

## COVERED ELECTRODES FOR MILD AND FINE GRAINED STEEL

Product name	Chemical composition (typical values) in %					AWS		EN/ISO	
	C	Mn	Si	P	S				
Fleetweld® 5P+	0.20	0.56	0.17	-	-	A5.1	E6010	ISO 2560-A	E 42 3 C 2 5
Supra®	0.12	0.5	0.6	-	-	A5.1	E6012	ISO 2560-A	E 38 0 RC 11
Omnia®	0.07	0.5	0.5	-	-	A5.1	E6013	ISO 2560-A	E 42 0 RC 11
Pantafix	0.09	0.5	0.4	-	-	A5.1	E6013	ISO 2560-A	E 38 0 RC 11
Omnia® 46	0.06	0.5	0.45	-	-	A5.1	E6013	ISO 2560-A	E 38 0 R 11
Numal	0.06	0.5	0.45	-	-	A5.1	E6013	ISO 2560-A	E 38 0 R 11
Cumulo®	0.1	0.5	0.4	-	-	A5.1	E6013	ISO 2560-A	E 38 0 R 12
Universalis®	0.1	0.6	0.4	-	-	A5.1	E6013	ISO 2560-A	E 42 0 RR 12
Rental	0.07	0.8	0.5	-	-	A5.1	E7024	ISO 2560-A	E 38 0 RR 7 3
Ferrod 165A	0.07	0.95	0.3	-	-	A5.1	E7024-1	ISO 2560-A	E 42 2 RA 7 3
Ferrod 135T	0.08	0.5	0.35	-	-	A5.1	E7024	ISO 2560-A	E 38 0 RR 5 3
Ferrod 160T	0.07	0.9	0.6	-	-	A5.1	E7024	ISO 2560-A	E 42 0 RR 7 3
Gonia 180	0.07	1.0	0.35	-	-	A5.1	E7024	ISO 2560-A	E 42 0 RR 7 3
Baso® 48 SP	0.075	1.4	0.45	-	-	A5.1	E7018-1 H8	ISO 2560-A	E 46 3 B 3 2 H10*
Basic 7018	0.05	1.3	0.4	-	-	A5.1	E7018 H4	ISO 2560-A	E 42 2 B 1 2 H10
Baso® 51P	0.06	1.3	0.5	0.015	0.01	A5.1	E7018-1	ISO 2560-A	E 46 3 B 3 2 H 5
Lincoln 7016 DR	0.08	1.2	0.6	-	-	A5.1	E7016	ISO 2560-A	E 42 3 B 1 2 H 5
Baso® 100	0.08	1.0	0.5	-	-	A5.1	E7016 H4R	ISO 2560-A	E 42 3 B 1 2 H 5
Baso® 120	0.08	1.2	0.5	-	-	A5.1	E7018 H4R	ISO 2560-A	E 42 3 B 3 2 H 5
Baso® G	0.05	1.3	0.4	-	-	A5.1	E7018-1 H4R	ISO 2560-A	E 42 5 B 3 2 H 5
Baso® 26V	0.09	1.1	0.7	-	-	A5.1	E 7048 H8	ISO 2560-A	E 42 3 B 1 5 H10
Vandal	0.07	1.2	0.5	-	-	A5.1	E7018-1 H4R	ISO 2560-A	E 42 4 B 3 2 H 5
Conarc® 48	0.05	1.3	0.3	-	-	A5.1	E7018-1 H4	ISO 2560-A	E 46 4 B 4 2 H 5
Conarc® 49	0.09	1.1	0.6	0.015	0.010	A5.1	E7018 H4	ISO 2560-A	E 46 3 B 4 2 H 5
Conarc® 49C	0.06	1.4	0.3	0.015	0.010	A5.1	E7018-1 H4R	ISO 2560-A	E 46 4 B 3 2 H 5
Conarc® One	0.05	1.3	0.4	0.015	0.010	A5.1	E7018-1 H4R	ISO 2560-A	E 42 5 B 3 2 H 5
Conarc® 50	0.05	1.0	0.3	--	-	A5.1	E7018-1 H4	ISO 2560-A	E 46 5 B 4 2 H 5
Conarc® 51	0.06	1.4	0.5	0.015	0.010	A5.1	E7016-1 H4R	ISO 2560-A	E 42 4 B 1 2 H 5
Conarc® 52	0.06	1.2	0.4	0.015	0.010	A5.1	E7016	ISO 2560-A	E 42 2 B 1 2 H 5
LINCOLN® 7018-1	0.05	1.0	0.3	0.015	0.010	A5.1	E7018-1	ISO 2560-A	E 46 3 B 3 2 H 5
Conarc® L150	0.07	0.95	0.4	0.015	0.010	A5.1	E7028 H4R	ISO 2560-A	E 42 2 B 5 3 H 5
Conarc® V180	0.08	1.2	0.3	0.015	0.010	A5.1	E7028 H4R	ISO 2560-A	E 42 4 B 7 3 H 5
Kardo®	0.03	0.4	0.25	0.015	0.010	A5.1	E6018 <sup>1)</sup>	ISO 2560-A	E 35 2 B 3 2 H 5

<sup>1)</sup> according classification 1966

\* also complies to E 46 3 BR 32 H10

COVERED ELECTRODES FOR LOW ALLOY STEEL (HIGH YIELD, LOW TEMPERATURE AND CREEP RESISTANT STEEL)

Product	Chemical composition (typical values) in %												AWS		EN/ISO	
	C	Mn	Si	Ni	Cr	Mo	Cu	V	Nb	N	P	S				
Shield Arc <sup>®</sup> HYP+	0.13-0.17	0.49-0.63	0.08-0.18	-	-	0.27-0.31	-	<0.01	-	-	-	-	A5.5	E 7010-P1	ISO 2560-A	E 42 2 Mo C 2 5
Shield Arc <sup>®</sup> 70+	0.13-0.17	0.6-1.2	0.05-0.3	0.75-0.97	0.01-0.2	0.05-0.15	-	0.02-0.04	-	-	-	0.012 0.013	A5.5	E 8010-G	ISO 2560-A	E 46 4 1Ni C 2 5
Conarc <sup>®</sup> 55CT	0.05	1.5	0.4	0.9	-	-	0.4	-	-	-	0.010 0.015	-	A5.5	E8018-WV2-H4R <sup>1)</sup>	ISO 2560-A	E 46 5 Mn1Ni B 3 2 H5
Conarc <sup>®</sup> 60G	0.06	1.0	0.4	1.6	-	0.3	-	-	-	-	0.015 0.010	-	A5.5	E9018M-H4	EN-ISO 18275	E 55 4 Z B 3 2 H5
Conarc <sup>®</sup> 70G	0.06	1.2	0.4	1.0	-	0.4	-	-	-	-	0.014 0.009	-	A5.5	E9018-G-H4R	EN-ISO 18275	E 55 4 1NiMo B 3 2 H5
Conarc <sup>®</sup> 74	0.05	1.5	0.5	0.95	-	-	-	-	-	-	0.010 0.005	-	A5.5	E8018-G-H4R	ISO 2560-A	E 50 6 Mn1Ni B 3 2 H5
Conarc <sup>®</sup> 80	0.06	1.5	0.4	2.2	-	0.4	-	-	-	-	0.015 0.01	-	A5.5	E11018M-H4	EN-ISO 18275	E 69 5 Z B 3 2 H5
Conarc <sup>®</sup> 85	0.06	1.4	0.3	2.0	0.4	0.4	-	-	-	-	0.01 0.01	-	A5.5	E12018-G-H4R	EN-ISO 18275	E 69 5 Mn2NiCrMo B 3 2 H5
Kryo <sup>®</sup> 1	0.05	1.5	0.4	0.9	-	-	-	-	-	-	0.01 0.01	-	A5.5	E7018-G-H4R <sup>2)</sup>	ISO 2560-A	E 50 6 Mn1Ni B 3 2 H5
Kryo <sup>®</sup> 1N	0.07	1.7	0.5	0.9	-	-	-	-	-	-	0.02 0.005	-	A5.5	E8016-G-H4R	ISO 2560-A	E 50 6 Mn1Ni B 1 2 H5
Kryo <sup>®</sup> 1P	0.05	1.5	0.5	0.95	-	-	-	-	-	-	0.010 0.005	-	A5.5	E 8018-G-H4R	ISO 2560-A	E 50 6 Mn1Ni B 3 2 H5
Kryo <sup>®</sup> 1-145	0.06	1.5	0.5	0.9	-	-	-	-	-	-	0.010 0.010	-	A5.5	E8018-G-H4R	ISO 2560-A	E 50 6 Mn1Ni B 5 3 H5
Kryo <sup>®</sup> 1-180	0.07	1.2	0.3	0.9	-	-	-	-	-	-	0.020 0.010	-	A5.5	E 8018-G-H4R	ISO 2560-A	E 50 5 1Ni B 7 3 H5
Kryo <sup>®</sup> 2	0.05	1.6	0.3	1.5	-	-	-	-	-	-	0.015 0.01	-	A5.5	E9018-G-H4R	EN-ISO 18275	E 55 6 Z B 3 2 H5
Kryo <sup>®</sup> 3	0.05	0.7	0.3	2.5	-	-	-	-	-	-	0.015 0.010	-	A5.5	E8018-C1-H4	ISO 2560-A	E 46 8 3Ni B 3 2 H5*
Kryo <sup>®</sup> 4	0.03	0.6	0.4	3.6	-	-	-	-	-	-	0.010 0.005	-	A5.5	E7016-C2L-H4R	ISO 2560-A	E 38 8 3Ni B 3 2 H5
SL <sup>®</sup> 12G	0.05	0.8	0.6	-	-	0.55	-	-	-	-	0.02 0.01	-	A5.5	E7018-A1-H4R	ISO 3580-A	E Mo B 3 2 H5
SL <sup>®</sup> 19G	0.06	0.75	0.6	-	1.1	0.5	-	-	-	-	0.015 0.01	-	A5.5	E8018-B2-H4	ISO 3580-A	E CrMo1 B 3 2 H5
SL <sup>®</sup> 20G	0.06	0.8	0.6	-	2.3	1.0	-	-	-	-	0.015 0.01	-	A5.5	E9018-B3-H4	ISO 3580-A	E CrMo2 B 3 2 H5
SL <sup>®</sup> 22G	0.06	0.8	0.6	-	0.5	0.5	-	0.3	-	-	0.02 0.01	-	A5.5	E8018-B1-H4	ISO 3580-A	E Z B 3 2 H5
SL <sup>®</sup> 502	0.07	0.8	0.6	-	5.3	0.6	-	-	-	-	0.020 0.010	-	A5.5	E8018-B6-H4R	ISO 3580-A	E CrMo5 B 3 2 H5
SL <sup>®</sup> 9Cr(P91)	0.09	0.6	0.2	0.6	9.0	1.0	-	0.2	0.04	0.04	0.010 0.010	-	A5.5	E9016-B9-H4	ISO 3580-A	E CrMo91 B 3 2 H5

<sup>1)</sup>For deviations, consult datasheet

<sup>2)</sup>meet also AWS A5.5: E8018-G-H4R

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information. Fumes, Safety Data Sheets (SDS) are available on our website.

## COVERED ELECTRODES FOR STAINLESS AND HEAT RESISTANT STEEL

Product name	Chemical composition (typical values) in %										AWS		EN/ISO	
	C	Mn	Si	Cr	Ni	Mo	Nb	Cu	N	W				
Arosta® 304L	0.02	0.80	0.80	19.5	9.7	-	-	-	-	-	A5.4	E308L-16	ISO 3581-A	E 19 9 L R 12
Limarosta® 304L	0.025	0.75	0.95	19.0	9.7	-	-	-	-	-	A5.4	E308L-17	ISO 3581-A	E 19 9 L R 12
Vertarosta® 304L	0.02	0.8	0.7	20.0	9.8	-	-	-	-	-	A5.4	E308L-15	ISO 3581-A	E 19 9 L R 21
Jungo® 304L	0.025	1.8	0.4	19.0	10.0	-	-	-	-	-	A5.4	E308L-15	ISO 3581-A	E 19 9 L B 22
Arosta® 347	0.03	0.8	0.8	19.5	9.8	-	0.35	-	-	-	A5.4	E347-16	ISO 3581-A	E 19 9 Nb R 12
Jungo® 347	0.02	1.6	0.5	20.0	10.0	-	0.40	-	-	-	A5.4	E347-15	ISO 3581-A	E 19 9 Nb B 22
Arosta® 316L	0.02	0.8	0.8	18.0	11.5	2.85	-	-	-	-	A5.4	E316L-16	ISO 3581-A	E 19 12 3 L R 12
Limarosta® 316L	0.02	0.8	1.0	18.0	11.5	2.8	-	-	-	-	A5.4	E316L-17	ISO 3581-A	E 19 12 3 L R 12
Vertarosta® 316L	0.02	0.7	0.85	18.0	11.5	2.8	-	-	-	-	A5.4	E316L-15	ISO 3581-A	E 19 12 3 L R 21
Jungo® 316L	0.025	1.6	0.4	18.5	11.0	2.7	-	-	-	-	A5.4	E316L-15	ISO 3581-A	E 19 12 3 L B 22
Limarosta® 316L-130	0.02	0.65	1.0	18.0	11.5	2.8	-	-	-	-	A5.4	E316L-17	ISO 3581-A	E 19 12 3 L R 53
Arosta® 318	0.03	0.8	0.85	18.0	11.5	2.7	0.35	-	-	-	A5.4	E318-16	ISO 3581-A	E 19 12 3 Nb R 12
Jungo® 4465	0.03	4.5	0.4	25.0	22.0	2.2	-	-	0.13	-	A5.4	E310Mo-15*	ISO 3581-A	E 25 22 2 N L B 22*
Jungo® 4500	0.02	1.2	0.9	20.0	25.0	5.0	-	1.5	-	-	A5.4	E385-16*	ISO 3581-A	E 20 25 5 Cu N L R 12
Arosta® 4462	0.02	0.8	1.0	22.5	9.5	3.2	-	-	0.16	-	A5.4	E2209-16	ISO 3581-A	E 22 9 3 N L R 32
Jungo® 4462	0.025	1.6	0.5	23.5	9.0	3.0	-	-	0.15	-	A5.4	E2209-15	ISO 3581-A	E 22 9 3 N L B 22
Jungo® 309L	0.025	1.5	0.4	23.0	13.0	-	-	-	-	-	A5.4	E309L-15	ISO 3581-A	E 23 12 L B 22
Arosta® 309S	0.02	0.8	0.8	23.5	12.5	-	-	-	-	-	A5.4	E309L-16	ISO 3581-A	E 23 12 L R 32
Limarosta® 309S	0.02	0.8	1.0	23.0	12.5	-	-	-	-	-	A5.4	E309L-17	ISO 3581-A	E 23 12 L R 32
Arosta® 309Mo	0.02	0.8	0.8	23.0	12.5	2.7	-	-	-	-	A5.4	E309LMo-16	ISO 3581-A	E 23 12 2 L R 32
Nichroma	0.025	0.8	1.0	20.0	9.5	2.3	-	-	-	-	A5.4	E308LMo-16	ISO 3581-A	E 20 10 3 R 32
Nichroma 160	0.05	0.7	1.0	23.7	12.8	2.4	-	-	-	-	A5.4	E309Mo-26	ISO 3581-A	E 23 12 2 LR 53*
Arosta® 329	0.08	0.7	1.2	25.0	4.5	-	-	-	-	-			ISO 3581-A	E 25 4 R 12*
Limarosta® 312	0.11	0.9	1.0	29.0	9.0	-	-	-	-	-	A5.4	E312-17	ISO 3581-A	E 29 9 R 12
Arosta® 307	0.09	5.0	0.6	18.5	8.5	-	-	-	-	-	A5.4	E307-16*	ISO 3581-A	E 18 8 Mn R 12
Arosta® 307-160	0.06	6.0	1.0	18.0	8.0	-	-	-	-	-	A5.4	E307-26*	ISO 3581-A	E 18 8 Mn R 53
Jungo® 307	0.08	5.5	0.3	19.0	8.5	-	-	-	-	-	A5.4	E307-15*	ISO 3581-A	E 18 8 Mn B 22
Arosta® 304H	0.05	0.75	0.85	18.5	9.5	-	-	-	-	-	A5.4	E308H-16	ISO 3581-A	E 19 9 H R 12
Arosta® 309H	0.10	0.8	1.6	22.0	11.0	-	-	-	-	-	A5.4	E309H-16*	ISO 3581-A	E 23 12 R 32*
Intherma® 310	0.12	2.5	0.5	26.0	20.5	-	-	-	-	-	A5.4	E310-16	ISO 3581-A	E 25 20 R 12
Intherma® 310B	0.1	3.0	0.3	25.0	21.0	-	-	-	-	-	A5.4	E310-15*	ISO 3581-A	E 25 20 B 12
Lincox P 308L	0.025	0.8	0.6	19.0	9.5	-	-	-	-	-	A5.4	E308L-16	ISO 3581-A	E 19 9 L R 32
Lincox 308L	0.025	0.8	0.8	19.0	9.5	-	-	-	-	-	A5.4	E308L-17	ISO 3581-A	E 19 9 L R 32
Lincox P 316L	0.025	0.8	0.6	19.0	12.0	2.5	-	-	-	-	A5.4	E316L-16	ISO 3581-A	E 19 12 3 L R 32
Lincox 316L	0.025	0.8	0.8	18.0	12.0	2.5	-	-	-	-	A5.4	E316L-17	ISO 3581-A	E 19 12 3 L R 32
Lincox P 309L	0.025	0.8	0.6	23.5	13.0	-	-	-	-	-	A5.4	E309L-16	ISO 3581-A	EE 23 12 L R 32
Lincox 309L	0.025	0.7	0.7	24.0	12.5	-	-	-	-	-	A5.4	E309L-17	ISO 3581-A	E 23 12 L R 32

\* For deviations, consult datasheet

## COVERED ELECTRODES FOR NICKEL BASE ALLOYS

Product name	Chemical composition (typical values) in %												AWS		EN/ISO	
	C	Mn	Si	Fe	Cr	Ni	Mo	Cu	Nb	W	Ti	S				
NiCro 31/27	0.02	0.8	0.9	bal.	271	31.0	3.5	0.9	-	-	-	-	A5.4	E383-16	ISO 3581-A	E 27 31 4 Cu L R 12
NiCro 60/20	0.03	0.5	0.35	0.9	22	62	9	-	3.4	-	-	-	A5.11/A5.11M	ENiCrMo-3	ISO 14172	E Ni 6625 (NiCr22Mo9Nb)
NiCro 70/15	0.02	4.4	0.45	6	18	bal.	-	-	1.9	-	-	-	A5.11/A5.11M	ENiCrFe-2*	ISO 14172	E Ni 6182* (NiCr15Fe6Mn)*
NiCro 70/15Mn	0.025	5.5	0.4	6.5	16	bal.	-	-	2.0	-	-	-	A5.11/A5.11M	ENiCrFe-3	ISO 14172	E Ni 6182 (NiCr15Fe6Mn)
NiCro 70/19	0.03	4.7	0.6	4.0	bal.	bal.	1.5	-	1.9	-	-	-	A5.11/A5.11M	ENiCrFe-2*	ISO 14172	E Ni 6082 (NiCr20Mn3Nb)
NYLOID 2	0.05	3.0	0.4	6	13	68	6	-	1.5	1.5	-	-	A5.11/A5.11M	ENiCrMo-6	ISO 14172	E Ni 6620 (NiCr14Mo7Fe)
NYLOID 4	0.05	3.0	0.4	6	13	bal.	6.5	-	1.5	1.5	-	-	A5.11/A5.11M	ENiCrMo-6	ISO 14172	E Ni 6620 (NiCr14Mo7Fe)

\* For deviations, consult datasheet

## COVERED ELECTRODES FOR ALUMINIUM ALLOYS

Product name	Chemical composition (typical values) in %									AWS		EN/ISO	
	Mn	Si	Fe	Cu	Al	Mg	Zn	Ti	Others				
AlMn	0.9-1.2	0.3 max.	0.6 max.	0.02 max.	Bal.	0.15 max.	0.09 max.	-	0.15 max.	A5.3	E3003*	ISO 18273	Al 3103 (AlMn)
AlSi5	-	5.0	-	-	Bal.	-	-	-	-	A5.3	E4043	ISO 18273	Al 4043A* (AlSi5[Al])
AlSi12	-	12.0	-	-	Bal.	-	-	-	-			ISO 18273	Al 4047A (AlSi12[Al])

\* For deviations, consult datasheet

## COVERED ELECTRODES FOR REPAIR WELDING

Product name	Chemical composition (typical values) in %										AWS	DIN		EN/ISO		
	C	Mn	Si	Cr	Mo	W	V	Nb	B	Ti						
Wearshield® BU-30	0.2	0.8	1.0	1.5	0.5	-	-	-	-	-		DIN 8555	E1-UM-350-GP	EN 14700	E Fe1	
Wearshield® Mangjet (e)	0.7	15	-	3.7	-	-	-	-	-	-		DIN 8555	E7-UM-200-KP	EN 14700	E Fe9	
Wearshield® 15CrMn	0.35	14.0	0.6	15.0	-	-	-	-	-	-	A5.13	E Fe9	DIN 8555	E7-UM-250-KP	EN 14700	E Fe9
Wearshield® MM 40	0.2	0.5	1.3	3.4	0.5	-	-	-	-	-			DIN 8555	E1-UM-400-G*	EN 14700	E Fe1
Wearshield® MM	0.55	0.5	1.5	4.5	0.5	0.5	-	-	-	-			DIN 8555	E2-UM-55-G*	EN 14700	E Fe2
Wearshield® T&D	0.65	0.4	0.5	4	6.5	2.6	1.1	-	-	-	A5.13	E Fe6*	DIN 8555	E4-UM-60-SZ	EN 14700	E Fe4
Wearshield® MI (e)	0.5	0.4	1.8	9	-	-	-	-	-	-	A5.13	E Fe6	DIN 8555	E6-UM-60-GPS	EN 14700	E Fe6
Wearshield® ABR	2.1	1.1	0.75	6.5	0.40	-	-	-	-	-			DIN 8555	E10-UM-50-GPZ	EN 14700	E Fe6
Wearshield® ME (e)	3	-	1.0	33	-	-	-	-	-	-			DIN 8555	E10-UM-60-GRZ	EN 14700	E Fe14
Wearshield® 60 (e)	5	-	4	35	-	-	-	-	-	-			DIN 8555	E10-UM-60-GR	EN 14700	E Fe15
Wearshield® 70	4.2	-	2.7	18	8.5	7	-	9	-	-			DIN 8555	E10-UM-65-GRZ	EN 14700	E Fe16
Wearshield® 420	0.5	0.3	0.4	12.4	0.4	-	1.3	-	-	-			DIN 8555	E6-UM-55-RZ	EN 14700	E Fe8

\*Nearest classification

## COVERED ELECTRODES FOR REPAIR WELDING

Product name	Chemical composition (typical values) in %						AWS		EN/ISO	
	C	Mn	Si	Ni	Cr	Fe				
RepTec Cast 1	0.7	-	-	97	-	2.0	A5.15	ENi-CI	ISO 1071	E C Ni-CI 1
RepTec Cast 3	0.6	-	-	balance	-	40	A5.15	ENiFe-CI	ISO 1071	E C NiFe-CI 1
RepTec Cast 31	0.7	-	-	balance	-	45	A5.15	ENiFe-CI	ISO 1071	E C NiFe-CI 1

**STICK ELECTRODES**

Mild and Fine Grained Steel.....

Fleetweld® 5P+ .....64

Supra® .....66

Omnia® .....68

Pantafix® .....70

Omnia® 46 .....72

Numal .....74

Cumulo® .....76

Universalis® .....78

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**Kryo® 1-145**

**Up to 145% recovery**  
stick electrode for offshore platforms



# Fleetweld® 5P+

## CLASSIFICATION

AWS A5.1	E6010	A-Nr	1
ISO 2560-A	E 42 3 C 2 5	F-Nr	3
		9606 FM	1

## 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)



PH/5Gu



PJ/5Gd

## CURRENT TYPE

DC +

## APPROVALS

ABS

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si
0.20	0.56	0.17

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)
					-29°C/-30°C
Required: AWS A5.1	AW	min. 330	min. 430	min. 22	min. 27
ISO 2560-A		min. 420	500-640	min. 20	min. 47
Typical values		471	586	24	56

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	350
Linc Can™	Pieces / unit	304	180	130	83
	Net weight/unit (kg)	5.1	4.7	5.1	5.1

Identification Imprint: 6010/FW5P+ Tip Color: none

Fleetweld® 5P+ rev. C-EN29-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
 Fumes: Safety Data Sheets (SDS) are available on our website.

# Fleetweld® 5P+

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>Pipe material</b>	
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	Weight/ 1000 pcs (kg)
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+	62.5

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions	
	PH/5G up	PJ/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

Use electrodes directly from metal cans

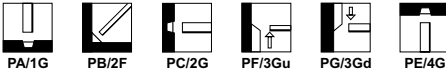
CLASSIFICATION

AWS A5.1	E 6012	A-Nr	1
ISO 2560-A	E 38 0 RC 11	F-Nr	2
		9606 FM	1

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)



CURRENT TYPE

AC / DC -

APPROVALS

ABS	BV	DNV	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, TYPICAL, ALL WELD METAL

Condition	Yield strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) 0°C
Required: AWS A5.1 ISO 2560-A	min. 330 min. 380	min. 430 470-600	min. 17 min. 20	not required 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
Carton + PE foil	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. C-EN24-01/02/16

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Supra®

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D
<b>Fine grained steels</b>	
EN 10025 part 3	S275
EN 10025 part 4	S275

## CALCULATION DATA

Diam. x length [mm]	Current range [A]	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs [kg]	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H[kg/h]			
2.5x350	70-90	AC	47	109	0.8	175	90	1.58
3.2x350	95-130	AC	64	175	1.1	276	53	1.45
4.0x350	130-170	AC	66	330	1.4	411	39	1.61
5.0x350	170-250	AC	77	534	1.8	63.6	26	1.63

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3G up	PG/3G down	PE/4G
2.5	85A	115A	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

**CLASSIFICATION**

AWS A5.1	E 6013	A-Nr	1
ISO 2560-A	E 42 0 RC 11	F-Nr	2
		9606 FM	1

**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)**



**CURRENT TYPE**

AC / DC -

**APPROVALS**

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

**CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL**

C	Mn	Si
0.07	0.5	0.5

**MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL**

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 330 min. 420	min. 430 500-640	min. 17 min. 20	not required min. 47
AW	520	550	26	60

**PACKAGING AND AVAILABLE SIZES**

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Carton + PE foil	Pieces / unit	155	155	120
	Net weight/unit (kg)	2.8	4.8	5.4

Identification Imprint: 6013/OMNIA Tip Color: none

Omnia<sup>®</sup>: rev. C-EN24-01/02/16

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## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/EN10217-1	P235, P275
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295
<b>Fine grained steels</b>	
EN 10025 part 3	S275
EN 10025 part 4	S275

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E(kJ)	H(kg/h)			
2.5x350	65-90	AC	52	108	0.8	18.5	85	1.59
3.2x350	95-130	AC	65	229	1.0	31.1	53	1.67
4.0x350	130-160	AC	72	333	1.3	43.6	37	1.61

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	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

## CLASSIFICATION

AWS A5.1	E 6013	A-Nr	1
ISO 2560-A	E 38 0 RC 11	F-Nr	2
		9606 FM	1

## 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/3Gu



PG/3Gd



PE/4G



PH/5Gu



PJ/5Gd

## CURRENT TYPE

AC / DC -

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si
0.09	0.5	0.4

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V[J] 0°C
Required: AWS A5.1 ISO 2560-A	min. 330 min. 380	min. 430 470-600	min. 17 min. 20	not required 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
Carton + PE foil	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. C-EN25-01/02/16

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/EN10217-1	P235, P275
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295
<b>Fine grained steels</b>	
EN 10025 part 3	S275
EN 10025 part 4	S275

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal/ B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H[kg/h]			
2.0x300	40-75	AC	41	58	0.5	10.4	178	1.98
2.5x350	50-90	AC	60	130	0.7	17.8	88	1.57
3.2x350	70-130	AC	66	206	1.0	29.5	53	1.58
4.0x350	130-175	AC	72	333	1.3	43.6	37	1.61

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	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

# Omnia<sup>®</sup> 46

SMAW

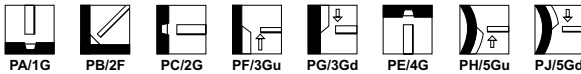
## CLASSIFICATION

AWS A5.1	E 6013	A-Nr	1
ISO 2560-A	E 38 0 R 11	F-Nr	2
		9606 FM	1

## GENERAL DESCRIPTION

Rutile general purpose, all positions electrode  
 Applicable for "clean" structural steel (2.0, 2.5, 3.2 mm)  
 Smaller diameters excellent for hobby market  
 Very suitable for low open circuit voltage transformers (min. OCV 42 V)

## WELDING POSITIONS (ISO/ASME)



## 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, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 330 min. 380	min. 430 470-600	min. 17 min. 20	not required min. 47
AW	460	540	27	65

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	1.6	2.0	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	250	300	350	350	450	350	450	450
Carton + PE foil	Pieces / unit	130	370	250	175	150	110	95	55
	Net weight/unit (kg)	0.8	4.2	4.8	5.3	6.2	5.0	5.9	5.8
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<sup>®</sup> 46: rev. C-ENZ7-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
 Fumes: Safety Data Sheets (SDS) are available on our website.

