80: rev. EN 21

Conarc® 80

Materials to be welded

Steel grades/Code	Type
Pipe material	
API-5LX	X70, X75
Fine grained steel	
EN 10137-2	S620, S690 root runs and fillet welds in S890

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	60 - 80	DC+	55	99	0.8	19.5	82	1.61
3.2 x 350	80 - 130	DC+	78	261	1.1	36.5	43	1.55
4.0 x 350	120 - 180	DC+	75	356	1.6	53.2	30	1.59
5.0 x 450	160 - 240	DC+	116	627	2.3	105.1	14	1.45

* 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	75A	75A	75A	80A	75A	80A
3.2	130A	120A	135A	120A	115A	120A
4.0	145A	145A	155A	140A	140A	140A
5.0	225A	230A	210A			

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Conarc® 85

High strength basic electrode

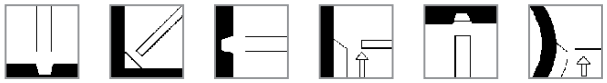
Classification

AWS A5.5 : E12018-G-H4R
EN 757 : E 69 5 Mn2NiCrMo B 32 H5

General description

Basic all position extremely low hydrogen electrode
For steels with a tensile strength UTS of max. 835 N/mm²
For high strength steels such as T1, HY 100, Naxtra 70, HRS 650, Dillimax. 690
Good impact values down to -50°C
Only available in vacuum sealed Sahara ReadyPack® (SRP): HDM < 3 ml/100g

Welding positions



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

Current type

AC / DC + / -

Approvals

ABS	DNV
+	4Y69H5

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

C	Mn	Mn	Si	P	S	Cr	Ni	Mo	HDM
0.06	ø3.2 1.3	_ ø4.0 1.6	0.3	0.01	0.01	0.4	2.0	0.4	2 ml/100g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	Impact ISO-V(J) -50°C
Required: AWS A5.5		min. 740	min. 830	min. 14	not required	
EN 757		min. 690	760-960	min. 17		min. 47
Typical values	AW	840	890	21	80	60
	SR: 1h/620°C	780	850	20	70	60

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	4.0	5.0
	Length (mm)	350	350	350	450	450
Unit: SRP	Pieces / unit	28	50	28	28	23
	Net weight/unit (kg)	1.4	1.9	1.5	1.9	2.5

Identification Imprint: 12018-G / CONARC 85 Tip Color: light blue

Conarc® 85: rev. EN 21

Materials to be welded

Steel grades/Code	Type
Pipe material	
API-5LX	X70, X75, X80
Fine grained steel	
EN 10137-2	S690 root runs and fillet welds in S890

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 - 130	DC+	69	219	1.0	37.5	50	1.89
4.0 x 350	120 - 180	DC+	68	321	1.5	53.2	35	1.87
5.0 x 450	160 - 240	DC+	106	632	2.0	106.7	17	1.81

* 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	135A	130A	140A	120A	120A	120A
4.0	155A	145A	155A	140A	140A	140A
5.0	225A	220A	215A			

Kryo® 1

Low temperature basic electrode

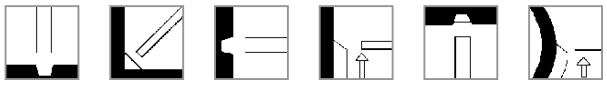
Classification

AWS A5.5 : E7018-G-H4R [1)]
ISO 2560-A : E 50 6 Mn1Ni B 32 H5
[1)] meet also AWS A5.5: E8018-G-H4R

General description

The basic all position offshore electrode with max. 1% Ni
Excellent mechanical properties (impact at -60°C)
Good CTOD at -10°C
Extremely low hydrogen content
110 - 120% recovery
Weldable on AC and DC
Vacuum sealed Sahara ReadyPack®: HDM < 3 ml/100g
Also available in carton boxes

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
3Y	UP	5Y46H5	6Y46H10	5Y40H5	4YH5	3-3YH5	+

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

C	Mn	Si	P	S	Ni	HDM
0.05	1.5	0.4	0.01	0.01	0.9	2 ml/100g

Mechanical properties, 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: AWS5.5		min. 390	min. 480	min. 25	not required	
ISO 2560-A		min. 500	560-720	min. 18		min. 47
Typical values	AW	550	640	24	150	90

CTOD value at -10°C > 0.25 mm

Packaging and available sizes

	Diameter (mm)	2.5	3.0	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	350	450	350	450	450
Unit: Box	Pieces / unit	135	90	120	120	85	85	55
	Net weight/unit (kg)	2.7	2.8	4.7	5.8	4.4	5.9	5.7
Unit: SRP	Pieces / unit	70	54	50	50	28	28	23
	Net weight/unit (kg)	1.4	1.5	1.9	2.4	1.5	2.0	2.5

Identification Imprint: 7018-G / KRYO 1 Tip Color: purple

Kryo® 1: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP 240R
Pipe material	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65
EN 10216-1	P275 T1
EN 10217-1	P275 T2, P355 N
Fine grained steel	
EN 10113-2	S275, S355, S420, S460
EN 10113-3	S275, S355, S420, S460
EN 10137-2	S460

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	55 - 80	DC+	59	85	0.72	19.3	86	1.65
3.0 x 350	70 - 110	DC+	74	256	0.93	30.2	52	1.58
3.2 x 350	80 - 140	DC+	66	220	1.2	37.7	48	1.79
3.2 x 450	80 - 140	DC+	78	259	1.3	48.7	35	1.72
4.0 x 350	120 - 170	DC+	77	355	1.6	54.1	29	1.59
4.0 x 450	120 - 170	DC+	90	450	1.8	68.4	23	1.56
5.0 x 450	180 - 240	DC+	104	784	2.4	105.2	15	1.53

* 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
3.0	110A	110A	115A	110A	105A	110A
3.2	140A	120A	145A	120A	120A	120A
4.0	150A	140A	150A	140A	135A	140A
5.0	220A	210A	210A	170A		

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Kryo® 1N

Low temperature basic electrode

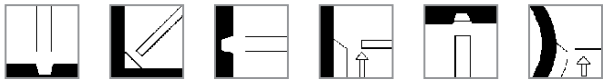
Classification

AWS A5.5 : E8016-G-H4R
ISO 2560-A : E 50 6 Mn1Ni B 12 H5

General description

The basic all position offshore electrode with max. 1% Ni
Thin coated electrode, easy weld pool control
Excellent mechanical properties (impact at -60°C)
Good CTOD at -10°C
Extremely low hydrogen content
Weldable on AC and DC
Only available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

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	P	S	Ni	H_{DM}
0.07	1.7	0.5	0.02	0.005	0.9	2 ml/100 g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	Impact ISO-V(J) -60°C
Required: AWS A5.5		min. 460	min. 550	min. 19	not required	
ISO 2560-A		min. 500	560-720	min. 18		min. 47
Typical values	AW	570	650	24	95	60

CTOD value at -10°C > 0.25 mm

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	450	450	450
Unit: SRP	Pieces / unit	45	56	30	23
	Net weight/unit (kg)	0.9	2.3	1.9	2.3

Identification Imprint: 8016-G / KRYO 1N Tip Color: red

Kryo® 1N: rev. EN 21

Kryo® 1N

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP 240R
Pipe material	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65
EN 10216-1	P275 T1
EN 10217-1	P275 T2, P355 N
Fine grained steel	
EN 10113-2	S275, S355, S420, S460
EN 10113-3	S275, S355, S420, S460
EN 10137-2	S460

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 - 95	DC+	50	106	0.82	19.2	90	1.71
3.2 x 450	80 - 145	DC+	68	256	1.2	40.1	43	1.73
4.0 x 450	120 - 190	DC+	82	436	1.7	63.6	26	1.65
5.0 x 450	175 - 230							

* 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	75A	70A	75A	70A	75A	80A
3.0	100A	110A	100A	100A	100A	110A
4.0	150A	140A	130A	125A	125A	120A

Kryo® 1P

Low temperature basic electrode

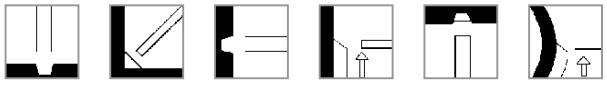
Classification

AWS A5.5 : E 8018-G-H4R
ISO 2560-A : E 50 6 Mn1Ni B 32 H5

General description

The basic all position offshore electrode with max. 1% Ni
Excellent mechanical properties (impact at -60°C)
Good CTOD at -10°C
Extremely low hydrogen content
110 - 120% recovery
Weldable on AC and DC
Vacuum sealed Sahara ReadyPack®: HDM < 3 ml/100g
Also available in carton boxes

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	P	S	Ni	HDM
0.05	1.5	0.5	0.010	0.005	0.95	2 ml/100g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	Impact ISO-V(J) -60°C
Required: AWSA5.5		min. 460	min. 550	min. 19	not required	
ISO 2560-A		min. 500	560-720	min. 18		min. 47
Typical values	AW	550	640	24	140	80
	SR: 580°C/15h	460	550	19		

CTOD value at -10°C > 0.25 mm

Packaging and available sizes

	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
Unit: Box	Pieces / unit	135	120	120		85	55
	Net weight/unit (kg)	2.7	4.7	5.8		5.9	5.7
Unit: SRP	Pieces / unit	70	50	50	28	28	23
	Net weight/unit (kg)	1.4	1.9	2.0	1.5	2.0	2.5

Identification Imprint: 8018-G / KRYO 1P Tip Color: purple

Kryo® 1P: rev. EN 21

Kryo® 1P

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S275, S355
Ship plates	
ASTM A131	Grade A, B, D, E, AH 32 to EH 40
Cast steel	
EN 10213-2	GP 240R
Pipe material	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65
EN 10216-1	P275 T1
EN 10217-1	P275 T2, P355 N
Fine grained steel	
EN 10113-2	S275, S355, S420, S460
EN 10113-3	S275, S355, S420, S460
EN 10137-2	S460

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 - 85	DC+	59	85	0.72	19.3	86	1.65
3.2 x 350	80 - 145	DC+	66	220	1.2	37.7	48	1.79
3.2 x 450	80 - 145	DC+	78	259	1.3	48.7	35	1.72
4.0 x 350	120 - 185	DC+	77	355	1.6	54.1	29	1.59
4.0 x 450	120 - 185	DC+	90	450	1.8	68.4	23	1.56
5.0 x 450	180 - 270	DC+	104	784	2.4	105.2	15	1.53

* 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	140A	120A	145A	120A	120A	120A
4.0	150A	140A	150A	140A	135A	140A
5.0	220A	210A	210A	170A		

Kryo® 1-180

Low temperature basic electrode

Classification

AWS A5.5 : E 8018-G-H4R
ISO 2560-A : E 50 5 1Ni B 73 H5

General description

Basic electrode with max. 1%Ni
Extremely low hydrogen content
Approx. 175% recovery, easy slag release, weldable on AC and DC
Filling horizontal V- and X-grooves
4 mm diam. also suitable for fillet welds
Reliable impact toughness at -60°C
Excellent X-ray quality
Also available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

Welding positions

ISO/ASME PA/1G PB/2F PC/2G

Current type

AC / DC + / -

Approvals

DNV	LR
4Y46H5	4YH5

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

C	Mn	Si	P	S	Ni	H_{DM}
0.07	1.2	0.3	0.020	0.010	0.9	2 ml/100g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	Impact ISO-V(J) -50°C
Required: AWSA5.5		min. 460	min. 550	min. 19	not required	
ISO 2560-A		min. 500	560-720	min. 18		min. 47
Typical values	AW	550	640	26	90	60
	SR: 600°C/4h	540	620	24	100	85

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0	6.3
	Length (mm)	450	450	450	450
Unit: SRP	Pieces / unit	27	23	19	8
	Net weight/unit (kg)	2.0	2.4	2.8	1.9

Identification Imprint: 8018-G / KRYO 1-180 Tip Color: pink

Kryo® 1-180: rev. EN 22

Kryo® 1-180

Materials to be welded

Steel/Code	Type
General structural steel	
EN 10025	S275, S355
Ship plates	
ASTM A131	Grade A, B, D, AH32 to EH40
Cast steel	
EN 10213-2	GP 240R
Pipe material	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5 LX	X42, X46, X52, X60, X65
EN 10216-1	P275 T1
EN 10217-1	P275 T2, P355 N
Fine grained steel	
EN 10113-2	S275, S355, S420, S460
EN 10113-3	S275, S355, S420, S460
EN 10137-2	S460

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	130 - 160							
4.0 x 450	170 - 240	AC	73	537	3.5	102.0	14	1.43
5.0 x 450	250 - 300	AC	78	772	5.0	156.7	9	1.45
6.3 x 450	280 - 390	AC	84	1171	6.9	234.6	6	1.45

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G
4.0	230A	190A	190A
5.0	300A	230A	230A
6.3	390A	280A	

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Kryo® 2

Low temperature basic electrode

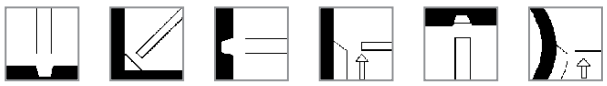
Classification

AWS A5.5 : E9018-G-H4R
EN 757 : E 55 6 Z B 32 H5

General description

Basic all position offshore electrode for high strength steels (YS 420 - 500 N/mm²)
110 - 120% recovery
Extremely low hydrogen content
Excellent impact toughness at -60°C
Good CTOD at -10°C
Vacuum sealed Sahara ReadyPack®: HDM < 3 ml/100g
Also available in carton boxes

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	P	S	Ni	HDM
0.05	1.6	0.3	0.015	0.01	1.5	2 ml/100 g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -40°C	-50°C	-60°C
Required: AWS A5.5		min. 530	min.620	min. 17	not required		
EN 757		min. 550	610-780	min. 18			min. 47
Typical values	AW	570	650	22	140	110	60
CTOD-value at -15°C > 0.30mm							

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	450	450	450
Unit: Box	Pieces / unit	135	120	85	55
	Net weight/unit (kg)	2.7	5.8	5.9	5.7
Unit: SRP	Pieces / unit	70	50	28	23
	Net weight/unit (kg)	1.4	2.4	2.0	2.5

Identification Imprint: 9018-G / KRYO 2 Tip Color: green

Kryo® 2: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S355
Cast steel	
EN 10213-2	GP 240R
Pipe material	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445, L480
API 5 LX	X42, X46, X52, X60, X65, X70
EN 10216-1	P275 T1
EN 10217-1	P275 T2, P355 N
Fine grained steel	
EN 10113-2	S275, S355, S420, S460
EN 10113-3	S275, S355, S420, S460
EN 10137-2	S460, S500
Low temperature steels	
EN 10028-4	11 MnNi 5-3, 13 MnNi 6-3, 15 NiMn 6
EN 10222-3	13 MnNi 6-3, 15 NiMn 6

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	55 - 85	DC+	59	85	0.72	19.4	86	1.65
3.2 x 450	80 - 140	DC+	80	268	1.2	46.8	36	1.70
4.0 x 450	120 - 170	DC+	89	445	1.8	70.0	22	1.52
5.0 x 450	180 - 240	DC+	96	598	2.6	103.8	14	1.51

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	85A	80A	80A
3.2	140A	120A	145A	120A	120A	120A
4.0	150A	140A	150A	140A	135A	140A
5.0	220A	210A	210A	170A		

Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

Kryo® 3

Low temperature basic electrode

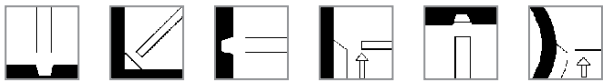
Classification

AWS A5.5 : E8018-C1-H4
ISO 2560-A : E 46 8 Z 3Ni B 32 H5
Z: Deviation, see remarks

General description

The basic all position offshore electrode with approx. 2.5% Ni
115 - 120% recovery
Excellent impact toughness at -80°C
Good CTOD at -10°C
Extremely low hydrogen content
Also available in vacuum sealed Sahara ReadyPack® (SRP): H_{DM} < 3 ml/100g

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	TÜV
+	UP	5YH10	6Y42H10	5Y40H	5YH5	+

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

C	Mn	Si	P	S	Ni	H_{DM}
0.05	0.7	0.3	0.015	0.010	2.5	2 ml/100 g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -59°C	-60°C	-80°C
Required: AWSA5.5	SR[1)]	min. 460	min. 550	min. 19	min. 27		
ISO 2560-A		min. 460	530-680	min. 20			min. 47
Typical values	AW	500	600	26		120	60

CTOD value at -10°C > 0.25 mm
Stress relieved: SR[1)] = 605±14°C/1h

Packaging and available sizes

	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
Unit: Box	Pieces / unit	135	120		85		55
	Net weight/unit (kg)	2.7	4.2		4.4		5.7
Unit: SRP	Pieces / unit	70	50	50		28	23
	Net weight/unit (kg)	1.4	1.9	2.4		2.0	2.5

Identification Imprint: 8018-C1 / KRYO 3 Tip Color: silver

Kryo® 3: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S355
Pipe material	
EN 10208-2	L360, L415, L445
API 5 LX	X52, X56, X60, X65
Fine grained steel	
EN 10113-2	S355, S420
EN 10113-3	S355, S420
Low temperature steels	
EN 10028-4	11 MnNi 5-3, 13 MnNi 6-3, 15 NiMn 6 (12 Ni 14 G 1, G 2)
EN 10222-3	13 MnNi 6-3, 15 NiMn 6

