

# ***HARDFACING PRODUCT CATALOG***

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***Wearshield® and Lincore® Consumables***

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## About The Lincoln Electric Company

*Lincoln Electric is the world's premier manufacturer of welding equipment and consumables. No company on earth is more focused on the ever-changing needs of the welding professional. Our business is all about helping companies make their welding operations more effective, more efficient, more profitable.*

*Lincoln is truly your "One Source" when it comes to welding. We're a company that continually rededicates itself to the equally important goals of exceptional quality, and exceptional service. Our field support team — with hundreds of field sales engineers and thousands of knowledgeable and responsive Lincoln distributors in countries all over the world — is the largest in the industry. Innovative thinking. A quality and service-first attitude. Fresh approaches to design, manufacturing, and packaging. Worldwide strength. That's Lincoln Electric.*

## What is Hardfacing?

The American Welding Society defines hardfacing as "A surfacing variation in which surfacing material is deposited to reduce wear." The term surfacing is defined as "The application by welding. . . of a layer, or layers, of material to a surface to obtain desired properties or dimensions, as opposed to making a joint."

### *AWS A3.0 Standard Welding Terms and Definitions*

What that means to you is that you can use hardfacing consumables from Lincoln Electric to:

- Get new life out of old parts
- Hardface new parts (such as on an OEM basis) to get better performance from new assemblies
- Hardface rather than replace parts

And that extends the service life of your equipment subject to wear, saves you money, and sometimes, even makes a service part better than new!

### **What are the benefits of Lincoln Hardfacing consumables?**

- Frequently, the resulting deposit exhibits superior wear-resistant compared to the original material.
- Often, the resulting deposit is harder than the original material.
- When properly applied, the hardfacing or build-up deposit will last longer than the original material.
- Lincoln hardfacing and build-up deposits go on smoothly and exhibit better wear characteristics than many competitive products intended for the same application.

### **Wide Range of Hardfacing Consumables**

#### **Wearshield® Stick Electrodes**

Select a Wearshield electrode from a broad selection – one for almost any application.

- Deliver maximum welding application flexibility in remote locations.
- Compared to other welding processes, requires the least amount of equipment.
- Many Wearshield Stick Electrodes can be used in all welding positions.



#### **Lincore® Open Arc Self-Shielded and Gas-Shielded Wire Electrodes and Submerged Arc Wire Electrodes**

Choose a Lincore wire for maximum productivity, especially useful on multiple layer or repetitive applications. Many alloys, sizes and packages are available.

- Produces a higher deposition rate than stick.
- Automatic welding, typically 1/8" (3.2 mm) electrode diameter and greater, requires the greatest amount of set-up, while delivering the highest deposition rates and maximum productivity.

*Hardfacing*

### Lincolnweld® Neutral and Alloy Submerged Arc Fluxes

Use a particular flux to tailor the resulting wear characteristics for your particular application.

- Neutral fluxes do not significantly change weld metal composition.
- Alloy fluxes are used with mild steel wire to make alloy weld deposits.
- Choosing the right flux can be simple with help from the Welding Experts at Lincoln Electric.

***We asked welding professionals what they expect. Then we exceeded those expectations.***

#### Industry-leading consistency

Consistency matters to you, and it matters to us. We go to incredible lengths to ensure that our hardfacing products are the most consistently performing consumables in the industry.

- We check and re-check every pound of raw steel and flux ingredients.
- Our manufacturing processes are the most meticulously designed, diligently monitored and technically advanced in the industry, relying on Six Sigma® process controls, optical emissions spectrometry, x-ray analysis and our own long-studied Performance Development System.
- Diameter and chemical composition are verified at 19 individual points throughout manufacturing.

#### Exceptional Composition Control

In test after test, Lincoln's composition control systems have shown to be significantly superior to that of other electrodes and wires on the market.

- Incredibly tight tolerances – means better and more consistent wear, less procedural adjusting, less waste and increased efficiency.