# Omnia<sup>®</sup> 46

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/EN10217-1	P235, P275
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295
<b>Fine grained steels</b>	
EN 10025 part 3	S275
EN 10025 part 4	S275

## CALCULATION DATA

Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal	kg electrodes/ kg weldmetal
			[S]*	E(kJ)	H(kg/h)		B	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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions							
	PA/1G	PB/2F	PC/2G	PF/3Gup	PG/3Gdown	PE/4G	PH/5Gup	PJ/5Gdown
2.0	55A	55A	55A	50A	55A	50A	50A	55A
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		230A				

# Numal

## CLASSIFICATION

AWS A5.1	E 6013	A-Nr	1
ISO 2560-A	E 38 0 R 11	F-Nr	2
		9606 FM	1

## 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 (min. OCV 42 V)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PG/3Gd



PE/4G



PH/5Gu



PJ/5Gd

## 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, TYPICAL, ALL WELD METAL

Condition	Yield strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) 0°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 331 min. 420 430	min. 414 500-640 480	min. 17 min. 20 26	not required min. 47 60
AW				

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.0	2.5	3.2	3.2	4.0	5.0
	Length (mm)	300	350	350	450	350	450
Carton + PE foil	Pieces / unit	180	275	195	150	110	55
	Net weight/unit (kg)	2.0	5.2	5.67	6.2	5.0	5.8

Identification Imprint: 6013-NUMAL

Tip Color: yellow

Numal.rev. C-EN04-01/02/16

# Numal

## MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D
<b>Cast steels</b>	
EN 10213-2	G P 240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/EN10217-1	P235, P275
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295
<b>Fine grained steels</b>	
EN 10025 part 3	S275
EN 10025 part 4	S275

## CALCULATION DATA

Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
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
4.0x350	140-190	AC	74	323	1.5	45.5	33	1.49

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions							
	PA/1G	PB/2F	PC/2G	PF/3Gup	PG/3Gdown	PE/4G	PH/5Gup	PJ/5Gdown
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

CLASSIFICATION

AWS A5.1	E 6013	A-Nr	1
ISO 2560-A	E 38 0 R 12	F-Nr	2
		9606 FM	1

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)



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, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(I) 0°C
Required: AWS A5.1 ISO 2560-A	min. 330 min. 380	min. 430 470-600	min. 17 min. 20	not required min. 47
Typical values AW	500	540	25	55

PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Carton + PE foil	Pieces / unit	150	175	115
	Net weight/unit (kg)	2.9	5.2	5.3

Identification Imprint: 6013 / CUMULO Tip Color: none

Cumulo: rev. C-EN25-01/02/16

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290
EN 10208-2	L240, L290
API 5LX	X42, X46
EN 10216-1/EN10217-1	P235, P275
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295
<b>Fine grained steels</b>	
EN 10025 part 3	S275
EN 10025 part 4	S275

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	65-90	AC	52	120	0.8	18.7	86	1.61
3.2x350	85-130	AC	66	181	1.1	29.7	51	1.53
4.0x350	130-180	AC	62	345	1.6	46.5	36	1.69

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	95A	85A	85A	75A	75A	75A
3.2	135A	135A	120A	120A	120A	120A
4.0	160A	160A	155A	140A	140A	

# Universalis®

## CLASSIFICATION

AWS A5.1	E 6013	A-Nr	1
ISO 2560-A	E 42 0 RR 12	F-Nr	2
		9606 FM	1

## GENERAL DESCRIPTION

Rutile electrode, especially for down hand welding in structural steel  
 Smaller sizes (2.0 & 2.5 mm) 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	GL	LR	TÜV
2Y	2Y	2Y	2Y	2Y	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si
0.1	0.6	0.4

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1 ISO 2560-A		min. 330	min. 430	min. 17	not required
Typical values	AW	480	500-640	min. 20 26	min. 47 50

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.0	2.5	3.2	3.2	4.0
	Length (mm)	300	350	350	450	450
Carton + PE foil	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. C-EN25-01/02/16

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to DH36
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360
API 5LX	X42, X46, X52, X60
EN 10216-1/EN10217-1	P235, P275, P355
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295, P355
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355
EN 10025 part 4	S275, S355

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal/ B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E(kJ)	H(kg/h)			
2.0x300	40-65	AC	41	58	0.5	11.4	178	2.0
2.5x350	70-100	AC	51	134	0.8	21.1	93	1.96
3.2x350	100-140	AC	57	281	1.3	39.3	47	1.85
3.2x450	100-140	AC	69	341	1.5	49.6	36	1.79
4.0x450	150-200	AC	69	483	2.1	66.9	25	1.67

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions			
	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

## 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

# Rental

SMAW

## CLASSIFICATION

AWS A5.1	E7024	A-Nr	1
ISO 2560-A	E 38 0 RR 7 3	F-Nr	1
		9606 FM	1

## 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

A very smooth and stable arc with very little spatter

Very neat finely rippled weld

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G

## CURRENT TYPE

AC / DC -

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si
0.07	0.8	0.5

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) 0°C
Required: AWS A5.1 ISO 2560-A	min. 399 min. 380	min. 490 470-600	min. 17 min. 20	not required min. 47
Typical values AW	440	510-560	24	70

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	350
Carton	Pieces / unit	40	24	16
	Net weight/unit (kg)	2.7	2.4	2.6

Identification Imprint: 7024 RENTAL

Tip Color: rental

Rental.rev.C-EN01-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Rental

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to DH36
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295, P355
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355
EN 10025 part 4	S275, S355

SMAW

## REMARKS / APPLICATION ADVICE

High yield strength steels such as S355, P355 and DH36 preheat according EN 1011-1

# Ferrod<sup>®</sup> 165A

## CLASSIFICATION

AWS A5.1	E7024-1	A-Nr	1
ISO 2560-A	E 42 2 RA 7 3	F-Nr	1
		9606 FM	1

## GENERAL DESCRIPTION

Rutile-acid 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, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-10°C	-18°C/-20°C
Required: AWS A5.1 ISO 2560-A	min. 400 min. 420	min. 490 500-640	min. 22 min. 20		min. 27 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
Carton + PE foil	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<sup>1</sup>: rev. C-EN24-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Ferrod<sup>®</sup> 165A

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to DH36
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295, P355
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355
EN 10025 part 4	S275, S355

## CALCULATION DATA

Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal/ B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H[kg/h]			
3.2x450	125-155	AC	75	326	1.9	62.9	25	1.39
4.0x450	140-235	AC	65	527	3.6	96.5	15	1.39
5.0x450	210-330	AC	68	853	5.3	144.9	10	1.39

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

High yield strength steels such as S355, P355 and DH36 preheat according EN 1011-1

# Ferrod<sup>®</sup> 135T

SMAW

## CLASSIFICATION

AWS A5.1	E7024	A-Nr	1
ISO 2560-A	E 38 0 RR 5 3	F-Nr	1
		9606 FM	1

## 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	GL	LR	RMRS	TÜV
2Y	2Y	2Y	2Y	2Y	2Y	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si
0.08	0.5	0.35

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact [ISO-V(J)] 0°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 400 min. 380 460	min. 490 470-600 530	min. 17 min. 20 25	not required 47 54
AW				

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	Length (mm)	3.2	4.0	5.0
Carton + PE foil	Pieces / unit	Net weight/unit (kg)	90	65	45
			5.5	5.7	5.9

Identification Imprint: 7024-FERROD 135T

Tip Color: none

Ferrod<sup>®</sup> 135T; rev. C-EN26-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Ferrod<sup>®</sup> 135T

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to DH36
<b>Cast steels</b>	
EN 10013-2	GP240R
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295, P355
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355
EN 10025 part 4	S275, S355

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
3.2x450	130-150	AC	85	344	1.6	61.3	27	1.67
4.0x450	180-200	AC	92	515	2.2	87.7	18	1.67
5.0x450	275-300	AC	86	735	3.7	129.9	11	1.43

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	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, P355 and DH36 preheat according EN 1011-1

# Ferrod<sup>®</sup> 160T

SMAW

## CLASSIFICATION

AWS A5.1	E7024	A-Nr	1
ISO 2560-A	E 42 0 RR 7 3	F-Nr	1
		9606 FM	1

## 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	GL	LR	RMRS	TÜV
2Y	2Y	2Y	2Y	2Y	2Y	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si
0.07	0.9	0.6

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 400 min. 420 450	min. 490 500-640 570	min. 17 min. 20 26	not required min. 47 70
AW				

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
Carton + PE foil	Pieces / unit	85	60	40
	Net weight/unit (kg)	5.6	6.3	6.1

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

Ferrod<sup>®</sup> 160T: rev. C-ENZ-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Ferrod<sup>®</sup> 160T

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to DH36
<b>Cast steels</b>	
EN 10013-2	GP240R
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295, P355
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355
EN 10025 part 4	S275, S355

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
3.2x450	130-160	AC						
4.0x350	180-220	AC	90	554	2.6	92.7	15	1.43
5.0x450	280-300	AC	78	897	5.4	166.7	9	1.43

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

High yield strength steels such as S355, P355 and DH36 preheat according EN 1011-1

# Gonia 180

SMAW

## CLASSIFICATION

AWS A5.1	E7024	A-Nr	1
ISO 2560-A	E 42 0 RR 7 3	F-Nr	1
		9606 FM	1

## 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	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, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) 0°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 399 min. 420 450	min. 490 500-640 525	min. 17 min. 20 27	not required min. 47 75
AW				

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	4.0	5.0	6.3
	Length (mm)	450	450	450
Carton + PE foil	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. C-EN24-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Gonia 180

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to DH36
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235, P265, P295, P355
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355
EN 10025 part 4	S275, S355

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
4.0x450	200-240	AC	78	515	3.4	100.0	14	1.35
5.0x450	280-300	AC	85	816	4.9	157.7	9	1.35
6.3x450	350-375	AC	102	1320	6.5	248.0	6	1.35

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	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, P355 and DH36 preheat according EN 1011-1

# Baso<sup>®</sup> 48SP

## CLASSIFICATION

<b>AWS A5.1</b>	E 7018-1 H8	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 46 3 B 3 2 H10*	<b>F-Nr</b>	4
* also complies to E 46 3 BR 3 2 H10		<b>9606 FM</b>	1

## 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 (HDM < 8 ml/100g)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G

## CURRENT TYPE

∅ 2.5 AC / DC + / -  
 ∅ 3.2 AC / DC +  
 ∅ 4.0 AC / DC +  
 ∅ 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	HDM
0.075	1.4	0.45	7 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
					-20°C	-30°C	-46°C
Required: AWS A5.1 ISO 2560-A		min. 400 min. 460	min. 490 530-680	min. 22 min. 20			min. 27
Typical values	AW	590	640	25	90	min. 47 60	

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	Length (mm)				
		2.5	3.2	3.2	4.0	4.0
		350	350	450	350	450
<b>Carton + PE foil</b>	<b>Pieces / unit</b>	125	78	78	50	50
	<b>Net weight/unit (kg)</b>	2.5	2.6	3.3	2.5	3.4
<b>SRP</b>	<b>Pieces / unit</b>	44	51	-	27	-
	<b>Net weight/unit (kg)</b>	0.9	1.8	-	1.4	-

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

Baso<sup>®</sup> 48SP+ rev. C-EN25-12/05/16

# Baso<sup>®</sup> 48SP

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH36
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420, S460

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	50-85	AC	48	104	0.9	19.4	82	1.6
3.2x450	85-135	AC	75	273	1.1	41.0	42	1.72
4.0x450	135-190	AC	95	487	1.6	64.6	24	1.55

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3Gup	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

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

# Basic 7018

## CLASSIFICATION

<b>AWS A5.1</b>	E7018 H4	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 42 4 B 4 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	1

## GENERAL DESCRIPTION

Electrode producing crack-free welded joints with good toughness properties even on steels with a carbon content up to 0,4 %.  
Recovery 120%

Excellent weldability even in positional welding

Good impact values down to -40°C

Suitable for depositing buffer layers on steels having a higher carbon content

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G

## CURRENT TYPE

DC +

## APPROVALS

BV	DNV	LR	DB	GL	TÜV
3YH5	3YH5	3YH10	+	3YH5	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	HDM
0.05	1.3	0.4	4 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
					-40°C	-46°C
Required: AWS A5.1		min. 400	min. 490	min. 22		min. 27
ISO 2560-A		min. 420	500-640	min. 20	min. 47	
Typical values	AW	475	540	27	105	50

## PACKAGING AND AVAILABLE SIZES

	<b>Diameter (mm)</b>	2.5	3.2	3.2	4.0	4.0	5.0
	<b>Length (mm)</b>	350	350	450	350	450	450
<b>Carton + PE foil</b>	<b>Pieces / unit</b>	205	125	125	85	85	55
	<b>Net weight/unit (kg)</b>	4.6	4.5	5.9	4.6	6.0	5.8

Identification Imprint: 7018 / BASIC 7018 Tip Color: none

Basic 7018: rev. C-EN02-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Basic 7018

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH36
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

SMAW

## REMARKS / APPLICATION ADVICE

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

# Baso<sup>®</sup> 51P

## CLASSIFICATION

AWS A5.1	E7018-1	A-Nr	1
ISO 2560-A	E 46 3 B 3 2 H5	F-Nr	4
		9606 FM	1

## 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/3Gu



PH/5Gu



PE/4G

## CURRENT TYPE

AC / DC +/-

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	HDM
0.06	1.3	0.5	0.015	0.010	5 ml/100g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				-20°C	-30°C	-46°C
Required: AWS A5.1 ISO 2560-A	min. 400	min. 490	min. 22			min. 27
Typical values	min. 460	530-680	min. 20		min. 47	
AW	510	600	27	90	70	40

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	5,0
	Length (mm)	450
Carton + PE foil	Pieces / unit	55
	Net weight/unit (kg)	5.5

Identification Imprint: 7018-1V BASO 51P

Tip Color: none

Baso<sup>®</sup> 51P: rev. C-EN26-01/02/16

# Baso<sup>®</sup> 51P

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420, S460

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	50-100	DC+	48	104	0.9	19.4	82	1.6
3.2x450	75-140	DC+	75	273	1.1	41.0	42	1.72
4.0x450	140-190	DC+	95	487	1.6	64.6	24	1.55
5.0x450	180-280	DC+						

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

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

# LINCOLN 7016 DR

## CLASSIFICATION

AWS A5.1	E7016	A-Nr	1
ISO 2560-A	E 42 2 B 12 H10	F-Nr	4
		9606 FM	1

## GENERAL DESCRIPTION

Double Coated Basic Electrode  
 Stable arc and smooth welds  
 Ideal for pipe welding in both root pass and filling  
 Excellent gap bridging  
 Good X-ray soundness and start/restart behaviour

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G

## CURRENT TYPE

AC/DC +

## APPROVALS

TÜV

Pending

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	HDM
0.08	1.2	0.6	5 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
					-20°C	-30°C
Required: AWS A5.1		min. 400	min. 490	min. 22		27
ISO 2560-A		min. 420	500-640	min. 20	47	
Typical values	AW	455	560	28	70	45

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	3.2	4.0
	Length (mm)	350	350	450	450
Pieces / unit	Net weight/unit (kg)	205	137	134	81
		4.1	4.3	5.5	5.2

Identification Imprint: Tip Color: none

LINCOLN 7016 DR: rev. C-EN01-01/02/16

# LINCOLN 7016 DR

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH36
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3/4	S275, S355, S420

## CALCULATION DATA

Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	60-90							
3.2x350	95-150							
3.2x450	95-150							
4.0x350	140-190							

\*Stub end 35mm

## REMARKS / APPLICATION ADVICE

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

## CLASSIFICATION

AWS A5.1	E7016 H4R	A-Nr	1
ISO 2560-A	E 42 3 B 1 2 H5	F-Nr	4
		9606 FM	1

## GENERAL DESCRIPTION

Basic very low hydrogen electrode (HDM< 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 down to -30°C  
 Popular at welding schools

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PH/5Gu



PE/4G

## CURRENT TYPE

AC / DC +/-

## APPROVALS

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

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	HDM
0.08	1.0	0.5	4 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-20°C	-29°/-30°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 400 min. 420	min. 490 500-640	min. 22 min. 20		min. 27 min. 47
AW	555	600	26	120	80

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
Carton + PE foil	Pieces / unit	136	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<sup>®</sup> 100: rev. C-EN26-01/02/16

# Baso<sup>®</sup> 100

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH36
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420, S460

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	55-80	AC	53	116	0.8	19.1	85	1.63
3.2x350	75-115	AC	62	229	1.2	36.1	50	1.81
4.0x350	120-160	AC	64	337	1.6	50.1	34	1.72
5.0x450	160-240	AC	91	578	2.4	96.7	16	1.58
5.0x450	160-240	DC+	93	591	2.6	96.7	15	1.44

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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		

## REMARKS / APPLICATION ADVICE

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

## CLASSIFICATION

AWS A5.1	E7018 H4R	A-Nr	1
ISO 2560-A	E 42 3 B 3 2 H5	F-Nr	4
		9606 FM	1

## GENERAL DESCRIPTION

Basic very low hydrogen electrode (HDM<4ml/100g)

Recovery 120%

Excellent weldability even on AC in all positions

Good impact values down to -30°C

Excellent X-ray soundness

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PH/5Gu



PE/4G

## CURRENT TYPE

AC / DC +/-

## APPROVALS

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

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	HDM
0.08	1.2	0.5	4 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
					-20°C	-29°/-30°C
Required: AWS A5.1		min. 400	min. 490	min. 22		min. 27
ISO 2560-A		min. 420	500-640	min. 20		min. 47
Typical values	AW	540	600	26	150	80

## 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
Carton + PE foil	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<sup>®</sup> 120: rev. C-EN26-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Baso<sup>®</sup> 120

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH36
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal/ B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H[kg/h]			
2.5x350	60-80	AC	55	121	0.8	19.1	85	1.61
3.2x350	90-140	AC	62	229	1.3	37.1	44	1.64
3.2x450	90-140	AC	74	275	1.5	50.1	33	1.67
4.0x350	120-160	AC	63	338	1.8	54.4	32	1.72
4.0x450	120-160	DC+	85	391	1.9	69.5	22	1.52
5.0x450	160-240	AC	99	616	2.6	108.8	14	1.54
5.0x450	160-240	DC+	100	625	2.6	108.8	14	1.52

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3Gup	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

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

### CLASSIFICATION

<b>AWS A5.1</b>	E7018-1 H4R	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 42 5 B 32 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	1

### 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 down to -50°C  
 Also available in vacuum sealed Sahara ReadyPack® (SRP)

### WELDING POSITIONS (ISO/ASME)



### CURRENT TYPE

AC / DC +/-

### APPROVALS

ABS	DB	DNV	LR	GL	RINA	RMRS	TÜV
3H,3Y	3,3YH	3YH5	3,3YH5	3YH10	4YH5	3-3YH5	+

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	HDM
0.05	1.3	0.4	2 ml/100 g

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

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

### 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
Carton + PE foil	Pieces / unit	135	120	120	85	85	55
	Net weight/unit (kg)	2.8	4.4	5.8	4.7	5.9	6.0
SRP	Pieces / unit	69	50	50	28	28	23
	Net weight/unit (kg)	1.4	2.0	2.5	1.6	2.0	2.6

Identification Imprint: 7018-1V BASO G+ Tip Color: blue

Baso® G.rev. C-EN27-01/02/16

# Baso<sup>®</sup> G

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H[kg/h]			
2.0x300	35-55	DC+	50	61	0.5	11.7	149	1.75
2.5x350	55-90	DC+	59	107	0.8	20.3	78	1.59
3.2x350	75-120	DC+	70	234	1.2	36.5	42	1.54
3.2x450	75-120	DC+	79	265	1.4	45.4	33	1.47
4.0x350	120-180	DC+	75	358	1.7	50.9	28	1.45
4.0x450	120-180	DC+	96	473	1.7	69.3	22	1.52
5.0x450	160-240	DC+	114	671	2.2	106.2	14	1.54

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PF/5Gup
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

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

# Baso<sup>®</sup> 26V

## CLASSIFICATION

<b>AWS A5.1</b>	E7048 H8	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 42 3 B 1 5 H10	<b>F-Nr</b>	4
		<b>9606 FM</b>	1

## GENERAL DESCRIPTION

Basic low hydrogen electrode

Specially developed for vertical down welding on shipyards and light general construction works

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/3Gu



PG/3Gd



PE/4G

## CURRENT TYPE

AC / DC +/-

## APPROVALS

ABS	BV	DNV	LR	GL	RMRS
3Y	3Y	3YH10	3,3YH10	3YH10	3,3YH10

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	HDM
0.09	1.1	0.7	6 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-20°C	-29°C/-30°C
Required: AWS A5.1 ISO 2560-A	min. 400	min. 490	min. 22		min. 27
Typical values	AW 580	500-640 630	min. 20 26	130	min. 47

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
Pieces / unit	Net weight/unit (kg)	150	100	70
		6.1	6.2	6.7

Identification Imprint: 7048 / BASO 26V

Tip Color: dark green

Baso<sup>®</sup> 26: rev. C-EN25-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Baso<sup>®</sup> 26V

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH36
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	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
3.2x450		110-140	DC+	51	181	1.5	34.0	48	1.62
4.0x450		155-185	DC+	70	315	2.1	59.7	24	1.44
5.0x450		195-225	DC+	86	435	2.7	92.9	15	1.43

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	PA/1G	PG/3Gdown	PE/4G
3.2	130A	130A	125A
4.0	145A	175A	165A
5.0	220A	220A	200A

## REMARKS / APPLICATION ADVICE

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

## CLASSIFICATION

<b>AWS A5.1</b>	E 7018-1 H4	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 42 4 B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	1

## GENERAL DESCRIPTION

Basic coated low-hydrogen welding electrode with very good welding properties giving a tough, crack resistant weld metal. Suitable for welding structural steel and high tensile ship plate with a minimum tensile strength of 500N/mm<sup>2</sup>. Smooth and stable arc.

The electrode is well suited for positional welding particularly vertical and overhead). Good slag removal even in narrow gaps. The weld metal provides high crack resistance and excellent impact toughness down to temperatures of -40°C.

