



ELECTRODE GUIDE



Linde Bangladesh Limited

Table of Contents

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Sl. No.	Titles	Page No.
1	Table of Contents	I
2	Distribution List	II
3	Ferrospeed	1
4	Vortic Marine	2
5	Zodian Universal	3
6	Bolarc 1400	4
7	Bolweld	5
8	Bolcraft	6
9	Ferrocrafft 11	7
10	Ferrocrafft 7016	8
11	Ferroweld 1	9
12	Ferrocrafft 61	10
13	Ferroweld 2	11
14	Duroid 350R	12
15	Hardcraft 650B	13
16	Duroid 650R	14
17	Mangcraft	15
18	Ferrolloid 1	16
19	Staincraft 308L-16	17
20	Staincraft 316L-16	18
21	Staincraft 309 Mo	19
22	<i>Staincraft 308-16</i>	20

		Page No.
		I



Linde Bangladesh Limited

Distribution List

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Sl No.	Holder	Location	Remarks
1.	Chief Executive Officer (CEO)	Corporate Office	
2.	Head of Business (HOB)	Corporate Office	
3.	National Sales Manager, Welding	Corporate Office	
4.	Sales & Application Manager, Welding	Corporate Office	
5.	Head of Factory (HOF)	Rupganj	
6.	Head of Quality, Stock & Distribution	Rupganj	
7.	Head of Maintenance	Rupganj	
8.	Head of Area (HOA) – Dhaka (West)	Tejgaon	
9.	Head of Area (HOA) – Dhaka (East)	Narayanganj	
10.	Head of Area (HOA) - Chittagong	Sagarika	
11.	Head of Area (HOA) – Bogra	Bogra	
12.	Head of Area (HOA) – Khulna	Khulna	
13.	Head of Territory (HOT)	Tejgaon	
14.	Head of Territory (HOT)	Tongi	
15.	Head of Territory (HOT)	Mirpur	
16.	Head of Territory (HOT)	Tipu Sultan Rd.	
17.	Head of Territory (HOT)	Postagola	
18.	Head of Territory (HOT)	Narayanganj	
19.	Head of Territory (HOT)	Comilla	
20.	Head of Territory (HOT)	Sylhet	
21.	Head of Territory (HOT)	Sagarika1	
22.	Head of Territory (HOT)	Sagarika2	
23.	Head of Territory (HOT)	Sagarika3	
24.	Head of Territory (HOT)	Noakhali	
25.	Head of Territory (HOT)	Khulna	
26.	Head of Territory (HOT)	Jessore	
27.	Head of Territory (HOT)	Faridpur	
28.	Head of Territory (HOT)	Barisal	
29.	Head of Territory (HOT)	Bogra	
30.	Head of Territory (HOT)	Rajshahi	
31.	Head of Territory (HOT)	Rangpur	
32.	Head of Territory (HOT)	Mymensingh	
33.	Management Representative	Corporate Office	
			Page No.
			II



Linde Bangladesh Limited

FERROSPEED

GENERAL PURPOSE MILD STEEL ELECTRODE

Electrode Guide

Issue No. : 05

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Classifications

AWS A5.1-91	E6012
BS 639-1976	E431 1 R24
JIS	D4313

Quality & Approvals

ABS	Grade 1
Lloyd's	Grade 1

Characteristics: A rutile coated general purpose electrode, the most popular in its class for economy and versatility. Good penetration and easy slag detachability. Easy to use and no special technique is required. It is suitable for all positional use and particularly for downhand and horizontal-vertical positions. Gives a sound joint even on rusty plates and uneven joints with higher root gaps.

Applications: General purpose welding of mild steel particularly grills, gates, repair jobs, steel furniture, steel frame work, truck and bus bodies, super structure of ships and all type of fabrication work.

Typical all weld metal properties

Chemical Composition (%)

C	0.09
Mn	0.43
Si	0.20
S	0.03 Max.
P	0.03 Max.

Mechanical Properties

Yield Strength	420 N/mm ²
UTS	490 N/mm ²
Elongation on 4D	29%
Impact (Charpy V Notch)	
At Room temperature	100 Joules
at 0 °C	67 Joules

Storage and Redrying: Store in a dry place. If dampness is suspected re-drying at 110 °C for 30-40 minutes is recommended for best results.

Operating Data: Use AC (Minimum OCV 70) or DC Electrode Positive or Negative

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
2.5	350	182	3.0	70-90
3.2	450	146	5.0	95-125
4.0	450	99	5.0	125-175
5.0	450	66	5.0	165-260

Welding Position-All positions except vertical down.