#### Outstanding Arc Stability

- Consistent and stable arc behavior makes all the difference in cutting time from procedural set-up and getting the hardfacing deposit and appearance characteristics you expect.



### Superior Feedability

Set it and forget it!

- Lincore wire feeds beautifully, so your hardfacing operators can concentrate on getting your equipment back in service instead of on adjustments and restarts.

### ***Backed by the best welding company in the world***

Wearshield, Lincore and Lincolnweld hardfacing products are designed, manufactured and supported by Lincoln Electric – The world's most respected name in welding.

#### Why?

- Total process capability – We understand welding consumables – and the equipment and systems used to apply them.
- Local support – Our sales engineers and hardfacing specialists in the field are located at an office near you.
- Technical support – Part analysis and other application engineering services are available.
- Training – The world's oldest welding school trains individuals or teams in standard or customized classes just for you.

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## WEARSHIELD® STICK ELECTRODE SELECTION GUIDE

Electrode Name	Rockwell Hardness (R <sub>C</sub> )	Polarity	General Description	Page No.
<b>Stick Electrode - Build-Up</b>				
Wearshield BU	20 - 25	DC+ AC	Build-up with moderate hardness to resist shock and metal-to-metal wear, as in rolling and sliding. Can be used as underbase for other hardfacing deposits or as final overlay on parts to be machined or forged. Use on mild and low alloy steels.	9
Wearshield BU-30	31 - 38	DC+ AC	Build-up with slightly higher hardness than Wearshield BU. Machinable deposit for build-up on medium carbon and low alloy materials, or final overlay of medium hardness.	10
<b>Stick Electrode - Metal-To-Metal Wear</b>				
Wearshield MM	45 - 58	DC+ AC	High hardness level for metal-to-metal wear with mild abrasion. Weld metal is heat treatable. Provides a martensitic wear-resistant steel deposit.	11
Wearshield T&D	58 - 65	DC+ AC	Deposit similar to Type M-1 tool steel, to resist metal-to-metal wear. Rebuilds dies and cutting edges of high speed tool steel.	12
Wearshield MI	50 - 54	DC+ AC	Resists metal-to-metal wear, mild abrasion and moderate impact. Provides a martensitic deposit with considerable retained austenite. General purpose electrode, a good compromise of metal-to-metal wear, moderate impact and mild abrasion.	13
Wearshield Mangjet	40 - 47 <sup>(1)</sup>	DC+ AC	For building up austenitic manganese steel and cladding carbon steels. Produces an austenitic manganese deposit that will work harden in service. Lowest cost austenitic manganese material.	14
<b>Stick Electrode - Impact</b>				
Wearshield 15CrMn	40 - 50 <sup>(1)</sup>	DC+ AC	Provides a premium austenitic chromium manganese deposit. Resists severe impact or gouging even in a single layer over carbon steel. Used to join Hadfield manganese steel to itself or to carbon steel.	15
Wearshield Frogmang®	45 - 55 <sup>(1)</sup>	DC+	Designed specifically for building up manganese frogs and manganese crossing diamonds in the railroad industry. Provides a high strength high alloy austenitic manganese deposit to handle the increased loading of railroad cars.	16
Wearshield ABR	24 - 55	DC+ AC	Provides good resistance to abrasion, impact and some metal-to-metal wear. Good hot forging properties. Hardness will vary based on cooling rate. Use on carbon, stainless and manganese steels. Low cost general purpose abrasion and impact product.	17
<b>Stick Electrode - Abrasion Plus Impact</b>				
Wearshield 44	42 - 48	DC+ AC	Moderate hardness to resist abrasion with impact up to 1100°F (593°C). Higher alloy results in improved spalling resistance than Wearshield ABR.	18

<sup>(1)</sup> The values shown are for work-hardened ranges. As-welded hardness ranges will be much lower.