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +

## APPROVALS

<b>ABS</b>	<b>BV</b>	<b>DNV</b>	<b>GL</b>	<b>TÜV</b>	<b>RINA</b>
3H5, 3Y	3,3Y H	3 YH5	3YH5	+	3,3Y H

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

<b>C</b>	<b>Mn</b>	<b>Si</b>	<b>HDM</b>
0.07	1.2	0.5	3 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
					-40°C	-46°C
Required: AWS A5.1		min. 399	min. 482	min. 22		27
ISO 2560-A		min. 420	500-640	min. 20	47	
Typical values	AW	436	533	29	100	90

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	3.2	4.0	4.0	5.0
		350	350	450	350	450	450
<b>Unit : Carton + PE foil</b>	<b>Pieces / unit</b>	118	73	73	55	55	32
	<b>Net weight/unit (kg)</b>	2.69	2.51	3.285	2.81	3.66	3.36
<b>Unit : Protech®</b>	<b>Pieces / unit</b>	96	60	60	40	40	30
	<b>Net weight/unit (kg)</b>	2.16	2.09	2.75	2.05	2.73	3.13

Identification Imprint: 7018-1 VANDAL Tip Color: none

Vandal: rev. C-EN04-01/02/16

# Vandal

## MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235 J0 / J2 / JR, S275 J0 / J2 / JR, S355 J0 / J2 / JR / K2
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, E, AH32 up to and including EH36
<b>Cast steels</b>	
EN 10213-2	GP 240 GH, GP 280 GH
<b>Pipe material</b>	
EN 10208-1	L210 GA, L235 GA, L245 GA, L290 GA, L360 GA
EN 10208-2	L245 MB / NB, L290 MB / NB, L360 MB / NB / QB, L415 MB / NB / QB
API 5LX	X42, X46, X52, X56, X60, X65
EN 10216-1	P195 TR1 / TR2, P235 TR1 / TR2, P265 TR1 / TR2
EN 10216-2	P195 GH, P235 GH, P265 GH
EN 10216-3	P275 NL1 / NL2, P355 N / NH / NL1 / NL2
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275 N / NL, S355 N / NL, S420 N / NL
EN 10025 part 4	S275 M / ML, S355 M / ML, S420 M / ML
<b>Others</b>	
	Steel grades with equivalent requirements as per above classified per ASTM, JIS etc

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current max. (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	70-90	110	DC+	44	137	1,0	22,8	83	1,90
3.2x350	100-130	140	DC+	56	216	1,3	34,4	50	1,72
3.2x450	100-135	140	DC+	68	269	1,4	45	37	1,67
4.0x350	130-180	200	DC+	59	312	1,8	51,1	34	1,76
4.0x450	130-190	200	DC+	77	421	1,9	66,5	24	1,62
5.0x450	220-260	280	DC+	88	709	2,6	105	16	1,67

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3Gup	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

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

## CLASSIFICATION

AWS A5.1	E7018-1 H4R	A-Nr	1
ISO 2560-A	E 46 4 B 4 2 H5	F-Nr	4
		9606 FM	1

## GENERAL DESCRIPTION

Basic very low hydrogen electrode (HDM<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/3Gu



PG/3Gd



PE/4G

## CURRENT TYPE

DC +

## APPROVALS

DNV

4YH5

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	HDM
0.05	1.3	0.3	4 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-40°C	-46°C
Required: AWS A5.1	min. 400	min. 490	min. 22		min. 27
ISO 2560-A	min. 460	530-680	min. 20	min. 47	
Typical values AW	470	570	27	103	80

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.0	2.5	3.2	4.0	5.0
	Length (mm)	300	350	450	450	450
Pieces / unit	Net weight/unit (kg)	146	110	110	82	58
		1.9	2.5	5.7	6.0	6.3

Identification Imprint: 7018-1 / CONARC 48

Tip Color: orange

Conarc® 48: rev. C-EN26-01/02/16

# Conarc<sup>®</sup> 48

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65
EN 10216-1	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.0x300	50-80	DC+	53	0.6	14.3	123	1.76	
2.5x350	80-110	DC+	64	0.8	23.1	67	1.55	
3.2x350	95-150	DC+	67	1.3	40.0	40	1.60	
3.2x450	95-150	DC+	-	-	-	-	-	
4.0x350	125-210	DC+	83	1.7	57.6	26	1.50	
4.0x450	125-210	DC+	95	1.8	73.4	21	1.54	
5.0x450	190-270	DC+						

\*Stub end 35mm

## REMARKS / APPLICATION ADVICE

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

## CLASSIFICATION

AWS A5.1	E7018 H4	A-Nr	1
ISO 2560-A	E 46 3 B 4 2 H5	F-Nr	4
		9606 FM	1

## GENERAL DESCRIPTION

Basic very low hydrogen electrode (HDM< 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

Also available in Protech™ Vacuum Pack

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PH/5Gu



PE/4G

## CURRENT TYPE

DC +

## APPROVALS

ABS	BV	DNV	LR	GL	RMRS	RINA	TÜV
3H5, 3Y	3,3YH5	3YH5	3,3YH5	3YH5	3,3YH5	3,3YH5	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	HDM
0.09	1.1	0.6	0.015	0.010	4 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				-20°C	-30°C	-40°C
Required: AWS A5.1 ISO 2560-A	min. 400 min. 460	min. 483 530-680	min. 22 min. 20		min. 27 min. 47	27
Typical values	AW 480	560	28	140	120	80

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	3.2	4.0	4.0	5.0
		350	350	450	350	450	450
Carton + PE foil	Pieces / unit	118	120	115	93	93	62
	Net weight/unit (kg)	2.7	4.5	5.2	5.0	6.3	6.7
Protech™	Pieces / unit	88	59	-	42	-	-
	Net weight/unit (kg)	2.0	2.2	-	2.2	-	-

Identification Imprint: 7018 H4/ CONARC 49

Tip Color: none

Conarc® 49: rev. C-EN80-01/02/16

# Conarc® 49

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415
API 5LX	X42, X46, X52, X60, X65
EN 10216-1	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	70-80	DC+	58	120	0.85	23.1	73	1.7
3.2x350	110-130	DC+	68	194	1.3	36.8	41	1.5
4.0x450	140-180	DC+	98	429	1.8	69.5	20	1.4
5.0x450	160-240	DC+	117	619	2.3	107.3	13	1.4

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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		

## REMARKS / APPLICATION ADVICE

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

### CLASSIFICATION

<b>AWS A5.1</b>	E7018-1 H4R	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 46 4 B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	1

### 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/3Gu



PH/5Gu



PE/4G

### CURRENT TYPE

AC/DC +/-

### APPROVALS

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

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	HDM
0.06	1.4	0.3	0.015	0.010	2 ml/100 g

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				-20°C	-50°C	-46°/-50°C
Required: AWS A5.1	min. 400	min. 490	min. 22			min. 27
ISO 2560-A	min. 460	530-680	min. 20		min. 47	
Typical values	AW 480	580	28	200	170	100

Suitable for both As Welded and Stress Relieve (PWHT) conditions  
 CTOD value at -10°C > 0.25mm

### PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.0	3.2	3.2	4.0	4.0	5.0
		350	350	350	450	350	450	450
Carton + PE foil	Pieces / unit	135	80	120	120	85	85	55
	Net weight/unit (kg)	2.7	2.4	4.4	5.8	4.7	5.9	6.0
SRP	Pieces / unit	70	-	50	50	28	28	23
	Net weight/unit (kg)	1.4	-	2.0	2.5	1.6	2.0	2.6

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

Conarc® 49C: rev. C-ENZ-12/05/16

# Conarc® 49C

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65
EN 10216-1	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460

## CALCULATION DATA

Sizes Diam. x length [mm]	Current range [A]	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs [kg]	Electrodes/ kg weldmetal/ B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H[kg/h]			
2.5x350	55-80	DC+	55	99	0.78	19.6	84	1.65
3.0x350	70-110	DC+	53	193	1.2	30.4	58	1.77
3.2x350	80-130	DC+	65	217	1.2	37.9	45	1.69
4.0x350	120-160	DC+	75	348	1.6	54.2	30	1.61
4.0x450	120-160	DC+	100	444	1.7	70.4	21	1.47
5.0x450	180-240	DC+	90	632	2.6	105.6	15	1.60

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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		

## REMARKS / APPLICATION ADVICE

Redry electrodes 2-4h 350 ±25°C after removal from cardboard boxes.  
Best choice : 3.0 x 350mm for rootlayer welding in pipes.

## CLASSIFICATION

AWS A5.1	E7018-1 H4R	A-Nr	1
ISO 2560-A	E 42 5 B 3 2 H5	F-Nr	4
		9606 FM	1

## 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  
 115 - 120% recovery  
 Good pipe welding properties  
 Excellent X-ray soundnessA  
 Iso available in vacuum sealed Sahara ReadyPack® (SRP)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PH/5Gu



PE/4G

## CURRENT TYPE

AC/DC +/-

## APPROVALS

ABS	BV	DNV	LR	GL	RMRS	RINA	TÜV
3H,3Y	3YHH	3YH5	3,3YH5	3YH10	3,3YH5	4YH5	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	HDM
0.05	1.3	0.4	0.015	0.010	3 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)			
				-20°C	-40°C	-46°C	-50°C
Required: AWS A5.1 ISO 2560-A	min. 400 min. 420	min. 490 500-640	min. 22 min. 20			min. 27	min. 27
Typical values AW	480	575	28	200	120	100	80

CTOD value at -10°C &gt; 0.25mm

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	4.0	5.0
			350	450	450
Carton + PE foil	Pieces / unit	110	120	85	55
	Net weight/unit (kg)	7.5	7.7	8.3	8.2
SRP	Pieces / unit	60	50	28	23
	Net weight/unit (kg)	1.4	2.5	2.0	2.5

Identification Imprint: 7018-1 / CONARC ONE Tip Color: blue

Conarc® ONE: rev. C-EN04-01/02/16

# Conarc® ONE

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L210, L240, L290, L360
EN 10208-2	L240, L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65
EN 10216-1	P235T1, P235T2, P275T1
EN 10217-1	P275T2, P355N
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	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 E(kJ)	Dep. rate H(kg/h)	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
2.5x350		60-100	DC+	60	138	0.83	23.1	72	1.67
3.2x450		90-145	DC+	93	337	1.27	50.8	30	1.54
4.0x450		110-160	DC+	103	464	1.65	71.2	21	1.52
5.0x450		160-250	DC+	177	717	2.24	108.8	14	1.49

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	90A	90A	85A	90A	85A	80A
3.2	140A	140A	150A	120A	115A	120A
4.0	175A	175A	170A	150A	145A	145A
5.0	230A	230A	215A	170A		

## REMARKS / APPLICATION ADVICE

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

## CLASSIFICATION

AWS A5.1	E7018-1 H4	A-Nr	1
ISO 2560-A	E 46 5 B 4.2 H5	F-Nr	4
		9606 FM	1

## GENERAL DESCRIPTION

Basic very low hydrogen electrode  
 Excellent for general purpose welding  
 Good impact values down to -50°C  
 Also available in Protech™ Vacuum Pack

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PH/5Gu



PE/4G

## CURRENT TYPE

DC +

## APPROVALS

ABS	BV	DNV/ GL	LR	TÜV
4Y40H5	4Y40HHH	4Y40H5	4Y40H5	Pending

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	HDM
0.05	1.0	0.3	4 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)			
				-30°C	-40°C	-46°C	-50°C
Required: AWS A5.1	min. 400	min. 482	min. 22			min. 27	
ISO 2560-A	min. 460	530-680	min. 20		min. 47		
Typical values							
AW	500	600	27	150	120	100	90
SR:1h/600°C	480	580	29	120		50	

## 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
Carton + PE foil	Pieces / unit	195	135	135	92	92	66
	Net weight/unit (kg)	4.3	4.7	6.1	4.7	5.9	6.7
Protech™	Pieces / unit	90	58	58	45	45	33
	Net weight/unit (kg)	2.0	2.0	2.6	2.3	3.0	3.3

Identification Imprint: 7018-1 H4 / CONARC 50 Tip Color: none

Conarc® 50: rev. C-EN09-23/05/16

# Conarc® 50

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E(kj)	H(kg/h)			
2.5x350	70-90	-	-	-	-	-	-	-
3.2x350	100-130	-	-	-	-	-	-	-
3.2x450	100-135	-	-	-	-	-	-	-
4.0x350	130-180	-	-	-	-	-	-	-
4.0x450	130-190	-	-	-	-	-	-	-
5.0x450	220-260	-	-	-	-	-	-	-

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	80A	85A	85A	85A	80A	85A
3.2	120A	115A	115A	115A	110A	115A
4.0	170A	180A	180A	180A	160A	
5.0	240A	250A	250A	250A	230A	

## REMARKS / APPLICATION ADVICE

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

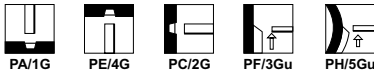
### CLASSIFICATION

<b>AWS A5.1</b>	E7016-1 H4R	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 42 4 B 1 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	1

### GENERAL DESCRIPTION

Basic extremely low hydrogen electrode  
 Good impact values down to -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): HDM< 3 ml/100g

### WELDING POSITIONS (ISO/ASME)



### CURRENT TYPE

AC/DC +/-

### APPROVALS

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

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	HDM
0.06	1.4	0.5	0.015	0.010	2 ml/100 g

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				-20°C	-40°C	-46°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 400 min. 420	min. 490 500-640	min. 22 min. 20			
AW	520	575	28	115	min. 47 80	min. 27 60

CTOD value at -10°C > 0.25mm

### PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	Length (mm)					
		2.5	3.2	3.2	4.0	4.0	5.0
<b>Carton + PE foil</b>		350	350	450	350	450	450
	<b>Pieces / unit</b>	136	150	-	100	-	-
	<b>Net weight/unit (kg)</b>	2.7	4.7	-	4.6	-	-
<b>SRP</b>							
	<b>Pieces / unit</b>	70	56	56	-	30	23
	<b>Net weight/unit (kg)</b>	1.4	1.8	2.3	-	1.8	2.6

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

Conarc® 51: rev. C-EN27-01/02/16

# Conarc® 51

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	40-80	DC+	53	123	0.8	19.6	86	1.68
3.2x350	70-120	DC+	62	178	1.0	30.8	57	1.74
3.2x450	70-120							
4.0x350	100-160	DC+	71	306	1.4	48.0	37	1.78
4.0x450	100-160							
5.0x450	180-240	DC+	104	702	2.6	103.0	13	1.36

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions				
	PA/1G	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

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

## CLASSIFICATION

AWS A5.1	E7016	A-Nr	1
ISO 2560-A	E 42 2 B 12 H5	F-Nr	4
		9606 FM	1

## GENERAL DESCRIPTION

Designed for vertical up root pass welding of pipes up to and including X80 and similar steel  
 Suitable for fill and cap pass welding for up to and including X65  
 Excellent low temperature impact properties down to -30°C  
 Good directed arc even at very low current makes welding easier, especially in critical pipe welding applications  
 Superior crack resistance, excellent stability in all welding positions  
 Open gap root pass welding with 2.5 and 3.2 mm electrodes using DC - / + polarity

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PH/5Gu



PE/4G

## CURRENT TYPE

AC/DC +/-

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	HDM
0.06	1.2	0.4	0.015	0.010	4 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-20°C	-29°/-30°C
Required: AWS A5.1 ISO 2560-A Typical values	min. 400 min. 420 510	min. 490 500-640 560	min. 22 min. 20 28	27 100	min. 47 80

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit Net weight/unit (kg)	Diameter (mm)	148	157	87
	Length (mm)	2.7	4.8	4.4

# Conarc® 52

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H(kg/h)			
2.5x350	50-80	DC+	59	100.6	0.71	18.5	86	1.59
3.2x350	60-120	DC+	68	179.9	1.02	30.3	52	1.57
4.0x350	120-170	DC+	77	258.7	1.50	48.7	31	1.51

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	85A	85A	85A	75A	85A	75A
3.2	120A	115A	115A	115A	115A	115A
4.0	170A	170A	170A	140A	140A	140A

## REMARKS / APPLICATION ADVICE

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

## Lincoln® 7018-1

## CLASSIFICATION

<b>AWS A5.1</b>	E7018-1	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 42 4 B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	1

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G

## CURRENT TYPE

AC / DC + / -

## APPROVALS

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

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S
0.05	1.0	0.3	0.015	0.010

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
					-40°C	-46°C
Required: AWS A5.1 ISO 2560-A Typical values	AW	min. 400 min. 420 436	min. 490 500-640 533	min. 22 min. 20 29	min. 47 100	min. 27 90

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	3.2	4.0	4.0	5.0
		350	350	450	350	450	450
<b>Carton + PE foil</b>	<b>Pieces / unit</b>	175	115	115	80	80	55
	<b>Net weight/unit (kg)</b>	3.9	4.0	5.2	4.1	5.3	5.6
<b>Protech™</b>	<b>Pieces / unit</b>	90	58	-	40	-	-
	<b>Net weight/unit (kg)</b>	2.0	2.0	-	2.0	-	-

Identification Imprint: 7018-1 / LINCOLN 7018-1 Tip Color: none

Lincoln® 7018-1: rev. C-EN26-01/02/16

# Lincoln® 7018-1

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	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
2.5x350		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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3Gup	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

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

# Conarc® L150

## CLASSIFICATION

<b>AWS A5.1</b>	E7028 H4R	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 42 2 B 5 3 H5	<b>F-Nr</b>	1
		<b>9606 FM</b>	1

## GENERAL DESCRIPTION

Basic low hydrogen electrode (HDM<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	LR	GL	TÜV
3H,3Y	3,3YH	3YH5	3,3YH15	3YH10	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	HDM
0.07	0.95	0.4	0.015	0.010	4 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)
				-18°C/-20°C
Required: AWS A5.1 ISO 2560-A	min. 400 min. 420	min. 490 500-640	min. 22 min. 20	min. 27 min. 47
Typical values AW	540	580	27	75

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
Carton + PE foil	Pieces / unit	90	55	35
	Net weight/unit (kg)	5.9	5.3	5.2
SRP	Pieces / unit	-	21	-
	Net weight/unit (kg)	-	2.1	-

Identification Imprint: 7028 / CONARC L150 Tip Color: yellow

Conarc®L150: rev. C-EN26-01/02/16

# Conarc® L150

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	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
3.2x450		140-160	AC/DC+	84	375	1.7	64.8	26	1.67
4.0x450		175-220	AC/DC+	80	555	2.6	97.8	17	1.69
5.0x450		275-325	AC/DC+	75	838	4.4	155.7	11	1.72
6.0x450		325-350	AC/DC+	85	1260	5.4	209.4	8	1.64

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	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

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

## CLASSIFICATION

AWS A5.1	E7028 H4R	A-Nr	1
ISO 2560-A	E 42 4 B 7 3 H5	F-Nr	1
		9606 FM	1

## GENERAL DESCRIPTION

Basic extremely low hydrogen electrode (HDM<3 ml/100g)  
175% recovery and easy slag release  
Fillet welds and horizontal V- and X-welds  
Reliable impact toughness down to -40°C, good CTOD at -10°C  
Excellent X-ray quality  
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	LR	GL	RINA	RMRS
3YH5	3,3YHH	3YH5	3,3YH5	3YH10	3YH5	3-3YH5

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	HDM
0.08	1.2	0.3	0.015	0.010	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-18°C/-20°C	-40°C
Required: AWS A5.1 ISO 2560-A	min. 400 min. 420	min. 490 500-640	min. 22 min. 20	min. 27	min. 47
Typical values CTOD value at -10°C > 0.25mm	AW 440	510	30	130	80

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	3.2	4.0	5.0	6.3
		450	450	450	450
Carton + PE foil	Pieces / unit	-	60	40	23
	Net weight/unit (kg)	-	6.0	6.1	5.4
SRP	Pieces / unit	27	23	19	-
	Net weight/unit (kg)	2.0	2.4	2.8	-

Identification Imprint: 7028 / CONARC V180

Tip Color: white

Conarc® V180: rev. C-EN24-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Conarc® V180

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S185, S235, S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
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
<b>Boiler &amp; pressure vessel steels</b>	
EN 10028-2	P235GH, P265GH, P295GH, P355GH
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
3.2x450	130-160	AC	73	337	2.3	68.9	21	1.47
4.0x450	170-240	AC	70	538	3.6	101.0	14	1.45
5.0x450	275-330	AC	75	780	4.9	149.7	10	1.45
6.3x450	280-425	AC	83	1171	7.0	230.4	6	1.43

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	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

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

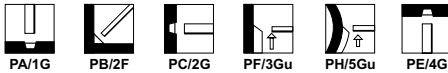
**CLASSIFICATION**

<b>AWS A5.1</b>	E 6018 <sup>1)</sup>	<b>A-Nr</b>	1
<b>ISO 2560-A</b>	E 35 2 B 3 2 H5	<b>F-Nr</b>	4
<sup>1)</sup> according to classification 1966		<b>9606 FM</b>	1

**GENERAL DESCRIPTION**

Basic extremely low hydrogen electrode (HDM<3 ml/100g)  
 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 clad stainless steel  
 Only available in vacuum sealed Sahara ReadyPack® (SRP)

**WELDING POSITIONS (ISO/ASME)**



**CURRENT TYPE**

AC/DC +/-

**CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL**

C	Mn	Si	P	S	HDM
0.03	0.4	0.25	0.015	0.010	3 ml/100 g

**MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL**

Condition		Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) -18°C/-20°C
Required: AWS A5.1 ISO 2560-A		min. 331	min. 414	min. 22	min. 27
Typical values	AW	390	440-570 450	min. 22 28	>200

**PACKAGING AND AVAILABLE SIZES**

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

Identification Imprint: KARDD Tip Color: black

Kardo® rev. C-EN25-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

**Kardo®**

## EXAMPLES OF MATERIALS TO BE WELDED

Weld the buffer layer of CrNi- and CrNiMo-stainless clad steel with one side welding.  
 High strength Fine grained steels as S460 for NH<sub>3</sub> 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 Nederlandse Gasunie)  
 API 5L: X52 - X65 (EN 10208: L360 to L460).

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H[kg/h]			
2.5x350	60-80	DC+	81	173	0.5	19.7	81	1.60
3.2x350	90-120	DC+	84	252	1.0	36.5	43	1.58
4.0x350	120-160	DC+	79	448	1.6	53.0	29	1.56

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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+

## CLASSIFICATION

AWS A5.5	E 7010-P1	A-Nr	1
ISO 2560-A	E 42 2 Mo C 2 5	F-Nr	3
		9606 FM	1

## GENERAL DESCRIPTION

Cellulosic electrode for vertical down pipe welding  
 Suitable for pipe with strengths X52 through 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

## APPROVALS

TÜV	ABS
+	+

## WELDING POSITIONS (ISO/ASME)



PJ/5Gd

## CURRENT TYPE

DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Mo	V
0.13-0.17	0.49-0.63	0.08-0.18	0.27-0.31	<0.01

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-20°C	-29°C
Required: AWS A5.5 ISO 2560-A Typical values	min. 415 min. 420 435-525	min. 490 500-640 525-635	min. 22 min. 20 24	min. 47	min. 27 50

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	Length (mm)	Pieces / unit		
			3.2	4.0	4.8
			355	355	355
Metal can	Pieces / unit	873	561	388	
	Net weight/unit (kg)	22.7	22.7	22.7	

Identification Imprint: 7010-P1 Tip Color: none

Shield Arc®HYP+; rev. C-EN07-01/02/16

# Shield Arc® HYP+

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>Pipe material</b>	
EN 10208-2	L360 , L415, L445
EN 10216-1 / 10217-1	P355
API 5LX	X52, X56, X60, X65
Gaz de France	X52, X63

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Weight/ 1000 pcs (kg)
3.2x355	75-130	DC+	26
4.0x355	90-185	DC+	40.4
4.8x355	140-225	DC+	58.5

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions PJ/5Gdown
3.2	75-130A
4.0	90-185A
4.8	140-225A

## 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+

## CLASSIFICATION

AWS A5.5	E8010-G	A-Nr	10
ISO 2560-A	E 46 4 1Ni C 2 5	F-Nr	3
		9606 FM	2

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



P/J/5Gd

## CURRENT TYPE

DC +

## APPROVALS

TÜV	ABS
+	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Ni	Cr	Mo	V
0.13-0.17	0.6-1.2	0.05-0.3	0.75-0.97	0.01-0.2	0.05-0.15	0.02-0.04

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				-29°C	-40°C	-46°C
Required: AWS A5.5 ISO 2560-A	min. 460	min. 550	min. 19			
Typical values	AW	460-620	530-680	min. 20	min. 47	
		585-680	24	75		60

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	3.2	4.0	4.8
	Length (mm)	355	355	355
Metal can	Pieces / unit	873	561	388
	Net weight/unit (kg)	22.7	22.7	22.7

Identification Imprint: 8010-G

Tip Color: none

Shield Arc70+ rev. C-ENZ-01/02/16

# Shield Arc® 70+

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>Pipe material</b>	
EN 10208-2	L360 , L415, L445, L480
EN 10216-1 / 10217-1	P355
API 5LX	X56, X60, X65, X70
Gaz de France	X52, X63

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Weight/ 1000 pcs (kg)
3.2x355	75-130	DC+	26
4.0x355	90-185	DC+	40.4
4.8x355	140-225	DC+	58.5

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions PJ/5Gdown
3.2	75-130A
4.0	90-185A
4.8	140-225A

# Conarc® 55CT

EMR  
SAHARA®

SMAW

## CLASSIFICATION

<b>AWS A5.5</b>	E8018-W2-H4R <sup>1)</sup>	<b>A-Nr</b>	10	<sup>1)</sup> Deviation, see remarks - <sup>2)</sup> Nearest classification
<b>ISO 2560-A</b>	E 46 5 MnNi B 3 2 H5 <sup>2)</sup>	<b>F-Nr</b>	4	
		<b>9606 FM</b>	2	

## GENERAL DESCRIPTION

All position electrode for welding weather resistant steel like Cor-Ten, Patinax etc...  
 Basic extremely low hydrogen electrode  
 Excellent mechanical properties (impact down to -50°C)  
 Also available in vacuum sealed Sahara ReadyPack® [SRP]: HDM < 3 ml/100g

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

LR

4Y42H5

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	Cu	HDM
0.05	1.5	0.4	0.010	0.015	0.9	0.4	3 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)			
				-18°C	-20°C	-40°C	-50°C
Required: AWS A5.5 ISO 2560-A Typical values	min. 460 min. 460	min. 550 530-680	min. 19 min. 20 25	min. 27			min. 47
AW	540	610			115	100	60

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2,5	3,2	4,0
	Length (mm)	350	350	350
Carton + PE foil	Pieces / unit	140	120	-
	Net weight/unit (kg)	2.7	4.5	-
SRP	Pieces / unit	69	50	27
	Net weight/unit (kg)	1.4	1.9	1.5

Identification Imprint: CONARC 55CT Tip Color: black

Conarc® 55CT; rev. C-EN28-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Conarc® 55CT

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
Weather resisting steels EN 10025-5	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
2.5x350	55-85	DC+	53	81	0.77	19.7	88	1.74
3.2x350	80-145	DC+	70	223	1.2	36.9	43	1.60
4.0x350	120-185	DC+	77	355	1.6	54.1	29	1.59
5.0x450	180-270	DC+	104	784	2.4	105.2	15	1.53

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

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

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 - 0.70%
Ni = 0.7 - 1.0%	AWS: Ni = 0.40 - 0.80%
Cu = 0.3 - 0.5%	EN: Cu max. 0.3%

## Conarc® 60G

EMR  
SAHARA®

## CLASSIFICATION

AWS A5.5	E9018M-H4	A-Nr	10
ISO 18275-A	E 55 4 Z B 32 H5	F-Nr	4
		9606 FM	2

## GENERAL DESCRIPTION

Basic all position extremely low hydrogen electrode (HDM< 2 ml/100g)

For welding high strength steel grades (UTS 540-640 N/mm<sup>2</sup>)

Good impact values down to -51°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/3Gu



PE/4G



PH/5Gu

## 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	HDM
0.06	1.0	0.4	0.015	0.010	1.6	0.3	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)		
				-20°C	-40°C	-51°C
Required: AWS A5.5	540-620*	min. 620	min. 24			min. 27
ISO 18275-A	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/mm<sup>2</sup>

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	Length (mm)	Carton + PE foil		SRP	
			Pieces / unit	Net weight/unit (kg)	Pieces / unit	Net weight/unit (kg)
	2.5	350	-	-	65	1.4
	3.2	350	-	-	50	2.0
	4.0	350	85	4.6	28	1.5
	5.0	450	55	5.8	23	2.6

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

Conarc® 60G: rev. C-EN25-01/02/16

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# Conarc® 60G

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S355
<b>Pipe material</b>	
EN 10208-2	L360, L415, L445, L480
API 5LX	X52, X56, X60, X65, X70
EN 10216-1/EN10217-1	P235T1, P235T2, P275T1, P275T2, P355N
<b>Fine grained steels</b>	
EN 10025 part 4	S420M (L), S460M (L), S420N (L), S460N (L)
EN 10025 part 6	S460, S500
<b>Weather resisting steels</b>	
EN 10155	S235 J0W S235 J2W S355 J0W S355 J2W S355 K2G1W

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	60-100	DC+	63	114	0.7	23.5	77	1.80
3.2x350	80-130	DC+	69	231	1.3	38.3	40	1.52
4.0x350	120-180	DC+	72	324	1.7	55.8	30	1.66
5.0x450	160-240	DC+	119	760	2.2	105.2	14	1.43

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

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

## Conarc® 70G

EMR  
SAHARA®

SMAW

## CLASSIFICATION

AWS A5.5	E9018-G-H4R	A-Nr	10
ISO 18275-A	E 55 4 1NiMo B 3 2 H5	F-Nr	4
		9606 FM	2

## GENERAL DESCRIPTION

Basic all position extremely low hydrogen electrode [HDM< 2 ml/100g]  
 For high strength steel grades (UTS 640-735 N/mm<sup>2</sup>), root passes in HY 100 steel  
 Good impact values down to -40°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/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

DNV TÜV

4Y50H5 +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	Mo	HDM
0.06	1.2	0.4	0.014	0.009	1.0	0.4	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation [%]	Impact ISO-V(J)		
					-20°C	-40°C	-46°C
Required: AWS A5.5		min. 530	min. 620	min. 17	not required		
ISO 18275-A		min. 550	610-780	min. 18	min. 47		
Typical values	AW	600	655	24	90		
	SR:15h/580°C	550	640	24	90	90	60
							50

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0	4.0	5.0
	Length (mm)	350	350	350	450	450
Carton + PE foil	Pieces / unit	110	120	85	-	55
	Net weight/unit (kg)	2.5	4.6	4.6	-	5.8
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. C-EN24-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
 Fumes: Safety Data Sheets (SDS) are available on our website.