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	55 - 80	DC+	57	103	0.72	19.5	88	1.71
3.2 x 350	80 - 140	DC+	65	218	1.3	37.4	44	1.64
3.2 x 450	80 - 140	DC+	79	263	1.4	48.5	33	1.59
4.0 x 350	120 - 170	DC+	74	344	1.6	52.7	30	1.57
4.0 x 450	120 - 170	DC+	100	463	1.7	69.8	21	1.45
5.0 x 450	180 - 240	DC+	103	723	2.5	104.8	14	1.48

* 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	85A	80A	80A
3.2	140A	120A	145A	120A	120A	120A
4.0	150A	140A	150A	140A	135A	140A
5.0	220A	210A	210A	170A		

Remarks/ Application advice

Deviations: chemical composition:

Ni = 2.25 - 2.75% EN: Ni = 2.6 - 3.8%

Kryo® 4

Low temperature basic electrode

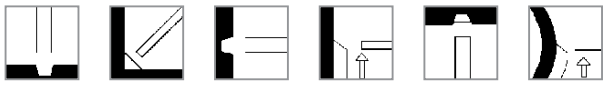
Classification

AWS A5.5 : E7016-C2L-H4R
ISO 2560-A : E 38 8 3Ni B 32 H5

General description

The basic all position offshore electrode with approx. 3.5% Ni
Excellent impact toughness at -80°C in as welded condition and -100°C after PWHT
Extremely low hydrogen content
Availability : on request

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	P	S	Ni	H_{DM}
0.03	0.6	0.4	0.010	0.005	3.6	2 ml/100 g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -80°C	Impact ISO-V(J) -101°C
Required: AWSA5.5	SR[1)]	min. 390	min. 480	min. 25		min. 27
Typical values	AW	450	520	26	80	
Typical values	SR[2)]	430	510	26		80

Stress relieved: SR[1)] = 605±14°C/1h
Stress relieved: SR[2)]= 605±14°C/1h

Packaging and available sizes

	Diameter (mm)	3.2	4.0
	Length (mm)	350	350
Unit: SRP	Pieces / unit	58	30
	Net weight/unit (kg)	1.8	1.4
	Consult Lincoln for availability		

Identification Imprint: 8018-C1 / KRYO 3 Tip Color: silver

Kryo® 4: rev. EN 21

Materials to be welded

Steel grades/Code	Type
General structural steel	
EN 10025	S355
Pipe material	
EN 10208-2	L360, L415, L445
API 5 LX	X52, X56, X60, X65
Fine grained steel	
EN 10113-2	S355, S420
EN 10113-3	S355, S420
Low temperature steels	
EN 10028-4	11 MnNi 5-3, 13 MnNi 6-3, 15 NiMn 6 (12 Ni 14 G 1, G 2)
EN 10222-3	13 MnNi 6-3, 15 NiMn 6

SL®12G

Creep resistant basic electrode

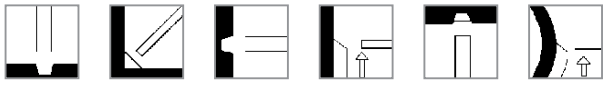
Classification

AWS A5.5	: E7018-A1-H4R
EN 1599	: E Mo B 32 H5

General description

Basic very low hydrogen all position electrode (H_{DM} < 5 ml/100g)
For welding creep resisting and fine grained steels
Service temperature from -40 up to 500°C
DC-welding preferred
115 - 120% recovery
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

DB	DNV	TÜV
x	0,3 Mo PT.2	+

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

C	Mn	Si	P	S	Mo	H_{DM}
0.05	0.8	0.6	0.02	0.01	0.55	2 ml/100g

Mechanical properties, 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 A5.5	SR[1)]	min. 390	min. 480	min. 25	not required	
EN 1599	SR[2)]	min. 355	min. 510	min. 22	min. 47	
Typical values	SR[3)]	560	620	25	140	50
	AW	550	610	25	160	70

Stress relieved: SR[1)] = 620±14°C/1h, SR[2)] = 570-620°C/1h, SR[3)] = 620°C/1h

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	110	120	85	55
	Net weight/unit (kg)	2.5	4.5	4.7	6.0
Unit: SRP	Pieces / unit	67	50	28	23
	Net weight/unit (kg)	1.4	2.0	1.5	2.6

Identification	Imprint: 7018-A1 / SL 12 G	Tip Color: blue	**SL®12G: rev. EN 21**

Materials to be welded

Steel grades/Code	Type
Creep resistant steels	
EN 10028-2	P295 G H, P355 G H, 16 Mo 3
EN 10222-2	17 Mo 3, 14 Mo 6
Fine grained steel	
EN 10113-2	S275, S355, S420
EN 10113-3	S275, S355, S420

Creep data

Test temperature	(°C)	400	450	500	550
Yield strength Rp-0,2%	(N/mm^2)	420	380	330	
Creep strength Rm/1000	(N/mm^2)		360	300	-200
Creep strength Rm/10.000	(N/mm^2)		320	180	-80
Creep resistance Rp1%/10.000	(N/mm^2)		230	150	-65

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	60 - 90	DC+	65	118	0.7	22.8	84	1.92
3.2 x 350	80 - 130	DC+	69	230	1.3	37.9	42	1.59
4.0 x 350	120 - 180	DC+	81	373	1.6	54.8	28	1.56
5.0 x 450	160 - 240	DC+	106	799	2.4	107.4	14	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
2.5	80A	85A	80A	85A	80A	80A
3.2	130A	120A	130A	120A	120A	120A
4.0	150A	145A	140A	140A	140A	140A
5.0	225A	225A	210A			

Remarks/ Application advice

Recommended tempering heat treatment range: 580 - 630°C (time depends on material thickness)
Redry electrodes 2-4h at 350 ± 25°C after removal from cardboard boxes

SL®19G

Creep resistant basic electrode

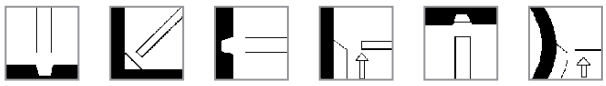
Classification

AWS A5.5 : E8018-B2-H4
EN 1599 : E CrMo1 B 32 H5

General description

Basic very low hydrogen all position electrode (H_{DM} < 5 ml/100g)
For welding creep and hydrogen resistant CrMo-steels
Maximum service temperature 550°C
DC-welding preferred
115 - 120% recovery
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	RINA	TÜV
C1M	1Cr0,5Mo	C1M	+

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

C	Mn	Si	P	S	Cr	Mo	H_{DM}
0.06	0.75	0.6	0.015	0.01	1.1	0.5	3 ml/100g

Mechanical properties, 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 A5.5	SR[1)]	min. 460	min. 550	min. 19	not required	
	EN 1599	SR[2)]	min. 355	min. 510	min. 20	min. 47	
Typical values		SR[3)]	570	640	24	180	100

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 660-700°C/1h, SR[3)] = 700°C/1h

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	110	120	85	55
	Net weight/unit (kg)	2.6	4.6	4.7	6.1
Unit: SRP	Pieces / unit	67	50	28	23
	Net weight/unit (kg)	1.4	2.0	1.5	2.6

Identification Imprint: 8018-B2 / SL 19 G Tip Color: red

SL®19G: rev. EN 21

Materials to be welded

Steel grades/Code	Type
Creep resistant steels	
EN 10028-2	13 CrMo 4-5
EN 10083-1	25 CrMo 4
EN 10222-2	14 CrMo 4-5
Tool steel	
DIN 17210	16 MnCr 5

Creep data

Test temperature	(°C)	400	450	500	550	600
Yield strength Rp-0,2%	(N/mm^2)	460	440	430		
Creep strength Rm/1000	(N/mm^2)			300	140	-80
Creep strength Rm/10.000	(N/mm^2)		350	240	110	-50
Creep resistance Rp1%/10.000	(N/mm^2)		250	170	80	-35

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	60 - 90	DC+	63	114	0.71	21.0	80	1.67
3.2 x 350	80 - 130	DC+	68	227	1.3	37.9	41	1.56
4.0 x 350	120 - 180	DC+	79	367	1.6	54.9	29	1.59
5.0 x 450	160 - 240	DC+	103	777	2.5	106.9	14	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
2.5	80A	85A	80A	85A	80A	80A
3.2	130A	120A	130A	120A	120A	120A
4.0	150A	145A	140A	140A	140A	140A
5.0	225A	225A	210A			

Remarks/ Application advice

Recommended preheat temperature: 200 - 250°C

Recommended tempering heat treatment range: 660 - 700°C (time depends on material thickness)

Redry electrodes 2-4h at 350 ± 25°C after removal from cardboard boxes

SL®19G(STC)

Creep resistant basic electrode

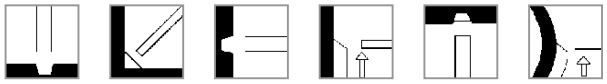
Classification

AWS A5.5 : E8018-B2-H4
EN 1599 : E CrMo1 B 32 H5

General description

Basic very low hydrogen all position electrode (H_{DM} < 5 ml/100g)
For welding creep and hydrogen resistant CrMo-steels
Excellent weldability for welding pipe and plate on site
Reliable X-ray properties
Good mechanical properties in the as welded and stress relieved condition
Applicable for service temperature from -20 to 500°C
SL19G(STC) meets the actual "step cool" requirements including the Bruscato factor of X < 15
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

AC / DC + / -

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

C	Mn	Si	P	S	Cr	Mo	Bruscato	H_{DM}
0.06	0.7	0.35	0.010	0.010	1.2	0.55	max. 15 ppm	3 ml/100g

Mechanical properties, 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 A5.5	SR[1)]	min. 460	min. 550	min. 19	not required	
EN 1599	SR[2)]	min. 355	min. 510	min. 20	min. 47	
Typical values	SR[3)]	570	640	24	180	100

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 660-700°C/1h, SR[3)] = 700°C/1h
Shifting CVN at 55 J(DeltaT55): +10°C after "STC" (step cool treatment)

Packaging and available sizes

	Length (mm)	350	350	350
	Diameter (mm)	2.5	3.2	4.0
Unit: SRP	Pieces / unit	69	50	28
	Net weight/unit (kg)	1.4	2.0	1.5

Identification Imprint: 8018-B2 / SL 19 G (STC) Tip Color: red

SL®19G(STC): rev. EN 21

SL®19G(STC)

Materials to be welded

Steel grades/Code	Type
Creep resistant steels	
EN 10028-2	13 CrMo 4-5
EN 10083-1	25 CrMo 4
EN 10222-2	14 CrMo 4-5
Tool steel	
DIN 17210	16 MnCr 5

Creep data

Test temperature	(°C)	400	450	500	550	600
Yield strength Rp-0,2%	(N/mm^2)	460	440	430		
Creep strength Rm/1000	(N/mm^2)			300	140	-80
Creep strength Rm/10.000	(N/mm^2)		350	240	110	-50
Creep resistance Rp1%/10.000	(N/mm^2)		250	170	80	-35

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 - 90							
3.2 x 350	80 - 145	DC+	68	227	1.3	37.9	41	1.56
4.0 x 350	120 - 185	DC+	79	367	1.6	54.9	29	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
3.2	130A	120A	130A	120A	120A	120A
4.0	150A	145A	140A	140A	140A	140A

Remarks/ Application advice

Recommended preheat temperature: 200 - 250 °C

Recommended tempering heat treatment range: 660 - 700°C (time depends on material thickness)

Stepcooling requirements: Bruscato factor X = (10 P + 5 Sb +4 Sn + As)/100 _ 15 ppm and Mn + Si < 1.1

SL®20G

Creep resistant basic electrode

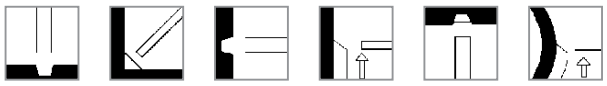
Classification

AWS A5.5 : E9018-B3-H4
EN 1599 : E CrMo2 B 32 H5

General description

Basic very low hydrogen all position electrode (H_{DM} < 5 ml/100g)
For welding creep and hydrogen resistant CrMo-steels
Maximum service temperature 600°C
DC-welding preferred
115 - 120% recovery
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

RINA	TÜV
C2M1	+

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

C	Mn	Si	P	S	Cr	Mo	H_{DM}
0.06	0.8	0.6	0.015	0.01	2.3	1.0	3 ml/100 g

Mechanical properties, 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 A5.5	SR[1)]	min. 530	min. 620	min. 17	not required	
	EN 1599	SR[2)]	min. 400	min. 500	min. 18	min. 47	
Typical values :		SR[3)]	530	650	22	150	90

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 690-750°C/1h, SR[3)] = 695°C/1h

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	110	120	85	55
	Net weight/unit (kg)	2.6	4.7	4.8	6.2
Unit: SRP	Pieces / unit	67	50	28	23
	Net weight/unit (kg)	1.4	2.0	1.5	2.6

Identification Imprint: 9018-B3 / SL 20 G Tip Color: white

SL®20G: rev. EN 21

Materials to be welded

Steel grades/Code	Type
Creep and hydrogen resistant steels	
EN 10028-2	10 CrMo 9-10
EN 10222-2	12 CrMo 9-10

Creep data

Test temperature	(°C)	400	450	500	550	600
Yield strength Rp-0,2%	(N/mm^2)	480	460	430		
Creep strength Rm/1000	(N/mm^2)			240	160	-100
Creep strength Rm/10.000	(N/mm^2)			210	110	-60
Creep resistance Rp1%/10.000	(N/mm^2)			160	85	-45

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 - 90	DC+	63	114	0.72	21.0	79	1.67
3.2 x 350	80 - 130	DC+	70	233	1.3	37.6	40	1.49
4.0 x 350	120 - 180	DC+	75	348	1.7	56.7	28	1.56
5.0 x 450	160 - 240	DC+	100	754	2.6	107.6	14	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	80A	85A	80A	85A	80A	80A
3.2	130A	120A	130A	120A	120A	120A
4.0	150A	145A	140A	140A	140A	140A
5.0	225A	225A	210A			

Remarks/ Application advice

Recommended preheat temperature: 200 - 300°C

Recommended tempering heat treatment range: 690 - 750°C (time depends on material thickness)

Redry electrodes 2-4h at 350 ± 25°C after removal from cardboard boxes

SL®20G(STC)

Creep resistant basic electrode

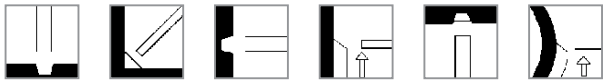
Classification

AWS A5.5 : E9018-B3-H4
EN 1599 : E CrMo2 B 32 H 5

General description

Basic very low hydrogen all position electrode (H_{DM} < 5 ml/100g)
For welding 2.25% Cr 1% Mo-creep and hydrogen resistant steels
Excellent weldability for pipe and site welding
Reliable X-ray properties
Good mechanical properties in the as welded and stress relieved condition
Applicable for service temperature from -20 to 600°C
SL 20G (STC) meets the actual "step cool" requirements including the Bruscato factor X < 15
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

AC / DC + / -

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

C	Mn	Si	P	S	Cr	Mo	Bruscato	H_{DM}
0.10	0.6	0.35	0.01	0.01	2.3	1.0	max. 15 ppm	3 ml/100g

Mechanical properties, 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 A5.5	SR[1]	min. 530	min. 620	min. 17	not required	
EN 1599	SR[2]	min. 400	min. 500	min. 18	min. 47	
Typical values	SR[3]	540	640	20	160	80

Stress relieved: SR[1] = 690±14°C/1h, SR[2] = 690-750°C/1h, SR[3] = 695°C/1h
Shifting CVN at 55 J(DeltaT55): +10°C after "STC" (step cool treatment)

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: SRP	Pieces / unit	67	51	28	23
	Net weight/unit (kg)	1.4	2.0	1.5	1.6

Identification Imprint: 9018-B3 / SL 20 G (STC) Tip Color: White

SL®20G(STC): rev. EN 21

SL®20G(STC)

Materials to be welded

Steel grades/Code	Type
Creep and hydrogen resistant steels	
EN 10028-2	10 CrMo 9-10
EN 10222-2	12 CrMo 9-10

Creep data

Test temperature	(°C)	400	450	500	550	600
Yield strength Rp-0,2%	(N/mm^2)	480	460	430		
Creep strength Rm/1000	(N/mm^2)			240	160	-100
Creep strength Rm/10.000	(N/mm^2)			210	110	-60
Creep resistance Rp1%/10.000	(N/mm^2)			160	85	-45

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 - 95	DC+	63	114	0.72	21.0	79	1.67
3.2 x 350	80 - 145	DC+	70	233	1.3	37.6	40	1.49
4.0 x 350	120 - 185	DC+	75	348	1.7	56.7	28	1.56
5.0 x 450	160 - 260	DC+	100	754	2.6	107.6	14	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	80A	85A	80A	85A	80A	80A
3.2	130A	120A	130A	120A	120A	120A
4.0	150A	145A	140A	140A	140A	140A
5.0	225A	225A	210A			