## WEARSHIELD® STICK ELECTRODE SELECTION GUIDE

Electrode Name	Rockwell Hardness (R <sub>C</sub> )	Polarity	General Description	Page No.
<b>Stick Electrode - Metal-To-Earth Wear</b>				
Wearshield ME	49 - 59	DC+ AC	Designed for metal-to-earth abrasion. High alloy produces chrome carbides and austenite. Provides greater abrasion resistance than Wearshield ABR or Wearshield 44.	19
<b>Stick Electrode - Abrasion</b>				
Wearshield 60	57 - 62	DC+ AC	Wearshield 60 is designed to resist severe abrasion. It exhibits higher alloy and higher abrasion resistance than Wearshield ABR, Wearshield 44 or Wearshield ME.	20
Wearshield 70	65 - 70	DC+ AC	Resists very severe abrasion at temperatures up to 1400°F (760°C). Exhibits the highest abrasion resistance of the Wearshield stick electrodes. Premium complex carbide deposit.	21
Wearshield SM80	45 - 60	DC+ AC	Designed specifically for surfacing crushing rolls in the sugar cane industry. Chrome carbide deposit resists abrasive wear.	22
<b>Stick Electrode - High Temperature Non-Ferrous (Cobalt)</b>				
Wearshield C1 & C1 Bare	50	DC+ AC	Highest abrasion resistance of the cobalt alloys. Resists abrasion at room temperatures and when temperatures exceed the limits of iron base alloys [1000-1800°F (538-982°C)]. Can be used on screw conveyors moving hot minerals (coke) in a corrosive environment. Available as a coated electrode for stick welding and bare rod for TIG or oxy-fuel applications.	23
Wearshield C6 & C6 Bare	40	DC+ AC	Resists metal-to-metal wear with mild abrasion and erosion at room temperatures and when temperatures exceed the limits of iron base alloys [1000-1800°F (538-982°C)]. Used for valve seats any where galling is a problem. Coated electrode for arc welding or bare rod for TIG or oxy-fuel applications.	24
Wearshield C21 & C21 Bare	25	DC+ AC	Resists metal-to-metal wear in severe corrosive environments at room temperatures and when service temperatures exceed the limits of iron based alloys [1000-1800°F (538-982°C)]. Used for high temperature impact cavitation and galling resistance. Coated electrode for stick welding or bare electrode for TIG welding. Oxy-fuel is not recommended.	25