# Conarc® 70G

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>Boiler &amp; pressure vessel steels (Reactor steels incl. Q &amp; T steels)</b>	
DIN	20MnMoNi5-5, 22NiMoCr3-7 15NiCuMoNb5-6-4 G5-18NiMoCr3-7
ASTM	A508CL2, A508CL3 A533CL1Gr.B / C A533CL2Gr.B / C
<b>Creep resistant steels</b>	
	15NiCuMoNb-5 (WB36) 1.6368 17MnMoV6-4(WB35) 1.5403
<b>Pipe material</b>	
EN 10208-2	L480, L550
API 5LX	X65, X70 (X80 root run)
<b>Fine grained steels</b>	
EN 10025 part 6	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	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	60-100	DC+	67	121	0.7	19.5	75	1.47
3.2x350	80-130	DC+	70	234	1.3	37.5	41	1.56
4.0x350	120-180	DC+	74	343	1.7	55.4	29	1.59
5.0x450	160-240	DC+	106	573	2.5	106.4	14	1.43

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

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

## CLASSIFICATION

<b>AWS A5.5</b>	E8018-G-H4R	<b>A-Nr</b>	10
<b>ISO 2560-A</b>	E 50 6 Mn1Ni B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	2

## GENERAL DESCRIPTION

The basic all position pipeline and offshore electrode with max. 1% Ni  
 Excellent mechanical properties (impact down to -60°C)  
 Extremely low hydrogen content  
 110 - 120% recovery  
 Weldable on AC and DC

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

## NAKS

Pending

## 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/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-40°C	-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	550	640	24	140	80

CTOD value at -10°C &gt; 0.25 mm

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	3.2	4.0
	Length (mm)	350	450
Pieces / unit		120	85
	Net weight/unit (kg)	4.7	5.9

Identification Imprint: 8018-G / CONARC 74

Tip Color: white

Conarc® 74: rev. C-EN05-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Conarc® 74

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65
EN 10216-1/EN 10217-1	P275T1, P275T2, P355N
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460
EN 10025 part 6	S460

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	55-80	DC+	59	85	0.72	19.3	86	1.65
3.2x350	80-145	DC+	66	220	1.2	37.7	48	1.79
4.0x350	120-185	DC+	77	355	1.6	54.1	29	1.59
4.0x450	120-185	DC+	90	450	1.8	68.4	23	1.56
5.0x450	180-240	DC+	104	784	2.4	105.2	15	1.53

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	80A	80A	80A	80A	80A	80A
3.2	140A	120A	145A	120A	120A	120A
4.0	150A	140A	150A	140A	135A	140A

## REMARKS / APPLICATION ADVICE

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

## CLASSIFICATION

AWS A5.5	E11018M-H4	A-Nr	10
ISO 18275-A	E 69 5 Z B 3 2 H5	F-Nr	4
		9606 FM	2

## GENERAL DESCRIPTION

Basic all position extremely low hydrogen electrode (HDM< 2 ml/100g)

Weldable on AC and DC

110 - 115% recovery

Good impact values down to -51°C

Meets the requirements of military specifications

Suitable for welding submarines high strength steels (UTS up to 800 N/mm<sup>2</sup>)

Also available in vacuum sealed Sahara ReadyPack® (SRP)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

ABS

LR

CCS

+

4Y69H5

4Y69H5

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	Mo	HDM
0.06	1.5	0.4	0.015	0.01	2.2	0.4	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)		
				-40°C	-50°C	-51°C
Required: AWS A5.5	680-760*	min. 760	min. 20			min. 27
ISO 18275-A	min. 690	760-960	min. 17		min. 47	
Typical values	AW	750	785	22	100	80

\* Diam.2.5 max.795 N/mm<sup>2</sup>

SR:14h/620°C

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	4.0	5.0
		350	350	350	450
Carton + PE foil	Pieces / unit	-	120	90	60
	Net weight/unit (kg)	-	4.5	5.0	6.3
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. C-EN25-12/01/16

# Conarc® 80

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>Pipe material</b>	
API 5LX	X70, X75
<b>Fine grained steels</b>	
EN 10025 part 6	S620, S690
	Root runs and fillet welds in S890

SMAW

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	60-80	DC+	55	99	0.8	19.5	82	1.61
3.2x350	80-130	DC+	78	261	1.1	36.5	43	1.55
4.0x350	120-180	DC+	75	356	1.6	53.2	30	1.59
5.0x450	160-240	DC+	116	627	2.3	105.1	14	1.45

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

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

**Conarc® 85****EMR  
SAHARA®**

SMAW

## CLASSIFICATION

<b>AWS A5.5</b>	E12018-G-H4R	<b>A-Nr</b>	10
<b>ISO 18275-A</b>	E 69 5 Mn2NiCrMo B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	2

## GENERAL DESCRIPTION

Basic all position extremely low hydrogen electrode (HDM < 2 ml/100g)

For steels with a tensile strength UTS of max. 835 N/mm<sup>2</sup>

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)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

<b>ABS</b>	<b>DNV</b>	<b>CCS</b>
+	4Y69H5	4Y69H5

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	Mo	Cr	HDM
0.06	1.4	0.3	0.010	0.010	2.0	0.4	0.4	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-40°C	-50°C
Required: AWS A5.5 ISO 18275-A	min. 740	min. 830	min. 14	not required	
Typical values	min. 690	760-960	min. 17		min. 47
AW	840	890	21	80	60
SR:1h/620°C	780	840	20	75	60

## PACKAGING AND AVAILABLE SIZES

	<b>Diameter (mm)</b>	2,5	3,2	4,0	4,0	5,0
	<b>Length (mm)</b>	350	350	350	450	450
<b>SRP</b>	<b>Pieces / unit</b>	68	50	28	28	23
	<b>Net weight/unit (kg)</b>	1.4	1.9	1.5	1.9	2.5

Identification Imprint: 12018-G / CONARC 85

Tip Color: light blue

Conarc® 85 rev. C-EN29-12/05/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Conarc® 85

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>Pipe material</b> API 5LX	X70, X75, X80
<b>Fine grained steels</b> EN 10025 part 6	S690 Root runs and fillet welds in S890

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal	kg electrodes/ kg weldmetal
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)		B	1/N
3.2x350	80-130	DC+	69	219	1.0	375	50	1.89
4.0x350	120-180	DC+	68	321	1.5	53.2	35	1.87
5.0x450	160-240	DC+	106	632	2.0	106.7	17	1.81

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	75A	75A	75A	80A	75A	80A
3.2	135A	130A	140A	120A	120A	120A
4.0	155A	145A	155A	140A	140A	140A
5.0	225A	220A	215A			

### CLASSIFICATION

<b>AWS A5.5</b>	E7018-G-H4R <sup>1)</sup>	<b>A-Nr</b>	10
<b>ISO 2560-A</b>	E 50 6 Mn1Ni B 3 2 H5	<b>F-Nr</b>	4
<sup>1)</sup> meet also AWS A5.5:E8018-G-H4R		<b>9606 FM</b>	2

### GENERAL DESCRIPTION

The basic all position offshore electrode with max. 1% Ni  
Excellent mechanical properties (impact down to -60°C)

Good CTOD down to -10°C

Extremely low hydrogen content

110 - 120% recovery

Weldable on AC and DC, also available in vacuum sealed Sahara ReadyPack<sup>®</sup> [SRP]: HDM < 3 ml/100g

### WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

### CURRENT TYPE

AC / DC +/-

### APPROVALS

ABS	BV	DNV	LR	GL	RINA	RMRS	TÜV
3Y	UP	5Y46H5	5Y40H5	6Y46H10	4YH5	3-3YH5	+

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	HDM
0.05	1.5	0.4	0.010	0.010	0.9	2 ml/100 g

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-20°C	-60°C
Required: AWS A5.5	min. 390	min. 480	min. 25	not required	
ISO 2560-A	min. 500	560-720	min. 18		min. 47
Typical values	550	640	24	150	90
AW	460	550	24		90
SR:580°C/15h					

CTOD value at -10°C > 0.25 mm

### PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	Length (mm)	2.5				3.0		3.2		4.0		5.0	
			350	350	350	450	350	450	450	450	350	450	350	450
<b>Carton + PE foil</b>	<b>Pieces / unit</b>		135	-	130	120	85	85	-	-	-	-	-	-
	<b>Net weight/unit (kg)</b>		2.7	-	4.7	5.8	4.4	5.9	-	-	-	-	-	-
<b>SRP</b>	<b>Pieces / unit</b>		70	54	50	50	28	28	23					
	<b>Net weight/unit (kg)</b>		1.4	1.5	1.9	2.4	1.5	2.0	2.5					

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

Kryo<sup>®</sup> 1: rev. C-EN26-12/05/16

# Kryo<sup>®</sup> 1

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1	P275T1
EN 10217-1	P275T2, P355N
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460
EN 10025 part 6	S460

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	55-80	DC+	59	85	0.72	19.3	86	1.65
3.0x350	70-110	DC+	74	256	0.93	30.2	52	1.58
3.2x350	80-140	DC+	66	220	1.2	37.7	48	1.79
3.2x450	80-140	DC+	78	259	1.3	48.7	35	1.72
4.0x350	120-170	DC+	77	355	1.6	54.1	29	1.59
4.0x450	120-170	DC+	90	450	1.8	68.4	23	1.56
5.0x450	180-240	DC+	104	784	2.4	105.2	15	1.53

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

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

# Kryo<sup>®</sup> 1N

EMR  
SAHARA<sup>®</sup>

SMAW

## CLASSIFICATION

<b>AWS A5.5</b>	E 8016-G-H4R	<b>A-Nr</b>	10
<b>ISO 2560-A</b>	E 50 6 Mn1Ni B 12 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	2

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	HDM
0.07	1.7	0.5	0.020	0.005	0.9	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-40°C	-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

SRP	Diameter (mm)	2,5	3,2	4,0	5,0
	Length (mm)	350	450	450	450
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<sup>®</sup> 1N: rev. C-EN25-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Kryo® 1N

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1	P275T1
EN 10217-1	P275T2, P355N
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460
EN 10025 part 6	S460

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	60-95	DC+	50	106	0.82	19.2	90	1.71
3.2x450	80-145	DC+	68	256	1.2	40.1	43	1.73
4.0x450	120-190	DC+	82	436	1.7	63.6	26	1.65
5.0x450	175-230							

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	75A	70A	75A	70A	75A	80A
3.2	100A	110A	100A	100A	100A	110A
4.0	150A	140A	130A	125A	125A	120A

## CLASSIFICATION

<b>AWS A5.5</b>	E 8018-G-H4R	<b>A-Nr</b>	10
<b>ISO 2560-A</b>	E 50 6 Mn1Ni B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	2

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



## 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/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				-40°C	-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	550	640	24	140	80
SR:580°C/15h	460	550	24	150	90

CTOD value at -10°C > 0.25 mm

## PACKAGING AND AVAILABLE SIZES

SRP	Diameter (mm)	2.5	3.2	3.2	4.0	4.0	5.0
	Length (mm)	350	350	450	350	450	450
	Pieces / unit	70	50	50	28	28	23
	Net weight/unit (kg)	1.4	1.9	2.4	1.5	2.0	2.5

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

Kryo<sup>®</sup> 1P: rev. C-EN26-01/02/16

# Kryo<sup>®</sup> 1P

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## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1	P275T1
EN 10217-1	P275T2, P355N
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460
EN 10025 part 6	S460

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	55-85	DC+	59	85	0.72	19.3	86	1.65
3.2x350	80-145	DC+	66	220	1.2	37.7	48	1.79
3.2x450	80-145	DC+	78	259	1.3	48.7	35	1.72
4.0x350	120-185	DC+	77	355	1.6	54.1	29	1.59
4.0x450	120-185	DC+	90	450	1.8	68.4	23	1.56
5.0x450	180-270	DC+	104	784	2.4	105.2	15	1.53

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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		

## REMARKS / APPLICATION ADVICE

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

# Kryo<sup>®</sup> 1-145

EMR  
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## CLASSIFICATION

<b>AWS A5.5</b>	E8018-G-H4R	<b>A-Nr</b>	10
<b>ISO 2560-A</b>	E 50 6 Mn1Ni B 5 3 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	2

## GENERAL DESCRIPTION

Basic electrode with max. 1%Ni to meet NACE MR0175 standard  
 Extremely low hydrogen content: HDM< 2 ml/100g  
 Up to 145% recovery, easy slag release, weldable on AC and DC  
 Filling horizontal V- and X-grooves  
 Excellent X-ray quality  
 Only available in vacuum sealed Sahara ReadyPack<sup>®</sup>(SRP)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G

## CURRENT TYPE

AC / DC +/-

## APPROVALS

DNV

5Y46H5

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	HDM
0.06	1.5	0.5	0.010	0.010	0.9	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) -60°C
Required: AWS A5.5	460	550	19	
ISO 2560-A	500	560-720	18	min. 47
Typical values AW	570	630	23	90

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
SRP	Pieces / unit	48	25	21
	Net weight/unit (kg)	2.5	2.0	2.6

Identification Imprint: 8018-G / KRYO 1-145 Tip Color: Orange

Kryo<sup>®</sup> 1-145; rev. C-EN01-12/05/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Kryo<sup>®</sup> 1-145

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## EXAMPLES OF MATERIALS TO BE WELDED

### Steel grades/Code Type

#### General structural steels

EN 10025 S275, S355

#### Ship plates

ASTM A 131 Grade A, B, D, E, AH32 up to and including EH40

#### Cast steels

EN 10213-2 GP 240 GH, GP 280 GH

#### Pipe material

EN 10216-1 P195 TR1 / TR2, P 235 TR1 / TR2, P265 TR1 / TR2

EN 10216-2 P195 GH, P235 GH, P265 GH

EN 10216-3 P275 NL1 / NL2, P355 N / NH / NL1 / NL2, P 460 N / NH / NL1 / NL2

EN 10208-1 L210 GA, L235 GA, L245 GA, L290 GA, L360 GA

EN 10208-2 L245 MB / NB, L290 MB / NB, L360 MB / NB / QB, L415 MB / NB / QB, L450 MB / QB

API 5L X42, X46, X52, X56, X60, X65, X70

#### Boiler & pressure vessel steel

EN 10028-2 P235 GH, P265 GH, P295 GH, P355GH

#### Fine grained steels

EN 10025 part 3 S275 N / NL, S355 N / NL, S420 N / NL, S460 N / NL

EN 10025 part 4 S275 M / ML, S355 M / ML, S420 M / ML, S460 M / ML

EN 10025 part 6 S460 / S460 Q/QL/QL1, S500 Q/QL/QL1 0, S500

#### Others

Steel grades with equivalent requirements as per above classified per ASTM, JIS etc

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			[S]*	- per electrode at max. current - E(kJ)	H(kg/h)			
3.2x450	90-150	DC+	82	271	1,6	54,4	27	1,47
4.0x450	150-190	DC+	95	433	2,2	82,2	18	1,48
5.0x450	180-270	DC+	98	688	3,3	127,4	12	1,53

\*Stub end 45mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PC/2G
3.2	130 A	130 A	130 A
4.0	170 A	160 A	160 A
5.0	235 A	225 A	225 A

# Kryo<sup>®</sup> 1-180

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## CLASSIFICATION

<b>AWS A5.5</b>	E 8018-G-H4R	<b>A-Nr</b>	10
<b>ISO 2560-A</b>	E 50 5 1Ni B 7 3 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	2

## 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  
 Excellent X-ray quality  
 Also available in vacuum sealed Sahara ReadyPack<sup>®</sup> (SRP): HDM<3 ml/100g

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC / DC + / -

## APPROVALS

<b>DNV</b>	<b>LR</b>
4Y4H5	4YH5

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	HDM
0.07	1.2	0.3	0.02	0.0010	0.9	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				-40°C	-50°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	550	640	26	90
SR:600°C/4h	540	620	24	100	85

CTOD value at -10°C > 0.25 mm

## PACKAGING AND AVAILABLE SIZES

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

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

Kryo<sup>®</sup> 1-180: rev. C-EN25-01/02/16

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# Kryo® 1-180

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## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S275, S355
<b>Ship plates</b>	
ASTM A 131	Grade A, B, D, AH32 to EH40
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1	P275T1
EN 10217-1	P275T2, P355N
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460
EN 10025 part 6	S460, S500

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
3.2x450	130-160							
4.0x450	170-240	AC	73	537	3.5	102.0	14	1.43
5.0x450	250-300	AC	78	772	5.0	156.7	9	1.45

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

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

# Kryo<sup>®</sup> 2

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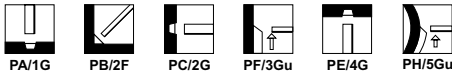
## CLASSIFICATION

<b>AWS A5.5</b>	E9018-G-H4R	<b>A-Nr</b>	10
<b>ISO 18275-A</b>	E 55 6 Z B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	2

## GENERAL DESCRIPTION

Basic all position offshore electrode for high strength steels  
 110 - 120% recovery  
 Extremely low hydrogen content  
 Excellent impact toughness down to -60°C  
 Good CTOD at -15°C  
 Also available in vacuum sealed Sahara ReadyPack<sup>®</sup>(SRP): HDM<3 ml/100g

## WELDING POSITIONS (ISO/ASME)



## 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, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)		
				-40°C	-50°C	-60°C
Required: AWS A5.5	min. 530	min. 620	min. 17	not required		
ISO 18275-A	min. 550	610-780	min. 18			min. 47
Typical values						
AW	570	650	22	140	110	60
SR:620°C/1h	530	620	22			

CTOD value at -10°C > 0.25 mm

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	450	450
SRP	Pieces / unit	70	50	28
	Net weight/unit (kg)	1.4	2.4	2.0

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

Kryo<sup>®</sup> 2: rev. C-EN27-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Kryo<sup>®</sup> 2

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## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S355
<b>Cast steels</b>	
EN 10213-2	GP240R
<b>Pipe material</b>	
EN 10208-1	L290 GA, L360 GA
EN 10208-2	L290, L360, L415, L445, L480
API 5LX	X42, X46, X52, X60, X65, X70
EN 10216-1	P275T1
EN 10217-1	P275T2, P355N
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420, S460
EN 10025 part 4	S275, S355, S420, S460
EN 10025 part 6	S460, S500
<b>Low temperature steels</b>	
EN 10028-4	11MnNi5-3, 13 MnNi6-3, 15NiMn 6
EN 10222-3	13MnNi6-3, 15NiMn 6

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time (S)*	Energy (kJ)	Dep. rate H(kg/h)	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)									
2.5x350	55-85	DC+	59	85	0.72	19.4	86	1.65	
3.2x450	80-140	DC+	80	268	1.2	46.8	36	1.70	
4.0x450	120-170	DC+	89	445	1.8	70.0	22	1.52	

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

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

### CLASSIFICATION

<b>AWS A5.5</b>	E 8018-C1-H4	<b>A-Nr</b>	10
<b>ISO 2560-A</b>	E 46 8 3Ni B 32 H5*	<b>F-Nr</b>	4
* Nearest equivalent		<b>9606 FM</b>	1

### GENERAL DESCRIPTION

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

### WELDING POSITIONS (ISO/ASME)



### CURRENT TYPE

AC / DC +/-

### APPROVALS

ABS	BV	DNV	LR	GL	RINA	TÜV
+	UP	5YH10	5Y40H	6Y42H10	5YH5	+

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	HDM
0.05	0.7	0.3	0.015	0.01	2.5	2 ml/100 g

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				-60°C	-80°C
Required: AWS A5.5 ISO 2560-A Typical values	SR <sup>1)</sup> min. 460 min. 460	min. 550 530-680	min. 19 min. 20	min. 27	min. 47
AW SR:610°C/2h	520 500	600 590	26 29	120 90	60

CTOD value at -10°C > 0.25 mm

Stress relieved: SR<sup>1)</sup> = 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
Carton + PE foil	Pieces / unit	135	120	-	85	85	55
	Net weight/unit (kg)	2.7	4.2	-	4.4	5.9	5.7
SRP	Pieces / unit	70	50	50	28	28	23
	Net weight/unit (kg)	1.4	1.9	2.4	1.5	2.0	2.5

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

Kryo<sup>®</sup> 3: rev. C-EN26-01/02/16

# Kryo<sup>®</sup> 3

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025	S355
<b>Pipe material</b>	
EN 10208-2	L360, L415, L445
API 5LX	X52, X56, X60, X65
<b>Fine grained steels</b>	
EN 10025 part 3	S355, S420, S460
EN 10025 part 4	S355, S420, S460
<b>Low temperature steels</b>	
EN 10028-4	11MnNi5-3, 13MnNi6-3, 15NiMn6 (12Ni4G1, G2)
EN 10222-3	13MnNi6-3, 15NiMn6

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	55-80	DC+	57	103	0.72	19.5	88	1.71
3.2x350	80-140	DC+	65	218	1.3	37.4	44	1.64
3.2x450	80-140	DC+	79	263	1.4	48.5	33	1.59
4.0x350	120-170	DC+	74	344	1.6	52.7	30	1.57
4.0x450	120-170	DC+	100	463	1.7	69.8	21	1.45
5.0x450	180-240	DC+	103	723	2.5	104.8	14	1.48

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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%      ISO: Ni = 2.6 - 3.8%

# Kryo® 4

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## CLASSIFICATION

<b>AWS A5.5</b>	E7016-C2L-H4R	<b>A-Nr</b>	10
<b>ISO 2560-A</b>	E 38 8 3Ni B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	1

## GENERAL DESCRIPTION

The basic all position offshore electrode with approx. 3.5% Ni  
 Excellent impact toughness down to -80°C in as welded condition and -100°C after PWHT  
 Extremely low hydrogen content  
 Only available in vacuum sealed Sahara ReadyPack® (SRP)

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC / DC +/-

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Ni	HDM
0.03	0.6	0.4	0.01	0.005	3.6	2 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	Yield strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
					-80°C	-101°C
Required: AWS A5.5	PWHT <sup>1)</sup>	min. 390	min. 480	min. 25		min. 27
ISO 2560-A	AW	min. 380	470-600	min. 20	47	
Typical values	AW	490	570	30	90	
	PWHT <sup>1)</sup>	420	510	30	120	90

<sup>1)</sup>605±14°C/1h

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2
	Length (mm)	350	350
SRP	Pieces / unit	70	58
	Net weight/unit (kg)	1.4	1.8

Identification Imprint: 7016-C2 / KRYO 4 Tip Color: silver

Kryo® 4; rev. C-EN27-01/02/16

# Kryo<sup>®</sup> 4

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## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>General structural steels</b>	
EN 10025-2	S355
<b>Pipe material</b>	
EN 10208-2	L360, L415
API 5LX	X52, X56, X60
<b>Fine grained steels</b>	
EN 10025 part 3	S355, S420
EN 10025 part 4	S355, S420
<b>Low temperature steels</b>	
EN 10028-4	11MnNi5-3, 13MnNi6-3, 15NiMn6 (12Ni4G1, G2)
EN 10222-3	13MnNi6-3, 15NiMn6
ASTM A203	Grade A, B
ASTM A333	Grade 3
ASTM A334	Grade 3
ASTM A350	Grade LF3, CL1 & 2
ASTM A420	Grade WPC3

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	60-90	DC+	60	85	0.75	14.7	100	1.43
3.2x350	80-140	DC+	72	207	1.1	30.8	48	1.45

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	75A	70A	75A	70A	75A	80A
3.2	110A	120A	110A	100A	100A	100A

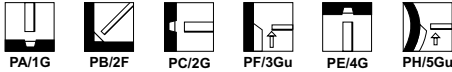
CLASSIFICATION

<b>AWS A5.5</b>	E7018-A1-H4R	<b>A-Nr</b>	2
<b>ISO 3580-A</b>	E Mo B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	1/3

GENERAL DESCRIPTION

Basic very low hydrogen all position electrode (HDM< 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<sup>®</sup> (SRP)

WELDING POSITIONS (ISO/ASME)



CURRENT TYPE

AC / DC +/-

APPROVALS

<b>DB</b>	<b>DNV</b>	<b>TÜV</b>
+	0,3 Mo	+

CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

<b>C</b>	<b>Mn</b>	<b>Si</b>	<b>P</b>	<b>S</b>	<b>Mo</b>	<b>HDM</b>
0.05	0.8	0.6	0.020	0.010	0.55	2 ml/100 g

MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
					+20°C	-20°C
Required: AWS A5.5	SR <sup>1</sup>	min. 390	min. 490	min. 25	not required	
ISO 3580-A	SR <sup>2</sup>	min. 355	min. 510	min. 22	min. 47	
Typical values	SR <sup>3</sup>	560	620	25	140	50
	AW	550	610	25	160	70

Stress relieved: SR<sup>1</sup> = 620±14°C/1h, SR<sup>2</sup> = 570-620°C/1h, SR<sup>3</sup> = 620°C/1h

PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	4.0	5.0
			350	350	350
<b>Carton + PE foil</b>	<b>Pieces / unit</b>	110	120	85	55
	<b>Net weight/unit (kg)</b>	2.5	4.5	4.7	6.0
<b>SRP</b>	<b>Pieces / unit</b>	67	50	28	23
	<b>Net weight/unit (kg)</b>	1.4	2.0	1.5	2.6

Identification Imprint: 7018-A1 / SL 12 G Tip Color: blue

SL<sup>®</sup> 12G: rev. C-EN26-12/05/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
 Fumes: Safety Data Sheets (SDS) are available on our website.