		Page No.
		1



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VORTIC MARINE
MILD STEEL ALL PURPOSES ELECTRODE

Electrode Guide

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Classifications

AWS A5.1-91 E6013
BS639-1976 E4333R13
JIS D4303

Quality & Approvals

ABS Grade 3
Lloyd's Grade 3

Characteristics: A high quality specially formulated rutile coated all purposes mild steel electrode, specially designed for vertical and overhead positions, using AC or DC power sources. Weld appearance is neat and smooth.

Other features include quiet arc and easy slag detachability even in deep grooves. Root runs have a neat profile and smooth appearance with complete freedom from undercut. Spatter level is exceptionally low.

Applications: The electrode is suitable for general construction, structure and framework, sheet metal work, ship building, bodies and under frames of railway carriages, wagons, storage tank etc.

Typical all weld metal properties

Chemical Composition (%)

C 0.06
Mn 0.47
Si 0.15
S 0.02 Max.
P 0.03 Max.

Mechanical Properties

Yield strength 445 N/mm²
UTS 508 N/mm²
Elongation on 4D 26%
Reduction of area 58%
Impact (Charpy V Notch) 70 Joules at - 20°C

Storage and Redrying: Store in a dry place. If dampness is suspected re-drying at 110 °C for 30-40 minutes is recommended for best results.

Operating Data: Use AC (Minimum OCV 50V) or DC Electrode *Positive or Negative*

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.0	350	244	3.0	45-75
2.5	350	179	3.0	75-100
3.2	350	145	4.0	100-125
4.0	450	94	5.0	135-175
5.0	450	59	5.0	150-280

Welding Position-All positions.

		Page No.
		2



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ZODIAN UNIVERSAL
MILD STEEL , HIGH QUALITY, ALL
POSITIONS ELECTRODE

Electrode Guide

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Classifications

AWS A5.1-91	E6013
BS 639	E4333 R1 1
JIS	D4303

Characteristics: An outstanding rutile-cellulosic electrode for welding mild steel in all positions including vertical down. It is capable of welding a variety of applications both in the workshop and on site with equal success. It is tolerant to a large range of current settings, arc length and travel speeds. It is very easy to use if even in difficult situations such as bridging gaps, corners etc. The slag detachability is excellent. The electrode consistently operates throughout the full length, the arc being smooth and crisp providing drive but without much fierce ness or spatter

Applications: The applications are almost limitless. It can be used both in the workshop and on site with equal success. An ideal application is in-situ welding on large fabrications, giving minimum "floor to floor" times in production and eliminating manipulation of the work piece. In the workshop-general fabrication, under frames of vehicles, steel structures, bearings, machine tool parts, storage tanks etc and site-shipbuilding liquid storage tanks, steel framed structure & towers, general process plant, agricultural implements and pipes etc.

Typical all weld metal properties

Chemical Composition (%)		Mechanical Properties	
C	0.08	Yield Strength	418 N/mm ²
Mn	0.50	UTS	510 N/mm ²
Si	0.20	Elongation	26%
S	0.03 Max.	Impact (Charpy V Notch)	88 Joules at 0°C
P	0.03 Max.		55 Joules at -20°C

Storage and Redrying: Store in a dry place. A certain amount of dampness can be tolerated but for best results, if dampness is suspected, re-drying at 90°C for 30-40 minutes is recommended for best results.

Operating Data: Use AC (Minimum OCV 50) or DC Electrode *Positive or Negative*

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	350	160	3.0	70-95
3.2	350	100	3.0	90-120
4.0	350	70	3.0	130-190
5.0	450	57	5.0	180-230

Welding Position-All positions.

		Page No.
		3



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BOLARC 1400

GENERAL PURPOSE MILD STEEL ELECTRODE

Electrode Guide

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Classifications

AWS A5.1-91

E6013

Characteristics: A general purpose electrode for welding Mild Steel in all positions. It is a special electrode for fabrication, work having good operating and mechanical characteristics. Weld bead appearance with this electrode is neat and smooth. Slag detachability is very easy. It has good arc starting characteristics.

Applications: This electrode is suitable for site fabrication work. Steel structure, Frame work, Grill, Gates, Automotive cab frames etc. can be suitably welded with this electrode.

Storage and Re-drying: Store in a dry place. If dampness is suspected re-drying at 110 °C for 30-40 minutes, is recommended for best results.

Typical all weld metal properties

Chemical Composition (%)

C	0.08
Mn	0.45
Si	0.2
S	0.03 Max.
P	0.03 Max.