Remarks/ Application advice

Recommended preheat temperature: 200 - 300°C

Recommended tempering heat treatment range: 680 - 750°C (time depends on material thickness)

Stepcooling requirements: Bruscato factor X = (10 P + 5 Sb +4 Sn + As)/100 _ 15 ppm and Mn + Si < 1.1

SL®22G

Creep resistant basic electrode

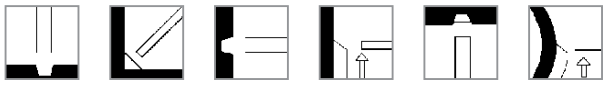
Classification

AWS A5.5 : E8018-B1-H4
EN 1599 : E Z B 32 H5

General description

Basic very low hydrogen all position electrode (H_{DM} < 5 ml/100g)
For welding creep resistant CrMoV-steels
Maximum service temperature 550°C
DC-welding preferred
115 - 120% recovery
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

AC / DC + / -

Approvals

TÜV
+

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

C	Mn	Si	P	S	Cr	Mo	V	H_{DM}
0.06	0.8	0.6	0.02	0.01	0.5	0.5	0.3	3 ml/100 g

Mechanical properties, 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 A5.5	SR[1)]	min. 460	min. 550	min. 19	not required	
Typical values	SR[2)]	570	640	24	180	110

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 730°C/1h

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: SRP	Pieces / unit	67	50	28	23
	Net weight/unit (kg)	1.4	2.0	1.5	2.6

Identification Imprint: 8018-B1 / SL 22 G Tip Color: orange

SL®22G: rev. EN 21

Materials to be welded

Steel grades/Code	Type
Creep resistant steels	
DIN	14MoV63
	17MnMoV64
	10CrSiMoV7

Creep data

Test temperature	(°C)	400	450	500	550	575
Yield strength Rp-0,2%	(N/mm^2)	480	470	450		
Creep strength Rm/1000	(N/mm^2)			270	170	150
Creep strength Rm/10.000	(N/mm^2)			250	150	130
Creep resistance Rp1%/10.000	(N/mm^2)			210	130	110

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	60 - 90	DC+	64	115	0.70	21.0	82	1.69
3.2 x 350	80 - 130	DC+	71	238	1.2	37.5	41	1.54
4.0 x 350	120 - 180	DC+	76	353	1.6	55.8	30	1.64
5.0 x 450	160 - 220	DC+	101	762	2.6	106.6	14	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	80A	85A	80A	85A	80A	80A
3.2	130A	120A	130A	120A	120A	120A
4.0	150A	145A	140A	140A	140A	140A
5.0	225A	225A	210A			

Remarks/ Application advice

Recommended preheat temperature: 200 - 250°C

Recommended tempering heat treatment range: 690 - 740°C (time depends on material thickness)

Redry electrodes 2-4h at 350 ± 25°C after removal from cardboard boxes

SL®502

Creep resistant basic electrode

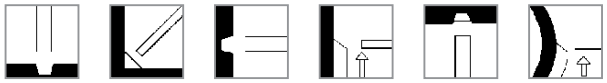
Classification

AWS A5.5 : E8018-B6-H4R
EN 1599 : E CrMo5 B 32 H5

General description

Basic very low hydrogen all position electrode (H_{DM} < 5 ml/100g)
For welding creep and hydrogen resistant 5% Cr-0.5% Mo-steels
Maximum service temperature 550°C
Developed for the petrochemical industry
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

AC / DC + / -

Approvals

TÜV
+

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

C	Mn	Si	P	S	Cr	Mo	H_{DM}
0.07	0.8	0.6	0.020	0.010	5.3	0.6	3 ml/100g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.5	SR[1)]	min. 460	min. 550	min. 19	not required
EN 1599	SR[2)]	min. 400	min. 590	min. 17	min. 47
Typical values	SR[3)]	580	680	22	110

Stress relieved: SR[1)] = 740 ±14°C/1h, SR[2)] = 730-760°C/1h, SR[3)] = 750°C/2h

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: SRP	Pieces / unit	67	52	29
	Net weight/unit (kg)	1.4	1.9	1.6

Identification	Imprint: 8018-B6 / SL 502	Tip Color: brown	**SL®502: rev. EN 21**

Materials to be welded

Steel grades/Code	Type
Creep and hydrogen resistant steels	
DIN	12CrMo19.5 and equivalent grades
ASTM	A182 F5
	A213 T5
	A335 P5
	A336 F5
	A369 FP5
	A387 Grade 5

Creep data

Test temperature	(°C)	400	450	500	550	600
Yield strength Rp-0,2%	(N/mm^2)	480	440	380		
Creep strength Rm/1000	(N/mm^2)			160	140	-80
Creep strength Rm/10.000	(N/mm^2)			130	90	-60
Creep resistance Rp1%/10.000	(N/mm^2)			100	50	-30

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 - 90	DC+	55	95	0.82	20.8	80	1.67
3.2 x 350	85 - 130	DC+	66	237	1.1	35.4	50	1.79
4.0 x 350	130 - 180	DC+	76	331	1.5	51.8	32	1.64

* 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	75A	70A	70A	70A
3.2	130A	130A	125A	120A	120A	120A
4.0	140A	140A	135A	135A	135A	135A

Remarks/ Application advice

Formerly not classified but produced to the E502 composition ranges in A5.4-81: E502
Recommended preheat and interpass temperature 200 - 300°C
Postweld heat treatment 730 - 760°C (time depends on material thickness)

SL®9Cr(P91)

Creep resistant basic electrode

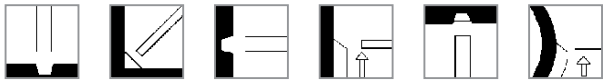
Classification

AWS A5.5 : E9016-B9-H4
EN 1599 : E CrMo91 B 32 H5

General description

Basic very low hydrogen all position electrode (H_{DM} < 5 ml/100g)
For welding creep and hydrogen resistant 9% Cr-1% Mo steels
Maximum service temperature 650°C
Developed for power plants and the petrochemical industry
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

AC / DC + / -

Approvals

TÜV
+

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

C	Mn	Si	P	S	Cr	Ni	Mo	Nb	V	N	H_{DM}
0.09	0.6	0.2	0.010	0.010	9.0	0.6	1.0	0.04	0.2	0.04	3 ml/100 g

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.5	SR[1)]	min. 530	min. 620	min. 17	not required
EN 1599	SR[2)]	min. 415	min. 585	min. 17	min. 47
Typical values	SR[3)]	650	800	20	50

Stress relieved: SR[1)] = 740±14°C/1h, SR[2)] = 750-770°C/2h, SR[3)] = 750-754°C/2h

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: SRP	Pieces / unit	69	50	28	23
	Net weight/unit (kg)	1.4	1.8	1.5	2,4

Identification Imprint: 9016-B9 / SL 9 Cr(P91) Tip Color: dark green

SL®9Cr(P91): rev. EN 21

SL®9Cr(P91)

Materials to be welded

Steel grades/Code	Type	Code	Type
Creep and hydrogen resistant steels			
EN 10222-2	X10CrMoV 9-1		
ASTM	A199 Grade T91	ASME	SA 182-F91
	A200 Grade T91		
	A213 Grade T91		SA 213-T91
	A335 Grade P91		SA 335-P91
	A336 Grade F91		SA 336-F91
			SA 369-FP91
			SA 387-Grade 91

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	60 - 90	DC+	57	88	0.7	19.3	92	1.78
3.2 x 350	85 - 140	DC+	65	172	1.0	34.8	59	2.04
4.0 x 350	130 - 175	DC+	66	263	1.5	50.8	36	1.81

* 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	75A	70A	70A	70A
3.2	130A	130A	125A	120A	120A	120A
4.0	140A	140A	135A	135A	135A	135A

Remarks/ Application advice

Recommended preheat and interpass temperature: 250 - 300°C

Recommended tempering heat treatment range: 750 - 780°C (time depends on material thickness)

Arosta® 304L

Stainless steel electrode

Classification

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

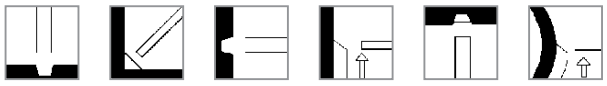
Temperature range

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
0.02	0.80	0.80	19.5	9.7	04-10

Mechanical properties, 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			242	141	84	
	Net weight/unit (kg)			4.8	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	W.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
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.

Limarosta® 304L

Stainless steel electrode

Classification

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

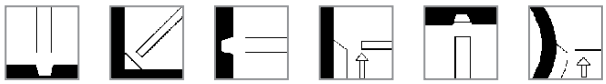
Temperature range

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
0.025	0.75	0.95	19.0	9.7	04-10

Mechanical properties, 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	200	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

Limarosta® 304L

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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
2.0 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				

For root passes DC- is recommended.

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 stainless steel electrode for welding 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
0.02	0.8	0.7	20.0	9.8	04-10

Mechanical properties, 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 102 13-4	W.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

Jungo® 304L

Stainless steel electrode

Classification

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

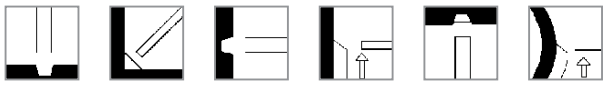
Temperature range

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

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
0.025	1.8	0.4	19.0	10.0	04-10

Mechanical properties, 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	W.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

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
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

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

General description

A rutile-basic 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
0.02	0.6	0.9	19.0	10.0	04-10

Mechanical properties, 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

Limarosta® 304L-130

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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

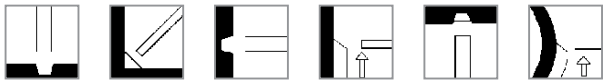
Temperature range

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
0.03	0.8	0.8	19.5	9.8	0.35	06-12

Mechanical properties, 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 102 13-4	W.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.

Stainless steel electrode

Classification

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

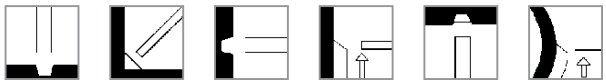
Temperature range

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
0.02	1.6	0.5	20.0	10.0	0.40	06-12

Mechanical properties, 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 102 13-4	W.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

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	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

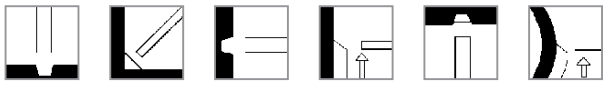
Temperature range

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
0.02	0.8	0.8	18.0	11.5	2.85	04-10

Mechanical properties, 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 102 13-4	W.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

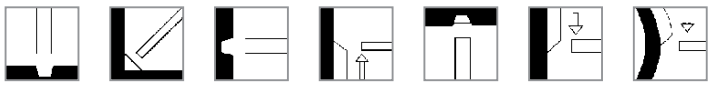
Temperature range

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
0.02	0.7	0.85	18.1	11.5	2.85	04-10

Mechanical properties, 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 102 13-4	W.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

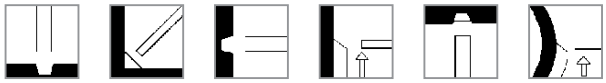
Temperature range

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
0.02	0.8	1.0	18.0	11.5	2.8	04-10

Mechanical properties, 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)	1.5	2.0	2.5	3.2	4.0	5.0
	Length (mm)	250	300	350	350	450	450
Unit: Box	Pieces / unit	125	200	125	135	85	55
	Net weight/unit (kg)	0.8	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 102 13-4	W.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							
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				

For root passes DC- is recommended.

EMR SAHARA®

Vertarosta® 316L

Stainless steel electrode

SMAW

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 stainless steel electrode for welding 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
0.02	0.7	0.85	18.0	11.5	2.8	04-10

Mechanical properties, 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

Vertarosta® 316L

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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 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

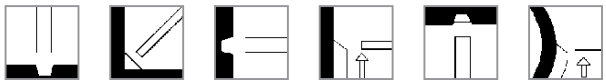
Temperature range

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
0.025	1.6	0.4	18.5	11.0	2.7	04-10

Mechanical properties, 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
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	135	150	100
	Net weight/unit (kg)	2.7	4.8	4.8

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

Jungo® 316L: rev. EN 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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 stainless steel electrode for welding 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
0.02	0.65	1.0	18.0	11.5	2.8	04-10

Mechanical properties, 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 102 13-4	W.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

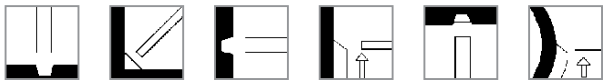
Temperature range

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
0.03	0.8	0.85	18.0	11.5	2.7	0.35	06-12

Mechanical properties, 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 102 13-4	W.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

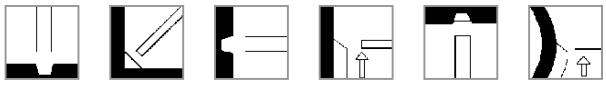
*: Deviation, see remarks

Temperature range

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
0.025	1.5	0.4	18.0	11.0	2.7	0.5	06-12

Mechanical properties, 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 102 13-4	W.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

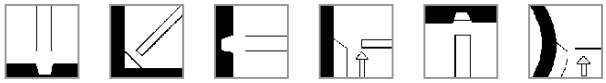
Temperature range

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
0.02	1.3	0.8	18.0	17.0	4.6	0.18	<0.3

Mechanical properties, 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 102 13-4	W.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 - 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+	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.

Stainless steel electrode

Classification

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

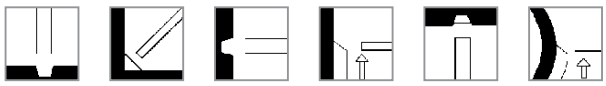
Temperature range

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
0.03	7.3	0.4	20.0	16.0	3.0	0.16

Mechanical properties, 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	Code	Type	W.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				

Jungo® 4465

Stainless steel electrode

Classification

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

*: Deviation, see remarks

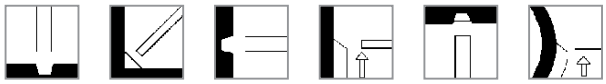
Temperature range

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
0.03	4.5	0.4	25.0	22.0	2.2	0.13

Mechanical properties, 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	W.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%

Stainless steel electrode

Classification

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

*: Deviation, see remarks

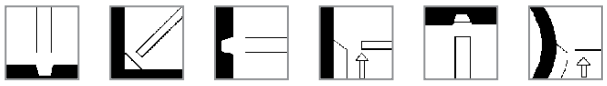
Temperature range

pressurized parts : -10 ... +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
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
0.02	1.2	0.9	20.0	25.0	5.0	1.5

Mechanical properties, 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. 520	min. 30	not required	
EN 1600		min. 320	min. 510	min. 25	not required	
Typical values	AW	410	620	40	80	100

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 21

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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		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

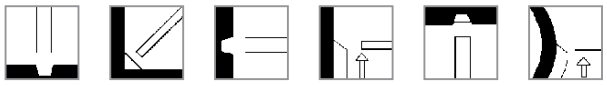
Temperature range

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
0.02	0.8	1.0	22.5	9.5	3.2	0.16	30-55

Mechanical properties, 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: SRP	Pieces / unit	69	52	29	24
	Net weight/unit (kg)	1.5	1.8	1.6	2.0
Unit: Box	Pieces / unit	120	152	80	55
	Net weight/unit (kg)	2.6	5.0	4.8	4.6

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

Arosta® 4462: rev. EN 21

Arosta® 4462

Materials to be welded

Steel grades	EN 10088-1/-2	W.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

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

Stainless steel electrode

Classification

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

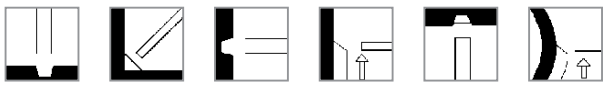
Temperature range

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 conditions
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
0.025	1.6	0.5	23.5	9.0	3.0	0.15	30-60

Mechanical properties, 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 21

Jungo® 4462

Materials to be welded

Steel grades	EN 10088-1/-2	W.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

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

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
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

Jungo® Zeron 100X

Stainless steel electrode

Classification

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

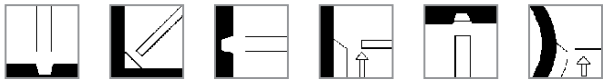
Temperature range

pressurized parts : -20 ... +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
0.03	0.8	0.3	25.0	9.5	3.6	0.8	0.7	0.2	30-60

Mechanical properties, 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) -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 21

Jungo® Zeron 100X

Materials to be welded

Steel grades	EN 10088-1/-2	E 102 13-4	W.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 (Zeron 100)

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+	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

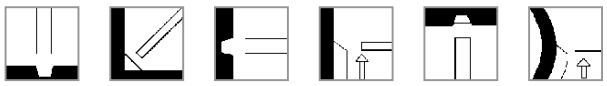
Temperature range

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
0.025	1.5	0.4	23.0	13.0	10-20

Mechanical properties, 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)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit			
	Net weight/unit (kg)			

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

Jungo® 309L: rev. EN 02

Materials to be welded

Steel grades	EN 10088-1/-2	W.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

* 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

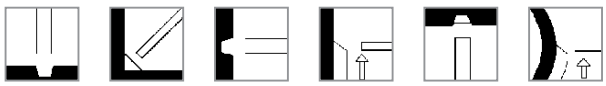
Temperature range

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
0.02	0.8	0.8	23.5	12.5	12-20