# SL<sup>®</sup> 12G

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Standard	Type
<b>Creep resistant steels</b>	
EN 10028-2	P295GH, P355GH, 16Mo3 & similar alloys
EN 10222-2	17Mo3, 14Mo6 & similar alloys
ASTM A335	Grade P1
ASTM A209	Grade T1
ASTM A250	Grade T1
ASTM A336	Grade F1
ASTM A204	Grade A, B, C
ASTM A217	Grade WC1
ASTM A352	Grade LC1
<b>Fine grained steels</b>	
EN 10025 part 3	S275, S355, S420
EN 10025 part 4	S275, S355, S420

## CREEP DATA

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

## CALCULATION DATA

Sizes		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
Diam. x length [mm]	Current range [A]							
2.5x350	60-90	DC+	65	118	0.7	22.8	84	1.92
3.2x350	80-130	DC+	69	230	1.3	379	42	1.59
4.0x350	120-180	DC+	81	373	1.6	54.8	28	1.56
5.0x450	160-240	DC+	106	799	2.4	1074	14	1.52

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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 350 ±25°C after removal from cardboard boxes

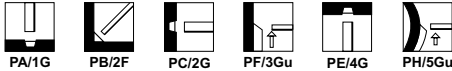
CLASSIFICATION

AWS A5.5	E8018-B2-H4	A-Nr	3
ISO 3580-A	E CrMo1 B 3 2 H5	F-Nr	4
		9606 FM	3

GENERAL DESCRIPTION

Basic very low hydrogen all position electrode (HDM< 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<sup>®</sup>(SRP)

WELDING POSITIONS (ISO/ASME)



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	HDM
0.06	0.75	0.6	0.015	0.010	1.1	0.5	3 ml/100 g

MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	-20°C
Required: AWS A5.5 ISO 3580-A Typical values	SR <sup>1</sup> SR <sup>2</sup> SR <sup>3</sup>	min. 460 min. 355 570	min. 550 min. 510 640	min. 19 min. 20 24	not required min. 47 180
					100

Stress relieved: SR<sup>1</sup> = 690±14°C/1h, SR<sup>2</sup> = 660-700°C/1h, SR<sup>3</sup> = 700°C/1h

PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	4.0	5.0
			350	350	350
Carton + PE foil	Pieces / unit	120	120	85	55
	Net weight/unit (kg)	2.6	4.6	4.7	6.1
SRP	Pieces / unit	67	50	28	-
	Net weight/unit (kg)	1.4	2.0	1.5	-

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

SL<sup>®</sup> 19G: rev. C-EN25-12/05/16

# SL<sup>®</sup> 19G

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Standard	Type
<b>Creep resistant steels</b>	
EN 10028-2	13CrMo4-5 & similar alloys
EN 10083-1	25CrMo4 & similar alloys
EN 10222-2	14CrMo4-5 & similar alloys
ASTM A387	Grade 11 & 12
ASTM A182	Grade F1 & F12
ASTM A217	Grade WC6 & WC11
ASTM A234	Grade WP11 & WP12
ASTM A199	Grade T11
ASTM A200	Grade T11
ASTM A213	Grade T11 & T12
ASTM A335	Grade P11 & P12
<b>Tool steel</b>	
DIN 17210	16MnCr5 & similar alloys

## CREEP DATA

Test temperature °C	400	450	500	550	600
Yield strength Rp-0.2% (N/mm <sup>2</sup> )	460	440	430		
Creep strength Rm/1000 (N/mm <sup>2</sup> )			300	140	(80)
Creep strength Rm/10.000 (N/mm <sup>2</sup> )		350	240	110	(50)
Creep resistance Rp1%/10.000 (N/mm <sup>2</sup> )		250	170	80	(35)

## CALCULATION DATA

Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5x350	60-90	DC+	63	114	0.71	21.0	80	1.67
3.2x350	80-130	DC+	68	227	1.3	37.9	41	1.56
4.0x350	120-180	DC+	79	367	1.6	54.9	29	1.59
5.0x450	160-240	DC+	103	777	2.5	106.9	14	1.52

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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 350 ±25°C after removal from cardboard boxes

# SL<sup>®</sup> 20G

EMR  
SAHARA<sup>®</sup>

SMAW

## CLASSIFICATION

<b>AWS A5.5</b>	E9018-B3-H4	<b>A-Nr</b>	4
<b>ISO 3580-A</b>	E CrMo2 B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	3

## GENERAL DESCRIPTION

Basic very low hydrogen all position electrode (HDM<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<sup>®</sup> (SRP)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

RINA TÜV

C2M1 +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Cr	Mo	HDM
0.06	0.8	0.6	0.015	0.010	2.3	1.0	3 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				+20°C	-10°C
Required: AWS A5.5	SR <sup>1</sup>	min. 530	min. 620	min. 17	not required
ISO 3580-A	SR <sup>2</sup>	min. 400	min. 500	min. 18	min. 47
Typical values	SR <sup>3</sup>	530	650	22	150
					90

Stress relieved: SR<sup>1</sup> = 690±14°C/1h, SR<sup>2</sup> = 690-750°C/1h, SR<sup>3</sup> = 695°C/1h

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)			
	2.5	3.2	4.0	
	Length (mm)			
	350	350	350	
Carton + PE foil	Pieces / unit	110	120	85
	Net weight/unit (kg)	2.6	4.7	4.8
SRP	Pieces / unit	67	50	28
	Net weight/unit (kg)	1.4	2.0	1.5

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

SL<sup>®</sup> 20G: rev. C-ENZ-12/05/16

# SL® 20G

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Standard	Type
<b>Creep resistant steels</b>	
EN 10028-2	10CrMo9-10 & similar alloys
EN 10222-2	12CrMo9-10 & similar alloys
ASTM A387	Grade 21 & 22
ASTM A182	Grade F22
ASTM A217	Grade WC9
ASTM A234	Grade WP22
ASTM A199/A200	Grade T21 & T22
ASTM A213	Grade T22
ASTM A335	Grade P22

## CREEP DATA

Test temperature °C	400	450	500	550	600
Yield strength Rp-0,2% [N/mm <sup>2</sup> ]	480	460	430	160	[100]
Creep strength Rm/1000 [N/mm <sup>2</sup> ]			240	210	[60]
Creep strength Rm/10.000 [N/mm <sup>2</sup> ]			160	85	[45]

## CALCULATION DATA

Sizes Diam. x length [mm]	Current range [A]	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs [kg]	Electrodes/ kg weldmetal	kg electrodes/ kg weldmetal
			[S]*	- per electrode at max. current - E[kJ]	H[kg/h]		B	1/N
2.5x350	60-90	DC+	63	114	0.72	21.0	79	1.67
3.2x350	80-130	DC+	70	233	1.3	37.6	40	1.49
4.0x350	120-180	DC+	75	348	1.7	56.7	28	1.56

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	80A	85A	80A	85A	80A	80A
3.2	130A	120A	130A	120A	120A	120A
4.0	150A	145A	140A	140A	140A	140A

## 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 350 ±25°C after removal from cardboard boxes

# SL<sup>®</sup> 22G

EMR SAHARA<sup>®</sup>

SMAW

## CLASSIFICATION

AWS A5.5	E8018-B1-H4	A-Nr	3
ISO 3580-A	E Z B 3 2 H5	F-Nr	4
		9606 FM	3

## GENERAL DESCRIPTION

Basic very low hydrogen all position electrode (HDM < 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<sup>®</sup> (SRP)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Cr	Mo	HDM
0.06	0.8	0.6	0.020	0.010	0.5	0.5	3 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				+20°C	-10°C
Required: AWS A5.5	SR <sup>1</sup>	min. 460	min. 550	min. 19	not required
Typical values	SR <sup>2</sup>	570	640	24	180
					110

Stress relieved: SR<sup>1</sup> = 690±14°C/1h, SR<sup>2</sup> = 1h/730°C

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	350	350	350	450
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<sup>®</sup> 22G; rev. C-EN24-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
 Fumes: Safety Data Sheets (SDS) are available on our website.

# SL<sup>®</sup> 22G

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>Creep resistant steels</b>	
DIN	14MoV6-3
	17MnMoV6-4
	10CrSiMoV7
	24CrMoV5-5

## CREEP DATA

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

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	60-90	DC+	64	115	0.7	21.0	82	1.69
3.2x350	80-130	DC+	71	238	1.2	37.5	41	1.54
4.0x350	120-180	DC+	76	353	1.6	55.8	30	1.64
5.0x450	160-220	DC+	101	762	2.6	106.6	14	1.49

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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:700 - 730°C (time depends on material thickness)

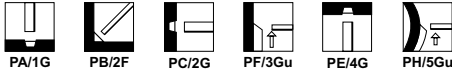
**CLASSIFICATION**

<b>AWS A5.5</b>	E8018-B6-H4R	<b>A-Nr</b>	4
<b>ISO 3580-A</b>	E CrMo5 B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	4

**GENERAL DESCRIPTION**

Basic very low hydrogen all position electrode (HDM< 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<sup>®</sup>(SRP)

**WELDING POSITIONS (ISO/ASME)**



**CURRENT TYPE**

AC / DC +/-

**APPROVALS**

TÜV

+

**CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL**

C	Mn	Si	P	S	Cr	Mo	HDM
0.07	0.8	0.6	0.020	0.010	5.3	0.6	3 ml/100 g

**MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL**

Condition		0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) +20°C
Required: AWS A5.5	SR <sup>1)</sup>	min. 460	min. 550	min. 19	not required
ISO 3580-A	SR <sup>2)</sup>	min. 400	min. 590	min. 17	min. 47
Typical values	SR <sup>3)</sup>	580	680	22	110

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

**PACKAGING AND AVAILABLE SIZES**

SRP	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
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<sup>®</sup> 502 rev. C-EN25-01/02/16

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# SL<sup>®</sup> 502

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type
<b>Creep resistant steels</b>	
DIN	
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 <sup>2</sup> )	480	440	380		
Creep strength Rm/1000 (N/mm <sup>2</sup> )			160	174	(80)
Creep strength Rm/10.000 (N/mm <sup>2</sup> )			130	90	(60)
Creep resistance Rp1%/10.000 (N/mm <sup>2</sup> )			100	50	(30)

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5x350	60-90	DC+	55	95	0.82	20.8	80	1.67
3.2x350	85-130	DC+	66	237	1.1	35.4	50	1.79
4.0x350	130-180	DC+	76	331	1.5	51.8	32	1.64

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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 temperature: 200 - 300°C  
 Postweld heat treatment 730 - 760°C (time depends on material thickness)

# SL<sup>®</sup> 9Cr(P91)

EMR  
SAHARA<sup>®</sup>

SMAW

## CLASSIFICATION

<b>AWS A5.5</b>	E9016-B9-H4	<b>A-Nr</b>	5
<b>ISO 3580-A</b>	E CrMo91 B 3 2 H5	<b>F-Nr</b>	4
		<b>9606 FM</b>	4

## GENERAL DESCRIPTION

Basic very low hydrogen all position electrode (HDM< 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<sup>®</sup> (SRP)

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	P	S	Cr	Mo	Ni	Nb	V	N	Mn+Ni	HDM
0.09	0.6	0.2	0.01	0.01	9.0	1.0	0.6	0.04	0.2	0.04	1.2	3 ml/100 g

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) +20°C
Required: AWS A5.5	SR <sup>1</sup>	min. 530	min. 11	not required
ISO 3580-A	SR <sup>2</sup>	min. 415	min. 17	min. 47
Typical values	SR <sup>3</sup>	570	21	80

Stress relieved: SR<sup>1</sup> = 740 ±14°C/1h, SR<sup>2</sup> = 750-770°C/1h, SR<sup>3</sup> = 2h/730-760°C

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
SRP	Pieces / unit	66	50	28
	Net weight/unit (kg)	1.4	1.8	1.5

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

SL<sup>®</sup> 9Cr(P91): rev. C-EN24-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# SL<sup>®</sup> 9Cr(P91)

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades/Code	Type	Code	Type
<b>Creep resistant steels</b>			
EN 10222-2 / EN 10302	X10CrMoVNb9-1 (1.4903)		
ASTM	A199 Grade T91 A200 Grade T91 A213 Grade T91/P91 A335 Grade P91 A336 Grade F91	ASME	SA 182-F91  SA 213-T91 SA 335-P91 SA 336-F91 SA 369-FP91 SA 387-Grade 91

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E(kJ)	H(kg/h)			
2.5x350	60-90	DC+	57	88	0.7	19.3	92	1.78
3.2x350	85-130	DC+	65	172	1.0	34.8	59	2.04
4.0x350	130-175	DC+	66	263	1.5	50.8	36	1.81

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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 temperature:200 - 300°C  
 Postweld heat treatment 730 - 760°C (time depends on material thickness)

# Arosta® 304L

EMR  
SAHARA®

## CLASSIFICATION

AWS A5.4	E308L-16	A-Nr	8	Mat-Nr	1.4316
ISO 3581-A	E 19 9 L R 12	F-Nr	5		
		9606 FM	5		

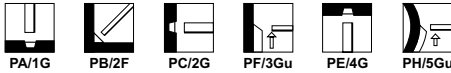
## TEMPERATURE RANGE

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

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC / DC +/-

## APPROVALS

BV	TÜV	DB
304L	+	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.02	0.8	0.8	19.5	9.7	4-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J)		
				+20°C	-20°C	-196°C
Required: AWS A5.4 ISO 3581-A	not required	min. 520	min. 35	not required		
Typical values	AW 440	580	43	70	60	24

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	Available Sizes				
		2.0	2.5	3.2	4.0	5.0
Carton + PE foil	Pieces / unit	225	135	150	85	65
	Net weight/unit (kg)	2.3	2.6	4.8	4.9	4.8
SRP	Pieces / unit	-	69	56	-	-
	Net weight/unit (kg)	-	1.4	1.9	-	-

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

Arosta® 304L: rev. C-EN26-12/05/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Arosta® 304L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNi19-11		1.4306	(TP)304L CF-3	S30403 J92500
	X2CrNi18-10		1.4311	(TP)304LN 302,304	S30453 S30400
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNi18-10		1.4301	(TP)304	S30409
		GX5CrNi19-10	1.4308	CF 8	J92600
<b>Ti-, Nb stabilized</b>					
	X6CrNiTi18-10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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 pass, DC- is recommended

# Limarosta® 304L

EMR SAHARA®

SMAW

## CLASSIFICATION

AWS A5.4	E308L-17	A-Nr	8	Mat-Nr	1.4316
ISO 3581-A	E 19 9 L R 12	F-Nr	5		
		9606 FM	5		

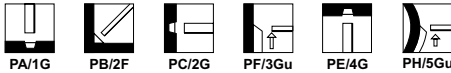
## TEMPERATURE RANGE

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]  
Arosta® 304L, diam. 2.5 mm, is recommended for welding root pass

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC / DC + / -

## APPROVALS

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

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN [acc.WRC 1992]
0.025	0.75	0.95	19.0	9.7	4-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J)	
				+20°C	-20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 440	min. 520 min. 510 600	min. 35 min. 30 45	not required not required 75	not required not required 60

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.0	2.5	3.2	4.0	5.0
		300	350	350	450	450
Carton + PE foil	Pieces / unit	125	125	135	85	55
	Net weight/unit (kg)	2.3	2.7	4.7	5.8	5.8
SRP	Pieces / unit	-	65	52	28	22
	Net weight/unit (kg)	-	1.4	1.8	2.0	2.4
Linc Can™	Pieces / unit	-	203	124	78	48
	Net weight/unit (kg)	-	4.4	4.3	5.3	3.5

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

Limarosta® 304L: rev. C-EN25-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Limarosta® 304L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNi19-11		1.4306	(TP)304L CF-3	S30403 J92500
	X2CrNi18-10		1.4311	(TP)304LN 302,304	S30453 S30400
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNi18-10		1.4301 1.4308	(TP)304 CF 8	S30409 J92600
		GX5CrNi19-10			
<b>Ti-, Nb stabilized</b>					
	X6CrNiTi18-10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	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 -		Dep. rate H(kg/h)	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			(S)*	E(kJ)				
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Vertarosta® 304L

EMR  
SAHARA®

## CLASSIFICATION

AWS A5.4 E308L-15 A-Nr 8 Mat-Nr 1.4316  
 ISO 3581-A E 19 9 L R 2 1 F-Nr 5  
 9606 FM 5

## TEMPERATURE RANGE

Pressurized parts : -196...+350°C  
 Oxidation resistance : to 800°C

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



PG/3Gd

## CURRENT TYPE

DC +

## APPROVALS

TÜV DB

+ +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.02	0.8	0.7	20.0	9.8	4-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				+20°C	-20°C	-120°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320	min. 520 min. 510	min. 35 min. 30	not required not required		
AW	440	600	40	70	50	40

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2
	Length (mm)	300	300
Pieces / unit Net weight/unit (kg)		190	130
		2.9	3.1

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

Vertarosta® 304L: rev. C-EN24-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Vertarosta® 304L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNi19-11		1.4306	(TP)304L CF-3	S30403 J92500
	X2CrNi18-10		1.4311	(TP)304LN 302,304	S30453 S30400
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNi18-10		1.4301 1.4308	(TP)304 CF 8	S30409 J92600
		GX5CrNi19-10			
<b>Ti-, Nb stabilized</b>					
	X6CrNiTi18-10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)	- per electrode at max. current - (S)*			E(kJ)	H(kg/h)				
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions
	PG/3Gdown
2.5	70A
3.2	100A

# Jungo<sup>®</sup> 304L

## CLASSIFICATION

AWS A5.4	E308L-15	A-Nr	8	Mat-Nr	1.4316
ISO 3581-A	E 19 9 L B 2 2	F-Nr	5		
		9606 FM	5		

## TEMPERATURE RANGE

Pressurized parts : -196...+350°C  
Oxidation resistance : to 800°C

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

DC +

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.025	1.8	0.4	19.0	10.0	4-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				+20°C	-196°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 400	min. 520 min. 510 600	min. 35 min. 30 40	not required not required 80	
AW					40

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Pieces / unit	350	350	350
Net weight/unit (kg)		2.4	4.8	4.8

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

Jungo<sup>®</sup> 304L: rev. C-EN24-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Jungo® 304L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt; 0.03%]</b>					
	X2CrNi19-11		1.4306	(TP)304L CF-3	S30403 J92500
	X2CrNi18-10		1.4311	(TP)304LN 302,304	S30453 S30400
<b>Medium carbon [C &gt; 0.03%]</b>					
	X4CrNi18-10		1.4301 1.4308	(TP)304 CF 8	S30409 J92600
		GX5CrNi19-10			
<b>Ti-, Nb stabilized</b>					
	X6CrNiTi18-10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)	- per electrode at max. current - (S)*			E(kJ)	H(kg/h)				
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Arosta® 347

EMR  
SAHARA®

SMAW

## CLASSIFICATION

<b>AWS A5.4</b>	E347-16	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4551
<b>ISO 3581-A</b>	E 19 9 Nb R 12	<b>F-Nr</b>	5		
		<b>9606 FM</b>	5		

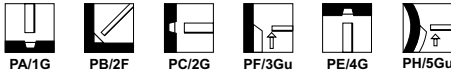
## TEMPERATURE RANGE

**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 (AISI 321 and 347)  
 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)



## CURRENT TYPE

AC / DC + / -

## APPROVALS

<b>TÜV</b>	<b>DB</b>
+	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Nb	FN [acc.WRC 1992]
0.03	0.8	0.8	19.5	9.8	0.35	6-12

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm²]	Tensile strength [N/mm²]	Elongation [%]	Impact ISO-V(J)		
				+20°C	-20°C	-60°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350 500	min. 550 min. 550 630	min. 25 min. 25 35	not required not required 70	50	35
AW						

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
<b>Carton + PE foil</b>	Pieces / unit	120	130	90
	Net weight/unit (kg)	2.6	4.7	4.9
<b>SRP</b>	Pieces / unit	69	52	-
	Net weight/unit (kg)	1.4	1.8	-

Identification Imprint: 347-16 / AROSTA 347 Tip Color: gold

Arosta® 347; rev. C-EN24-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Arosta® 347

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/AISI A240/A312/A351	UNS
<b>Ti-, Nb stabilized</b>					
	X6CrNiTi18-10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	1.4552	CF-8C 302	J92710
<b>Non stabilized</b>					
	X4CrNi18-10		1.4301	(TP)304	S30400
	X2CrNi19-11		1.4306	(TP)304L	S30403
		GX5CrNi19-10	1.4308	CF-8	J92600
			1.4312	(TP)304H	S30409

SMAW

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)	- per electrode at max. current - (S)*			E(kJ)	H(kg/h)				
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

For root pass, DC- is recommended

# Jungo® 347

## CLASSIFICATION

<b>AWS A5.4</b>	E347-15	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4551
<b>ISO 3581-A</b>	E 19 9 Nb B 2 2	<b>F-Nr</b>	5		
		<b>9606 FM</b>	5		

## 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 (AISI 321 and 347)  
 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/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

DC +

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Nb	FN (acc.WRC 1992)
0.02	1.6	0.5	20.0	10.0	0.40	6-12

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)		
				+20°C	-20°C	-120°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350 500	min. 520 min. 550 630	min. 30 min. 25 35	not required not required 80	50	40
AW						

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit		150	100	75
	Net weight/unit (kg)	2.6	4.8	4.4

Identification Imprint: 347-15 / JUNGO 347

Tip Color: brown

Jungo® 347; rev. C-ENZ7-01/02/16

# Jungo® 347

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Ti-, Nb stabilized</b>					
	X6CrNiTi18-10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	1.4552	CF-8C 302	J92710
<b>Non stabilized</b>					
	X4CrNi18-10		1.4301	(TP)304	S30400
	X2CrNi19-11		1.4306	(TP)304L	S30403
		GX5CrNi19-10	1.4308	CF-8	J92600
			1.4312	(TP)304H	S30409

SMAW

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)	- per electrode at max. current - (S)*			E(kJ)	H(kg/h)				
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Arosta® 316L

EMR  
SAHARA®

SMAW

### CLASSIFICATION

AWS A5.4	E316L-16	A-Nr	8	Mat-Nr	1.4430
ISO 3581-A	E 19 12 3 L R 1 2	F-Nr	5		
		9606 FM	5		

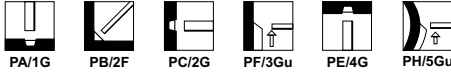
### TEMPERATURE RANGE

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)



### CURRENT TYPE

AC / DC +/-

### APPROVALS

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

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN [acc.WRC 1992]
0.02	0.8	0.8	18.0	11.5	2.85	4-10

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J)		
				+20°C	-20°C	-120°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 450	min. 490 min. 510 580	min. 30 min. 25 39	not required not required	60	40

### PACKAGING AND AVAILABLE SIZES

	Diameter (mm)		Length (mm)				
	1.5	2.0	2.5	3.2	4.0	5.0	
carton box	Pieces / unit	140	200	135	150	90	65
	Net weight/unit (kg)	0.7	2.3	2.7	4.9	4.8	5.0
SRP	Pieces / unit	-	-	69	56	-	-
	Net weight/unit (kg)	-	-	1.4	1.8	-	-
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. C-ENZ-12/05/16

# Arosta® 316L

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
	X2CrNiMoN17-11-2		1.4406	(TP)316LN	S31653
	X2CrNiMoN17-13-3		1.4429		
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
		GX5CrNiMo19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
	X6CrNiNb18-10		1.4550	(TP)347	S34700
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E(kJ)	H(kg/h)			
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
1.5	30A	35A	35A			
2.0	40A	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 pass, DC- is recommended

# Limarosta® 316L

EMR  
SAHARA®

SMAW

### CLASSIFICATION

AWS A5.4	E316L-17	A-Nr	8	Mat-Nr	1.4430
ISO 3581-A	E 19 12 3 L R 12	F-Nr	5		
		9606 FM	5		

### 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]  
Arosta® 316L is recommended for welding root pass

### WELDING POSITIONS (ISO/ASME)



### CURRENT TYPE

AC / DC +/-

### APPROVALS

DNV	LR	RMRS	TÜV
316LH10	316L	316L	+

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN (acc.WRC 1992)
0.02	0.8	1.0	18.0	11.5	2.8	4-10

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm²]	Tensile strength [N/mm²]	Elongation [%]	Impact ISO-V[J]		
				+20°C	-20°C	-105°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320	min. 490 min. 510	min. 30 min. 25	not required not required		
AW	450	580	40	70	60	40

### PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	1.5	2.0	2.5	3.2	4.0	5.0
		Carton + PE foil	Pieces / unit Net weight/unit (kg)	140 0.7	200 2.3	125 2.7	135 4.8
SRP	Pieces / unit Net weight/unit (kg)	- -	57 0.6	65 1.5	52 1.8	28 2.0	22 2.4
Linc Can™	Pieces / unit Net weight/unit (kg)	- -	- -	195 4.3	124 4.3	79 5.3	- -

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

Limarosta® 316L rev. C-EN25-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Limarosta® 316L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
	X2CrNiMoN17-11-2		1.4406	(TP)316LN	S31653
	X2CrNiMoN17-13-3		1.4429		
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
		GX5CrNiMo19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
	X6CrNiNb18-10		1.4550	(TP)347	S34700
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

## CALCULATION DATA

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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
1.5	30A	35A	35A			
2.0	40A	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				

## CLASSIFICATION

AWS A5.4	E316L-15	A-Nr	8	Mat-Nr	1.4430
ISO 3581-A	E 19 12 3 L R 2 1	F-Nr	5		
		9606 FM	5		

## TEMPERATURE RANGE

Pressurized parts : -60...+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 %  
Specially developed for vertical down welding on DC  
Root passes in grooves with root opening  
High general corrosion resistance

## WELDING POSITIONS (ISO/ASME)



PG/3Gd

## CURRENT TYPE

AC/DC +

## APPROVALS

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

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN (acc.WRC 1992)
0.02	0.7	0.85	18.0	11.5	2.8	4-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)		
				+20°C	-20°C	-60°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 500	min. 490 min. 510 620	min. 30 min. 25 35	not required not required 50	45	35

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2
	Length (mm)	300	300
Pieces / unit Net weight/unit (kg)	190	130	
	2.9	3.1	

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

Vertarosta® 316L: rev. C-EN24-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Vertarosta® 316L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
	X2CrNiMoN17-11-2		1.4406	(TP)316LN	S31653
	X2CrNiMoN17-13-3		1.4429		
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
		GX5CrNiMo19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
	X6CrNiNb18-10		1.4550	(TP)347	S34700
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)	- per electrode at max. current - (S)*			E(kJ)	H(kg/h)				
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions PG/3Gdown
2.5	70A
3.2	100A

# Jungo<sup>®</sup> 316L

## CLASSIFICATION

AWS A5.4	E316L-15	A-Nr	8	Mat-Nr	1.4430
ISO 3581-A	E 19 12 3 L B 2 2	F-Nr	5		
		9606 FM	5		

## 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  
High resistance against general and intercrystalline corrosion

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

DC +

## APPROVALS

BV

316LBT

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN [acc.WRC 1992]
0.025	1.6	0.4	18.5	11.0	2.7	4-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	-196°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 450	min. 490 min. 510 650	min. 30 min. 25 35	not required not required 100	
AW					35

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Carton + PE foil	Pieces / unit	135	150	100
	Net weight/unit (kg)	2.7	4.8	4.8
SRP	Pieces / unit	-	56	30
	Net weight/unit (kg)	-	1.8	1.4

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

Jungo 316L: rev. C-EN26-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Jungo® 316L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
	X2CrNiMoN17-11-2		1.4406	(TP)316LN	S31653
	X2CrNiMoN17-13-3		1.4429		
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
		GX5CrNiMo19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
	X6CrNiNb18-10		1.4550	(TP)347	S34700
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

EMR  
SAHARA®

## CLASSIFICATION

AWS A5.4	E316L-17	A-Nr	8	Mat-Nr	1.4430
ISO 3581-A	E 19 12 3 L R 5 3	F-Nr	5		
		9606 FM	5		

## TEMPERATURE RANGE

Pressurized parts : -120...+350°C  
Oxidation resistance : n.a

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F

## CURRENT TYPE

AC / DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN [acc.WRC 1992]
0.02	0.65	1.0	18.0	11.5	2.8	4-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)		
				+20°C	-20°C	-105°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 450	min. 490 min. 510 580	min. 30 min. 25 40	not required not required 70	60	40
AW						

## PACKAGING AND AVAILABLE SIZES

SRP	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	450	450	450
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. C-EN24-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Limarosta® 316L-130

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
	X2CrNiMoN17-11-2		1.4406	(TP)316LN	S31653
	X2CrNiMoN17-13-3		1.4429		
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
		GX5CrNiMo19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
	X6CrNiNb18-10		1.4550	(TP)347	S34700
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)	- per electrode at max. current - (S)*			E(kJ)	H(kg/h)				
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Arosta® 318

## CLASSIFICATION

AWS A5.4	E318-16	A-Nr	8	Mat-Nr	1.4576
ISO 3581-A	E 19 12 3 Nb R 12	F-Nr	5		
		9606 FM	5		

## 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/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +/-

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	Nb	FN (acc.WRC 1992)
0.03	0.8	0.85	18.0	11.5	2.7	0.35	6-12

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				+20°C	-20°C	-60°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350 500	min.550 min. 550 630	min. 25 min. 25 38	not required not required 60	50	35

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit	Net weight/unit (kg)	135	140	90
		2.8	5.0	4.8

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

Arosta® 318: rev. C-EN25-01/02/16

# Arosta® 318

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Medium carbon (C &gt; 0.03%)</b>					
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
		GX5CrNiMo19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
	X6CrNiNb18-10		1.4550	(TP)347	S34700
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal	kg electrodes/ kg weldmetal
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)		B	1/N
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Jungo® 4465