## LINCORE® WIRE SELECTION GUIDE

Electrode Name	Rockwell Hardness (R <sub>c</sub> )	Polarity	General Description	Page No.
<b>Self-Shielded and Gas-Shielded Cored Wires - Build-Up</b>				
Lincore BU	78 - 98 R <sub>b</sub>	DC+	Self-shielded, flux-cored wire provides a tough machinable deposit for build-up or final overlay. Lincore BU delivers non-severe metal-to-metal wear with outstanding crack resistance.	26
Lincore BU-G	21 - 33	DC+	Gas-shielded, metal-cored wire delivering deposits with moderate hardness for build-up or as final overlay. Lincore BU-G does provide some resistance to metal-to-metal wear and moderate impact. Can be used for the matrix with the Bulk Tungsten Carbide process.	27
Lincore 33	14 - 34	DC+	Self-shielded, flux-cored wire delivers tough machinable deposits for build-up or final overlay intended for metal-to-metal wear. Use for build-up of steel mill parts such as rougher couplings. Also can be used as build-up under harder materials.	28
<b>Self-Shielded and Gas-Shielded Cored Wires - Metal-to-Metal Wear</b>				
Lincore 40-O	36 - 41	DC+	Self-shielded, flux-cored wire produces a deposit which resists metal-to-metal rolling or sliding wear as well as mild abrasion. Produces a martensitic deposit.	29
Lincore 55	50 - 60	DC+	Self-shielded, flux-cored wire with higher hardness for metal-to-metal wear and mild abrasion. Used on transfer rollers and guides, crane wheels and shafts.	30
Lincore 55-G	50 - 57	DC+	Gas-shielded, metal-cored wire produces a deposit which resists metal-to-metal wear and mild abrasion. The deposit results in an even harder material when used with the Bulk Tungsten Carbide process.	31
<b>Self-Shielded and Gas-Shielded Cored Wires - Impact</b>				
Lincore T&D	48 - 55	DC+	Self-shielded, flux-cored wire delivers a deposit similar to H12 tool steel. For build-up of tool steel dies and edges, or applying wear resistance surface on carbon or low alloy steels.	32
Lincore M	30 - 48 <sup>(1)</sup>	DC+	The deposit of this self-shielded, flux-cored wire resists severe impact as well as moderate abrasion. Produces an austenitic manganese deposit that work-hardens. Recommended for build-up and repair of Hadfield-type austenitic manganese materials as well as carbon and low alloy steels.	33
Lincore M-1	30 - 48 <sup>(1)</sup>	DC+	This self-shielded, flux-cored wire is recommended for the same applications as Lincore M. However, M-1 produces less slag.	34
Lincore 15CrMn	44 - 55 <sup>(1)</sup>	DC+	This self-shielded, flux-cored wire deposits an austenitic manganese deposit which exhibits very good crack resistance. Work-hardens for overlay or joining austenitic manganese steel to itself or to carbon steel. Can be used as a build-up layer before capping with abrasion resistant alloys.	35
Lincore 15CrMn LS	44 - 55 <sup>(1)</sup>	DC+	This self-shielded, flux-cored wire is intended for the same applications as Lincore 15CrMn. However, 15CrMn LS produces a lighter slag.	36
Lincore Frogmang	40 - 50 <sup>(1)</sup>	DC+	Self-shielded, flux-cored wire designed for repair of manganese frogs and manganese crossing diamonds in the railroad industry. High alloy austenitic manganese deposit.	37

<sup>(1)</sup> The values shown are for work-hardened ranges. As-welded hardness ranges will be much lower.

## LINCORE® WIRE SELECTION GUIDE

Electrode Name	Rockwell Hardness (R <sub>C</sub> )	Polarity	General Description	Page No.
<b>Self-Shielded and Gas-Shielded Cored Wires - Abrasion</b>				
Lincore Frogmang-G	40 - 50 <sup>(1)</sup>	DC+	Gas-shielded, metal-cored wire, designed for repair of manganese frogs and manganese crossing diamonds in the railroad industry. High alloy austenitic manganese deposit.	38
Lincore 50	34 - 52	DC+	Self-shielded, flux-cored wire delivers an abrasion resistant deposit, even under conditions of moderate impact. Larger wire diameter sizes may be used for the submerged arc process.	39
Lincore 60-O	55 - 60	DC+	This self-shielded, flux-cored wire features higher alloy levels than Lincore 50. Its deposits resist both abrasion and moderate impact. Lincore 60-O can be used at temperatures up to 1300°F (704°C).	40
Lincore 60-G	57 - 61	DC+	This gas-shielded, metal-cored wire features higher alloy levels than Lincore 50. The deposits resist both higher levels of abrasion and moderate impact. Lincore 60-G can be used at temperatures up to 1300°F (704°C).	41
Lincore 65-O	57 - 64	DC+	Deposits of this self-shielded, flux-cored wire resist severe abrasion and light impact. These deposits include higher carbon and chrome levels than Lincore 60-O. It is recommended for use on wear plate, coal pulverizer rolls, earth engaging tools, and on slurry pipe and elbows.	42
<b>Metal-Cored Submerged Arc Wires - Build-Up</b>				
Lincore 30-S	26 - 30	DC+	This metal-cored wire is intended for build-up before final overlay, and as a final surface for metal-to-metal wear with moderate impact. Lincore 30-S is recommended for use with Lincolnweld® 801 flux.	43
Lincore 32-S	28 - 32	DC+	This metal-cored wire is designed for build-up on 4140 drill stems in the deep hole drilling industry. It is recommended for use with Lincolnweld 802 flux.	44
Lincore 35-S	33 - 39	DC+	This metal-cored wire is intended for rolling and sliding metal-to-metal wear with moderate impact and abrasion. Use on crane and mine car wheels, rollers and shafts. Also can be used for build-up on continuous caster rolls prior to a stainless overlay. Recommended flux is Lincolnweld 801.	45
<b>Metal-Cored Submerged Arc Wires - Metal-To-Metal Wear</b>				
Lincore 40-S	39 - 42	DC+	This metal-cored wire is designed for rebuilding heavy equipment undercarriages. The deposit resists rolling and sliding metal-to-metal wear. It is also machinable and hot forgeable. Recommended flux is Lincolnweld 801.	46
Lincore 42-S	39 - 42	DC+	This metal-cored wire is designed for rebuilding heavy equipment undercarriages. The deposit exhibits enhanced crack resistance and toughness compared to Lincore 40-S. It is intended to resist rolling and sliding metal-to-metal wear. Recommended flux is Lincolnweld 801.	47
<b>Metal-Cored Submerged Arc Wires - Severe Abrasion</b>				
Lincore 60-S	55 - 60	DC+	Metal-cored wire which resists severe abrasion with mild impact. Can be used on carbon, low alloy, manganese and stainless steels, as well as cast iron. Many layers can be applied using high travel speeds and small bead sizes, to promote close spaced cross check cracks. Recommended flux is Lincolnweld 803.	48