Mechanical properties, 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	W.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			

EMR SAHARA®

Limarosta® 309S

Stainless steel electrode

Classification

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

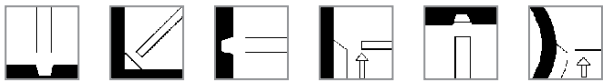
Temperature range

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
0.02	0.8	1.0	23.0	12.5	10-20

Mechanical properties, 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	22
	Net weight/unit (kg)	0.6	1.5	1.8	2.0	2.4
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	W.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	: E309Nb-16*
EN 1600	: E 23 12 Nb R 32

*: Deviation, see remarks

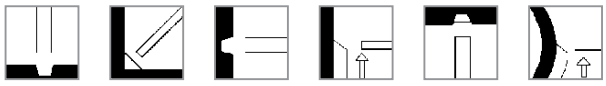
Temperature range

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
0.02	0.8	0.8	23.0	12.0	0.5	15-25

Mechanical properties, 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 21**

Arosta® 309Nb

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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 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	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

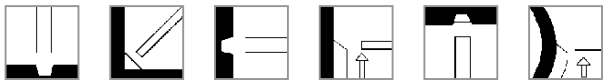
Temperature range

pressurized parts : -10 ... +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
0.02	0.8	0.8	23.0	12.5	2.7	15-25

Mechanical properties, 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 102 13-4	W.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 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	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

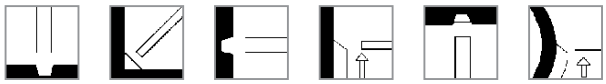
Temperature range

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
0.025	0.8	1.0	20.0	9.5	2.3	20

Mechanical properties, 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 102 13-4	W.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
0.05	0.7	1.0	23.7	12.8	2.4	15

Mechanical properties, 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	550	740	28	50

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 102 13-4	W.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

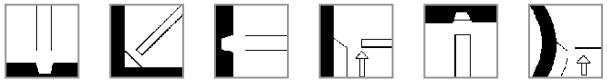
pressurized parts : -10 ... +350°C
scaling resistance : +1100°C

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, 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

Arosta® 329

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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

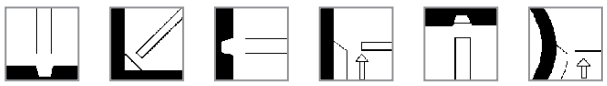
Temperature range

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, 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		125	150	100	72
	Net weight/unit (kg)		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 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	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

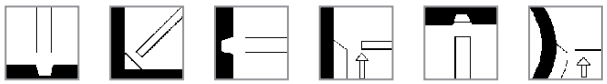
Temperature range

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 plates, 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
0.09	5.0	0.6	18.5	8.5

Mechanical properties, 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%

Jungo® 307

Stainless steel electrode

Classification

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

*: Deviation, see remarks

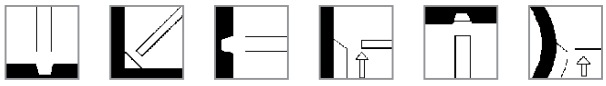
Temperature range

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 plates, 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, 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 - 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+	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%
Ni = 5.7 - 9.5%

AWS: Mn = 3.30 - 4.75%
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

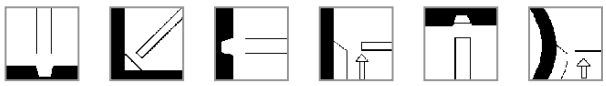
Temperature range

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

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 W.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
0.05	0.75	0.85	18.5	9.5	03-7

Mechanical properties, 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

Arosta® 304H

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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		

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	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

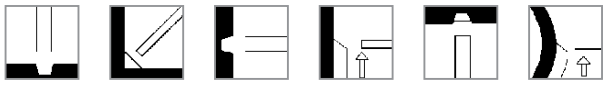
Temperature range

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
0.10	0.8	1.6	22.0	11.0	03-8

Mechanical properties, 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 102 13-4	W.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 - 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 - 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% AWS: Si = max. 1.0% EN: Si = max. 1.2%

Cr = 21.0 - 23.0%, AWS: Cr = 22.0 - 25.0%

Ni = 11.0 - 13.0%, AWS: Ni = 12.0 - 14.0%

Intherma® 310

Stainless steel electrode

Classification

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

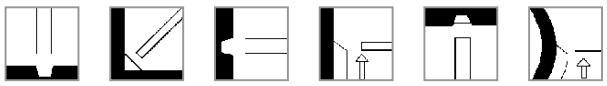
Temperature range

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
0.12	2.5	0.5	26.0	20.5

Mechanical properties, 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 102 13-4	W.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 - 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	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
0.1	3.0	0.3	25.0	21.0

Mechanical properties, 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**

Intherma® 310B

Materials to be welded

Steel grades	EN 10088-1/-2	EN 102 13-4	W.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%

NiCro 31/27

Ni-base electrode

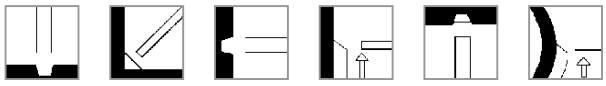
Classification

AWS A5.4 : E383-16*
EN 1600 : E 27 31 4 Cu L R 12

General description

A rutile-basic all position fully austenitic NiCrMoCu electrode
Especially for phosphoric and sulphuric acid plants
Designed for Mo and Cu alloyed high NiCr-alloyed grades
Very smooth bead appearance and easy slag release
Also approved for welding dissimilar metals for service up to 450°C
High resistance to pitting (PREN ~40)

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	Ni	Cr	Mo	Cu	Fe
0.02	0.8	0.9	31.0	27.1	3.5	0.9	35.8

Mechanical properties, 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. 520	min. 30	not required
EN 1600		min. 240	min. 500	min. 25	not required
Typical values	AW	440	640	38	70

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: PE tube	Pieces / unit	91	66	45
	Net weight/unit (kg)	1.8	2.0	2.0

Identification Imprint: NICRO 31/27 Tip Color: orange

NiCro 31/27: rev. EN 21

NiCro 31/27

Materials to be welded

Steel grades	Code	Type	W.Nr.	ASTM/ACI	UNS
Copper alloyed CrNiMo and NiCrMo steels					
	EN 10088-1/-2	X1NiCrMoCu 31 27 4	1.4563		N08028
		X1NiCrMoCu 25-20-5	1.4539	Alloy 904L	N08904
	DIN 17744	NiCr 21 Mo	2.4858	Alloy 825	N08825
		NiCr 21 Mo 6Cu	2.4641	Alloy 825 h Mo	N08821
		X3NiCrMoTi 27 23	1.4503		

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
2.5x350	45-70	DC+	52	95	0.84	21.3	83	1.75
3.2x350	70-95	DC+	56	132	1.3	31.2	48	1.49
4.0x350	110-150	DC+	53	198	2.0	46.0	34	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	65A	70A	70A	60A	60A	60A
3.2	95A	95A	95A	80A	80A	80A
4.0	120A	120A				

Remarks/ Application advice

Si = max. 1.0%

AWS: Si = max. 0.9%

Ni-base electrode

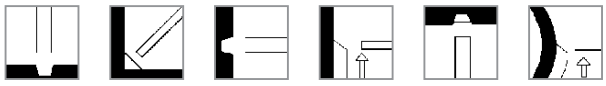
Classification

AWS A5.11/A5.11M : ENiCrMo-3
ISO 14172 : E Ni 6625 (NiCr22Mo9Nb)

General description

Fully basic Ni-base high CrMoNb alloyed austenitic all position electrode
Extreme high resistance to general and intergranular corrosion, pitting and crevice corrosion and stress corrosion cracking
Suitable for welding dissimilar joints; high resistance to hot cracking
High resistance to high temperature oxidation (max. 1200°C) and carburization
Good impact values at low temperatures (down to -196°C), suitable for 9% Ni steel

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	Ni	Cr	Mo	Nb	Fe
0.03	0.5	0.35	62	22	9	3.4	2

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) -196°C
Required: AWS A5.11		not required	min. 760	min. 30	not required
ISO 14172		min. 420	760	min. 27	not required
Typical values	AW	510	770	44	92

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	300	350
Unit: PE tube	Pieces / unit	94	61	45
	Net weight/unit (kg)	1.6	1.7	2.1

Identification Imprint: NiCrMo-3 / NICRO 60/20 Tip Color: green

NiCro 60/20: rev. EN 21

NiCro 60/20

Materials to be welded

Steel grades	DIN/EN	W.Nr	ASTM/ACI	UNS	
NiCrMo-steel type alloy 625 and welding dissimilar high NiCrMo-steels for corrosion and heat resisting purposes					
	X1NiCrMoCuN25-20-6	1,4529	Alloy 925	N08925	
	X1NiCrMoCu25-20-5	1,4539	Alloy 904L	N08904	
	X1CrNiMoCuN20-18-7	1,4547	Alloy 254	S31254	
	X2NiCrAlTi32-20	1,4558	Alloy 800L	N08800	
	G-X10NiCrNb32-20	1,4859			
	X10NiCrAlTi32-20	1,4876	Alloy 800/800H	N08800/-10	
	NiCr22Mo6Cu	2,4618	Alloy G	N06007	
	NiCr22Mo7Cu	2,4619	Alloy G-3	N06985	
	NiCr21Mo6Cu	2,4641	Alloy 825hMo	N08821	
	NiCr20CuMo	2.4660	Alloy 20	N08020	
	NiCr15Fe	2,4816	B168-Alloy 600	N06600	
	NiCr22Mo9Nb	2,4856	B443-Alloy 625	N06625	
	NiCr21Mo	2,4858	B424-Alloy 825	N08825	
	NiCr20Ti	2,4951	Alloy 75	N06075	
	NiCr20TiAl	2,4952	Alloy 80A	N07080	
Low Alloyed steels					
	10Ni14 (3.5% Ni)	1,5637	ASTM A333 Grade 3		-
	12Ni19, X12Ni5	1.5680	-	K41583	
9% Ni steel for LNG storage tanks					
	X8Ni9 (9% Ni)	1,5662	A353/A353M	-	
	X8Ni9 (9% Ni)	1,5662	A553/A553M Type I		-
	(8% Ni)		A553/A553M Type II		K71340

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	45 - 70	DC+	44	80	0.95	17.2	87	1.51
3.2 x 300	70 - 100	DC+	44	101	1.5	26.8	55	1.48
4.0 x 350	100 - 130	DC+	53	215	2.2	46.4	30	1.41

* 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	55A	60A	60A	60A	60A
3.2	90A	80A	85A	80A	80A	80A
4.0	120A	120A				

Remarks/ Application advice

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

Ni-base electrode

Classification

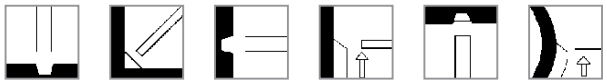
AWS A5.11/A5.11M : ENiCrFe-2*
ISO 14172 : E Ni 6182 (NiCr15Fe6Mn)*

*: Deviation, see remarks

General description

Fully basic all position NiCr electrode
High creep resistance up to 815°C
High resistance to embrittlement
High toughness at low temperature (-196°C)
For welding, Ni base alloys (as Alloy 600) and dissimilar joints
High resistance to carburization

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	Ni	Cr	Nb	Fe
0.02	4.4	0.45	68.4	18	1.9	6

Mechanical properties, 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 A5.11		not required	min. 550	min. 30	not required	
ISO 14172		min. 360	min. 550	min. 27	not required	
Typical values	AW	430	680	40	145	130

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	300	350
Unit: PE tube	Pieces / unit	90	57	43
	Net weight/unit (kg)	1.6	1.9	2.1

Identification Imprint: NICRO 70/15 Tip Color: silver

NiCro 70/15: rev. EN 21

NiCro 70/15

Materials to be welded

Steel grades	BS 3076	DIN 17742 SEW 470/595	W.Nr.	ASTM / ACI B366	UNS
Ni base on Cr alloyed steels for high and low temperature service					
		LC-NiCr15Fe	2.4817		N06600
	NA14	NiCr15Fe	2.4816	Alloy600/B168	N06600
		NiCr23Fe	2.4851	Alloy601(H)	N06601
		NiCr60 15	2.4867		
		NiCr80 20	2.4869		
		NiCr20Ti	2.4951	Alloy75	N06075
		NiCr20TiAl	2.4952	Alloy80A	N07080
	NA17	X12NiCrSi36 16	1.4864	330	N08330
		G-X10NiCrNb32 20	1.4859		
	NA15	X10NiCrAlTi32 20	1.4876	Alloy800/800H	N08800/ N08810

Suitable for welding dissimilar metals:
- Mild- and low-alloyed steel to stainless steel
- Mild- and low-alloyed steel to Ni base alloys
- Stainless steel to low-alloyed creep resisting steel

Not sensitive for embrittlement after heat treatment

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	45 - 60	DC+	44	63	0.9	17.5	91	1.59
3.2 x 300	70 - 100	DC+	52	107	1.3	29.2	52	1.54
4.0 x 350	90 - 160	DC+	61	214	2.0	51.0	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	60A	55A	60A	60A	60A	60A
3.2	90A	80A	90A	80A	80A	80A
4.0	120A	120A				

Remarks/ Application advice

Deviations: chemical composition

Mn = 3.0 - 6.0%
Cr = max. 18.0%

AWS: Mn = 1.0 - 3.5%
AWS: Cr = max. 17.0%

ISO: Mn = 5.0 - 10%
ISO: Cr = max. 17%

NiCro 70/15Mn

Ni-base electrode

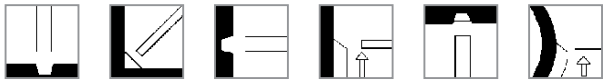
Classification

AWS A5.11/A5.11M : ENiCrFe-3
ISO 14172 : E Ni 6182 (NiCr15Fe6Mn)

General description

Fully basic all position NiCr electrode
For welding Ni-base alloys (as Alloy 600), claddings and dissimilar metals
High creep resistance up to 815°C
High resistance to embrittlement
High toughness also at low temperature (-196°C)
High resistance to carburization
Extra alloyed with ~6% Mn to provide hot cracking resistance

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	S	Ni	Cr	Nb
0.025	5.5	0.4	0.010	76.1	16	2.0

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -196°C
Required: AWS A5.11		not required	min. 550	min. 30	not required
ISO 14172		min. 360	min. 550	min. 27	not required
Typical values	AW	400	630	40	125

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	300	300	350	450
Unit: PE tube	Pieces / unit	91	57	39	45
	Net weight/unit (kg)	1.6	1.9	1.9	4.5

Identification Imprint: NiCrFe-3 / NICRO 70/15Mn Tip Color: yellow

NiCro 70/15Mn: rev. EN 21

NiCro 70/15Mn

Materials to be welded

Steel grades	BS 3076	DIN 17742 SEW 470/595	W.Nr.	ASTM / ACI B366	UNS
Ni base on Cr alloyed steels for high and low temperature service					
		LC-NiCr15Fe	2.4817		N06600
	NA14	NiCr15Fe	2.4816	Alloy600/B168	N06600
		NiCr23Fe	2.4851	Alloy601(H)	N06601
		NiCr60 15	2.4867		
		NiCr80 20	2.4869		
		NiCr20Ti	2.4951	Alloy75	N06075
		NiCr20TiAl	2.4952	Alloy80A	N07080
	NA17	X12NiCrSi36 16	1.4864	330	N08330
		G-X10NiCrNb32 20	1.4859		
	NA15	X10NiCrAlTi32 20	1.4876	Alloy800/800H	N08800/N08810

Suitable for welding dissimilar metals:
- Mild- and low-alloyed steel to stainless steel
- Mild- and low-alloyed steel to Ni base alloys
- Stainless steel to low-alloyed creep resisting steel

Not sensitive for embrittlement after heat treatment

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	40 - 70	DC+	80	119	0.52	17.4	86	1.49
3.2 x 300	70 - 100	DC+	77	193	0.84	29.0	56	1.61
4.0 x 350	90 - 140	DC+	74	289	1.7	50.9	29	1.47
5.0 x 450	130 - 160							

* 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	55A	60A	60A	60A	60A
3.2	90A	80A	90A	80A	80A	80A
4.0	120A	120A				

Remarks/ Application advice

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

Ni-base electrode

Classification

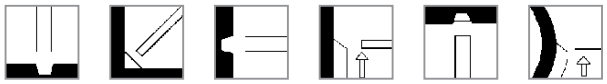
AWS A5.11/A5.11M : ENiCrFe-2*
ISO 14172 : E Ni 6082 (NiCr20Mn3Nb)

*: Deviation, see remarks

General description

Fully basic NiCr alloyed all position electrode
For welding high Ni alloyed material such as Alloy 600 and Alloy 601
Also applicable for welding dissimilar joints and for CMn- and low alloyed clad steel
High resistance to oxidation at high temperature
High impact values at low temperature (-196°C)

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	Ni	Cr	Mo	Nb	Fe
0.03	4.7	0.6	67.7	19.0	1.5	1.9	4.0

Mechanical properties, 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 A5.11		not required	min. 550	min. 30	not required	
ISO 14172		min. 360	min. 600	min. 22	not required	
Typical values	AW	400	650	40	110	90