Mechanical Properties

Yield Strength	430 N/mm ²
UTS	495 N/mm ²
Elongation on 4D	24%
Impact (Charpy V Notch)	60 Joules at 0°C

Operating Data: Use AC (Min OCV 50) or DC Electrode *Positive or Negative*

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	350	169	3	70-90
3.2	450	146	5.15	95-125
3.2	350	110	3	95-125
4.0	450	87	5	125-175
5.0	450	57	5	155-260

Welding Position-All positions except vertical down.

		Page No.
		4



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BOLWELD
MILD STEEL ALL PURPOSE ELECTRODE

Electrode Guide

Issue No. : 05

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Classifications

AWS A5.1-91 E6013

Characteristics: A general purpose electrode for welding Mild Steel in all positions. It is a special electrode for fabrication work having good operating and mechanical characteristics. Weld bead appearance with this electrode is neat and smooth. Slag detachability is very easy. It has good arc starting characteristics.

Applications: This electrode is suitable for site fabrication work. Steel structure, frame work, grill, gates, automotive cab frames etc. can be suitably welded with this electrode.

Typical all weld metal properties

Chemical Composition (%)

C	0.08
Mn	0.40
Si	0.20
S	0.03 Max.
P	0.03 Max.

Mechanical Properties

Yield strength	430 N/mm ²
UTS	500 N/mm ²
Elongation on 4D	24%
Impact (Charpy V Notch)	70.8 Joules at Room Temperature

Storage and Redrying: Store in a dry place. If dampness is suspected re-drying at 110°C for 30-40 minutes is recommended for best results.

Operating Data: Use AC (Minimum OCV 50V) or DC Electrode *Positive or Negative*

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
2.5	350	164	3.0	70-90
3.2	350	97	3.0	95-125
4.0	350	64	3.0	125-175
5.0	450	53	5.0	155-260

Welding Position-All positions except vertical down.

		Page No. 5



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BOLCRAFT
MILD STEEL ALL PURPOSE ELECTRODE

Electrode Guide

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Classifications

AWS A5.1-91 E6013
BS639-1976 E4322R1

Quality & Approvals

Lloyd's Grade 2

Characteristics: Bolcraft is a rutile-coated electrode, designed for welding mild steel in all positions. It is especially suitable for fabrication of thin sections and structures. It produces evenly rippled bead and slag detachability is easy. Its spatter level is low and running characteristics is very smooth.

Applications: It is recommended for site erection work, steel furniture, storage tanks, trucks and bus bodies, tubular structures, ship buildings, other sheet metal and general engineering fabrications. Also for root run & filling passes of water pipelines.

Typical all weld metal properties

Chemical Composition (%)

C	0.09
Mn	0.48
Si	0.20
S	0.02
P	0.02

Mechanical Properties

Yield strength	425 N/mm ²
UTS	490 N/mm ²
Elongation	26%
Impact (Charpy V Notch)	65 Joules at 0°C

Storage and Redrying: Store in a dry place. If dampness is suspected re-drying at 110°C for 30-40 minutes is recommended for best results.

Operating Data: Use AC (Minimum OCV 50V) or DC Electrode *Positive or Negative*

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	350	168	3.0	70-90
3.2	350	106	3.0	95-125
4.0	350	65	3.0	125-175
5.0	450	55	5.0	155-260

Welding Position-All positions.



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FERROCRAFT 11
MILD STEEL CELLULOSE DEEP PENETRATION
ELECTRODE

Electrode Guide

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Classifications

AWS A5.1-91	E6011
BS 639-1976	E4333CI6
JIS	D4311

Quality & Approvals

Lloyd's	Grade 3, 3Y
ABS	Grade 3

Characteristics: A cellulose base electrode containing iron powder suitable for use in all position on either AC or DC power supply. Deep penetrating arc with freezing metal and low spatter loss for its type. The inclusion of a small portion of iron powder in the coating formulation improves arc stability, smoother arc transfer and relatively higher metal recovery.

Applications: An excellent electrode for pipe welding (including Natural Gas pipes) and storage tank fabrication. Particularly suited for the first run of butt joints, using the 'stovepipe' or 'flick' techniques to obtain full root penetration. Suitable for two pass welding of unprepared butt-joints upto 8 mm thick, root, hot, fill and capping pass welding of pipes and tanks.

Typical all weld metal properties

Chemical Composition (%)

C	0.10
Mn	0.47
Si	0.11
S	0.03 Max.
P	0.03 Max.

Mechanical Properties

Yield Strength	430 N/mm ²
UTS	500 N/mm ²
Elongation on 4D	28%
Impact (Charpy V Notch)	85 Joules at -20 °C
	50 Joules at -29°C

Storage and Re-drying: Store in a dry place. Normally re-drying is not recommended unless electrodes are excessively damp or wet, when re-drying at 90°C for 30-40 minutes may be carried out.