<sup>(1)</sup> The values shown are for work-hardened ranges. As-welded hardness ranges will be much lower.

## LINCORE® WIRE AND LINCOLNWELD® FLUX SELECTION GUIDE

Electrode Name	Rockwell Hardness (R <sub>C</sub> )	Polarity	General Description	Page No.	
<b>Metal-Cored Submerged Arc Wires for Roll Rebuilding - Build-Up</b>					
Lincore 20	23 - 28	DC+	Metal-cored wire with moderate hardness for build-up before final overlay. Good crack resistance and high compressive strength. Recommended flux is Lincolnweld 801.	50 - 52	
Lincore 8620	16 - 20	DC+	Metal-cored wire for build-up on worn or undersize rolls. A little softer than Lincore 20, for easier machining. Recommended flux is 801.		
Lincore 4130	17 - 21	DC+	Metal-cored wire for general build-up. Can be flame hardened to 38 R <sub>C</sub> . Also used on mining components such as cable drums, sheaves, gears and shafts. Recommended flux is 801.		
<b>Metal-Cored Submerged Arc Wires for Roll Rebuilding - Metal-to-Metal Wear</b>					
Lincore 410	27 - 32	DC+	Metal-cored wire with a 410 martensitic stainless steel deposit. Low carbon content and corrosion resistant deposit. Soft and easily machined. Flux recommendation is 801.	53	
Lincore 410NiMo	32 - 40	DC+	Metal-cored wire with low carbon deposit, which forms softer, tougher martensite than other roll alloys. Recommended flux is 801.		
Lincore 424A	36 - 42	DC+	Metal-cored wire with higher nickel content than 410NiMo alloy. Flux recommendation is 801.		
Lincore 423L	41 - 47	DC+	Metal-cored wire which provides a softer weld deposit than Lincore 420, with more resistance to softening during tempering above 900°F (482°C). Recommended flux is 802.		
Lincore 423Cr	41 - 47	DC+	Metal-cored wire with a higher chrome deposit than Lincore 423L for improved corrosion resistance. Recommended flux is 802.		
Lincore 420	46 - 50	DC+	Metal-cored wire that is most widely used for caster roll rebuilding. Flux recommendation is 801.		
Lincore 96S	48 - 54	DC+	Metal-cored wire with a high carbon, 420 stainless steel deposit. Use where a higher hardness is required. Can be used on work rolls and backup rolls, when water spray causes pitting on tool steel deposits. Flux recommendation is 801.		
Lincore 102W	48 - 54	DC+	Metal-cored wire which produces a tool steel deposit that retains hardness at high working temperatures. Used for guide rolls, and work rolls. Can also be used as the seat on blast furnace bells and hoppers. 802 flux is recommended.		
Lincore 102HC	54 - 60	DC+	Metal-cored wire with a higher carbon content than Lincore 102W. Will give a higher hardness tool steel deposit. Deposit is "hot" [above 400°F (204°C)] machinable, for easy sizing after welding. Recommended flux is 802.		
<b>Lincolnweld Hardfacing Fluxes</b>					
H535			Good metal-to-metal wear. Allows for some machinability.		53
A-96S			Type 420 stainless deposit with a carbon content near the high side for as-welded hardness.		
H560			High alloy flux, excellent for severe abrasion.		
801, 802, 803, 860 & 880			Lincolnweld neutral fluxes do not significantly change deposits composition, rather welding characteristics.		