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	300	350
Unit: PE tube	Pieces / unit	76	57	31
	Net weight/unit (kg)	1.5	1.7	1.8

Identification Imprint: NICRO 70/19 Tip Color: blue

NiCro 70/19: rev. EN 21

NiCro 70/19

Materials to be welded

Steel grades	BS3076	DIN 17744/17465 SEW 595	W.Nr.	ASTM/ACI B366	UNS
Ni base to CrNi alloyed steel for composition in highly corrosive environments					
	NA 14	NiCr15Fe	2.4816	B168-Alloy 600	N06600
		LC-NiCr15Fe	2.4817	Alloy 600L	N06600
		NiCr20Ti	2.4951	Alloy 75	
		NiCr20TiA1	2.4952	Alloy 80A	N07080
	NA 15	X10NiCrAlTi32 20	1.4876	Alloy 800/800H	N08800/10
		NiCr23Fe	2.4851	Alloy 601(H)	N06601
	NA 17	X12NiCrSi36 16	1.4864	330	N08330
		G-X40NiCrNb35 25	1.4852		
		G-X40NiCrSi35 25	1.4857	HP	

Suitable for welding dissimilar metals:
- Mild- and low-alloyed steel to stainless steel
- Mild- and low-alloyed steel to Ni base alloys
- Stainless steel to low-alloyed creep resisting steel

Not sensitive for embrittlement after heat treatment

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	45 - 65	DC+	41	61	0.95	19.3	92	1.79
3.2 x 300	70 - 95	DC+	59	127	1.2	32.7	51	1.64
4.0 x 350	100 - 140	DC+	75	314	1.7	59.3	29	1.72

* 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	55A	60A	60A	55A	60A
3.2	90A	80A	90A	80A	80A	80A
4.0	120A	120A				

Remarks/ Application advice

Deviations: chemical composition

Mn = 2.0 - 6.0% AWS: Mn = 1.0 - 3.5%

Cr = 18.0 - 22.0% AWS: Mn = 13.0 - 17%

SMAW

NiCroMo 60/16

Ni-base electrode

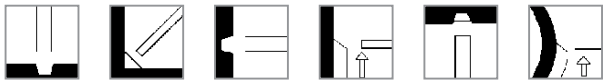
Classification

AWS A5.11/A5.11M : ENiCrMo-4
ISO 14172 : E Ni 6276 (NiCr15Mo15Fe6W4)

General description

A basic all position Ni-base CrMoW-alloyed electrode
For welding Alloy C276 and comparable compositions
Depending on the corrosion requirements also applicable for welding C-22 and C-4
Applicable for surfacing in high temperature applications (up to 1200°C)
Suitable for welding low temperature steel such as 5% and 9% Ni steel

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	Ni	Cr	Mo	W	Fe
0.015	0.5	0.05	57.9	15.5	16.0	3.5	6.5

Mechanical properties, all weld metal

	Condition	Yield Strength (N/mm^2)	Tensile Strength (N/mm^2)	Elongation (%)	Impact ISO-V(J) 20 °C	Impact ISO-V(J) -196 °C
Required: AWS A5.11M		not required	min. 690	min. 25	not required	
ISO 14172		min. 400	min. 690	min. 22	not required	
Typical values	AW	550	800	40	60	50

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	350	350
Unit: PE tube	Pieces / unit	xx	xx	xx
	Net weight/unit (kg)	xx	xx	xx

Identification Imprint: NiCrMo-4 / NICROMO 60/16 Tip Color: grey

NiCroMo 60/16: rev. EN 21

NiCroMo 60/16

Materials to be welded

Steel grades	DIN/EN	Mat. Nr.	ASTM/ACI	UNS
Ni Base high CrMo steel for high corrosion environments				
	NiMo 16Cr15W	2.4819	C-276	N10276
	NiCr21Mo14W	2.4602	C-22	N06022
	NiMo 16Cr16Ti	2.4610	C-4	N06455
9% Ni steel				
	X8Ni9	1.5662	A353/A353M	
8% Ni steel				
			A553/553M Type I	
			A553/553M Type II	
5% Ni steel				
	X12Ni5	1.5680		

NiCroMo 60/16 is developed for welding C-276 material
Can also be applied for welding C-22 and C-4, depending on the corrosion requirements

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	40-70	DC+						
3.2 x 350	70-100	DC+	61	137	1.34	32.5	44	1.43
4.0 x 350	90-140	DC+	65	219	1.92	50.9	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	60A	55A	60A	60A	60A	60A
3.2	90A	80A	85A	80A	80A	80A
4.0	130A	130A	120A	120A	120A	120A

Remarks/ Application advice

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

Ni-base electrode

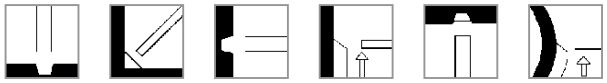
Classification

AWS A5.11/A5.11M : ENiCrMo-13
ISO 14172 : E Ni 6059 (NiCr23Mo16)

General description

Basic coated 22%Cr and 16% Mo alloyed Ni-base electrode for all positions without vertical down
Excellent resistance against pitting-, crevice and stress corrosion in sulphur and phosphorus environments also at higher temperature
Suitable for welding Alloy 59 (UNS N06059), Alloy C 276 (UNS N10276), C4 (UNS N06455) and C 22 (UNS N06022) in the chemical industry
Suitable for dissimilar joints such as mentioned above to low alloyed steel grades
Wear resistant overlays for high temperature applications
Also for superaustenitic steel alloyed with 6% Mo (UNS S 31254)

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	Ni	Cr	Mo
0.015	0.4	0.15	59.0	22.5	15.5

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.11		not required	min. 690	min. 25	not required
ISO 14172		min. 350	min. 690	min. 22	not required
Typical values	AW	450	720	30	75

Packaging and available sizes

	Diameter (mm)	3.2
	Length (mm)	350
Unit: PE tube	Pieces / unit	52
	Net weight/unit (kg)	1.8

Identification Imprint: NiCrMo-13 / NICROMO 59/23 Tip Color: light green

NiCroMo 59/23: rev. EN 21

NiCroMo 59/23

Materials to be welded

Steel grades	Code	Type	W.Nr.	ASTM/ACI	UNS
Ni base alloys with high CrMo content					
	DIN 17744	NiCr23Mo16	2.4605		N06059
		NiMo16Cr16Ti	2.4610	C-4	N06455
		NiMo16Cr15Ti	2.4819	C-276	N10276
		NiCr21Mo14W	2.4602	C-22	N06022
		NiCr22 Mo 9Nb	2.4856	625	N06625
High Mo stainless steel for high corrosion environments					
	EN 10088-1/-2	X1 NiCrMoCuN25-20-7	1.4529	904hMo	N08925
		X1 CrNiMoCuN20-18-7	1.4547		S31254

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	70 - 100	DC+	60	149	1.3	36.8	46	

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G
3.2	90A	90A	80A

Remarks/ Application advice

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

NiCu 70/30

Ni-base electrode

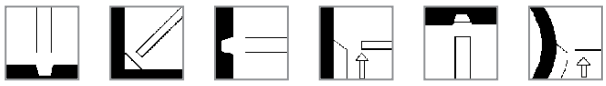
Classification

AWS A5.11/A5.11M : ENiCu-7
ISO 14172 : E Ni 4060 (NiCu30Mn3Ti)

General description

Basic all position electrode for welding CuNi and NiCu-alloys
High resistance to seawater corrosion (not stagnant)
Applicable for welding NiCu-alloys to mild and low alloyed steel
Very suitable for welding salt fabrication components
Excellent weldability and self releasing slag

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	Ni	Cu	Fe	Ti
0.03	3.0	0.4	64.5	30	1.75	0.35

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J) -196°C
Required: AWS A5.11M		not required	min. 480	min. 30	not required
ISO 14172		min. 200	min. 480	min. 27	not required
Typical values	AW	300	485	40	110

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	350	350
Unit: PE tube	Pieces / unit	105	61	45
	Net weight/unit (kg)	1.7	1.9	2.1

Identification Imprint: NiCu-7 / NICU 70/30 Tip Color: black

NiCu 70/30: rev. EN 21

NiCu 70/30

Materials to be welded

Steel grades	BS3076	DIN 17743	W.Nr.	ASTM/ACI	UNS
	NA 13	NiCu30Fe	2.4360	Monel 400	N04400
		G-NiCu30Nb	2.4365		
	NA 18	NiCu30Al	2.4375	Monel K500	N05500

The NiCu 70/30 is also applicable for welding carbon steels to CuNi and NiCu alloys

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	45 - 70	DC+	50	72	0.80	20.7	90	1.85
3.2 x 350	70 - 90	DC+	65	129	1.2	32.5	46	1.49
4.0 x 350	90 - 130	DC+	67	245	1.75	47.17	31	1.51

* 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	65A	60A	65A	55A	55A	55A
3.2	90A	85A	90A	75A	75A	75A
4.0						

Remarks/ Application advice

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

Ni-base electrode

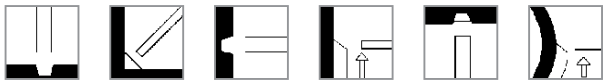
Classification

AWS A5.11/A5.11M : ENiCrMo-6
ISO 14172 : E Ni 6620 (NiCr14Mo7Fe)

General description

Basic high recovery all position electrode for welding low temperature steels
Recovery of approximately 150%, providing high deposition rates
Especially developed for welding 9% Ni steel
Linear expansion coefficient equivalent to that of 9% Ni steel
Excellent impact toughness at -196°C, reliable 0.2%-Yield strength
Weldable on AC as well as DC+ polarity
Only available in Sahara ReadyPack (vacuum sealed)

Welding positions



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

Current type

AC / DC +

Approvals

GL	TÜV
5680	+

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

C	Mn	Si	Ni	Cr	Mo	Nb	W	Fe
0.05	3.0	0.4	68	13	6	1.5	1.5	6

Mechanical properties, 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 A5.11M		not required	min. 620	min. 35	not required	
ISO 14172		min. 350	min. 620	min.32	not required	
Typical values	AW	475	725	40	100	90

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: SRP	Pieces / unit	62	52	27	10
	Net weight/unit (kg)	1.7	2.2	1.8	1.5

Identification Imprint: NiCrMo-6 / NYLOID 2 Tip Color: white

Nyloid 2: rev. EN 21

Materials to be welded

Steel grades	EN 10028-4	W.Nr.	ASTM	UNS
9% Ni steel for LNG storage tanks				
	X8Ni9	1.5662	A353/A353M	
	X8Ni9 (9% Ni)	1.5662	A553/A553M Type I	
	(8% Ni)		A 553/A553M Type II	K71340
Low alloyed steel for cryogenic applications				
	12Ni19, X12Ni5	1.5680		K41583
	10Ni14 (3.5% Ni)	1.5637	A333 Grade 3	
	12Ni14 (3.5% Ni)	1.5637	A202 Grade E	

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	70 - 100	AC	54	128	1.3	26.5	53	1.39
3.2 x 350	85 - 145	AC	63	229	1.8	43.6	31	1.37
4.0 x 350	140 - 190	AC	73	355	2.4	65.8	21	1.33
5.0 x 450	180 - 280	AC	94	764	3.7	133.5	10	1.35

* 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	90 - 100A	90 - 100A	90 - 100A	90 - 100A	90 - 100A	80 - 100A
3.2	135 - 145A	135 - 145A	135 - 145A	125 - 135A	125 - 135A	120 - 135A
4.0	170 - 185A	170 - 185A	170 - 185A	140 - 165A		
5.0	220 - 270A	220 - 280A				

Remarks/ Application advice

Recommended Heat-Input for plate thickness:
15 mm: 1.4 kJ/mm
15 - 20 mm: 1.6 kJ/mm
20 mm: 2.0 kJ/mm

Aluminium electrode

Classification

AWS A5.3 : E1100*
ISO 18273 : Al 1080A (Al 99.8(A))

*: Deviation, see remarks

General description

Especially for welding pure aluminium
Good weldability, no porosity

Welding positions

ISO/ASME PA/1G PB/2F

Current type

DC +

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

Al	Si	Fe	Cu	Mn	Zn	Others
99.8 min.	0.085 max.	0.13 max.	0.02 max.	0.02 max.	0.03 max.	0.02 max.

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile Strength (N/mm²)	Elongation (%)
Typical values	AW	30	80	30

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Can	Pieces / unit	217	143	98
	Net weight/unit (Kg)	2.0	2.0	2.0

Al99.8: rev. EN 21

Materials to be welded

Pure Aluminium like:
Al99.8 (Werkstoff-Nr. 3.0285)
Al99 (Werkstoff-Nr. 3.0205)

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
2.5x350	60-90	DC+				9.2		
3.2x350	80-110	DC+				14.0		
4.0x350	100-140	DC+				20.4		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F
2.5	80A	80A
3.2	100A	100A
4.0	130A	130A

Remarks/ Application advice

Deviations: chemical composition
Cu = max. 0.02% AWS: Cu = 0.05 - 0.20%
If the thickness is more than 10 mm, it is advisable to preheat at 150 - 250°C

Aluminium electrode

Classification

AWS A5.3 : E3003*
ISO 18273 : Al 3103 (AlMn1)

*: Deviation, see remarks

General description

Especially for welding forged and cast aluminium-magnesium alloys and aluminium-manganese alloys
Good weldability, no porosity

Welding positions

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

Current type

DC +

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

Si	Mg	Fe	Cu	Mn	Zn	Others	Al
0.3 max.	0.15 max.	0.6 max.	0.02 max.	0.9-1.2	0.09 max.	0.15 max.	Bal.

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm^2)	Tensile Strength (N/mm^2)	Elongation (%)
Typical values	AW	40	110	20

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Can	Pieces / unit	222	146	98
	Net weight/unit (Kg)	2.0	2.0	2.0

Materials to be welded

Aluminium manganese alloys and Aluminium magnesium alloys like:
AlMn1 (Werkstoff-Nr. 3.0515)
AlMn1Mg1 (Werkstoff-Nr. 3.0526)
AlMg1 (Werkstoff-Nr. 3.3315)

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
2.5x350	60-90	DC+				9.2		
3.2x350	80-110	DC+				14.0		
4.0x350	100-140	DC+				20.4		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PF/3G up
2.5	80A	80A	75A
3.2	100A	100A	95A
4.0	130A	130A	125A

Remarks/ Application advice

Deviations: chemical composition
Cu = max. 0.02% AWS: Cu = 0.05 - 0.20%
Mn = 0.9 - 1.2% AWS: Mn = 1.0 - 1.5%
If the thickness is more than 10 mm, it is advisable to preheat at 150 - 250°C

Aluminium electrode

Classification

AWS A5.3 : E4043
ISO 18273 : Al 4043A (AlSi5(A))*

General description

Especially for welding forged and cast aluminium alloys containing less than 5% Si as main alloying element
Good weldability, no porosity

Welding positions

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

Current type

DC +

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

Si	Fe	Cu	Mn	Mg	Zn	Ti	Others	Al
4.7-5.3	0.2 max.	0.05 max.	0.05 max.	0.05 max.	0.10 max.	0.10 max.	0.15 max.	Bal.

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm^2)	Tensile Strength (N/mm^2)	Elongation (%)
Typical values	AW	90	160	15

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Can	Pieces / unit	222	152	98
	Net weight/unit (Kg)	2.0	2.0	2.0

AlSi5: rev. EN 21

Materials to be welded

Several Aluminium alloys like :
AlCuMg1 (Werkstoff-Nr. 3.1325)
AlMgSi1 (Werkstoff-Nr. 3.2315)
AlZn4.5Mg1 (Werkstoff-Nr. 3.4335)

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
2.5x350	60-90	DC+				9.2		
3.2x350	80-110	DC+				14.0		
4.0x350	100-140	DC+				20.4		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PF/3G up
2.5	80A	80A	75A
3.2	100A	100A	95A
4.0	130A	130A	125A

Remarks/ Application advice

If the thickness is more than 10 mm, it is advisable to preheat at 150 - 250°C

Aluminium electrode

Classification

ISO 18273 : Al 4047A (AlSi12(A))

General description

Especially for welding forged and cast aluminium alloys containing more than 7% Si as main alloying element
Also applicable as surfacing electrode
Good weldability, no porosity
Applicable when Al-properties are unknown

Welding positions

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

Current type

DC +

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

Si	Fe	Cu	Mn	Mg	Zn	Ti	Others	Al
11.0-12.0	0.40 max.	0.05 max.	0.10 max.	0.05 max.	0.10 max.	0.10 max.	0.15 max.	Bal.