Operating Data: Use AC (Minimum OCV 65) or DC Electrode *Positive or Negative*

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	300	152	2.0	65-85
3.2	350	117	3.0	95-125
4.0	350	78	3.0	130-160
5.0	350	49	3.0	175-210

Welding Position- All positional (including vertical down)



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FERROCRAFT 7016
MILD STEEL LOW HYDROGEN ELECTRODE

Electrode Guide

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Classifications

AWS A 5.1-81

BS EN 499

E 7016

E 42 4 B 12 H10

Quality & Approvals

ABS

Lloyd's

Grade 3H10, 3Y.

Grade 3, 3Y H10.

Characteristics: A basic coated, low-hydrogen electrode designed for welding mild, medium carbon steel, low alloy steels, medium tensile steels, free cutting and difficult steels, grey cast iron using AC or DC power sources for complete absence of porosity and cracking. It gives excellent operator appeal in all welding positions and exhibits a smooth, penetrating arc with excellent bead appearance and shape. Slag is easy to control and remove.

The composition of the coating ensures high weld metal ductility, extremely low hydrogen and absence of other non-metallic inclusions. The electrode allows touch welding and deposits weld metal of highest radiographic soundness, free from under bead cracking and high notch ductility at sub zero temperature. The striking end of the electrode is tipped with a special compound and so minimizes the risk of "start run" porosity.

Applications: Ferrocrafft 7016 is designed for the all positional (except vertical down) fillet and butt welding of general purpose hydrogen controlled work where the emphasis is on operator appeal. It is also recommended for more critical applications where low temperature impact toughness to -30°C is required. Typical applications include pressure vessel fabrication, bridge and ship building and repair and maintenance work.

Typical all weld metal properties

Chemical Composition (%)

C	0.08
Mn	1.10
Si	0.65
S	0.03 (Max)
P	0.03 (Max)

Mechanical Properties

Yield Strength	480 N/mm ²
UTS	570 N/mm ²
Elongation	25%
Impact (Charpy V Notch)	125 J at -20°C
	100 J at -30°C

Storage and Redrying: Ferrocrafft 7016 may lose its low hydrogen characteristics due to moisture re-absorption from the storage environment. Where electrodes have been exposed to moisture or where hydrogen control is important re-bake for maximum of 90-120 minutes at 300°C in a vented oven and thereafter use from a hot box set at 100-120°C.

Operating Data: Use AC (Minimum OCV 55) or DC Electrode *Positive or Negative*.

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	350	112	2.0	65-100
3.2	350	100	3.0	90-130
4.0	350	65	3.0	120-180
5.0	450	54	5.0	170-240

Welding Position-All positions (except vertical down).

		Page No.
		8



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FERROWELD 1
MILD STEEL LOW HYDROGEN ELECTRODE

Electrode Guide

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Classifications

AWS A5.1-91	E 7016
BS 639-1976	E 5144B26(H)
JIS	D5016,D4316

Quality & Approvals

ABS	Grade 3H 3Y
Lloyd's	Grade 3,3YH

Characteristics: A basic coated, low-Hydrogen electrode designed for welding mild, medium carbon steel, low alloy steels, medium tensile steels, free cutting and difficult steels, grey cast iron (non-machinable deposits) in all positions using AC or DC power sources for complete absence of porosity and cracking. The composition of the coating ensures high weld metal ductility, extremely low Hydrogen and absence of other non-metallic inclusions. The electrode allows touch welding and deposits weld metal of highest radiographic soundness, free from under bead cracking and high notch ductility at sub zero temperature. The electrode has a relative smooth running characteristic with easily controlled arc. Ease of manipulation and low spatter levels produces welds of excellent appearance. The striking end of the electrode is tipped with a special compound to minimize the risk of "start run" porosity.

Applications: Ferroweld1 is designed for welding mild, medium carbon steels, low alloy steels, medium tensile steels, boiler and pressure vessels, penstock, structured and other components under restrained conditions and dynamic loading, ship building, steel of doubtful composition, grey cast iron (non-machinable deposits), buffer layer prior to hard facing etc.

Typical all weld metal properties.

Chemical Composition (%)

C	0.08
Mn	1.05
Si	0.45
S	0.03 Max.
P	0.03 Max.

Mechanical Properties

Yield Strength	450 N/mm ²
UTS	575 N/mm ²
Elongation on 4D	26 %
Impact (Charpy V Notch)	100 J at -20°C
	75 J at -29°C

Storage and Redrying: To preserve and maintain the low Hydrogen characteristics, electrodes must be stored in a holding oven at 110-150° while in use. Re-drying at 350 °C for 90-120 minutes is recommended to resist Hydrogen induced cracking on highly restrained joints.