**Build-up and Moderate Hardness to Resist Shock and Metal-to-Metal Wear**

Build-up with moderate hardness to resist shock and metal-to-metal wear, as in rolling and sliding. Can be used as underbase for other hardfacing deposits or as final overlay on parts to be machined or forged. Use on mild and low alloy steels.

**ADVANTAGE LINCOLN**

- Easy restrike and good arc action.

- Low spatter gives Wearshield BU a high operator appeal.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Slag removes easily and cleanly.
- Unlimited layers with proper preheat, interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

**DEPOSIT COMPOSITION (1)**

On Carbon Steel	%C	%Mn	%Si	%Cr	%S	%P
2 or more Layers	.14	1.15	.60	1.40	.025	.015

**MECHANICAL PROPERTIES (1)**

	Rockwell Hardness (R <sub>C</sub> )		
1 Layer	2 Layers	3 Layers	
15 - 20	18 - 23	23 - 28	

(1) Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	10 Lb. (4.5 kg) Carton (40 Lb. Master)	50 Lb. (22.7 kg) Carton
	5/32 (4.0)	ED021991
3/16 (4.8)	ED021993	ED021994
1/4 (6.4)		ED021995

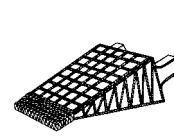
**TYPICAL OPERATING PROCEDURES**

Polarity	Current (amps)		
	5/32" (4.0mm)	3/16" (4.8mm)	1/4" (6.4mm)
DC+	145 - 210	180 - 280	230 - 360
AC	155 - 225	200 - 290	255 - 375

Preferred polarity is listed first.

**TYPICAL APPLICATIONS**

**FOR BUILD-UP**



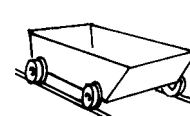
Bucket Teeth



Crusher Hammers

- Shovel and Bucket Lips
- Pump Impellers and Housings
- Pulverizer Plows
- Mill Hammers

**FOR HARDFACING**



Mine Car Wheels



Idlers

- Trunnions/Shafts
- Tractor Rolls and Links
- Cranes
- Gears

**COMPETITIVE PRODUCTS**

**Stoody®**  
Buildup

**McKay®**  
32

**NOTES**

Using a short arc with a slight weave motion, deposit beads about 1/2" - 3/4" (13-19 mm) wide with the 5/32" and 3/16" (4.0 - 4.8 mm) electrode diameters, and about 1"(25 mm) wide with the 1/4" (6.4 mm) diameter. However, on edges and corners, fast-moving stringer beads or very narrow weaved beads are usually preferred. The exact width and thickness of the bead will depend on the mass of the piece being welded. Work-hardened base or weld metal should be removed before applying Wearshield BU, since such areas are more prone to embrittlement and possible cracking. The part should be preheated to at least 70°F (21°C). Preheating above 100°F (40°C) is usually not required. Preheating depends largely on the base metal composition. On large, complex, or restrained parts, a preheat of 300° - 500°F (150° - 260°C) may be necessary.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Build-up and Moderate Hardness to Resist Shock and Metal-to-Metal Wear

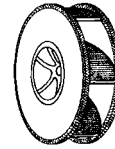
Build-up with slightly higher hardness than Wearshield BU. Machinable deposit for build-up on medium carbon and low alloy materials, or final overlay of medium hardness.