EMR  
SAHARA®

SMAW

### CLASSIFICATION

**AWS A5.4** E310Mo-15\* **A-Nr** 9 **Mat-Nr** 1.4465  
**ISO 3581-A** E 25 22 2 N L B 2 2\* **F-Nr** 5  
 \*:Deviation,see remarks **9606 FM** 5

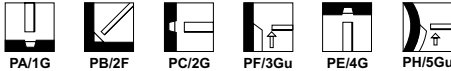
### TEMPERATURE RANGE

**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 oxidizing 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)



### CURRENT TYPE

DC +

### APPROVALS

TÜV

+

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	N	FN (acc.WRC 1992)
0.03	4.5	0.4	25.0	22.0	2.2	0.13	0

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	-196°C
Required: AWS A5.4 ISO 3581-A	not required	min. 550 min. 510	min. 30 min. 25	not required	not required
Typical values AW	400	620	35	90	50

### PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit	Net weight/unit (kg)	135	150	100
		2.8	4.8	4.9

Identification Imprint: JUNG0 4465

Tip Color: yellow

Jungo® 4465: rev. C-EN24-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Jungo<sup>®</sup> 4465

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM / ACl A240/A312/A351	UNS
<b>Fully austenitic CrNiMo corrosion resistant steels</b>				
	X1CrNiMoN25-25-2	1.4465		
	X3CrNiMoTi25-25	1.4577		
	X2CrNi19-11	1.4306	(TP)304L CF-3	S30403 J92500
	X2CrNiN18-10	1.4311	(TP)304LN 310S	S30453 S31008

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

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

Deviations: chemical composition:

Cr = 24.5 - 26.0%

AWS: Cr = 25.0 - 28.0%

Ni = 21.5 - 22.5%

AWS: Ni = 20.0 - 22.0%

Mn = 4.5 - 5.3%

AWS: Mn = 1.0 - 2.5%

EN: Mn = 1.0 - 5.0%

Welding with Heat-Input max. 1.5 kJ/mm

Interpass temperature max. 150°C

# Jungo<sup>®</sup> 4500

## CLASSIFICATION

<b>AWS A5.4</b>	E385-16*	<b>A-Nr</b>	9	<b>Mat-Nr</b>	1.4519
<b>ISO 3581-A</b>	E 20 25 5 Cu N L R 12	<b>F-Nr</b>	5		
	*:Deviation,see remarks	<b>9606 FM</b>	5		

## TEMPERATURE RANGE

Pressurized parts: -60...+400°C  
Oxidation resistance: n.a

## GENERAL DESCRIPTION

A rutile-basic fully austenitic all position electrode

Smooth bead appearance

Easy slag release

Especially developed for applications in phosphoric acid and sulphuric acid and paper mill equipment

Designed for welding alloy 904L

World wide reputation for reliability

Weldable on DC+ polarity

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

DC +

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	Cu	FN (acc.WRC 1992)
0.02	1.2	0.9	20.0	25.0	5.0	1.5	0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)		
				+20°C	-40°C	-60°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 410	min. 520 min. 510 620	min. 30 min. 25 40	not required not required 100	80	50

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit	Pieces / unit	145	185	125
	Net weight/unit (kg)	2.9	5.7	5.9

Identification Imprint: JUNG0 4500

Tip Color: black

Jungo<sup>®</sup> 4500: rev. C-EN25-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Jungo<sup>®</sup> 4500

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr
<b>Fully austenitic NiCrMoCu and CrNiMoCu steels</b>			
	X5NiCrMoCuTi20-18	GX7NiCrMoCuNb25-20	1.4500
			1.4506
		GX2NiCrMoCuN20-18	1.4531
		GX2NiCrMoCuN25-20	1.4536
	X1NiCrMoCu25-20-5	(Alloy 904L)	1.4539
		GX7CrNiMoCuNb18-18	1.4585
	X5NiCrMoCuNb22-18		1.4586

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	70A	70A	70A	60A	80A	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

EMR  
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SMAW

## CLASSIFICATION

<b>AWS A5.4</b>	E2209-16*	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4462
<b>ISO 3581-A</b>	E 22 9 3 N L R 3 2	<b>F-Nr</b>	5		
		<b>9606 FM</b>	5		

## 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/mm<sup>2</sup>  
Weldable on AC and DC  
Also available in vacuum sealed Sahara ReadyPack® (SRP)

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC/DC +/-

## APPROVALS

BV	DNV	GL	RINA	TÜV
2209	+	4462	2209	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	N	FN (acc.WRC 1992)
0.02	0.8	1.0	22.5	9.5	3.2	0.16	30-55

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				+20°C	-30°C	-40°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 450 650	min. 690 min. 550 800	min. 20 min. 20 27	not required not required 60	not required not required 50	not required not required 40

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	4.0	5.0
		350	350	350	350
Carton + PE foil	Pieces / unit	120	152	95	-
	Net weight/unit (kg)	2.6	5.0	4.8	-
SRP	Pieces / unit	69	52	29	24
	Net weight/unit (kg)	1.5	1.8	1.6	2.0

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

Arosta® 4462: rev. C-EN26-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Arosta® 4462

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2/-4	Mat. Nr	ASTM / ACI A240	UNS
Duplex stainless steels	X2CrNiMoN22-5-3	1.4462		S31803
		1.4417		S31500
	X3CrNiMoN27-5-2	1.4460		S31200
	X2CrNiN23-4	1.4362		S32304
	X2CrMnNi21-5-1	1.4162		S32101

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

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
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		65	357	2.8	77.4	20	1.61

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

Welding with Heat-Input max. 2.5 kJ/mm  
 Interpass temperature max. 150°C  
 Deviations chemical composition:  
 Si = 0,4-1,2      AWS = max 1,00

# Jungo® 4462

SMAW

## CLASSIFICATION

<b>AWS A5.4</b>	E2209-15	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4462
<b>ISO 3581-A</b>	E 22 9 3 N L B 2 2	<b>F-Nr</b>	5		
		<b>9606 FM</b>	5		

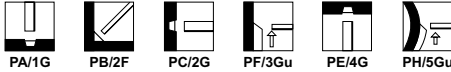
## TEMPERATURE RANGE

Pressurized parts: -50...+250°C  
Oxidation resistance: n.a

## GENERAL DESCRIPTION

A basic electrode for 22% Cr duplex stainless steel welding  
Excellent weldability for filling as well as for root runs  
Applicable up to a service temperature of 250°C  
High resistance to general corrosion, pitting and stress corrosion (PREN ~35)  
High yield strength > 500 N/mm<sup>2</sup>  
Weldable on DC+ polarity  
Also available in vacuum sealed Sahara ReadyPack® (SRP)

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

DC +

## APPROVALS

DNV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	N	FN (acc.WRC 1992)
0.025	1.6	0.5	23.5	9.0	3.0	0.15	30-60

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)				
				+20°C	-20°C	-40°C	-50°C	
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 450 650	min. 690 min. 550 800	min. 20 min. 20 28	not required not required 80		75	70	45
AW								

## PACKAGING AND AVAILABLE SIZES

SRP	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
	Pieces / unit	69	55	30
	Net weight/unit (kg)	1.4	1.8	1.5

Identification Imprint: 2209-15 / JUNG0 4462 Tip Color: red

Jungo® 4462: rev. C-EN26-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Jungo<sup>®</sup> 4462

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2/-4	Mat. Nr	ASTM / ACI A240	UNS
Duplex stainless steels	X2CrNiMoN22 -5-3	1.4462		S31803
		1.4417		S31500
	X3CrNiMoN27-5-2	1.4460		S31200
	X2CrNiN23-4	1.4362		S32304
	X2CrMnNi21-5-1	1.4162		S32101

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

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)	- per electrode at max. current - (S)*			E(kJ)	H(kg/h)				
2.5 x 350	50-80	DC+	74	101	0.62	21.0	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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

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

# Jungo® 309L

## CLASSIFICATION

AWS A5.4	E309L-16	A-Nr	8	Mat-Nr	1.4332
ISO 3581-A	E 23 12 L B 2 2	F-Nr	5		
		9606 FM	5		

## TEMPERATURE RANGE

Pressurized parts : -196...+300°C  
Oxidation 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/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC/DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.025	1.5	0.4	23.0	13.0	10-20

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) -196°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 470	min. 520 min. 510 570	min. 30 min. 25 40	40
AW				

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	4.0	5.0
	Length (mm)	350	350	350
Pieces / unit		117	97	60
	Net weight/unit (kg)	2.4	4.8	4.8

Identification Imprint: 309L-15 / JUNGO 309 L

Tip Color:

Jungo® 309L rev. C-EN07-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Jungo® 309L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Corrosion resistant cladsteels</b>				
	X2CrNiN18-10	1.4311	(TP)304LN	S30453
	X2CrNi19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X4CrNi18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloy steel to CrNi or CrNiMo stainless steel)

Build-up welding on mild and low alloy steel

Buffer layer CrNi-cladsteel

## CALCULATION DATA

Sizes Diam. x length [mm]	Current range [A]	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs [kg]	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - [S]*	E[kJ]	H[kg/h]			
2.5 x 350	40-75	DC+	50	88	0.93	21.0	77	1.61
4.0 x 350	80-150	DC+	64	241	1.8	48.3	31	1.49

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	70A	70A	70A	60A80A	60A	60A
4.0	140A	140A	140A			

# Arosta® 309S

EMR  
SAHARA®

SMAW

## CLASSIFICATION

<b>AWS A5.4</b>	E309L-16	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4332
<b>ISO 3581-A</b>	E 23 12 L R 3 2	<b>F-Nr</b>	5		
		<b>9606 FM</b>	5		

## TEMPERATURE RANGE

Pressurized parts : -120...+300°C  
Oxidation resistance : n.a

## GENERAL DESCRIPTION

A rutile-basic high CrNi alloyed buffer electrode  
For welding stainless steel to mild steel and root runs 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)



## CURRENT TYPE

AC/DC +

## APPROVALS

ABS	BV	RMRS	TÜV
+	309L	SS/CMn	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.02	0.8	0.8	23.5	12.5	12-20

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J)		
				+20°C	-20°C	-120°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 480	min. 520 min. 510 560	min. 30 min. 25 40	not required not required 60	50	40

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.5	3.2	4.0	5.0
		350	350	350	350
Carton + PE foil	Pieces / unit	135	150	100	65
	Net weight/unit (kg)	2.8	5.0	5.0	5.0
SRP	Pieces / unit	69	56	-	-
	Net weight/unit (kg)	1.4	1.9	-	-

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

Arosta 309S: rev. C-EN25-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Arosta® 309S

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Corrosion resistant cladsteels</b>				
	X2CrNi18-10	1.4311	(TP)304LN	S30453
	X2CrNi19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X4CrNi18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloy steel to CrNi or CrNiMo stainless steel)

Build-up welding on mild and low alloy steel

Bufferlayer CrNi-cladsteel

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Limarosta® 309S

EMR  
SAHARA®

SMAW

## CLASSIFICATION

AWS A5.4	E309L-17	A-Nr	8	Mat-Nr	1.4332
ISO 3581-A	E 23 12 L R 3 2	F-Nr	5		
		9606 FM	5		

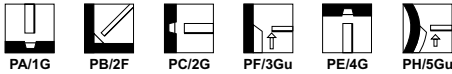
## TEMPERATURE RANGE

Pressurized parts : -20...+300°C  
Oxidation 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)



## CURRENT TYPE

AC/DC +

## APPROVALS

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

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.02	0.8	1.0	23.0	12.5	10-20

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm²)	Tensile strength (N/mm²)	Elongation (%)	Impact ISO-V(J)	
				+20°C	-20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 480	min. 520 min. 510 560	min. 30 min. 25 40	not required not required 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
Carton + PE foil	Pieces / unit	200	125	135	85	55
	Net weight/unit (kg)	2.3	2.8	4.9	5.9	6.0
SRP	Pieces / unit	-	65	50	28	-
	Net weight/unit (kg)	-	1.5	1.8	2.0	-
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. C-EN25-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Limarosta® 309S

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Corrosion resistant cladsteels</b>				
	X2CrNi18-10	1.4311	(TP)304LN	S30453
	X2CrNi19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X4CrNi18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloy steel to CrNi or CrNiMo stainless steel)

Build-up welding on mild and low alloy steel

Bufferlayer CrNi-cladsteel

SMAW

## CALCULATION DATA

Sizes		Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
Diam. x length (mm)	- per electrode at max. current - (S)*			E(kJ)	H(kg/h)				
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 350	100-155	DC+	76	317	2.0	69.9	23	1.64	
5.0 x 350	150-220	DC+	84	575	2.9	108.0	15	1.59	

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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® 309Mo

EMR  
SAHARA®

## CLASSIFICATION

AWS A5.4	E309LMo-16	A-Nr	8	Mat-Nr	1.4459
ISO 3581-A	E 23 12 2 L R 3 2	F-Nr	5		
		9606 FM	5		

## TEMPERATURE RANGE

Pressurized parts: -60...+300°C  
Oxidation 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)



## CURRENT TYPE

AC/DC +

## APPROVALS

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

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN (acc.WRC 1992)
0.02	0.8	0.8	23.0	12.5	2.7	15-25

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)		
				+20°C	-20°C	-60°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350 580	min. 520 min. 550 700	min. 30 min. 25 30	not required not required 57	50	45

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.0	2.5	3.2	4.0	5.0
	Length (mm)	300	350	350	350	450
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. C-EN23-01/02/16-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Arosta® 309Mo

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>First layer in CrNiMo claddings</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
	X2CrNiMoN17-11-2		1.4406	(TP)316LN	S31653
	X2CrNiMoN17-13-3		1.4429		
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X10CrNiMoTi17-3		1.4573	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
		GX5CrNiMo19-11	1.4408		

Welding dissimilar metals: mild steel or low alloy steel to stainless CrNiMo-steel up to max. thickness of 12 mm.

Build-up welding on mild and low alloy steel

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time		Energy		Dep. rate		Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*		E(kJ)		H(kg/h)				
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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			

## CLASSIFICATION

AWS A5.4	E308LMo-16	A-Nr	8	Mat-Nr	1.4431
ISO 3581-A	E 20 10 3 R 3 2	F-Nr	5		
		9606 FM	5		

## TEMPERATURE RANGE

Pressurized parts : -20...+300°C  
Oxidation 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/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC/DC +

## APPROVALS

BV	DNV	GL	TÜV	DB
UP	308Mo	4431	+	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN (acc.WRC 1992)
0.025	0.8	1.0	20.0	9.5	2.3	20

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	-20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 400 500	min. 520 min. 620 720	min. 35 min. 20 30	not required not required 70	
AW					60

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit		135	150	100
	Net weight/unit (kg)	2.7	4.9	5.0

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

Nichroma: rev. C-ENZ-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Nichroma

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>First layer in CrNiMo claddings</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
	X2CrNiMoN17-11-2		1.4406	(TP)316LN	S31653
	X2CrNiMoN17-13-3		1.4429		
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X10CrNiMoTi17-3		1.4573	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
		GX5CrNiMo19-11	1.4408		

Welding dissimilar metals: mild steel and low alloy steel to stainless CrNi and CrNiMo-steel

Build-up welding on mild and low alloy steel

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
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 450	140 - 220	DC+	66	365	2.8	78.4	19	1.52

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

EMR  
SAHARA®

SMAW

## CLASSIFICATION

<b>AWS A5.4</b>	E309Mo-26	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4459
<b>ISO 3581-A</b>	E 23 12 2 LR 53*	<b>F-Nr</b>	5		
*:Deviation,see remarks		<b>9606 FM</b>	5		

## TEMPERATURE RANGE

Pressurized parts : -20...+300°C  
Oxidation 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 Metal can be used  
High deposition rates  
Smooth bead appearance and easy slag release  
Weldable on AC and DC+ polarity

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F

## CURRENT TYPE

AC/DC +

## APPROVALS

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

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN (acc.WRC 1992)
0.05	0.7	1.0	23.7	12.8	2.4	15

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				+20°C	-20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350 550	min. 550 min. 550 740	min. 30 min. 25 28	not required not required 50	
AW					45

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	3.2	4.0
	Length (mm)	450	450
Pieces / unit	Net weight/unit (kg)	90	55
		6.1	5.9

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

Nichroma 160: rev. C-EN25-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Nichroma 160

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>First layer in CrNiMo claddings</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L	S31603
	CF-3M	J92800			
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X10CrNiMoTi17-3		1.4573	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
		GX5CrNiMo19-11	1.4408		

Welding dissimilar metals: mild steel or low alloy steel to stainless CrNiMo-steel up to max. thickness of 12 mm.

Build-up welding on mild and low alloy steel

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time (s)*	Energy - per electrode at max. current - 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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

Deviations: chemical composition

C = max. 0.05%

EN: C = max. 0.04%

# Limarosta® 312

EMR  
SAHARA®

SMAW

## CLASSIFICATION

<b>AWS A5.4</b>	E312-17	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4337
<b>ISO 3581-A</b>	E 29 9 R 12	<b>F-Nr</b>	5		
		<b>9606 FM</b>	5		

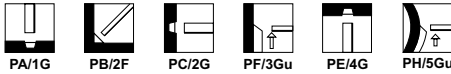
## TEMPERATURE RANGE

**Pressurized parts:** -10...+350°C  
**Oxidation 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)



## CURRENT TYPE

AC/DC +

## APPROVALS

DB

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni
0.11	0.9	1.0	29.0	9.0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V[J] +20°C
Required: AWS 5.4 ISO 3581-A Typical values	not required min. 450 700	min. 660 min. 650 800	min. 22 min. 15 20	not required not required 50
AW				

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.0	2.5	3.2	4.0
	Length (mm)	300	350	350	350
<b>Carton + PE foil</b>	Pieces / unit	175	125	150	100
	Net weight/unit (kg)	2.2	2.6	5.0	5.0
<b>SRP</b>	Pieces / unit	-	69	52	31
	Net weight/unit (kg)	-	1.5	1.8	1.5
<b>Linc Pack</b>	Pieces / unit	-	48	30	-
	Net weight/unit (kg)	-	1.0	1.0	-

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

Limarosta®312: rev. C-EN26-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Limarosta® 312

## EXAMPLES OF 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

SMAW

## CALCULATION DATA

Sizes		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
Diam. x length [mm]	Current range [A]							
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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Arosta® 307

EMR  
SAHARA®

## CLASSIFICATION

**AWS A5.4** E307-16\*      **A-Nr** 8      **Mat-Nr** 1.4370  
**ISO 3581-A** E 18 8 Mn R 12      **F-Nr** 5  
 \*:Deviation,see remarks      **9606 FM** 5

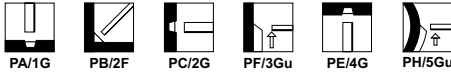
## TEMPERATURE RANGE

**Pressurized parts** :-60...+350°C  
**Oxidation resistance** : n.a

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC/DC +

## APPROVALS

**TÜV**      **DB**  
 +      +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.09	5.0	0.6	18.5	8.5	0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm²]	Tensile strength [N/mm²]	Elongation [%]	Impact ISO-V[J]	
				+20°C	-60°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350 450	min. 590 min. 500 650	min. 30 min. 25 35	not required not required 110	- 75

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit	Net weight/unit (kg)	125	135	85
		2.6	4.7	4.6

Identification    Imprint: AROSTA 307

Tip Color: dark blue

Arosta®307: rev. C-EN23-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Arosta® 307

## EXAMPLES OF 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 joints
- Problem steels

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

Deviations: chemical composition

Mn = 4.5 - 6.0%

AWS: Mn = 3.30 - 4.75%

# Arosta® 307-160

## CLASSIFICATION

<b>AWS A5.4</b>	E307-26*	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4370
<b>ISO 3581-A</b>	E 18 8 Mn R 5 3	<b>F-Nr</b>	5		
* Nearest classification, see remarks		<b>9606 FM</b>	5		

## 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	6.0	1.0	18.0	8.0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				+20°C	-10°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350	min. 590 min. 500	min. 30 min. 25	not required not required	
AW	425	650	35	85	60

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	3.2	4.0
	Length (mm)	350	450
Pieces / unit	Pieces / unit	94	62
	Net weight/unit (kg)	4.7	6.0

Identification Imprint: AROSTA 307-160 Tip Color: red

Arosta® 307-160: rev. C-EN06-01/02/16

# Arosta® 307-160

## EXAMPLES OF 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	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			[S]*	E(kJ)	H(kg/h)			
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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

## REMARKS / APPLICATION ADVICE

Deviations: chemical composition

Mn = 4.5 - 7.5%

Cr = 17.0 - 20.0%

Ni = 7.0 - 10.0%

AWS: Mn = 3.30 - 4.75%

AWS: Cr = 18.0 - 21.5%

AWS: Ni = 9.0 - 10.7%

# Jungo® 307

SMAW

## CLASSIFICATION

**AWS A5.4** E307-15\*      **A-Nr** 8      **Mat-Nr** 1.4370  
**ISO 3581-A** E 18 8 Mn B 2 2      **F-Nr** 5  
 \*:Deviation,see remarks      **9606 FM** 5

## TEMPERATURE RANGE

**Pressurized parts** : -120...+350°C  
**Oxidation resistance** : n.a

## GENERAL DESCRIPTION

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

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC/DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni
0.08	5.5	0.3	19.0	8.5

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				+20°C	-120°C
Required: AWS A5.4 ISO 3581-A	not required	min. 590 min. 500	min. 30 min. 25	not required	not required
Typical values      AW	500	650	35	100	35

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	3.2	4.0
	Length (mm)	350	450
Carton + PE foil	Pieces / unit	170	110
	Net weight/unit (kg)	5.0	6.5
SRP	Pieces / unit	56	-
	Net weight/unit (kg)	1.8	-

Identification      Imprint: JUNGO 307

Tip Color: silver

Jungo 307- rev. C-ENZ-01/02/16

# Jungo<sup>®</sup> 307

## EXAMPLES OF 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 joints
- Problem steels

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time - per electrode at max. current - (S)*	Energy E(kJ)	Dep. rate H(kg/h)	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions			
	PA/1G	PB/2F	PC/2G	PF/3Gup
3.2	90A	90A	90A	70A
4.0	140A	115A	130A	95A

## REMARKS / APPLICATION ADVICE

Deviations: chemical composition

Mn = 4.5 - 6.5%

Ni = 7.5 - 9.5%

AWS: Mn = 3.30 - 4.75%

AWS: Ni = 9.0 - 10.7%

# Arosta® 304H

## CLASSIFICATION

<b>AWS A5.4</b>	E308H-16	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4829
<b>ISO 3581-A</b>	E 19 9 H R 12	<b>F-Nr</b>	5		
		<b>9606 FM</b>	5		

## TEMPERATURE RANGE

Pressurized parts : -20...+730°C  
Oxidation 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 Mat. Nr 1.4948  
Low sensitivity to precipitation of intermetallic phases  
Weldable on AC and DC  
Petrochemical and chemical industry

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC/DC +/-

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.05	0.75	0.85	18.5	9.5	3-7

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	-20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350	min. 550 min. 550 600	min. 35 min. 30 44	not required not required 85	50
AW	450				

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
		Length (mm)	350	350
Pieces / unit	Pieces / unit	145	150	100
	Net weight/unit (kg)	2.8	4.8	4.9

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

Arosta® 304H: rev. C-EN25-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Arosta® 304H

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI	UNS
<b>Medium carbon [C &gt;0.03%]</b>					302
	X4CrNi18-10		1.4301	(TP)304 (TP)304H	S30400 S30409
		GX5CrNi19-10	1.4308 1.4948	CF8	J92600
<b>Ti-, Nb stabilized</b>					
	X6CrNiTi18-10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## CALCULATION DATA

Sizes	Current range	Current type	Arc time	Energy	Dep. rate	Weight/	Electrodes/	kg electrodes/
Diam. x length	[A]		- per electrode at max. current -	- per electrode at max. current -	- per electrode at max. current -	1000 pcs	kg weldmetal	kg weldmetal
[mm]			[S]*	E[kJ]	H[kg/h]	[kg]	B	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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A
4.0	140A	140A	140A	80A		

# Arosta® 309H

SMAW

## CLASSIFICATION

<b>AWS A5.4</b>	E309H-16*	<b>A-Nr</b>	8	<b>Mat-Nr</b>	1.4829
<b>ISO 3581-A</b>	E 23 12 R 3 2*	<b>F-Nr</b>	5		
*:Deviation, see remarks		<b>9606 FM</b>	5		

## TEMPERATURE RANGE

Pressurized parts : -10...+400°C  
Oxidation resistance : to 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/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC/DC +/-

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.10	0.8	1.6	22.0	11.0	3-8

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350	min. 550 min. 550	min. 30 min. 25 30	not required not required	50
AW	500	700			

## PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2
	Length (mm)	350	350
Pieces / unit	Net weight/unit (kg)	120	130
		2.6	4.8

Identification Imprint: AROSTA 309 H Tip Color: yellow

Arosta® 309H: rev. C-EN25-01/02/16

# Arosta® 309H

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI	UNS
		GX30CrSi6	1.4710		
	X10CrAl7		1.4713	502	
	X10CrAl13		1.4724	410/414-TP405-CA15	
		GX40CrSi13	1.4729		
		GX40CrSi17	1.4740		
	X10CrAl18		1.4742	430-TP430-CB30	
	X10CrAl24		1.4762	TP443	
		GX25CrNiSi18-9	1.4825		J92502
		GX40CrNiSi22-9	1.4826		
	X15CrNiSi20-12		1.4828	TP309	S30900
		GX25CrNiSi20-14	1.4832		
	X12CrNiTi18-9				

## CALCULATION DATA

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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	70A	70A	70A	60A	60A	60A
3.2	100A	100A	100A	70A	70A	70A

## REMARKS / APPLICATION ADVICE

Deviations: chemical composition

Si = max. 2.0%

Cr = 20.0 - 23.0%

Ni = 10.0 - 13.0%

AWS: Si = max. 1.0%

AWS: Cr = 22.0 - 25.0%

AWS: Ni = 12.0 - 14.0%

EN: Si = max. 1.2%

# Intherma® 310

EMR  
SAHARA®

SMAW

### CLASSIFICATION

AWS A5.4	E310-16	A-Nr	9	Mat-Nr	1.4842
ISO 3581-A	E 25 20 R 12	F-Nr	5		
		9606 FM	5		

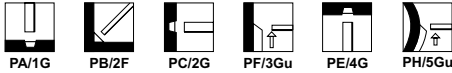
### TEMPERATURE RANGE

Pressurized parts : -20...+400°C  
Oxidation resistance : to 1200°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 1200°C  
Weldable on AC and DC

### WELDING POSITIONS (ISO/ASME)



### CURRENT TYPE

AC/DC +

### CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.12	2.5	0.5	26.0	20.5	0

### MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) +20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 350 440	min. 550 min. 550 600	min. 30 min. 20 30	not required not required 80
AW				

### PACKAGING AND AVAILABLE SIZES

Carton + PE foil	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit	Net weight/unit (kg)	145	150	100
		3.0	5.1	5.1

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

Intherma®310: rev. C-EN25-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Intherma® 310

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/AISI A240/A351	UNS
<b>Heat resisting steels</b>					
	X10CrAl24		1.4762		
		GX25CrNiSi18-9	1.4825		
		GX40CrNiSi22-9	1.4826		
	X15CrNiSi20-12		1.4828		
		GX25CrNiSi20-14	1.4832		
	X15CrNiSi25-20		1.4841	310S	S31008
				CK20	J94202
	X12CrNi25-21		1.4845		
		GX40CrNiSi25-20	1.4848	HK40	