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm^2)	Tensile Strength (N/mm^2)	Elongation (%)
Typical values	AW	30	80	30

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Can	Pieces / unit	227	152	102
	Net weight/unit (Kg)	2.0	2.0	2.0

AlSi12: rev. EN 21

Materials to be welded

Aluminium cast alloys with silicon level up to approx. 12%, like:
G-AlSi 10Mg (Werkstoff-Nr. 3.2381)
G-AlSi 12 (Werkstoff-Nr. 3.2581)

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
2.5x350	60-90	DC+				8.8		
3.2x350	80-110	DC+				13.2		
4.0x350	100-140	DC+				19.6		

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PF/3G up
2.5	80A	80A	75A
3.2	100A	100A	95A
4.0	130A	130A	125A

Remarks/ Application advice

If the thickness is more than 10 mm, it is advisable to preheat at 150 - 250°C

Wearshield® BU-30

Hardfacing electrode

Classification

DIN 8555 : E1-UM-350-GP
EN 14700 : E Fe1

General description

Can be used both downhand and out of position, although the flat position is preferred
Arc characteristics are excellent with very low spatter levels
The electrode coating permits the use of the drag or contact welding technique
Good arc restriking

Application

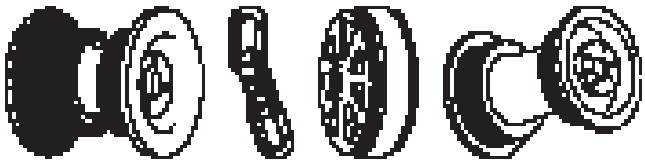
Wearshield BU 30 produces a crack-free wear resistant deposit with a hardness of 31-38 HRc (295-350 HB) depending on dilution and number of layers. It is particularly suitable under conditions of moderate abrasion and friction, combined with resistance to impact. Ideally suitable for APLs involving rolling, sliding and metal to metal wear. It may also be used as a final overlay on parts which need to be machined or as a build-up layer for other hardfacing materials.

Typical applications include:

Buildup:
Shovel and bucket lips
Pump impellers and housings
Dredge and shovel bucket teeth
Mill and crushing hammers

Hardfacing:

Crane and mine car wheels
Tractor rolls, idlers, links and sprockets
Cable drums
Roller guides



Mechanical properties, all weld metal

	Typical hardness values
1 Layer	31 HRc (295 HB)
2 Layers	35 HRc (330 HB)
3 Layers	38 HRc (350 HB)

Welded on Mild Steel Plate

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0	6.0
	Length (mm)	350	350	450	450
Unit: Box	Pieces / unit	65	44	23	-
	Net weight/unit (kg)	2.5	2.5	2.5	2.5

Identification Imprint: WEARSHIELD BU-30 Tip Color: black

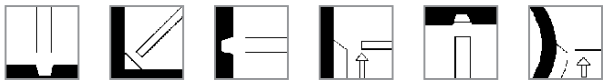
Wearshield® BU-30: rev. EN 22

Wearshield® BU-30

Additional information

When welding with Wearshield BU30, DC+ is preferred for most applications, although AC also provides satisfactory results. The bead width should be limited to between 12 - 20mm for all electrode diameters when applying a weaving technique. Narrow stringer beads are preferred for edge and corner buildup.
All work-hardened base material should be removed prior to applying Wearshield BU30 in order to prevent embrittlement and cracking.
A preheat and interpass temperature of 150-250°C is necessary to prevent cracking, especially on large complex or high restrained components.The component should be completed without interruptions, however, if interruptions are unavoidable the component should be preheated again prior to welding.
The deposited weld metal can be machined to exact dimensions using high speed or carbide cutting tools.
There is no limit to the deposit build-up with this electrode.
Wearshield BU30 exhibits good resistance to spalling and peeling and moderate resistance to gouging and galling. If gouging is severe then Wearshield Mangjet or Wearshield 15CrMn would be more appropriate because of the higher work hardening effect. If galling is more severe then Wearshield MM or Wearshield MM40 would be preferred.

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	Mo
0.2	0.8	1.0	1.5	0.5

Structure

In the as welded condition the microstructure consists mainly of martensite with some bainite

Calculation data

Sizes Diam. x length (mm)	Current range
3.2 x 350	90 - 130A
4.0 x 350	140 - 180A
5.0 x 450	180 - 220A
6.0 x 450	220 - 260A

Complementary products

Complementary products include flux cored wire Lincore® 3 3

Wearshield® Mangjet (e)

Hardfacing electrode

Classification

DIN 8555	: E7-UM-200-KP
EN 14700	: E Fe9

General description

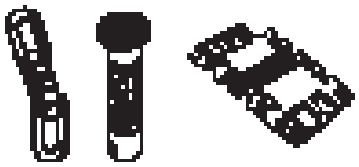
A low hydrogen hardfacing electrode designed for operator appeal
Exhibits excellent arc striking characteristics, clean slag detachability and low spatter
The electrode coating permits out of position welding
140% recovery

Application

Wearshield Mangjet produces a 14% Mn deposit that rapidly work hardens under heavy impact and battering. Ideally suited to APLs to high impact and gouging coupled with moderate abrasion.

Typical applications include:

Jaw and cone crushers
Heavy rock moving plant
Hammer drills
Crusher screens
Dredge parts
Shovel tracks
Rail crossovers, frogs and switches



Mechanical properties, all weld metal

	Typical hardness values
As deposited	18 HRc (210 HB)
Work hardened	47 HRc (450 HB)

Packaging and available sizes

	Diameter (mm)	3.2	4.0
	Length (mm)	350	350
Unit: Box	Pieces / unit	53	24
	Net weight/unit (kg)	2.5	2.5

Identification Imprint: WEARSHIELD MANGJET(e) Tip Color: Violet

Wearshield® Mangjet (e): rev. EN 22

Wearshield® Mangjet (e)

Additional information

When welding with Wearshield Mangjet DC+ is preferred for most applications especially positional work, although AC and DC - are also satisfactory. The weld width should be limited to 12-20mm for all electrode diameters when employing a weaving technique. Narrow stringer beads are preferred for edge and corner buildup.
All work-hardened base material and previously deposited material should be removed prior to applying a new deposit, since such areas are prone to embrittlement and possible cracking.
No preheat is required on austenitic manganese steels although a preheat of between 150-200°C maybe necessary on carbon and low alloy steels to prevent pullout.
It is important to avoid excessive heat build up in the base material. Temperatures above 260°C should be avoided as this can cause embrittlement.
For joint welding of manganese steel Wearshield 15CrMn or Arosta 307 are preferred.
There is no definite limitation to the number of passes that may be deposited, however, it is good practise to peen each pass immediately after welding to minimise internal stresses and possible distortion and cracking.

Welding positions

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

Current type

AC / DC + / -

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

C	Mn	Cr
0.7	15	3.7

Structure

In the as deposited condition, the microstructure consists of a soft manganese alloy austenite which rapidly work hardens under impact loading.

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)
3.2 x 350	95 - 105	dc+	-	-	1.1
4.0 x 350	130 - 140	dc+	-	-	1.6

Complementary products

Complementary products include flux cored wire Lincore® M and submerged arc wire Lincore® M.

Wearshield® 15CrMn

Hardfacing electrode

Classification

DIN 8555 : E7-UM-250-KP
EN 14700 : E Fe9

General description

A rutile hardfacing electrode that exhibits excellent arc characteristics
Easy slag detachability, good arc restriking and low spatter
The electrode coating permits out of position welding

Application

APL Wearshield 15CrMn produces a premium austenitic chromium-manganese deposit. The term premium is used because the weld metal has sufficient alloy content to produce a single pass austenitic deposit on ordinary carbon steel. The deposit rapidly work hardens under impact making it particularly suitable for APLs of high impact and gouging, coupled with moderate abrasion. In addition to surfacing, the high crack resistance of this alloy design makes Wearshield 15CrMn an ideal electrode for joining manganese steel to itself or carbon steels with minimal risk of centreline cracking.

Typical applications include:

Railroad frogs
Track ends
Crusher hammers and screens
Earth moving equipment
Rebuilding of austenitic manganese plates and components
Construction equipment

Mechanical properties, all weld metal

	Typical hardness values
As deposited	18 - 24 HRc (210-250 HB)
Work hardened	40 - 50 HRc (375-490 HB)

Packaging and available sizes

	Diameter (mm)	3.2	4.0	4.8
	Length (mm)	355	355	455
Unit: Box	Pieces / unit	49	33	24
	Net weight/unit (kg)	2.5	2.5	2.5

Identification	Imprint: WEARSHIELD 15CrMn	Tip Color: none

Wearshield® 15CrMn: rev. EN 22

Wearshield® 15CrMn

Additional information

When welding with Wearshield 15CrMn a short arc or contact drag technique is preferred. The weld width should be limited to 12-20mm for all electrode diameters. Narrow stringer beads are preferred for edge and corner build up.
All work-hardened base material and previously deposited material should be removed prior to applying a new deposit, since such areas are prone to embrittlement and possible cracking.
No preheat is required on austenitic manganese steels although a preheat of between 150-200°C may be necessary on carbon and low steels to prevent heat affected zone cracking.
It is important to avoid excessive heat build up in the base material. High heat input welds and interpass temperatures above 260°C should be avoided as this can cause embrittlement.
There is no definite limitation to the number of passes that may be deposited, however, it is good practise to peen each pass immediately after welding to minimise internal stresses and possible distortion and cracking.
Wearshield 15CrMn deposits workharden rapidly making them difficult to machine. For best results carbide or ceramic cutting tools and rigid tooling should be used. Grinding can also be successfully employed.
For applications involving severe impact and abrasion, a buildup of Wearshield 15CrMn coupled with a single pass of Wearshield 60 or Lincore 60-O should be employed.
The Wearshield 15CrMn deposit can not be cut using the Oxy-fuel process due to the high chromium content, however, plasma arc and air carbon arc processes are appropriate.

SMAW

Welding positions

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

Current type

AC / DC +

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

C	Mn	Si	Cr
0.35	14.0	0.6	15.0

Structure

In the as deposited condition, the microstructure consists of a soft manganese alloy austenite which rapidly work hardens under impact loading.

Calculation data

Sizes Diam. x length (mm)	Current range (A)
3.2 x 355	140 - 160
4.0 x 355	190 - 210
4.8 x 355	220 - 250

Complementary products

Complementary products include flux cored wire Lincore® 15CrMn

Wearshield® MM 40

Hardfacing electrode

Classification

DIN 8555 : E1-UM-400-G*
EN 14700 : E Fe1

* Nearest classification

General description

An all position rutile/basic coated electrode that produces a machinable martensitic deposit
Designed for operator appeal and weld quality having excellent arc characteristics
Good restriking and low spatter
The electrode can be used with the drag or contact welding technique as well as out of position

Application

Wearshield MM 40 produces a crack-free wear resistant deposit with a hardness of 42-45 HRc depending on upon material dilution and number of layers. It is particularly suitable for APLs involving sliding, rolling and metal to metal wear, combined with resistance to mild abrasion.

Typical applications include:

Buckets links, bucket bases
Guide rolls
Tractor rolls
Crane wheels

Mechanical properties, all weld metal

	Typical hardness values
1 Layer	39-42 HRc (360-400 HB)
2 Layers	40-45 HRc (375-425 HB)
3 Layers	42-45 HRc (400-425 HB)

Welded on Mild Steel Plate

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	450
Unit: Box	Pieces / unit	66	43	22
	Net weight/unit (kg)	2.5	2.5	2.5

Identification	Imprint: WEARSHIELD MM40	Tip Color: red

Wearshield® MM 40: rev. EN 22

Wearshield® MM 40

Additional information

When welding with Wearshield MM40 the bead width should be limited to 12 - 20mm for all electrode diameters when using a weaving technique. For edge and corner build-up narrow stringer beads are preferred.
A preheat between 150-250°C is necessary to prevent cracking in situations of high restraint and/or heavy thicknesses.
The deposited weld metal is machinable, therefore, tempering and annealing are not generally necessary but may be carried out to decrease hardness and increase toughness. Annealing at 760°C for several hours and slow cooling followed by tempering at 520°C will reduce the hardness. This deposit can subsequently be flame hardened or furnace hardened.
The build up is usually limited to 4 layers.

Welding positions

ISO/ASME	PA/1G	PC/2G	PF/5Gup

Current type

AC / DC +

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

C	Mn	Si	Cr	Mo
0.2	0.5	1.3	3.4	0.5

Structure

In the as welded condition the microstructure consists mainly of martensite

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	90 - 130	DC+	71	175	1.3	38.6	41	1.57
4.0 x 350	140 - 180	DC+	83	312	1.5	56.6	28	1.61
5.0 x 450	170 - 220	DC+	108	640	2.5	114.1	13	1.50

Complementary products

Flux cored wire Lincore® 40-0

Hardfacing electrode

Classification

DIN 8555 : E2-UM-55-G*
EN 14700 : E Fe2

* Nearest classification

General description

An all position rutile/basic coated electrode that produces a high carbon heat treatable martensitic deposit
Designed for operator appeal and weld quality
Excellent arc characteristics, good restriking and low spatter
The electrode can be used with the drag or contact welding technique as well as out of position

Application

Wearshield MM produces a crack-free wear resistant deposit with a hardness of 55-57 Rc depending on dilution and number of layers. It is particularly suitable for APLs involving sliding, rolling and metal to metal wear, combined with resistance to mild abrasion.

Typical applications include:

Crane and mine car wheels
Sprockets and gear teeth
Skip guides
Dredger buckets
Scrapper blades
Transfer tables
Cable sheaves

Mechanical properties, all weld metal

	Typical hardness values
1 Layer	45-55 HRc
2 Layers	52-57 HRc

Welded on Mild Steel Plate

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0	6.0
	Length (mm)	350	350	450	450
Unit: Box	Pieces / unit	66	45	22	-
	Net weight/unit (kg)	2.5	2.5	2.5	2.5
Unit: Linc Pack	Pieces / unit	26	18		
	Net weight/unit (kg)	1.0	1.0		

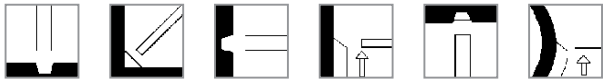
Identification Imprint: WEARSHIELD MM Tip Color: purple

Wearshield® MM: rev. EN 22

Additional information

When welding with Wearshield MM the bead width should be limited to 12 - 20mm for all electrode diameters when using a weaving technique. For edge and corner buildup narrow stringer beads are preferred.
A preheat between 200-350°C is necessary to prevent cracking with interpass temperatures of up to 400°C in situations of high restraint and/or heavy thicknesses. After welding the component should be covered and slowly cooled.
The deposited weld metal is not machinable by conventional methods although the deposit can be shaped by grinding.
The deposit can be tempered at about 425°C to toughen the weld metal resulting in a hardness of approximately 50 HRc. Annealing at 760°C for several hours and slow cooling will reduce the hardness to approximately 30 HRc. This deposit can be readily machined.
Rehardening is archieved by heating to about 950°C for several hours to dissolve all carbides and homogenise the structure, followed by either water or oil quench (thin sections may be air cooled). After quenching the component should be tempered.
Flame hardening is also possible after annealing, although full hardness may not be archieved due to the inability to homogenize the steel in the short heating cycle.
The build up is usually limited to 4 layers.

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	Mo	W
0.55	0.5	1.5	4.5	0.5	0.5

Structure

In the as welded condition the microstructure consists mainly of martensite with carbides.

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	90 - 130	DC+	75	186	1.2	39.0	42	1.62
4.0 x 350	140 - 180	DC+	87	343	1.4	55.8	30	1.65
5.0 x 450	170 - 220	DC+	112	516	2.3	115.2	14	1.62
6.0 x 450	230 - 270	DC+						

Complementary products

Complementary products include flux cored wire Lincore® 55.

Hardfacing electrode

Classification

AWS A5.13	: E Fe6*
DIN 8555	: E4-UM-60-SZ
EN 14700	: E Fe4

* Nearest classification

General description

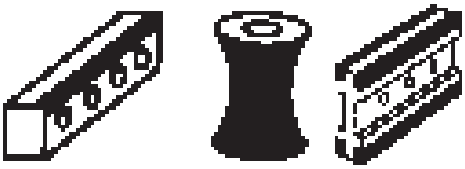
A basic coated electrode that produces a high speed steel deposit similar to M-1 tool steel
The deposited weld metal is air hardening
Designed for operator appeal and weld quality
Excellent arc characteristics, good restriking and low spatter
The electrode coating permits the use of the drag or contact welding technique

Application

Wearshield T & D produces a crack-free wear resistant tool steel deposit with a hardness of 58-62 HRc. This hardness can be further increased to between 63-65HRc after tempering (540-600°C). It is particularly suitable for APLs involving severe metal to metal wear coupled with elevated temperatures (up to 540°C). Ideally suited to the buildup of worn steel dies, cutting tools or the APL of wear resistant surfaces to carbon and low alloy steels.

Typical applications include:

Punch and forging dies
Shear blades
Trimmers
Cutting tools



Mechanical properties, all weld metal

	Typical hardness values
As Welded	58-62 HRc
Tempered at 540-600°C	63-65 HRc

Welded on Mild Steel Plate (12mm)

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	85	56	35
	Net weight/unit (kg)	2.5	2.5	2.5

Identification	Imprint: WEARSHIELD T&D	Tip Color: none	**Wearshield® T&D: rev. EN 22**

Additional information

When welding with Wearshield T & D the weld width should be limited to between 12 - 25mm for all electrode diameters when employing a weaving technique. For edge and corner buildup narrow stringer beads are preferred.
A preheat and interpass temperature of 325°C, or higher (up to 540°C), is necessary to avoid cracking. It is important to ensure that an adequate "soak" is achieved prior to the welding operation. After welding, the component should be covered and slow cooled down to room temperature. Once cooled, the deposited weldment should be post weld heat treated to temper the martensite and toughen the deposit. Tempering at 540-600°C normally produces the optium combination of hardness and toughness.
The deposited weld metal is not machinable by conventional methods although the deposit can be shaped by grinding.
Annealing at 850°C for several hours and slow cooling will reduce the hardness to approximately 30 HRc. This deposit can be readily machined. Rehardening is achieved by heating to about 1200°C for several hours to dissolve all carbides and homogenise the steel, followed by air cooling and tempering (540-600°C).
The deposit thickness is usually limited to 4 layers.
Wearshield T & D cannot be cut by the oxy-fuel processes. Plasma arc and air-carbon arc processes can be used to both cut an gouge the weld deposit. Preheat temperature similar to those for welding may be necessary to prevent cracking along the cut edge.