Operating Data: Use AC (Minimum OCV 70) or DC Electrode *Positive or Negative*.

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
2.5	350	93	2.0	65-95
3.2	350	91	3.0	95-140
3.2	450	69	3.0	95-140
4.0	450	47	3.0	135-180
5.0	450	52	5.0	160-270

Welding Position-All positions (except vertical down)



FERROCRAFT 61

Linde Bangladesh Limited

MILD STEEL LOW HYDROGEN IRON POWDER
ELECTRODE

Electrode Guide

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Classifications

AWS A5.1-91	E 7018
BS 639-1976	E5154BI 1026H
JIS	D5016

Quality & Approvals

ABS	Grade 3H. 3Y
Lloyd's	Grade 3H. 3Y

Characteristics: Low Hydrogen basic coated electrode containing iron powder. Deposited metal is the 520 N/mm² in tensile class and has excellent X-ray soundness. The addition of iron powder gives excellent side wall wash features and results in improved arcing characteristics with higher recovery. The "striking" end of the electrode is tipped with a special compound to facilitate initiating the arc and minimizes the risk of "start run" porosity.

Applications: For welding mild steel of heavy sections, highly restrained joints, medium and high Carbon steels, medium tensile structural steel, low alloy engineering steels, low temperature notch, tough steels, cast steel, cast iron (non-machinable deposit), high Sulphur steels. It is also preferred for "round the clock" welding of hydro-penstocks and similar work site applications because of its excellent all position welding characteristics.

Typical all weld metal properties

Chemical Composition (%)

C	0.06
Mn	1.30
Si	0.40
S	0.03 Max.
P	0.03 Max.

Mechanical Properties

Yield Strength	450 N/mm ²
UTS	545 N/mm ²
Elongation	28 %
Impact (Charpy V Notch)	110 Joules at -20°C
	75 Joules at -29°C

Storage and Re-drying: Keep in a dry place and re-dry immediately before use at 350 °C for 90-120 minutes in a vented oven and thereafter use from a hot box set at 100-120 °C

Operating Data: Use AC (Minimum OCV 55) or DC Electrode *Positive or Negative*

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	300	110	2.0	65-100
3.2	350	81	3.0	95-150
4.0	350	57	3.0	145-220
5.0	350	38	3.0	195-270

Welding Position- All positions (except Vertical Down).

		Page No.
		10



Linde Bangladesh Limited

FERROWELD 2
MILD STEEL LOW HYDROGEN IRON POWDER
ELECTRODE

Electrode Guide

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Classifications

AWS A5.1-91	E 7018
BS 639-1976	E5154Bl 1026H
JIS	D5016

Quality & Approvals

ABS	Grade 3 H10, 3Y
Lloyd's	Grade 3,3Y,H15.

Characteristics: A basic coated, low Hydrogen electrode containing iron powder (high metal recovery of 110%) designed for welding mild, medium carbon steels, low alloy steels, medium tensile steels, free cutting and difficult to weld steels, grey cast iron (non-machinable deposits) in all positions using AC or DC power sources. The addition of iron powder permits higher current to be used and results in improved arc characteristics. The electrodes allow touch welding and deposit weld metal of highest radiographic soundness free from under-bead cracking and high notch ductility at sub zero temperature. The striking end of the electrode is tipped with a special compound to facilitate initiating the arc and so minimizes the risk of "start run" porosity.

Applications: : For welding mild, medium carbon steels, low alloy steels, medium tensile steels, boiler and pressure vessels, penstock, structured and other components under restrained conditions and dynamic loading, ship building, steel of doubtful composition, grey cast iron (non-machinable deposits), buffer layer prior to hard facing etc.

Typical all weld metal properties

Chemical Composition (%)

C	0.07
Mn	1.20
Si	0.45
S	0.020
P	0.022

Mechanical Properties

Yield Strength	480 N/mm ²
UTS	570 N/mm ²
Elongation	27%
Reduction of area	75%
Impact (Charpy V Notch)	80 J at minus 30°C

Storage and Re-drying: Keep in a dry place and re-dry immediately before use at 300 °C for 90-120 minutes in a vented oven and thereafter use from a hot box set at 100-120 °C.

Operating Data: Use AC (Minimum OCV 70) or DC Electrode *Positive or Negative*

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	350	91	2.0	70-110
3.2	350	82	3.0	110-140
3.2	450	66	3.0	110-140
4.0	450	43	3.0	140-185
5.0	450	49	5.0	160-275

Welding Position- All positions.