SMAW

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
2.5 x 350	80-110	DC+	50	84	0.74	18.9	97	1.83
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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	100A	100A	100A	90A	90A	90A
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

## CLASSIFICATION

AWS A5.4 E310-15\*      A-Nr 9      Mat-Nr 1.4842  
 ISO 3581-A E 25 20 B 12      F-Nr 5  
 \*:Deviation, see remarks      9606 FM 5

## TEMPERATURE RANGE

Pressurized parts: -20...+400°C  
 Oxidation resistance: to 1200°C

## 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 1200°C  
 Avoid service temperatures between 650 - 850°C  
 Weldable on DC only

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G

## CURRENT TYPE

DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.1	3.0	0.3	25.0	21.0	0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) +20°C
Required: AWS A5.4 ISO 3581-A	not required	min. 550	min. 30	not required
Typical values	AW 440	min. 350 600	min. 20 30	not required 100

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Carton + PE foil	Pieces / unit	135	150	100
	Net weight/unit (kg)	2.4	4.3	4.3

Identification    Imprint: INTHERMA 310 B    Tip Color: dark green

Intherma®310B; rev. C-EN24-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Intherma® 310B

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A351	UNS
<b>Heat resisting steels</b>					
	X10CrAl24		1.4762		
		GX25CrNiSi18-9	1.4825		
		GX40CrNiSi22-9	1.4826		
	X15CrNiSi20-12		1.4828		
		GX25CrNiSi20-14	1.4832		
	X15CrNiSi25-20		1.4841	310S	S31008
			1.4832	CK20	J94202
	X12CrNi25-21		1.4845		
		GX40CrNiSi25-20	1.4848	HK40	

SMAW

## CALCULATION DATA

### Sizes

Diam. x length (mm)	Current range (A)
2.5 x 350	60-70
3.2 x 350	80-90
4.0 x 350	110-130

\*Stub end 35mm

## REMARKS / APPLICATION ADVICE

Deviations: chemical composition

Mn = max. 5.0%

AWS: Mn = 1.0 - 2.5%

Welding with Heat-Input max. 1.5 kJ/mm

Interpass temperature max. 100°C

# Linux P 308L

**CLASSIFICATION**

AWS A5.4	E308L-16	A-Nr	8	Mat-Nr	1.4316
ISO 3581-A	E 19 9 L R 3 2	F-Nr	5		
		9606 FM	5		

**TEMPERATURE RANGE**

Pressurized parts :-196...+350°C  
 Oxidation resistance :to 800°C

**GENERAL DESCRIPTION**

A rutile stainless steel electrode for 304L or equivalent steels  
 All positional welding including fixed pipework  
 Smooth weld appearance  
 Minimum spatter and high resistance to porosity  
 Good side wall wetting, no undercut  
 Easy slag removal  
 Weldable on AC and DC  
 Also available in PROTECH™ Vacuum Pack

**WELDING POSITIONS (ISO/ASME)**


PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

**CURRENT TYPE**

AC / DC +

**APPROVALS**

ABS	TÜV
+	+

**CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL**

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.025	0.8	0.6	19.0	9.5	3-10

**MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL**

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation [%]	Impact ISO-V(J) -100°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 310 450	min. 520 min. 510 590	min. 35 min. 30 45	35

**PACKAGING AND AVAILABLE SIZES**

	Diameter (mm)	2.0	2.5	3.2	4.0
	Length (mm)	300	350	350	450
Carton + PE foil	Pieces / unit	194	119	82	55
	Net weight/unit (kg)	2.13	2.38	2.7	3.59
Protech™	Pieces / unit	158	110	70	46
	Net weight/unit (kg)	1.74	2.2	2.33	3.0

Identification Imprint: 308L-16 / LINOX P 308L Tip Color: none

LinuxP308L: rev. C-EN01-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# Linux P 308L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>	X2CrNi19-11		1.4306	(TP)304L CF-3	S30403 J92500
<b>Medium carbon [C &gt;0.03%]</b>	X4CrNi18-10		1.4301 1.4308	(TP)304 CF 8	S30409 J92600
<b>Ti-, Nb stabilized</b>	X6CrNiTi18-10	GX5CrNi19-10	1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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		

# Linux 308L

SMAW

## CLASSIFICATION

AWS A5.4	E308L-17	A-Nr	8	Mat-Nr	1.4316
ISO 3581-A	E 19 9 L R 3 2	F-Nr	5		
		9606 FM	5		

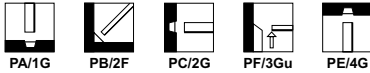
## TEMPERATURE RANGE

Pressurized parts :-196...+350°C  
Oxidation resistance :to 800°C

## GENERAL DESCRIPTION

A rutile stainless steel electrode for 304L or equivalent steels  
Smooth weld appearance  
Minimum spatter and high resistance to porosity  
Good side wall wetting, no undercut  
Easy slag removal  
Weldable on AC and DC  
Also available in PROTECH™ Vacuum Pack

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC / DC +

## APPROVALS

ABS	DNV	TÜV
+	Pending	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.025	0.8	0.8	19.0	9.5	3-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	-20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 310 450	min. 520 min. 510 590	min. 35 min. 30 45	not required not required 70	- 50

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.0	2.5	3.2	4.0	5.0
		300	350	350	450	450
Carton + PE foil	Pieces / unit	196	120	80	55	32
	Net weight/unit (kg)	2.3	2.53	2.78	3.69	3.43
Protech™	Pieces / unit	160	110	69	45	30
	Net weight/unit (kg)	1.84	2.32	2.4	3.09	3.2

Identification Imprint: 308L-17 / LINOX 308 L Tip Color: none

Linux308L:rev. C-EN03-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

# Linux 308L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNi19-11		1.4306	(TP)304L CF-3	S30403 J92500
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNi18-10		1.4301	(TP)304	S30409
		GX5CrNi19-10	1.4308	CF 8	J92600
<b>Ti-, Nb stabilized</b>					
	X6CrNiTi18-10		1.4541	(TP)321 (TP)321H	S32100 S32109
	X6CrNiNb18-10		1.4550	(TP)347 (TP)347H	S34700 S34709
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Linux P 316L

SMAW

## CLASSIFICATION

AWS A5.4 E308L-16 A-Nr 8 Mat-Nr 1.4430  
 ISO 3581-A E 19 12 3 L R 3 2 F-Nr 5  
 9606 FM 5

## TEMPERATURE RANGE

Pressurized parts :-120...+350°C  
 Oxidation resistance : n.a

## GENERAL DESCRIPTION

A rutile stainless steel electrode for 316L or equivalent steels  
 All positional welding including fixed pipework  
 Smooth weld appearance  
 Minimum spatter and high resistance to porosity  
 Good side wall wetting, no undercut  
 Easy slag removal  
 Weldable on AC and DC  
 Also available in PROTECH™ Vacuum Pack

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC +

## APPROVALS

ABS TÜV  
 + +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	FN [acc.WRC 1992]
0.025	0.8	0.6	19.0	12.0	2.5	3-10

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V[J]	
				+20°C	-105°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 480	min. 520 min. 510 580	min. 30 min. 25 41	not required not required 70	not required not required 40

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm) Length (mm)	2.0	2.5	3.2	4.0	5.0
		300	350	350	450	450
Carton + PE foil	Pieces / unit	195	119	79	55	32
	Net weight/unit (kg)	2.15	2.41	2.7	3.62	3.29
Protech™	Pieces / unit	159	110	70	46	28
	Net weight/unit (kg)	1.75	2.21	2.34	3.05	3.11

Identification Imprint: 316L-16 / LINOX P 316L Tip Color: none

LinuxP316L.rev.C-EN02-01/02/16

# Linux P 316L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
		GX5CrNiMo19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
	X6CrNiNb18-10		1.4550	(TP)347	S34700
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.0	40A	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			

# Linux 316L

**CLASSIFICATION**

AWS A5.4	E316L-17	A-Nr	8	Mat-Nr	1.4430
ISO 3581-A	E 19 12 3 L R 3 2	F-Nr	5		
		9606 FM	5		

**TEMPERATURE RANGE**

Pressurized parts :-120...+350°C  
 Oxidation resistance : n.a

**GENERAL DESCRIPTION**

A rutile-basic stainless steel electrode for 316L or equivalent steels  
 Smooth weld appearance  
 Minimum spatter and high resistance to porosity  
 Good side wall wetting, no undercut  
 Easy slag removal  
 Weldable on AC and DC  
 Also available in PROTECH™ Vacuum Pack

**WELDING POSITIONS (ISO/ASME)**


PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G

**CURRENT TYPE**

AC / DC +

**APPROVALS**

ABS	DNV	TÜV
+	Pending	+

**CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL**

C	Mn	Si	Cr	Ni	Mo	FN (acc.WRC 1992)
0.025	0.8	0.8	18.0	12.0	2.5	3-10

**MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL**

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	-105°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320 480	min. 490 min. 510 600	min. 30 min. 25 42	not required not required 70	40

**PACKAGING AND AVAILABLE SIZES**

	Diameter (mm) Length (mm)	2.0	2.5	3.2	4.0	5.0
		300	350	350	450	450
Carton + PE foil	Pieces / unit	196	120	80	55	31
	Net weight/unit (kg)	2.3	2.53	2.78	3.75	3.41
Protech™	Pieces / unit	160	110	69	46	28
	Net weight/unit (kg)	1.84	2.32	2.4	3.12	3.08

Identification Imprint: 316L-17 / LINOX 316 L Tip Color: none

Linux316L.rev.C-EN03-01/02/16

# Linux 316L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	EN 10213-4	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Extra low carbon [C &lt;0.03%]</b>					
	X2CrNiMo17-12-2		1.4404	(TP)316L CF-3M	S31603 J92800
	X2CrNiMo18-14-3		1.4435	(TP)316L	S31603
<b>Medium carbon [C &gt;0.03%]</b>					
	X4CrNiMo17-12-2		1.4401	(TP)316	S31600
	X4CrNiMo17-13-3		1.4436		
		GX5CrNiMo19-11	1.4408	CF 8M	J92900
<b>Ti-, Nb stabilized</b>					
	X6CrNiMoTi17-12-2		1.4571	316Ti	S31635
	X6CrNiMoNb17-12-2		1.4580	316Cb	S31640
	X6CrNiNb18-10		1.4550	(TP)347	S34700
		GX5CrNiNb19-10	1.4552	CF-8C	J92710

SMAW

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Linux P 309L

**CLASSIFICATION**

AWS A5.4	E316L-16	A-Nr	8	Mat-Nr	1.4332
ISO 3581-A	E 23 12 L R 3 2	F-Nr	5		
		9606 FM	5		

**TEMPERATURE RANGE**

Pressurized parts :-20...+350°C  
 Oxidation resistance : n.a

**GENERAL DESCRIPTION**

A rutile all position CrNi over-alloyed buffer electrode  
 All positional welding including fixed pipework  
 Suitable for welding stainless steel to mild and low alloy steels, stainless steel cladding  
 Smooth weld appearance  
 Minimum spatter and high resistance to porosity  
 Good side wall wetting, no undercut  
 Easy slag removal  
 Weldable on AC and DC  
 Also available in PROTECH™ Vacuum Pack

**WELDING POSITIONS (ISO/ASME)**


PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

**CURRENT TYPE**

AC/DC +

**APPROVALS**

ABS	TÜV
-----	-----

+	+
---	---

**CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL**

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.025	0.8	0.6	23.5	13.0	8-20

**MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL**

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J) -20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 320	min. 520 min. 510	min. 30 min. 25	not required not required
AW	495	595	41	45

**PACKAGING AND AVAILABLE SIZES**

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	450
<b>Carton + PE foil</b>	Pieces / unit	119	80	55
	Net weight/unit (kg)	2.49	2.8	3.76
<b>Protech™</b>	Pieces / unit	110	70	46
	Net weight/unit (kg)	2.31	2.42	3.15

Identification Imprint: 309L-17 / LINOX P 309L Tip Color: none

LinuxP309L: rev. C-EN01-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
 Fumes: Safety Data Sheets (SDS) are available on our website.

# Lincoln P 309L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Corrosion resistant cladsteels</b>				
	X2CrNi18-10	1.4311	(TP)304LN	S30453
	X2CrNi19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X4CrNi18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloy steel to CrNi or CrNiMo stainless steel)

Build-up welding on mild and low alloy steel

Bufferlayer CrNi-cladsteel

SMAW

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# Linux 309L

**CLASSIFICATION**

AWS A5.4	E309L-17	A-Nr	8	Mat-Nr	1.4332
ISO 3581-A	E 23 12 L R 3 2	F-Nr	5		
		9606 FM	5		

**TEMPERATURE RANGE**

Pressurized parts : +20...+300°C  
 Oxidation resistance : n.a

**GENERAL DESCRIPTION**

A rutile all position CrNi over-alloyed buffer electrode  
 Suitable for welding stainless steel to mild and low alloy steels, stainless steel cladding  
 Smooth weld appearance  
 Minimum spatter and high resistance to porosity  
 Good side wall wetting, no undercut  
 Easy slag removal  
 Weldable on AC and DC  
 Also available in PROTECH™ Vacuum Pack

**WELDING POSITIONS (ISO/ASME)**


PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G

**CURRENT TYPE**

AC/DC +

**APPROVALS**

ABS	DNV	TÜV
+	Pending	+

**CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL**

C	Mn	Si	Cr	Ni	FN (acc.WRC 1992)
0.025	0.7	0.7	24.0	12.5	8-20

**MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL**

	Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
					+20°C	-20°C
Required: AWS A5.4 ISO 3581-A	AW	not required	min. 520	min. 30	not required	
Typical values		min. 320	min. 510	min. 25	not required	
		500	620	40	55	40

**PACKAGING AND AVAILABLE SIZES**

	Diameter (mm)	2.5	3.2	4.0
		Length (mm)	350	350
Carton + PE foil	Pieces / unit	120	80	58
	Net weight/unit (kg)	2.59	2.9	4.12
Protech™	Pieces / unit	110	69	45
	Net weight/unit (kg)	2.37	2.5	3.2

Identification Imprint: 309L-17 / LINOX 309 L Tip Color: none

Linux309L.rev.C-EN02-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
 Fumes: Safety Data Sheets (SDS) are available on our website.

# Lincoln 309L

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10088-1/-2	Mat. Nr	ASTM/ACI A240/A312/A351	UNS
<b>Corrosion resistant cladsteels</b>				
	X2CrNi18-10	1.4311	(TP)304LN	S30453
	X2CrNi19-11	1.4306	(TP)304L	S30403
			CF-3	J92500
	X4CrNi18-10	1.4301	(TP)304	S30400

Dissimilar metals (mild and low alloy steel to CrNi or CrNiMo stainless steel)

Build-up welding on mild and low alloy steel

Bufferlayer CrNi-cladsteel

SMAW

## WELDING PARAMETERS, OPTIMUM FILL PASSES

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

# NiCro 31/27

SMAW

## CLASSIFICATION

<b>AWS A5.4</b>	E383-16*	<b>A-Nr</b>	9	<b>Mat-Nr</b>	1.4563
<b>ISO 3581-A</b>	E 27 31 4 Cu L R 12	<b>F-Nr</b>	5		
* nearest classification		<b>9606 FM</b>	5		

## 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)



## CURRENT TYPE

AC/DC +

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	Cu	Fe	FN [acc.WRC 1992]
0.02	0.8	0.9	271	31.0	3.5	0.9	bal.	0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) +20°C
Required: AWS A5.4 ISO 3581-A Typical values	not required min. 240 440	min. 520 min. 500 640	min. 30 min. 25 38	not required not required 70
AW				

## PACKAGING AND AVAILABLE SIZES

	Diameter [mm]	Length [mm]
	2.5	350
	3.2	350
	4.0	350
PE-Tube	Pieces / unit	Net weight/unit [kg]
	91	1.8
	66	2.0
	45	2.0

Identification Imprint: NiCro 31/27 Tip Color: orange

NiCro 31/27: rev. C-EN26-01/02/16

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 Fumes: Safety Data Sheets (SDS) are available on our website.

# NiCro 31/27

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	Standard	Type	Mat. Nr	ASTM/ACI	UNS
Copper alloyed CrNiMo and NiCrMo steels	EN 10088-1/-2	X1NiCrMoCu31-27-4	1.4563	Alloy 28	N08028
		X1NiCrMoCu25-20-5	1.4539	Alloy 904L	N08904

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
2.5 x 350	45-70	DC+	52	95	0.84	21.3	83	1.75
3.2 x 350	70-95	DC+	56	132	1.3	31.2	48	1.49
4.0 x 350	110-150	DC+	53	198	2.0	46.0	34	1.56

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	65A	70A	70A	70A	60A	60A
3.2	95A	95A	95A	95A	80A	80A
4.0	120A	120A				

## REMARKS / APPLICATION ADVICE

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

# NiCr 60/20

SMAW

## CLASSIFICATION

<b>AWS A5.11</b>	ENiCrMo-3	<b>A-Nr</b>	-	<b>Mat-Nr</b>	2.4621
<b>ISO 14172</b>	E Ni 6625 (NiCr22Mo9Nb)	<b>F-Nr</b>	43		
		<b>9606 FM</b>	6		

## 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)



## CURRENT TYPE

DC +

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	Nb	Fe
0.03	0.5	0.35	22.0	62.0	9.0	3.4	0.9

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	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	510	770	44	92

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	Length (mm)	2.5	3.2	4.0
<b>PE-Tube</b>	<b>Pieces / unit</b>		94	61	45
	<b>Net weight/unit (kg)</b>		1.6	1.7	2.1

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

NiCr 60/20: rev. C-EN23-01/02/16

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# NiCro 60/20

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	DIN/EN	Mat. Nr	ASTM/ACI	UNS
<b>NiCrMo-steel type alloy 625 and welding dissimilar high NiCrMo-steels for corrosion and heat resisting purposes</b>				
	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
<b>Low alloy steels</b>				
	10Ni14 (3.5% Ni)	1,5637	ASTM A333 Grade 3	-
	12Ni19, X12Ni5	1,5680	-	K41583
<b>9% Ni steel for LNG storage tanks</b>				
	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 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+	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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

# NiCro 70/15

SMAW

## CLASSIFICATION

<b>AWS A5.11</b>	ENiCrFe-2*	<b>A-Nr</b>	-	<b>Mat-Nr</b>	2.4807
<b>ISO 14172</b>	E Ni 6182* (NiCr15Fe6Mn)	<b>F-Nr</b>	43		
*:Deviation,see remarks		<b>9606 FM</b>	6		

## 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/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

DC +

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Nb	Fe
0.02	4.4	0.45	18.0	bal.	1.9	6

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
					+20°C	-196°C
Required: AWS A5.11 ISO 14172 Typical values	AW	not required min. 360 430	min. 550 min. 550 680	min. 30 min. 27 40	not required not required 145	130

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	300	350
PE-Tube	Pieces / unit	90	57	43
	Net weight/unit (kg)	1.6	1.9	2.0

Identification Imprint: NiCro 70/15 Tip Color: silver

NiCro 70/15: rev. C-EN24-01/02/16

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# NiCro 70/15

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	BS 3076	DIN 17742 SEW 470/595	Mat. Nr	ASTM / ACI B366	UNS
<b>Ni base on Cr alloyed steels for high and low temperature service</b>					
		LC-NiCr15Fe	2.4817		N06600
	NA14	NiCr15Fe	2.4816	Alloy600/B168	N06600
		NiCr23Fe	2.4851	Alloy601(H)	N06601
		NiCr60-15	2.4867		N06004
		NiCr80-20	2.4869		N06003
		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 alloy steel to stainless steel
- Mild- and low alloy steel to Ni base alloys
- Stainless steel to low alloy 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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
2.5	60A	55A	60A	60A	60A	60A
3.2	90A	80A	85A	80A	80A	80A
4.0	120A	120A				

## REMARKS / APPLICATION ADVICE

Deviations: chemical composition

Mn = 3.0 - 6.0%

Cr = max. 18.0%

Welding with Heat-Input max. 1.5 kJ/mm

Interpass temperature max. 150°C

AWS: Mn = 1.0 - 3.5%

AWS: Cr = max. 17.0%

ISO: Mn = 5.0 - 10%

ISO: Cr = max. 17%

# NiCro 70/15Mn

SMAW

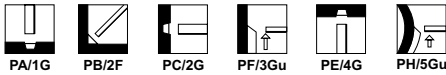
## CLASSIFICATION

<b>AWS A5.11</b>	ENiCrFe-3	<b>A-Nr</b>	-	<b>Mat-Nr</b>	2.4620
<b>ISO 14172</b>	E Ni 6182 (NiCr15Fe6Mn)	<b>F-Nr</b>	43		
		<b>9606 FM</b>	6		

## 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)



## CURRENT TYPE

DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Nb	S	Fe
0.025	5.5	0.4	16.0	bal.	2.0	0.01	6.5

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J) -196°C
Required: AWS A5.11 ISO 14172 Typical values	not required min. 360 400	min. 550 min. 550 630	min. 30 min. 27 40	not required not required 125

## PACKAGING AND AVAILABLE SIZES

	Diameter [mm]	2.5	3.2	4.0
	Length [mm]	300	300	350
<b>PE-Tube</b>	Pieces / unit	91	57	39
	Net weight/unit [kg]	1.6	1.7	1.9

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

NiCro 70/15Mn; rev. C-EN24-01/02/16

# NiCro 70/15Mn

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	BS 3076	DIN 17742 SEW 470/595	Mat. Nr	ASTM / ACI B366	UNS
<b>Ni base on Cr alloyed steels for high and low temperature service</b>					
		LC-NiCr15Fe	2.4817		N06600
	NA14	NiCr15Fe	2.4816	Alloy600/B168	N06600
		NiCr23Fe	2.4851	Alloy601(H)	N06601
		NiCr60-15	2.4867		N06004
		NiCr80-20	2.4869		N06003
		NiCr20Ti	2.4951	Alloy75	N06075
		NiCr20TiAl	2.4952	Alloy80A	N07080
	NA17	X12NiCrSi36-16	1.4864	330	N08330
		GX10NiCrNb32-20	1.4859		
	NA15	X10NiCrAlTi32-20	1.4876	Alloy800/800H	N08800/ N08810

Suitable for welding dissimilar metals:

- Mild- and low alloy steel to stainless steel
- Mild- and low alloy steel to Ni base alloys
- Stainless steel to low alloy creep resisting steel

Not sensitive for embrittlement after heat treatment

## CALCULATION DATA

Sizes Diam. x length [mm]	Current range [A]	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs [kg]	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			[S]*	E[kJ]	H[kg/h]			
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

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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. 100°C

SMAW

# NiCro 70/19

SMAW

## CLASSIFICATION

<b>AWS A5.11</b>	ENiCrFe-2*	<b>A-Nr</b>	-	<b>Mat-Nr</b>	2.4648
<b>ISO 14172</b>	E Ni 6082 (NiCr20Mn3Nb)	<b>F-Nr</b>	43		
*:Deviation,see remarks		<b>9606 FM</b>	6		

## 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 alloy clad steel  
 High resistance to oxidation at high temperature  
 High impact values at low temperature [-196°C]

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

DC +

## APPROVALS

TÜV

+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	Nb	Fe
0.03	4.7	0.6	19.0	bal.	1.5	1.9	4.0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Impact ISO-V(J)	
				+20°C	-196°C
Required: AWS A5.11 ISO 14172 Typical values	not required min. 360 400	min. 550 min. 600 650	min. 30 min. 22 40	not required not required 110	90

## PACKAGING AND AVAILABLE SIZES

PE-Tube	Diameter (mm)	2.5	3.2	4.0	5.0
	Length (mm)	300	300	350	450
Pieces / unit	76	57	31	45	
Net weight/unit (kg)	1.5	1.7	1.8	4.5	

Identification Imprint: NiCro 70/19 Tip Color: blue

NiCro 70/19 rev. C-EN24-01/02/16

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# NiCro 70/19

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	BS3076	DIN 17744/17465 SEW 595	Mat. Nr	ASTM/ACI B366	UNS
<b>Ni base to CrNi alloyed steel for composition in highly corrosive environments</b>					
	NA 14	NiCr15Fe	2.4816	B168-Alloy 600	N06600
		LC-NiCr15Fe	2.4817	Alloy 600L	N06600
		NiCr20Ti	2.4951	Alloy 75	
		NiCr20TiAl	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
		GX40NiCrNb35-25	1.4852		
		GX40NiCrSi35-25	1.4857	HP	

Suitable for welding dissimilar metals:

- Mild- and low alloy steel to stainless steel
- Mild- and low alloy steel to Ni base alloys
- Stainless steel to low alloy creep resisting steel

Not sensitive for embrittlement after heat treatment

## CALCULATION DATA

Sizes		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
Diam. x length [mm]	Current range [A]							
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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 = 2.0 - 6.0%

Cr = 18.0 - 22.0%

Welding with Heat-Input max. 1.5 kJ/mm

Interpass temperature max. 150°C

AWS: Mn = 1.0 - 3.5%

AWS: Mn = 13.0 - 17%

# Nyloid 2

SMAW

## CLASSIFICATION

<b>AWS A5.11</b>	ENiCrMo-6	<b>A-Nr</b>	-
<b>ISO 14172</b>	E Ni 6620 (NiCr14Mo7Fe)	<b>F-Nr</b>	43
		<b>9606 FM</b>	6

## 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 vacuum sealed Sahara ReadyPack® (SRP)

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC / DC +

## APPROVALS

<b>GL</b>	<b>TÜV</b>
5680	+

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	Nb	Fe	W
0.05	3	0.4	13	bal.	6.0	1.5	6	1.5

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				+20°C	-196°C
Required: AWS A5.11 ISO 14172 Typical values	not required min. 350 475	min. 620 min. 620 725	min. 20 min. 32 40	not required not required 100	90

## PACKAGING AND AVAILABLE SIZES

SRP	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Pieces / unit	62	52	27	
Net weight/unit (kg)	1.7	2.2	1.8	

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

Nyloid 2 rev. C-EN25-01/02/16

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# Nyloid 2

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10028-4	Mat. 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 alloy steel for cryogenic applications	X12Ni5 (12Ni19)	1.5680		K41583
	10Ni14 (3.5% Ni)	1.5637	A333 Grade 3	
	12Ni14 (3.5% Ni)	1.5637	A203 Grade E	

## CALCULATION DATA

Diam. x length [mm]	Current range [A]	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs [kg]	Electrodes/ kg weldmetal	kg electrodes/ kg weldmetal
			[S]*	E[kJ]	H[kg/h]		B	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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions					
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G	PH/5Gup
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

# Nyloid 4

SMAW

## CLASSIFICATION

<b>AWS A5.11</b>	ENiCrMo-6	<b>A-Nr</b>	-
<b>ISO 14172</b>	E Ni 6620 (NiCr14Mo7Fe)	<b>F-Nr</b>	43
		<b>9606 FM</b>	6

## GENERAL DESCRIPTION

Basic high recovery all position electrode for welding low temperature steels  
 Especially developed for performing in the PE/4G position (High resistance to porosity)  
 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 vacuum sealed Sahara ReadyPack® (SRP)

## WELDING POSITIONS (ISO/ASME)



## CURRENT TYPE

AC / DC +

## APPROVALS

<b>DNV</b>	<b>GL</b>	<b>BV</b>
Pending	Pending	Pending

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr	Ni	Mo	Nb	Fe	W
0.05	3.0	0.4	13	bal.	6.0	1.5	6.0	1.5

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Impact ISO-V(J)	
				+20°C	-196°C
Required: AWS A5.11 ISO 14172 Typical values	not required min. 350 490	min. 620 min. 620 770	min. 20 min. 32 33	100	min. 47 85

## PACKAGING AND AVAILABLE SIZES

SRP	Diameter [mm]	2.5	3.2	4.0
	Length [mm]	300	300	350
Pieces / unit	69	36	30	
Net weight/unit [kg]	1.3	1.1	1.7	

Identification Imprint: NiCrMo-6 / NYLOID 4 Tip Color: Yellow

Nyloid 4: rev. C-EN02-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
 Fumes: Safety Data Sheets (SDS) are available on our website.