Welding positions

ISO/ASME PA/1G

Current type

AC / DC +

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

C	Mn	Si	Cr	Mo	W	V
0.65	0.4	0.7	4	6.0	1.8	1.1

Structure

In the as welded condition the microstructure consists mainly of martensite with some carbides.

After tempering the microstructure consists of tempered martensite with secondary carbides

Calculation data

Sizes Diam. x length (mm)	Current range (A)
3.2 x 350	80 - 100
4.0 x 350	110 - 130
5.0 x 350	130 - 160

Complementary products

Complementary products include Lincore® T&D

Wearshield® MI (e)

Hardfacing electrode

Classification

AWS A5.13	: E Fe6
DIN 8555	: E6-UM-60-GPS
EN 14700	: E Fe6

General description

A basic coated electrode that produces a martensitic deposit with a considerable amount of retained austenite
Designed for operator appeal and weld quality
Excellent arc characteristics, good restriking and low spatter

Application

Wearshield MI produces a wear resistant martensite/austenite deposit with a hardness of 45-58 HRc. It can be used to surface a variety of carbon, carbon manganese and alloy steels. The martensite/austenite deposit makes Wearshield MI particularly suitable for APLs involving impact, metal to metal wear and mild abrasion such as by limestone. This deposit tends to cross check.

Typical applications include:

Dipper lips
Construction equipment
Earth moving equipment
Rock crushers
Hammer mills
Conveyor screws
Ditcher teeth
Agricultural equipment

Mechanical properties, all weld metal

	Typical hardness values
1 Layer	45-55 HRc
2 Layers	50-58 HRc

Welded on Mild Steel Plate

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Unit: Box	Pieces / unit	117	69	38	25
	Net weight/unit (kg)	2.5	2.5	2.5	2.5

Identification	Imprint: WEARSHIELD MI (E)	Tip Color: violet

Wearshield® MI (e): rev. EN 22

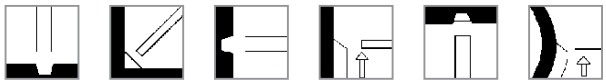
Wearshield® MI (e)

Additional information

A preheat and interpass temperature of over 200°C is preferred to help reduce check cracking and avoid chipping and fragmentation.
The deposited weld metal is not machinable by conventional methods although the deposit can be shaped by grinding.
The Wearshield MI deposit tends to cross check and is therefore usually limited to 2 layers to avoid chipping and fragmentation.
Wearshield MI cannot be cut by the oxy-fuel processes. Plasma arc and air-carbon arc processes can be used to both cut and gouge the weld deposit.

SMAW

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
0.5	0.4	1.8	9

Structure

In the as welded condition the microstructure consists of a mixed structure of martensite and austenite.

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)
2.5 x 350	60 _ 70	AC/DC E-	-	-	7.6
3.2 x 350	70 _ 120	AC/DC E-	-	-	1.10
4.0 x 450	110 _ 150	AC/DC E-	-	-	1.45
5.0 x 450	150 - 200	AC/DC E-	-	-	2.00

Complementary products

Solid wire LNM 420 FM.

Wearshield® ABR

Hardfacing electrode

Classification

DIN 8555 : E10-UM-50-GPZ
EN 14700 : E Fe6

General description

A graphite coated electrode that produces a primary austenite and austenite-eutectic weld deposit.
Wearshield ABR is the most versatile product within the Wearshield range
Good resistance to both abrasion and impact, as well as hot-forging properties

Application

Wearshield ABR produces an abrasion and impact resistant deposit with a hardness of 28-55HRc depending on base metal chemistry, dilution and number of layers. The combination of abrasion and impact resistance coupled with hot forging properties makes Wearshield ABR particularly suitable for APLs involving transportation of abrasive media under heavy variable loading. Wearshield ABR is also suitable for metal to metal wear APLs.

Typical applications include:

Dipper and dredge cutter teeth
Rock crusher hammers and mill hammers
Rock crushers and crusher mantles
Screw flights
Coal mining cutters
Conveyor buckets and rolls
Plough shares, scrapper blades and cultivator sweeps
Truck chain and gears

Mechanical properties, all weld metal

	Typical hardness values
1 Layer	24-53 HRc
2 Layers	28-53 HRc
3 Layers	28-55 HRc

Welded on Mild Steel Plate

Packaging and available sizes

	Diameter (mm)	54	4.0	4.8
	Length (mm)	355	355	355
Unit: Box	Pieces / unit	85	54	38
	Net weight/unit (kg)	2.5	2.5	2.5

Identification Imprint: WEARSHIELD ABR Tip Color: none

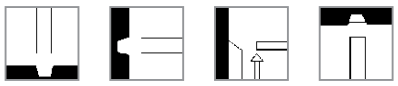
Wearshield® ABR: rev. EN 22

Wearshield® ABR

Additional information

When welding with Wearshield ABR a short arc should be employed. The weld width should be limited to between 12-20mm for all electrode diameters when employing a weaving technique. For edge and corner build up narrow stringer beads are preferred.
Preheat is not necessary when surfacing austenitic substrates such as stainless and manganese steels, although the interpass temperature should be limited to about 260°C for manganese steels. For low alloy and carbon steels a preheat of 200°C is usually sufficient, but is dependent on material thickness and chemistry. For optimum abrasion resistance the interpass temperature should be limited to 320°C.
The deposited weld metal is not machinable by conventional methods although the deposit can be shaped by grinding.
To obtain a deposit that can be machined by carbide cutting tools, the component should be heated to 750°C for one hour followed by air cooling to room temperature. For maximum machinability the component should be heated to 875-900°C for one hour, furnace cooled to 650°C at a rate not exceeding 10°C per hour, followed by furnace or air cooling to room temperature. The abrasion resistance can be restored by heating to 800°C, quenching and tempering at 200°C.
The deposit thickness is usually limited to 2 layers.
For applications requiring thicker deposits, an intermediate layer of an austenitic material such as Wearshield 15CrMn should be used and each layer peened to relieve residual stresses.
For maximum resistance to spalling one or more layers of Wearshield 15CrMn should be used as buildup.
There is no flux cored equivalent to Wearshield ABR.

Welding positions



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

Current type

AC / DC + / -

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

C	Mn	Si	Cr	Mo
2.1	1.1	0.75	6.5	0.40

Structure

In the as welded condition the microstructure consists of primary austenite and a eutectic of austenite plus carbides.

Calculation data

Sizes Diam. x length (mm)	Current range (A)
3.2 x 355	40 - 150
4.0 x 355	75 - 200
5.0 x 355	110 - 250

Complementary products

The closest product is Lincore® 50, however, the deposit varies significantly to Wearshield ABR.

Hardfacing electrode

Classification

DIN 8555 : E10-UM-45-GPZ
EN 14700 : E Fe14

General description

A heavy coated rutile electrode that produces a primary austenite-chrome carbide eutectic weld deposit
Designed for operator appeal and weld quality
Excellent arc characteristics, good restriking, complete slag coverage and low spatter
The electrode coating permits the use of the drag or contact welding technique

Application

Wearshield 44 produces an abrasion and impact resistant deposit with a hardness of 42-48HRc.
The intended use of Wearshield 44 is to provide a combination of abrasion and impact resistance at service temperatures up to 600°C.

Typical applications include:

Ingot tongs
Scrapper blades
Rolling mill guides
Screw flights
Coal mining chutes
Plough shares, scrapper blades and cultivator sweeps
Pulleys and chain links

Mechanical properties, all weld metal

	Typical hardness values
1 Layer	42 HRc
2 Layers	49 HRc
3 Layers	48 HRc

Welded on Mild Steel Plate

Packaging and available sizes

	Diameter (mm)	3.2	4.0	4.8
	Length (mm)	355	355	355
Unit: Box	Pieces / unit	59	-	2.7
	Net weight/unit (kg)	2.5	2.5	2.5

Identification Imprint: WEARSHIELD 44 Tip Color: none

Wearshield® 44: rev. EN 22

Wearshield® 44

Additional information

When welding with Wearshield 44 the bead width should be limited to 12-20mm for all electrode diameters when employing a weaving technique. For edge and corner build up narrow stringer beads are preferred.
Preheating is not necessary when surfacing austenitic substrates such as stainless steels and manganese steels, although the interpass temperature should be limited to about 260°C for manganese steels. For low alloy and carbon steels a preheat of 200°C is usually sufficient, but is dependent on base material thickness and chemistry.
The deposited weld metal is not machinable by conventional methods although the deposit can be shaped by grinding.
The build up is usually limited to 2-3 layers.
Wearshield 44 can be deposited on small components without check cracking, however, check cracking may not be preventable on larger sections.
Wearshield 44 may also be used to overlay cast irons, however, this is not possible without check cracking. To minimise the risk of spalling, closely spaced check cracks are preferred. These are obtained by employing stringer bead welding procedures.

SMAW

Welding positions

ISO/ASME PA/1G PC/2G

Current type

AC / DC +

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

C	Mn	Si	Cr	Mo
2.0	0.16	0.9	24.2	2.5

Structure

In the as welded condition the microstructure consists of primary austenite with an interdendritic eutectic of austenite and chromium carbides

Calculation data

Sizes Diam. x length (mm)	Current range (A)
3.2 x 355	120-160
4.0 x 355	150 - 220
4.8 x 355	190 - 270

Complementary products

There is no flux cored equivalent to Wearshield 44. The closest product is Lincore® 50, however, the deposit varies significantly to Wearshield 44.

Wearshield® ME (e)

Hardfacing electrode

Classification

DIN 8555 : E10-UM-60-GRZ
EN 14700 : E Fe14

General description

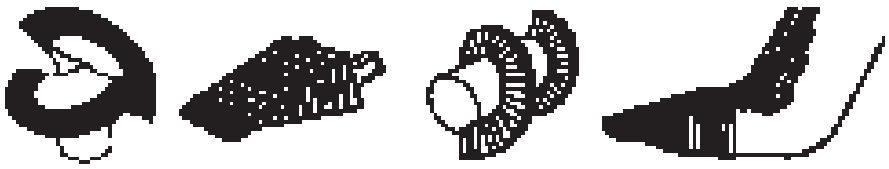
A heavily coated rutile electrode that produces a near eutectic mix of chromium carbides and austenite, with limited primary carbides weld deposit 170% recovery. Designed for operator appeal and weld quality having excellent arc characteristics, good restriking, complete slag coverage and low spatter levels. The electrode coating permits the use of a light drag or contact welding technique

Application

Wearshield ME produces an abrasion resistant deposit with a hardness range of 55-60HRc.
The intended use of Wearshield ME is to provide a combination of abrasion and impact resistance at service temperatures up to 600°C.

Typical applications include:

Ingot tongs
Scrapper blades
Rolling mill guides
Screw flights
Coal mining chutes
Plough shares, scrapper blades and cultivator sweeps
Pulleys and chain links



Mechanical properties, all weld metal

	Typical hardness values
1 Layer	55 HRc
2 Layers	60 HRc

Welded on Mild Steel Plate

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
Unit: Box	Pieces / unit	37	23	15
	Net weight/unit (kg)	2.5	2.5	2.5

Identification	Imprint: WEARSHIELD ME (E)	Tip Color: violet

Wearshield® ME (e): rev. EN 22

Wearshield® ME (e)

Additional information

When welding with Wearshield ME the weld width should be limited to 20mm. Since wide weaves generally increase the check crack spacing which can result in deposit spalling on multiple layers. For edge, corner and general buildup, narrow stringer beads are preferred. Wearshield ME generally check cracks except for single layers on thin base material. Stringer beads tend to produce a consistent crack spacing of between 12-25mm.
Preheat is not necessary when surfacing austenitic substrates such as stainless steels and manganese steels, although the interpass temperature should be limited to about 260°C for manganese steels, For low alloy and carbon steels a preheat of 200°C is usually sufficient, but is dependent on base material thickness and chemistry. The deposited weld metal is not machinable by conventional methods although the deposit can be shaped by grinding.
The deposit thickness is usually limited to 2-3 layers to avoid spalling.
To minimise the risk of spalling, stringer beads should be employed to produce closely spaced check cracks.
The resultant weld metal microstructure is determined by the level of dilution and base material chemistry. Low dilution welds on carbon and low alloy steels results in a microstructure that is a near eutectic mix of chromium carbides and austenite, with limited primary carbides. High dilution weld deposit produce a microstructure of primary austenite and eutectic resulting in higher toughness and lower abrasion resistance.
For maximum spalling resistance on carbon and low alloy steels, a buffer layer of Wearshield MM 40 or RepTec 126 should be applied prior to the Wearshield ME.

Welding positions

ISO/ASME PA/1G PB/2F

Current type

AC / DC +

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

C	Cr	Si
3	33	1.0

Structure

In the as welded condition the microstructure consists of a near eutectic mix of chromium carbides and austenite, with limited primary carbides

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)
3.2 x 450	100 - 140	DC+	-	-	1.15
4.0 x 450	130 - 190	DC+	-	-	1.70
5.0 x 450	160 - 260	DC+	-	-	2.25

Complementary products

There is no flux cored equivalent to Wearshield ME. The closest product is Lincore® 60-O, however, the deposit varies significantly to Wearshield ME.

Hardfacing electrode

Classification

DIN 8555 : E10-UM-65-GRZ
EN 14700 : E Fe16

General description

Basic coated electrode for hardfacing with an efficiency of about 200%
Extreme resistance against abrasion up to temperatures of 700°C

Application

Typical APLs include:
Ore-crushers, ore chutes, hot slag crushers, dragline teeth, diggers, etc.

Mechanical properties, all weld metal

	Typical hardness values
1 Layer Welded on Mild Steel Plate	62-67 HRc

Packaging and available sizes

	Diameter (mm)	3.2	4.0
	Length (mm)	350	350
Unit: Box	Pieces / unit	41	27
	Net weight/unit (kg)	2.5	2.5

Identification Imprint: WEARSHIELD 50 MC Tip Color: white

Wearshield® 50MC: rev. EN 22

Wearshield® 50MC

Additional information

By preference, weld under inclined angle of 20 degrees.
Weave during welding in a width of approx. 50 mm.
During solidification small cracks will occur.
These cracks, however, will have no detrimental effect on the weld metal properties regarding its abrasive wear resistance.
A maximum of two layers should be applied to prevent the weld from braking out.

Welding positions

ISO/ASME PA/1G PF/3Gup

Current type

AC / DC +

SMAW

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

C	Mn	Cr	Nb	W	V	Si	B
5	2	21	6.4	3.1	0.7	2.1	0.8

Structure

Supereutectic + primary carbides.

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	120 - 160	DC+	156	699	1.28	67	18	1.21
4.0 x 350	160 - 200	DC+	172	1011	1.50	100	14	1.40

Complementary products

Complementary products include flux cored wire Lincore® 65-O.

Wearshield® 60 (e)

Hardfacing electrode

Classification

DIN 8555 : E10-UM-60-GR
EN 14700 : E Fe15

General description

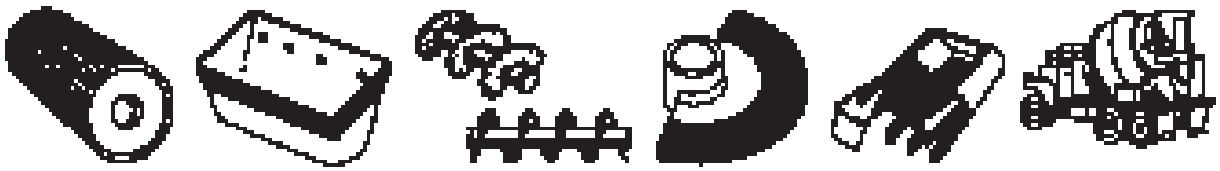
A basic coated downhand 200% recovery electrode that produces a primary carbide weld deposit. The electrode coating facilitates easy arc control and arc visibility whilst maintaining a short arc

Application

Wearshield 60 produces an primary carbide deposit with a hardness range of 60-62 HRc.
The primary carbide microstructure makes Wearshield 60 ideally suitable for APLs of severe abrasion

Typical applications include:

Crusher rolls, plates and jaws
Conveyor screws and sleaves
Shovel lips
Brick & coke machinery
Cement mill parts



Mechanical properties, all weld metal

	Typical hardness values
1 Layer	57-60 HRc
2 Layers	60-62 HRc

Welded on Mild Steel Plate

Packaging and available sizes

	Diameter (mm)	3.2	4.0
	Length (mm)	450	450
Unit: Box	Pieces / unit	37	23
	Net weight/unit (kg)	2.5	2.5

Identification Imprint: WEARSHIELD 60 (E) Tip Color: Violet

Wearshield® 60 (e)

Additional information

When welding with Wearshield 60 stringer beads should be employed. Weaving is not advised since wide weaves generally increase the check crack spacing which can result in deposit spalling.
The as-welded deposit readily check cracks.
Preheat is not necessary when surfacing austenitic substrates such as stainless steels and manganese steels, although the interpass temperature should be limited to about 260°C for manganese steels.
The deposited weld metal is not machinable.
The deposit thickness is usually limited to 2 layers.
For applications requiring build-ups in excess of 2 layers, buttering layers of RepTec 126, Wearshield BU30 or Wearshield Mangjet (manganese steels) should be used prior to Wearshield 60. Alternatively, a preheat of 650°C can be used to eliminate the formation of check cracks.
Alternatively, a preheat of 650°C can be used to eliminate the formation of check cracks.