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DUROID 350 R
MODERATE ABRASION MODERATE IMPACT
MACHINABLE ELECTRODE

Electrode Guide

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Characteristics: A smooth running rutile coated hardfacing electrode depositing a tough air hardening type Chrome-Manganese alloy weld metal with a hardness of around 350 HV suitable for resisting moderate abrasion and impact. The deposit is machinable with carbide tipped tools. The electrode has a smooth and stable arc with low spatter loss. It is usable in all positions and deposits a weld with fine bead appearance and easy deslagging properties.

Applications: Recommended for hardfacing of mild steel, carbon steel and low alloy steel components, which require the maximum hardness within the machinable range. Typical items include roller, tractor idler wheels, brake shoes, crane wheels, wobblers, gears, stairs, forging dies, plough shares, conveyor parts, drive sprockets, tie tamping bars and picks.

Deposited Hardness: Around 350HV

Welding Technique: For new material to be hardfaced normal cleaning to remove rust scale, paint etc is adequate. For reconditioning it is important to remove all earlier worn material so that no residual crack remains. Preheating may not be needed for low carbon, 0.3% C low alloy steels, but is necessary for high carbon, high alloy steels, generally by slow heating to 300°C followed by very slow cooling.

Storage and Redrying: The electrode should be stored in a dry place and if dampness is suspected redrying at 130°C for 30-40 minutes is recommended for best results.

Operating Data: AC (Min OCV 60) or DC Electrode *Positive or Negative*

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
3.2	450	82	3.0	90-120
4.0	450	55	3.0	130-170
5.0	450	35	3.0	160-210

		Page No.
		12



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HARDCRAFT 650 B
HIGH ABRASION MODERATE IMPACT
ELECTRODE

Electrode Guide

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Characteristics: A smooth running basic coated electrode which deposits air hardening Chromium Manganese Carbon steel for resisting high abrasion with moderate impact. This alloy is one of the hardest that can be deposited free of relief checks under normal welding conditions and so these electrodes find wide application for hardfacing on alloy steels and components subject to flexing during service. The basic flux coating gives excellent resistance to rust, mill scale, dirt and oil on the surface being hardfaced.

Applications: Suitable for grader and dozer blades, earth scoops, bucket lips, grousers, conveyor screws, post hole auger flutes, crusher jaws, pulping knives, agricultural points etc.

Hardness: 600-700 HV (not machinable / Grinding Only)

Storage and Redrying: The electrodes should be stored in a dry place and if suspected to be damp redrying at 150°C for 30-40 minutes is recommended.

Operating Data: Use AC (Minimum OCV 70) or DC Electrode *Positive or Negative*

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
3.2	350	100	3.0	105-135
4.0	350	65	3.0	140-180

		Page No.
		13



Linde Bangladesh Limited

DUROID 650R

HIGH ABRASION WITH MODERATE IMPACT

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Characteristics: A highly alloyed rutile coated electrode, depositing an unmachinable, air-hardening, weld metal, with a hardness of approximately 650HV (Rc 58), capable of withstanding severe abrasive wear with moderate impact. Due to high chromium content, the weld metal possesses a high resistance to corrosion and scaling, although not comparable to stainless steel.

Application: Suitable for metal to mineral wear applications, particularly on heavy earth-moving equipment, where conditions of high abrasion, accompanied by medium impact is expected.

Typical all weld metal composition:

Chemical Composition (%)

C	0.40
Mn	0.35
Cr	5.70
Mo	0.90
Si	1.00

Hardness: 600 – 700 HV (not machinable with standard tools)

Storage and Redrying : The electrodes should be stored in a dry place and if suspected to be damp, re-drying at 130°C for 30-40 minutes is recommended.

Operating Data: Use AC (Minimum OCV 70) or DC Electrode *Positive or Negative*

Size mm	Length mm	Stick per Pkt(±2)	Kgs. per Pkt (Approx.)	Recommended Current Range (Amperes)
3.2	350	100	3.0	90-120
4.0	350	65	3.0	120-170



Linde Bangladesh Limited

MANGCRAFT

HARDFACING 13% MANGANESE STEEL
ELECTRODE

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Classifications

Equivalent to AWS A5.13-80 E.Fe Mn

Characteristics: A smooth running electrode depositing fully austenitic manganese steel weld metal. The deposits are extremely tough with high resistance to impact and will work harden under load giving added abrasion resistance.

Applications: It is an excellent austenitic manganese steel electrode for rebuilding and reinforcing of 11-14% Manganese steel component either to finished dimensions or prior to applying an overlay of more abrasion resistant material. Typical items include dredge bucket lips and driving tumblers, hammers, grizzly, bucket teeth, blow bars, crusher jaws, roller and roll segments, Manganese steel rail points and crossing, etc.