# Nyloid 4

SMAW

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	EN 10028-4	Mat. Nr	ASTM/ICA	UNS
<b>9%-Ni steel for LNG applications</b>				
	X8Ni9	1.5662	A353/A353M NN+T	
	X8Ni9 (9% Ni)	1.5662	A553/A553M Type I	
	X8Ni9 (8% Ni)		A553/A553M Type II	K71340
<b>Low alloy steel for cryogenic applications</b>				
	X12Ni5 (12Ni9)	1.5680		K41583
	10Ni14 (3.5% Ni)	1.5637	A333 Grade 3	
	12Ni14 (3.5% Ni)	1.5637	A203 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]	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
2.5 x 300	50-70	AC	52	88	0.9	77	1.47
3.2 x 300	70-110	AC	60	146	1.3	46	1.50
4.0 x 350	110-140	AC	75	234	1.9	25	1.41

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G
2.5	60 - 70A	60 - 70A	55 - 70A	55 - 70A	55 - 65A
3.2	90 - 105A	90 - 105A	80 - 95A	70 - 90A	85 - 95A

## REMARKS / APPLICATION ADVICE

Recommended heat-Input :

≤ 15 mm: 1.4 kJ/mm

15 - 20 mm: 1.6 kJ/mm

> 20 mm: 2.0 kJ/mm

# AlMn

## CLASSIFICATION

<b>AWS A5.3</b>	E3003*	<b>F-Nr</b>	21
<b>ISO 18273</b>	Al 3103 (AlMn1)	<b>Mat-Nr</b>	3.0516

\*: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/3Gu

## CURRENT TYPE

DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

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

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]
Typical values	AW	40	110	20

## PACKAGING AND AVAILABLE SIZES

	<b>Diameter (mm)</b>	2.5	3.2
	<b>Length (mm)</b>	350	350
<b>Metal can</b>	<b>Pieces / unit</b>	-	-
	<b>Net weight/unit (kg)</b>	2.0	2.0

AlMn: rev. C-EN24-12/05/16

# AlMn

## EXAMPLES OF MATERIALS TO BE WELDED

Aluminium manganese alloys and Aluminium magnesium alloys	Mat. Nr
AlMn1	3.0515
AlMn1Mg1	3.0526
AlMg1	3.3315

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Weight/ 1000 pcs (kg)
2.5 x 350	40-70	DC+	9.2
3.2 x 350	60-90	DC+	14.0

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PF/3Gup
2.5	60A	60A	55A
3.2	80A	80A	75A

## 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

# AlSi5

## CLASSIFICATION

<b>AWS A5.3</b>	E4043	<b>F-Nr</b>	23
<b>ISO 18273</b>	Al 4043A* [AlSi5(A)]	<b>Mat-Nr</b>	3.2245

\*:Deviation,see remarks

## 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/3Gu

## CURRENT TYPE

DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

<b>Al</b>	<b>Si</b>
bal.	5.0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]
Typical values	AW	90	160	15

## PACKAGING AND AVAILABLE SIZES

	Diameter [mm]	2.5	3.2	4.0
	Length [mm]	350	350	350
<b>Metal can</b>	Pieces / unit	-	-	-
	Net weight/unit [kg]	2.0	2.0	2.0

AlSi5: rev. C-EN23-12/05/16

# AlSi5

## EXAMPLES OF MATERIALS TO BE WELDED

Aluminium-silicon alloys and dissimilar of several aluminium alloys.

With restriction : precipitation hardening alloys such as :

	Mat. Nr
AlCuMg1	3.1325
AlMgSi1	3.2315
AlZn4.5Mg1	3.4335

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Weight/ 1000 pcs (kg)
2.5 x 350	40-70	DC+	9.2
3.2 x 350	60-90	DC+	14.0
4.0 x 350	80-120	DC+	20.4

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PF/3Gup
2.5	60A	60A	55A
3.2	80A	80A	75A
4.0	110A	110A	105A

## REMARKS / APPLICATION ADVICE

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

Welding with short arc preferable

Electrode with 90°angle on material

# AlSi12

## CLASSIFICATION

ISO 18273 Al 4047A (AlSi12(A)) F-Nr 23\*  
 \*:Deviation, see remarks Mat-Nr 3.2585

## 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/3Gu

## CURRENT TYPE

DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

Al	Si
bal.	12.0

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

	Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)
Typical values	AW	80	180	5

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	350	350	350
Metal can	Pieces / unit	-	-	-
	Net weight/unit (kg)	2.0	2.0	2.0

AlSi12; rev. C-EN23-12/05/16

# AlSi12

## EXAMPLES OF MATERIALS TO BE WELDED

Aluminium cast alloys with silicon level up to approx. 12%, like	Mat. Nr
G-AISI 10Mg	3.2381
G-AISI 12	3.2581

SMAW

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Weight/ 1000 pcs (kg)
2.5 x 350	40-70	DC+	8.8
3.2 x 350	60-90	DC+	13.2
4.0 x 350	80-120	DC+	19.6

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions		
	PA/1G	PB/2F	PF/3Gup
2.5	60A	60A	55A
3.2	80A	80A	75A
4.0	110A	110A	105A

## REMARKS / APPLICATION ADVICE

If the thickness is more than 15 mm, it is advisable to preheat at 150 - 250°C  
 Welding with short arc preferable  
 Electrode with 90°angle on material

# Wearshield® BU-30

## 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

## WELDING POSITIONS (ISO/ASME) (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## 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

## MECHANICAL PROPERTIES, TYPICAL, 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
	Length (mm)	350	350	450
PE-Tube	Pieces / unit	65	44	23
	Net weight/unit (kg)	2.5	2.5	2.5

Identification Imprint: WEARSHIELD BU-30 Tip Color: black

Wearshield®BU-30:rev.C-EN24-01/02/16

# Wearshield® BU-30

## 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 applications 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

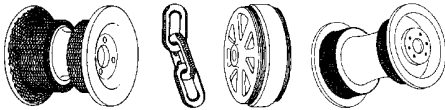
Hardfacing:

Crane and mine car wheels

Tractor rolls, idlers, links and sprockets

Cable drums

Roller guides



## ADDITIONAL INFORMATION

When welding with Wearshield BU-30, DC+ is preferred for most applications, although AC provides satisfactory results too. 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 BU-30 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 BU-30 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 MM 40 would be preferred.

## CALCULATION DATA

Sizes		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
Diam. x length [mm]	Current range [A]								
3.2 x 350	90-130	DC+	62	229	1.3	371	44	1.64	
4.0 x 350	140-180	DC+	63	338	1.8	54.4	32	1.72	
5.0 x 450	180-260	DC+	99	616	2.6	108.8	14	1.54	

## COMPLEMENTARY PRODUCTS

Lincore® 33

# Wearshield® Mangjet (e)

## CLASSIFICATION

AWS A5.13	EFeMn-A	F-Nr	71
DIN 8555	E7-UM-200-KP		
EN 14700	E Fe9		

## GENERAL DESCRIPTION

A low hydrogen hardfacing electrode designed for heavy impact properties  
Exhibits excellent arc striking characteristics, clean slag detachability and low spatter  
The electrode coating permits out of position welding  
140% recovery

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



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.

## MECHANICAL PROPERTIES, TYPICAL, 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	450
PE-Tube	Pieces / unit	53	24
	Net weight/unit (kg)	2.5	2.5

Identification Imprint: WEARSHIELD Mangjet Tip Color: violet

Wearshield® Mangjet: rev. C-EN24-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

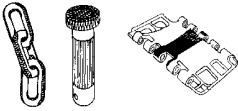
# Wearshield® Mangjet (e)

## APPLICATION

Wearshield Mangjet produces a 14% Mn deposit that rapidly work hardens under heavy impact and battering. Ideally suited for applications 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



## 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 may be 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 Jungo 307 are preferred. Small thickness can be welded with Arosta 307 as well. 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.

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Dep. rate H(kg/h)
3.2 x 350	95-105	DC+	1.1
4.0 x 350	130-140	DC+	1.6

## COMPLEMENTARY PRODUCTS

Lincore® M  
Wire/flux combination : Lincore M / 801 or 802

# Wearshield® 15CrMn

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## CLASSIFICATION

DIN 8555 E7-UM-250-KP  
EN 14700 E Fe9

## GENERAL DESCRIPTION

A rutile hardfacing electrode designed for applications of light impact wear, high gouging wear  
Easy slag detachability, good arc restriking and low spatter  
The electrode coating permits out of position welding  
Designed for applications of high impact wear and high gouging wear  
Gives moderate abrasion resistance

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G

## CURRENT TYPE

AC / DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr
0.35	14	0.6	15

## STRUCTURE

In the as deposited condition, the microstructure consists of a soft manganese alloy austenite which rapidly work hardens under impact loading.

## MECHANICAL PROPERTIES, TYPICAL, 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
PE-Tube	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. C-EN24-01/02/16

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Fumes: Safety Data Sheets (SDS) are available on our website.

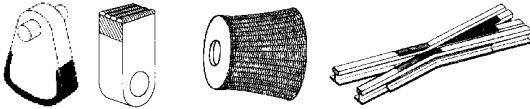
# Wearshield® 15CrMn

## APPLICATION

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 applications 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



## 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 60-0 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 appropriately.

## CALCULATION DATA

Sizes		Current range (A)
Diam. x length (mm)		
3.2 x 355		140-160
4.0 x 355		130-140
4.8 x 455		220-250

## COMPLEMENTARY PRODUCTS

Lincore® 15CrMn

# Wearshield<sup>®</sup> MM 40

## 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 if weld metal is not quenched  
Designed for rolling, sliding and metal to metal wear resistance

Good restriking and low spatter

The electrode can be used with the drag or contact welding technique as well as out of position

## WELDING POSITIONS (ISO/ASME)



PA/1G



PC/2G



PH/5Gu

## 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

## MECHANICAL PROPERTIES, TYPICAL, 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
PE-Tube	Pieces / unit	66	43	22
	Net weight/unit (kg)	2.5	2.5	2.5

Identification Imprint: WEARSHIELD MM40 Tip Color: red

Wearshield<sup>®</sup> MM40: rev. C-EN24-01/02/16

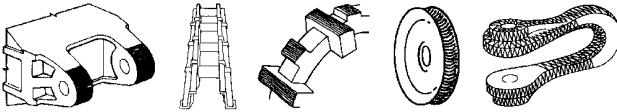
# Wearshield® MM 40

## 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 applications 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



## ADDITIONAL INFORMATION

When welding with Wearshield MM 40 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.

## CALCULATION DATA

Sizes Diam. x length (mm)	Current range (A)	Current type	Arc time	Energy	Dep. rate	Weight/ 1000 pcs (kg)	Electrodes/ kg weldmetal B	kg electrodes/ kg weldmetal 1/N
			- per electrode at max. current - (S)*	E(kJ)	H(kg/h)			
3.2 x 350	90-130	DC+	71	175	1.3	36.6	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

Lincore® 40-0

# Wearshield<sup>®</sup> MM

## 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 non machinable martensitic deposit (only by grinding)  
Designed for rolling, sliding and metal to metal wear resistance  
Good restriking and low spatter  
The electrode can be used with the drag or contact welding technique as well as out of position

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## 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.

## MECHANICAL PROPERTIES, TYPICAL, 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
	Length (mm)	350	350	450
PE-Tube	Pieces / unit	66	45	22
	Net weight/unit (kg)	2.5	2.5	2.5
Linc Pack	Pieces / unit	26	18	-
	Net weight/unit (kg)	1.0	1.0	-

Identification Imprint: WEARSHIELD MM Tip Color: purple

Wearshield<sup>®</sup> MM: rev. C-EN24-01/02/16

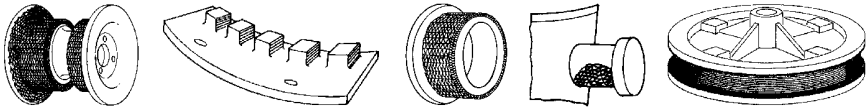
# Wearshield® MM

## 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 applications 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
- Scraper blades
- Transfer tables
- Cable sheaves



## 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 achieved 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 achieved due to the inability to homogenize the steel in the short heating cycle.

The build up is usually limited to 4 layers.

## CALCULATION DATA

Sizes		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
Diam. x length (mm)									
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	

## COMPLEMENTARY PRODUCTS

Lincore® 55

# Wearshield® T&D

## CLASSIFICATION

<b>AWS A5.13</b>	E Fe6*	<b>F-Nr</b>	71
<b>DIN 8555</b>	E4-UM-60-SZ		
<b>EN 14700</b>	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  
 Resists metal-to-metal abrasion  
 Excellent arc characteristics, good restriking, low spatter and weld quality  
 The electrode coating permits the use of the drag or contact welding technique

## 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	0.5	4.0	6.5	2.6	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

## MECHANICAL PROPERTIES, TYPICAL, 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
PE-Tube	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. C-EN24-01/02/16

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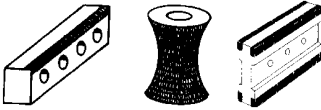
# Wearshield® T&D

## 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 applications 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 applications of wear resistant surfaces to carbon and low alloy steels.

Typical applications include:

- Punch and forging dies
- Shear blades
- Trimmers
- Cutting tools



## 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 optimum 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 and gouge the weld deposit. Preheat temperature similar to those for welding may be necessary to prevent cracking along the cut edge.

## CALCULATION DATA

Sizes		Current range (A)
Diam. x length (mm)		
2.5 x 350	80-100	
3.2 x 350	110-130	
4.0 x 350	130-160	

## COMPLEMENTARY PRODUCTS

Lincore® T&D

# Wearshield® MI (E)

## 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  
 All position welding, except vertical down  
 Excellent arc characteristics, good restriking, low spatter and weld quality  
 Designed for applications with impact and metal-to-metal wear

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu



PE/4G



PH/5Gu

## CURRENT TYPE

AC / DC -

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Mn	Si	Cr
0.5	0.4	1.8	9.0

## STRUCTURE

In the as welded condition the microstructure consists of a mixed structure of martensite and austenite.

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

### Typical hardness values

1 Layer	45-55 HRc
2 Layers	50-58 HRc
Welded on Mild Steel Plate	

PWHT : 4H/480°C / 52HRc

## PACKAGING AND AVAILABLE SIZES

		Diameter (mm)			
		2.5	3.2	4.0	5.0
	Length (mm)	350	350	450	450
PE-Tube	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. C-EN24-01/02/16

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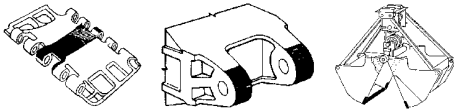
# Wearshield® MI (e)

## 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 Applications 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



## 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.

## CALCULATION DATA

Sizes		Dep. rate
Diam. x length (mm)	Current range (A)	H(kg/h)
2.5 x 350	60-70	0.76
3.2 x 350	70-120	1.1
4.0 x 350	110-150	1.45
5.0 x 450	150-200	2.0

## COMPLEMENTARY PRODUCTS

Solid wire LNM 420 FM and flux-cored wire Lincore 420

# Wearshield® ABR

## 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

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F



PC/2G



PF/3Gu

## 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

## MECHANICAL PROPERTIES, TYPICAL, 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)	3.2	4.0	4.8
	Length (mm)	355	355	355
PE-Tube	Pieces / unit	85	54	38
	Net weight/unit (kg)	2.5	2.5	2.5

Identification Imprint: WEARSHIELD ABR Tip Color: none

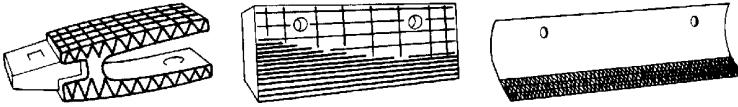
Wearshield® ABR: rev. C-EN23-01/02/16

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# Wearshield® ABR

## 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 applications involving transportation of abrasive media under heavy variable loading. Wearshield ABR is also suitable for metal to metal wear applications.



SMAW

## 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.

## CALCULATION DATA

Sizes	
Diam. x length [mm]	Current range [A]
3.2 x 355	40 - 150
4.0 x 355	75-200
4.8 x 355	110-250

## COMPLEMENTARY PRODUCTS

The closest product is Lincore® 50, however, the deposit varies significantly to Wearshield ABR.

# Wearshield® ME (e)

## 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 metal to earth application to provide abrasion resistance  
The electrode coating permits the use of a light drag or contact welding technique.

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F

## CURRENT TYPE

AC / DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Cr	Si
3.0	33.0	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

## MECHANICAL PROPERTIES, TYPICAL, 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
PE-Tube	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. C-EN25-01/02/16

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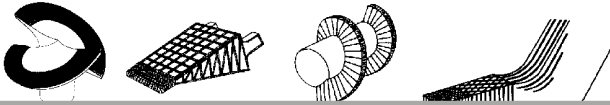
# Wearshield® ME (e)

## 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



## 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 Arosta 307-160 should be applied prior to the Wearshield ME.

## CALCULATION DATA

Sizes		Current range (A)	Current type	Dep. rate
Diam. x length (mm)	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® 60-0, however, the deposit varies significantly to Wearshield ME.

# Wearshield® 60 (e)

## 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  
Designed for severe abrasion applications

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F

## CURRENT TYPE

AC / DC +/-

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Cr	Si
5.0	35	4

## STRUCTURE

In the as welded condition the microstructure consists of primary chromium carbides in an austenite - carbide eutectic matrix.

## MECHANICAL PROPERTIES, TYPICAL, 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	3.2	4.0	4.0
	Length (mm)	350	450	350	450
PE-Tube	Pieces / unit	48	37	32	23
	Net weight/unit (kg)	2.5	2.5	2.5	2.5

Identification Imprint: WEARSHIELD 60 (E) Tip Color: violet

Wearshield® 60 (e) rev. C-EN25-01/02/16

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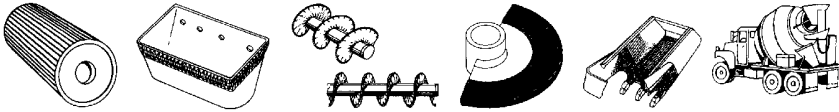
# Wearshield® 60 (e)

## APPLICATION

Wearshield 60 produces a primary carbide deposit with a hardness range of 60-62 HRC. The primary carbide microstructure makes Wearshield 60 ideally suitable for applications of severe abrasion.

Typical applications include:

- Crusher rolls, plates and jaws
- Conveyor screws and sleeves
- Shovel lips
- Brick & coke machinery
- Cement mill parts



## 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 Arosta 307-160, Wearshield BU-30 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.

## CALCULATION DATA

Diam. x length [mm]	Current range [A]	Current type	Dep. rate
			H(kg/h)
3.2 x 450	110-150	DC+	1.75
4.0 x 450	140-180	DC+	2.2

## COMPLEMENTARY PRODUCTS

Lincore® 60-O and Lincore® 60-S with flux 801 or 802

# Wearshield® 70

## 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. Designed for high stress, severe abrasion and and abrasion at elevated temperatures  
Recovery 240%.

## WELDING POSITIONS (ISO/ASME)



PA/1G



PB/2F

## CURRENT TYPE

AC / DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Si	Cr	Mo	Nb	W
4.2	2.7	18	8.5	9.0	7.0

## STRUCTURE

The microstructure consists mainly of primary chromium carbides with premium carbides of molybdenum, niobium, tungsten and vanadium in an austenite - carbide eutectic matrix.

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

### Typical hardness values

1 Layer 62-67 typical 65 HRc  
Welded on Mild Steel Plate

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	3.2	4.0	5.0
	Length (mm)	350	350	350
PE-Tube	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. C-EN24-01/02/16

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# Wearshield® 70

## APPLICATION

Wearshield 70 produces a "premium" carbide weld deposit with a hardness range of 62-70HRc. The premium carbide microstructure makes Wearshield 70 ideally suitable for applications 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



## 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. (i.e. Arosta 307-160) Wearshield 70 will perform standard primary carbide electrodes (such as Wearshield 60) under either low stress or high temperature abrasion conditions.

## 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	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

There is no flux cored equivalent to Wearshield 70. The closest product is Lincore® 65-0, however, the deposit varies significantly to Wearshield 70.

# Wearshield® 420

## 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 abrasion resistance under high corrosion conditions  
The electrode coating permits the use of the drag or contact welding technique as well as positional welding if required.

## WELDING POSITIONS (ISO/ASME)



PA/1G



PC/2G



PF/3Gu



PE/4G

## CURRENT TYPE

AC / DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Si	Mn	Cr	Mo	V
0.5	0.4	0.3	12.4	0.4	1.3

## STRUCTURE

Ferrite and martensite

## MECHANICAL PROPERTIES, TYPICAL, 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
PE-Tube	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. C-EN24-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information.  
Fumes: Safety Data Sheets (SDS) are available on our website.

# Wearshield® 420

## 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.

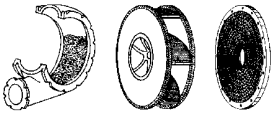
Typical applications include:

Sand pumps

Dredging equipment

Fans

Valve seats in steam and liquid pipes



## 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 irregularities such as cracks and deep gouges can be repaired locally using Wearshield BU-30 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.

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 its martensitic stainless structure. But the reduced chromium level might adversely affect the corrosion resistance of the deposit.

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions			
	PA/1G	PC/2F	PF/3Gup	PE/4G
3.2	130A	130A	130A	130A
4.0	160A	160A	160A	150A
5.0	220A		200A	

## CALCULATION DATA

Sizes		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
Diam. x length (mm)	Current range (A)							
3.2 x 350	90 - 130	DC+	88	217	1.2	45.6	33	1.51
4.0 x 350	120 - 170	DC+	114	544	1.4	70.2	23	1.59
5.0 x 450	170 - 270	DC+	193	1187	1.4	109.8	14	1.49

## COMPLEMENTARY PRODUCTS

Lincore® 420.

# RepTec Cast 1

## CLASSIFICATION

AWS A5.15 ENi-CI  
ISO 1071 E C Ni-CI

## 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/3Gu



PG/3Gd



PE/4G



PH/5Gu



PJ/5Gd

## CURRENT TYPE

AC / DC + / -

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Fe	Ni
0.7	2.0	97

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Hardness HB10
Required: AWS A5.15	262-414	276-448	3-6	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
PE-Tube	Pieces / unit	146	76	44
	Net weight/unit (kg)	2.5	2.5	2.5
Linc Pack	Pieces / unit	58	30	-
	Net weight/unit (kg)	1.0	1.0	-

Identification Imprint: REPECT CAST 1 Tip Color: black

RepTec Cast 1: rev. C-EN24-01/02/16

# RepTec Cast 1

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	DIN1691	DIN 1692	DIN 1693
<b>For welding and repair</b>			
	GG-10	GTS-35-10	GGG-40
	GG-15	GTS-45-06	GGG-50
	GG-20	GTS-55-4	GGG-60
	GG-25	GTW-35-04	
	GG-30	GTW-40-05	
	GG-35	GTW-45-07	
		GTW-S-38-12	

SMAW

## CALCULATION DATA

Sizes		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
Diam. x length [mm]	Current range [A]							
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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter [mm]	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G
2.5	70A	70A	70A	70A	70A
3.2	100A	100A	100A	100A	100A
4.0	120A	120A	120A	110A	110A

## REMARKS / APPLICATION ADVICE

Residual stresses are decreased by peening after each layer  
 Cold welding, interpass temperature ( $T_i < 100^\circ\text{C}$ )  
 Heavy parts preheat (to max.  $300^\circ\text{C}$ )

## COMPLEMENTARY PRODUCTS

LNM NiTi  
 LNT NiTi

# RepTec Cast 3

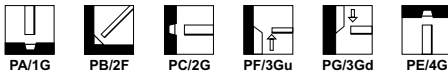
## CLASSIFICATION

AWS A5.15 ENiFe-CI  
ISO 1071 E C 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)



## CURRENT TYPE

AC / DC +

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Fe	Ni
0.6	40	bal.

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition		0.2% Proof strength [N/mm <sup>2</sup> ]	Tensile strength [N/mm <sup>2</sup> ]	Elongation [%]	Hardness HB10
Required: AWS A5.5		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
PE-Tube	Pieces / unit	155	95	54
	Net weight/unit (kg)	2.5	2.5	2.5

Identification Imprint: REPEEC CAST 3 Tip Color: black

RepTec Cast 3: rev. C-EN23-01/02/16

# RepTec Cast 3

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	DIN1691	DIN 1692	DIN 1693
<b>For welding and repair</b>			
	GG-10	GTS-35	GGG-40
	GG-15	GTS-45	GGG-50
	GG-20	GTS-55	GGG-60
	GG-25	GTW-35	GGG-70
	GG-30	GTW-40	GGG-80
	GG-35	GTW-45	
	GG-40	GTW-S-38	

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 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
4.0 x 350	100-120	AC	75	234	1.78	46.2	27	1.2

\*Stub end 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3Gup	PE/4G
2.5	60A	60A	60A	60A	70A
3.2	80A	80A	80A	75A	80A
4.0	110A	110A	110A	105A	110A

## 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.

## COMPLEMENTARY PRODUCTS

LNM NiFe

# RepTec Cast 31

## CLASSIFICATION

AWS A5.15 ENiFe-CI  
ISO 1071 E C 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 due to 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/3Gu



PG/3Gd



PE/4G



PH/5Gu



PJ/5Gd

## CURRENT TYPE

AC / DC -

## CHEMICAL COMPOSITION (W%), TYPICAL, ALL WELD METAL

C	Fe	Ni
0.7	45	bal.

## MECHANICAL PROPERTIES, TYPICAL, ALL WELD METAL

Condition	0.2% Proof strength (N/mm <sup>2</sup> )	Tensile strength (N/mm <sup>2</sup> )	Elongation (%)	Hardness HB10
Required: AWS A5.5	296-434	400-579	6-18	165-218
ISO 1071	250	350	6	
Typical values AW	300	460	10	180

## PACKAGING AND AVAILABLE SIZES

	Diameter (mm)	2.5	3.2	4.0
	Length (mm)	300	350	400
PE-Tube	Pieces / unit	154	82	47
	Net weight/unit (kg)	2.5	2.5	2.5
Linc Pack	Pieces / unit	62	33	-
	Net weight/unit (kg)	1.0	1.0	-

Identification Imprint: REPTec CAST 31 Tip Color: black

RepTec Cast 31: rev. C-EN24-01/02/16

All information in this data sheet is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.eu](http://www.lincolnelectric.eu) for any updated information. Fumes: Safety Data Sheets (SDS) are available on our website.

# RepTec Cast 31

## EXAMPLES OF MATERIALS TO BE WELDED

Steel grades	DIN1691	DIN 1692	DIN 1693
<b>For welding and repair</b>			
	GG-10	GTS-35-10	GGG-40
	GG-15	GTS-45-06	GGG-50
	GG-20	GTS-55-4	GGG-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	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 35mm

## WELDING PARAMETERS, OPTIMUM FILL PASSES

Diameter (mm)	Welding positions				
	PA/1G	PB/2F	PC/2G	PF/3Gup	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)

## COMPLEMENTARY PRODUCTS

LNM NiFe