Welding positions

ISO/ASME PA/1G PB/2F

Current type

AC / DC + / -

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

C	Cr	Si
5	35	4

Structure

In the as welded condition the microstructure consists of primary chromium carbides in an austenite - carbide eutectic matrix

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)
3.2 x 450	110 - 150	DC+	-	-	1.75
4.0 x 450	140 _ 180	DC+	-	-	2.20

Complementary products

Complementary products include flux cored wire Lincore® 60-O and submerged arc wire Lincore® 60-S

Hardfacing electrode

Classification

DIN 8555 : E10-UM-65-GRZ
EN 14700 : E Fe16

General description

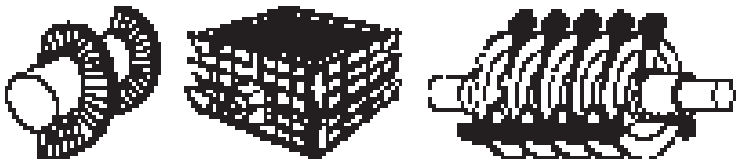
A highly alloyed basic-graphite coated downhand hardfacing electrode that produces a "premium" carbide weld deposit. The electrode facilitates easy arc control whilst maintaining a long arc. Recovery 240%.

Application

Wearshield 70 produces a "premium" carbide weld deposit with a hardness range of 68-70HRc.
The premium carbide microstructure makes Wearshield 70 ideally suitable for APLs of high stress abrasion (crushing of abrasive particles), severe abrasion and abrasion at elevated temperatures (>760°C)

Typical applications include:

Blast furnace bells (burden area)
Hoppers and screens
Sinter plants
Cement mill parts



Mechanical properties, all weld metal

	Typical hardness values
1 Layer	68-70 HRc
Welded on Mild Steel Plate	

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	350
Unit: Box	Pieces / unit	28	18	12
	Net weight/unit (kg)	2.5	2.5	2.5

Identification Imprint: WEARSHIELD 70 Tip Color: violet

Wearshield® 70: rev. EN 22

Wearshield® 70

Additional information

When welding with Wearshield 70 stringer beads are preferred, although weld widths up to 50mm by weaving are acceptable. A short welding arc is preferred and the drag technique is not recommended.
In the as welded condition readily check cracks and the spacings between the cracks are small even at slow travel speeds
Preheat is not necessary when surfacing austenitic substrates such as stainless steels and manganese steels, although the interpass temperature should be limited to about 260°C for manganese steels.
The deposited weld metal is not machinable or forgeable.
The deposit thickness is usually limited to 2 layers.
Optimum spalling resistance is achieved using austenitic substrates. For service conditions below 260°C an austenitic manganese substrate is preferred.
For high temperature applications >260°C, an austenitic stainless steel substrate should be used. F.i. RepTec 126.
Wearshield 70 will perform standard primary carbide electrodes (such as Wearshield 60) under either low stress or high temperature abrasion conditions.

Welding positions

ISO/ASME PA/1G PB/2F

Current type

AC / DC +

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

C	Cr	Nb	Mo	W	Si
4.2	18	9	8.5	7	2.7

Structure

The microstructure consists mainly of primary chromium carbides with premium carbides of molybdenum, niobium, tungsten and vanadium in an austenite - carbide eutectic matrix

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	120 - 160	AC	156	699	1.28	67	18	1.21
4.0 x 350	180 - 220	AC	172	1011	1.50	100	14	1.40
5.0 x 350	230 - 300	AC	194	1630	2.06	155	9	1.39

Complementary products

Complementary products include flux cored wire Lincore® 65-O.

Wearshield® 420

Hardfacing electrode

Classification

DIN 8555 : E6-UM-55-RZ
EN 14700 : E Fe8

General description

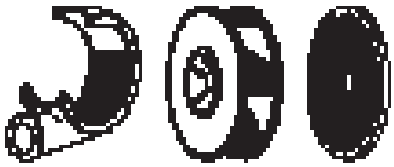
Heavily coated electrode that produces a martensitic deposit similar to AISI 420 stainless steel. Designed for operator appeal and weld quality having excellent arc characteristics, good restriking and low spatter levels. The electrode coating permits the use of the drag or contact welding technique as well as positional welding if required.

Application

Wearshield 420 electrodes are intended to provide abrasion resistance under conditions of high corrosion, abrasion and impact.
The electrode can be used on carbon steels, low alloy steel and martensitic steel.

Typical applications include:

Sand pumps
Dredging equipment
Fans
Valve seats in steam and liquid pipes



Mechanical properties, all weld metal

Typical hardness values: 55 HRc (560HB)

Packaging and available sizes

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	450
Unit: Box	Pieces / unit	51	36	22
	Net weight/unit (kg)	2.5	2.5	2.5

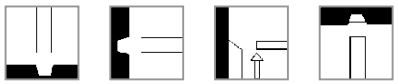
Identification	Imprint: WEARSHIELD 420	Tip Color: brown	**Wearshield® 420: rev. EN 22**

Wearshield® 420

Additional information

All work-hardened base material and previously deposited hardfacing material should be removed prior to applying a new deposit, since such areas are prone to embrittlement and possible cracking. Areas that contain irregularaties such as cracks and deep gouges can be repaired locally using Wearshield BU30 or Wearshield 15CrMn prior to hardfacing with Wearshield 420.
Preheat would be needed if the welding is done over either highly restrained material or martensitic stainless base metal.
Preheat would be needed if the welding is done over either highly restrained material or martensitic stainless base metal.
A preheat and interpass temperature in the range of 200-300°C can be used depending on the nature of the material to be welded.
Under conditions of low dilution, the microstructure is similar to that of AISI 420 martensitic stainless steel. This structure provides good abrasion resistance under conditions of severe corrosion and high impact. At higher dilutions, when overlaid on mild steel or low alloy steel, the weld metal microstructure will retain it's martensitic stainless structure. But the reduced chromium level might adversely affect the corrosion resistance of the deposit.

Welding positions



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

Current type

AC / DC +

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

C	Mn	Si	Cr	Mo	Ti
0.5	0.3	0.4	12.4	0.4	1.3

Structure

Ferrite and martensite

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	90 - 130	AC	83	324	1.08	45	40	1.80
4.0 x 350	120 - 170	AC	102	522	1.36	67	26	1.74
5.0 x 450	170 - 220	AC						

Complementary products

Complementary products include Lincore® 420

Repair 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, 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	48	25	17
	Net weight/unit (kg)	2.5	2.5	2.5	2.5

Identification Imprint: REPTEC 126 Tip Color: red

RepTec 126: rev. EN 21

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	60A	60A	60A
3.2	90A	90A	90A
4.0	140A	115A	130A
5.0	160A	165A	

Remarks/ Application advice

Deviations: chemical composition

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

RepTec Cast 1

Repair electrode

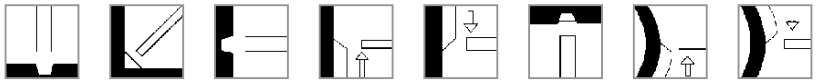
Classification

AWS A5.15 : ENi-CI
ISO 1071 : EC Ni-CI 1

General description

Ni-electrode for repair welding of lamellar cast iron, malleable cast iron and cast iron to steel
Produces a soft malleable weld deposit
Hardness weld deposit ~ 175 HB
Preferable welding on DC-, gives pulsed arc welding, deep penetration, smooth surface, no lack of fusion
Welding on AC, lowest heat input, important at filling
Best choice for multilayer welding

Welding positions



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

Current type

AC / DC + / -

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

C	Fe	Ni
0.7	2.0	97

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Hardness HB10
Required: AWS A5.15		262-414	276-448	03-6	135-218
ISO 1071		200	250	3	
Typical values	AW	270	445	8	175

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	350	400
Unit: PE tube	Pieces / unit	146	76	44
	Net weight/unit (kg)	2.5	2.5	2.5
Unit: Linc Pack	Pieces / unit	58	30	18
	Net weight/unit (kg)	1.0	1.0	1.0

Identification Imprint: REPTEC CAST 1 Tip Color: black

RepTec Cast 1: rev. EN 21

RepTec Cast 1

Materials to be welded

Steel grades	DIN1691	DIN 1692	DIN 1693
For welding and repair			
	GG 10	GTS-35-10	G GG-40
	GG 15	GTS-45-06	G GG-50
	GG 20	GTS-55-4	G GG-60
	GG 25	GTW-35-04	
	GG 30	GTW-40-05	
	GG 35	GTW-45-07	
		GTW-S-38-12	

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	50 - 100	DC-	176	268	0.24	19.1	84	1.61
3.2 x 350	70 - 130	DC-	145	303	0.48	32.6	52	1.52
4.0 x 400	90 - 150	DC-	262	647	0.55	56.7	25	1.41

* 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	70A	70A	
3.2	100A	100A	100A	80A	80A	
4.0	120A	120A	120A	110A	110A	

Remarks/ Application advice

Residual stresses are decreased by peening after each layer
Cold welding, interpass temperature (Ti<100°C)
Heavy parts preheat (to max. 300°C)

Repair electrode

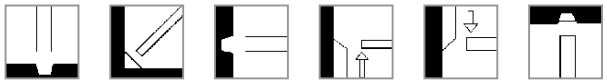
Classification

AWS A5.5 : ENiFe-CI
ISO 1071 : EC NiFe-CI 1

General description

Basic graphite coated stick electrode with nickel iron core for cold welding of cast iron, malleable cast iron and joint welding to steel
Specially developed for good peen- and machinable seams e.g. for thick joints
In order to introduce as little heat into the work piece as possible, it is advisable to weld with DC positive

Welding positions



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

Current type

AC / DC +

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

C	Fe	Ni
0.6	40	balance

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Hardness HB10
Required: AWS A5.15		296-434	400-579	6-18	165-218
ISO 1071		250	350	6	
Typical values	AW	300	460	10	175

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	300	350
Unit: PE tube	Pieces / unit	155	95	54
	Net weight/unit (kg)	2.5	2.5	2.5

Identification Imprint: REPTEC CAST 3 Tip Color: black

RepTec Cast 3: rev. EN 21

RepTec Cast 3

Materials to be welded

Steel grades	DIN 1691	DIN 1692	DIN 1693
For welding and repair			
	GG-10	GTS-35	G GG-40
	GG-15	GTS-45	G GG-50
	GG-20	GTS-55	G GG-60
	GG-25	GTW-35	G GG-70
	GG-30	GTW-40	G GG-80
	GG-35	GTW-45	
	GG-40	GTW-S-38	

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	50 - 70	AC	58	106	0.76	15.9	82	1.3
3.2 x 300	70 - 90	AC	69	161	1.24	30.8	42	1.3
3.2 x 350	70 - 90							
4.0 x 350	100 - 120	AC	75	234	1.78	46.2	27	1.2
4.0 x 400	100 - 120							

* 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		
3.2	80A	80A	80A	75A		
4.0	110A	110A	110A	105A		

Remarks/ Application advice

Welding of short beads is recommendable.
Peening (with a ball hammer) immediately after welding eliminates shrinkage stresses.
Perlitic cast iron often needs 200°C preheating.

Repair electrode

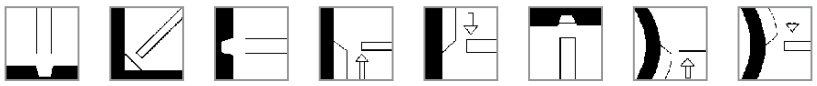
Classification

AWS A5.15 : ENiFe-CI
ISO 1071 : EC NiFe-CI 1

General description

Electrode for repair welding of cast iron, malleable cast iron and cast iron to steel
The nickel-iron weld deposit is easily machineable
Particularly applicable for nodular cast iron
Hardness weld deposit ~ 180 HB
Excellent current carrying capacity cause bi-metal core wire
Welding on AC and DC- polarity
Best choice welding DC -

Welding positions



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

Current type

AC / DC -

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

C	Fe	Ni
0.7	45	balance

Mechanical properties, all weld metal

	Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Hardness HB10
Required: AWS A5.15		296-434	400-579	6-18	165-218
ISO 1071		250	350	6	
Typical values	AW	300	460	12	180

Packaging and available sizes

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	350	400
Unit: PE tube	Pieces / unit	154	82	47
	Net weight/unit (kg)	2.5	2.5	2.5
Unit: Linc Pack	Pieces / unit	62	33	19
	Net weight/unit (kg)	1.0	1.0	1.0

Identification Imprint: REPTEC CAST 31 Tip Color: black

RepTec Cast 31: rev. EN 21

RepTec Cast 31

Materials to be welded

Steel grades	DIN 1691	DIN 1692	DIN 1693
For welding and repair			
	GG10	GTS-35-10	G GG-40
	GG15	GTS-45-06	G GG-50
	GG20	GTS-55-4	G GG-60
	GG25	GTW-35-04	
	GG30	GTW-40-05	
	GG35	GTW-45-07	
		GTW-S-38-12	

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	70 - 100	DC-	124	211	0.32	19.1	91	1.72
3.2 x 350	90 - 150	DC-	123	328	0.62	29.4	47	1.37
4.0 x 400	100 - 180	DC-	168	714	0.74	55.7	30	1.45

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PC/2G	PF/3G up	PE/4G
2.5	80A	80A	80A	80A	80A
3.2	110A	110A	110A	110A	110A
4.0	150A	160A	160A	150A	150A

Remarks/ Application advice

Residual stresses are decreased by peening after each layer
Cold welding, interpass temperature (Ti<100°C)
Heavy parts preheat (to max. 300°C)

Repair electrode

Classification

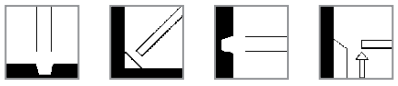
AWS A5.3 : E4043
ISO 18273 : Al 4043A*

* Nearest classification

General description

Coated electrode for welding aluminium-silicon alloys and dissimilar welding of aluminium alloys
Weldmetal aluminium-silicon alloy

Welding positions



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

Current type

DC +

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

Al	Si
bal.	5

Mechanical properties, typical

		Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)
Required:	AWS A5.3			95	
Typical values		AW	90	160	15

Packaging and available sizes

	Diameter (mm)	2.5	3.2
	Length (mm)	350	350
Unit: Can	Pieces / unit	227	152
	Net weight/unit (kg)	2.0	2.0

Identification Imprint: Tip Color:

RepTec AlSi5: rev. EN 21

RepTec AlSi5

Materials to be welded

Aluminium-silicon alloys, and dissimilar of several aluminium alloys
With restriction: precipitation hardening alloys such as:
AlCuMg (3.1325)
AlMgSi1 (3.2315)
AlZn 4.5Mg1 (3.4335)

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 - 70	-	-	-	-	9.0	-	-
3.2 x 350	60 - 90	-	-	-	-	13.2	-	-

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PF/3G up
2.5	60A	60A	55A
3.2	90A	80A	75A

Remarks/ Application advice

After welding of precipitation hardening alloys the strength in H.A.Z. is decreasing
Welding with short arc preferable
Electrode with 90° angle on material
At wall thickness >15 mm preheating 150 - 250°C

Repair electrode

Classification

ISO 18273 : Al 4047A

General description

Coated aluminium electrode for welding cast aluminium-silicon alloys
Also applicable as surfacing electrode
Good weldability, no porosity

Welding positions

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

Current type

DC +

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

Al	Si	Mn
bal.	12	0.1

Mechanical properties, typical

	Condition	0.2% Proof strength (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%)
Typical values	AW	80	180	5

Packaging and available sizes

	Diameter (mm)	2.5	3.2
	Length (mm)	350	350
Unit: Can	Pieces / unit	227	152
	Net weight/unit (kg)	2.0	2.0

Identification Imprint: Tip Color:

RepTec AlSi12: rev. EN 21

RepTec AlSi12

Materials to be welded

Cast aluminium alloys with silicon up to 12%, such as:
G-AlSi 10 Mg (3.2381)
G-AlSi 12 (3.2581)

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 - 70	-	-	-	8.9	8.8	-	-
3.2 x 350	60 - 90	-	32	66	0.7	13.2	164	2.16

* stub end 35 mm

Welding parameters, optimum fill passes

Welding positions Diameter (mm)	PA/1G	PB/2F	PF/3G up
2.5	60A	60A	55A
3.2	80A	80A	75A

Remarks/ Application advice

Redrying generally speaking not necessary. If required max. 150°C
Welding with short arc preferable
Electrode with 90° angle on material
At wall thickness >15 mm preheating 150 - 250°C

Notes