Hardness

220-250 HV as deposited
Upto 425 HV work hardened.

Welding Technique: The inherent toughness of 13% Manganese steel can be seriously reduced by alterations in the structure if the material is excessively heated during welding. Generally the degree of embrittlement, which occurs, will be greater as the temperature and heating period is increased. Keep austenitic manganese steels cool during welding.

To counteract this, welding procedure should aim at keeping the base material cold. Preheating and stress relieving should never be used, and the heat input kept down by using the lowest convenient currents, short runs and by staggering the welds, water quenching may be done at frequent intervals if necessary. The weld metal is machinable with carbide tools.

Storage and Redrying conditions: The electrodes should be stored in a dry place and if is suspected that they have become damp, re-drying at 130°C for 60-75 minutes is recommended.

Operating Data: Use AC (Minimum OCV 55) or DC Electrode *Positive or Negative*

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
3.2	350	84	3.0	90-125
4.0	350	56	3.0	130-170
5.0	350	35	3.0	150-200

Welding Position-Downhand and Horizontal Build-up Applications

		Page No.
		15



Linde Bangladesh Limited

FERROLOID 1
CAST IRON MACHINABLE ELECTRODE

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Classifications

AWS EA. 5.15 -90 : E Ni Cu B

Characteristics: Monel (Nickel-Copper alloy) core electrode for making machinable deposit on cast iron and for welding grey cast iron without preheating. The deposited weld gives a good colour match and the electrode is particularly suitable for rectification and rebuilding of castings. The electrode has a smooth arc and the deposited weld is round and neat in appearance. The slag is very easily detached.

Applications: Used extensively for filling up flaws, blowholes, and pockets, etc in gray iron castings.

Welding Technique: Clean welding area of oil, grease and sand which can cause an unsatisfactory joint. Heat oil impregnated castings to burn off oil. Open out casting defects to gain proper access to the bottom. Uniform preheating to red heat should be employed where possible with very slow cooling after welding for best result. When welding without preheat restrict heat input to a minimum by using small size electrode, depositing short runs by scattered or planned wandering technique and allow casting to cool to about 100°C at frequent intervals. Use lowest convenient current.

Storage and Re-drying: Store in a dry place. If electrodes are suspected to be damp, re-drying at 110°C for 30-40 minutes before use can be carried out.

Operating Data: Use AC (Minimum OCV 50) or DC Electrode *Positive*

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
2.5	350	58	1.0	50-75
3.2	350	66	2.0	75-95
4.0	350	64	3.0	100-130

Welding Position-Downhand and fillet.

		Page No.
		16



Linde Bangladesh Limited

STAINCRAFT 308L-16
STAINLESS STEEL ELECTRODE

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Classifications

AWS A5.4 – 92	E308L - 16
BS 2926-1970	19.9 LR
JIS	D308L - 16

Characteristics: A rutile type all position low carbon austenitic electrode of the 19% Chromium, 9% Nickel type suitable for welding of all 18/8 ELC Grades of stainless Steel. The electrode is suitable for multi pass welding of AISI 308 and 308L Stainless steels. The main advantage is the added corrosion resistance due to extra low carbon.

Applications: Welding AISI 308 and 308L type Stainless Steel parts in Chemical and Fertilizer plants, Paper and Pulp Industries, Gas Turbines, Food Industries etc.

Typical all weld metal properties

Chemical Composition (%)

C	0.03
Mn	0.70
Si	0.45
Cr	19.5
Ni	10.0
S	0.015
P	0.018

Mechanical Properties

UTS	570 N/mm ²
Elongation on 4D	40 %

Storage & Redrying: The electrodes should be stored in a dry place. If the electrode picks up moisture or critical welding condition demand, it is recommended that these electrodes are redried at 250°C for a minimum period of 60-75 minutes before use.

Operating Data: AC (Min OCV 50) or DC Electrode *Positive*.

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	300	57	1.0	40-80
3.2	350	57	2.0	75-100
4.0	350	40	2.0	110-140

Welding Position-All positions (except Vertical Down)

		Page No.
		17



Linde Bangladesh Limited

STAINCRAFT 316L-16
STAINLESS STEEL ELECTRODE

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Classifications

AWS A5.4-92	E316L-16
BS 2926-1970	19.122 LR
JIS	D316L-16

Characteristics: A rutile type all position low Carbon austenitic electrode for welding of 19% Chromium, 12% Nickel, 3% Molybdenum type Stainless Steel. This electrode is suitable for single and multipass welding of AISI 316 and 316L Stainless Steels. Molybdenum increases resistance to pitting corrosion and raises the creep strength for high temperature applications. Excellent slag release and smooth finish is achieved.

Applications: AISI 316 and 316L type Stainless Steel parts in Chemical and Fertilizer plants, Paper and Pulp Industries, Food and Dairy Industries, etc.

Typical all weld metal properties

Chemical Composition (%)

C	0.03
Mn	0.80
Si	0.47
Cr	19.4
Ni	12.3
Mo	2.35
S	0.015
P	0.018

Mechanical Properties

UTS	570 N/mm ²
Elongation on 4D	38%

Storage and Re-drying: The electrodes should be stored in a dry place. If the electrodes are suspected to be damp, re-drying at 250°C for a 60-75 minutes, before use is recommended.

Operating Data: AC (Minimum OCV 50) or DC Electrode *Positive*.

Size	Length	Stick per	Kgs.per Pkt	Recommended Current Range
mm	mm	Pkt(±2)	(Approx.)	(Amperes)
2.5	300	57	1.0	40-80
3.2	350	61	2.0	80-110
4.0	350	40	2.0	115-140

Welding Position- All positions.

		Page No.
		18



Linde Bangladesh Limited

STAINCRAFT 309 Mo
STAINLESS STEEL ELECTRODE

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Classifications

AWS A5.4-92	E 309 Mo-16
BS2926-1970	23.12.3R
JIS	D309 Mo- 16

Characteristics: A rutile type Stainless Steel Electrode suitable for depositing 25/12 type austenitic weld metal containing approximately 2.5% Mo. Ideally suited for joining 18-8 types stainless steel to mild steel as well as medium Carbon low alloy steels. It has a good corrosion and crack resistance properties. It is very useful for joining Stainless Steel to Carbon Steel & dis-similar steels.

Applications: For welding AISI type 309 and 309 Mo sheet, plates, pipes and castings. Also for welding AISI 316 and 316L clad steels for Building of Cr-Mo steel, carbon steel Buffer layer in Build up.

Typical all weld metal properties

Chemical Composition (%)

C	0.05
Mn	0.65
Si	0.50
Cr	23.5
Ni	12.7
Mo	2.6
S	0.015
P	0.018

Mechanical Properties

UTS	620 N/mm ²
Elongation on 4D	35 %

Storage & Redrying: The electrode should be stored in a dry place. If the electrodes pick up moisture or critical welding condition demand, it is recommended that these electrodes are redried at 250°C for 60-75 minutes before use.

Operating Data: AC (Minimum OCV 50) or DC Electrode *Positive*.

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
2.5	300	58	1.0	45-70
3.2	350	61	2.0	85-110
4.0	350	40	2.0	110-140

Welding Position- All Positions.

		Page No. 19



Linde Bangladesh Limited

STAINCRAFT 308-16
STAINLESS STEEL ELECTRODES

Electrode Guide

Issue No. : 05

Effective From : 01/01/2010

Classifications

AWS A 5.4 – 92	E308-16
JIS	D308-16

Characteristics: Rutile coated all positional austenitic stainless steel electrodes. The electrode is suitable for welding of 18% Chromium 8% Nickel type, AISI 304 stainless steel sheets, pipes and castings.

Excellent weld bead appearance giving mitre in Horizontal-Vertical and other positions. Smooth stable arc, good wetting, low spatter and easy restarting properties. Fluid but controlled slag with good slag detachability properties. Minimum time requires for cleaning, grinding and polishing.

Applications: Suitable for similar unstabilised varieties of stainless steel such as AISI 301,302,302B, 303, 304, and 305. The electrode has ferrite controlled within 6-10% and has good crack resistance. It can also be used for surfacing and overlay applications and joining 14% Manganese steel.

Typical all weld metal properties

Chemical Composition (%)

C	0.045
Mn	0.62
Si	0.38
Cr	19.8
Ni	10.0
S	0.012
P	0.019

Mechanical Properties

UTS	580 N/mm ²
Elongation on 5D	38 %
Impact (CVN) at room temp	93 Joule

Storage and Re-drying: The electrodes should be stored in a dry place. If the electrode picks up moisture or critical welding condition demand, it is recommended that these electrodes are re-dried at 250°C for 60-75 minutes before use.

Operating Data: AC (Min OCV 50) or DC Electrode Positive

Size mm	Length mm	Stick per Pkt(±2)	Kgs.per Pkt (Approx.)	Recommended Current Range (Amperes)
2.5	300	54	1.0	55-65
3.2	350	58	2.0	75-95
4.0	350	40	2.0	95-125

Welding Position- All positions.

		Page No.
		20