### ADVANTAGE LINCOLN

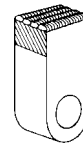
- Use on mild, medium carbon, low alloy and high tensile steels.

- High operator appeal, with easy restrike and slag removal.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Unlimited layers with proper preheat, interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS FOR BUILD-UP



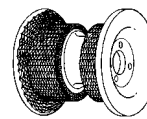
Pump Impellers



Crusher Hammers

- Shovel and Bucket Lips
- Pump Housings
- Dredge and Shovel Bucket Teeth
- Mill Hammers

## FOR HARDFACING



Tractor Rolls



Chain Links



Idlers

- Crane and Mine Car Wheels
- Trunnions and Shafts
- Churn Bit Points
- Gears
- Sprockets
- Cable Drums
- Clutch Jaws

## DEPOSIT COMPOSITION <sup>(1)</sup>

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo
1 Layer	.15	.82	1.03	1.23	.48
2 Layers	.16	.87	1.14	1.49	.58
4 Layers	.16	.88	1.23	1.63	.56

## MECHANICAL PROPERTIES <sup>(1)</sup>

1 Layer	Rockwell Hardness (R <sub>C</sub> )	
	2 Layers	4 Layers
31	35	38

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter mm (Inches)	10 Lb. (4.5 kg) Carton	50 Lb. (22.7 kg) Carton
	(40 Lb. Master)	
3.2 (1/8)	ED024943	
4.0 (5/32)	ED024944	
5.0 (3/16)		ED024945

Manufactured in metric diameters, U.S. customary sizes are approximate.

## TYPICAL OPERATING PROCEDURES

Polarity	3.2mm (1/8")	Current (amps)	
		4.0mm (5/32")	5.0mm (3/16")
DC+	90 - 130	140 - 180	170 - 220
AC	100 - 140	150 - 200	190 - 240

Preferred polarity is listed first.

## COMPETITIVE PRODUCTS

**Stody®**  
Buildup

**McKay**  
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## NOTES

A preheat and interpass temperature of 300 - 500°F (150 - 260°C) is necessary to prevent cracking, especially on large, complex or restrained parts.

For most overlay applications, a weaving drag technique on beads of about 1/2" (13 mm) with all three diameter sizes can be used. Stringer beads can be used when welding on edges or around corners.

For ease of machining, the following procedures should be adopted while welding:

- Preheat temperature should be in the 300 - 500°F (150 - 260°C) range.
- Maintain interpass temperature of 300 - 500°F (150 - 260°C).
- Use the largest diameter electrode possible for the application, at the highest current in the typical operating procedure range.
- Anneal or normalize after welding. Heat treat after machining.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Metal-to-Metal Wear and Mild Abrasion

High hardness for metal-to-metal wear with mild abrasion. Weld metal is heat treatable. Provides a martensitic wear-resistant steel deposit.

### ADVANTAGE LINCOLN

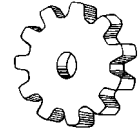
- Use on carbon steel and low alloy steel applications.
- Designed for all-position welding except vertical-down.

- Restrike is easy, slag removes very easily and cleanly.
- Spatter is low, which gives it a high operator appeal.
- Unlimited layers with proper pre-heat, interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Cable Sheaves



Sprockets

- Crane wheels
- Skip wheels
- Cams
- Gear teeth
- Transfer tables

## DEPOSIT COMPOSITION <sup>(1)</sup>

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo	%W
2 Layers	0.55	0.5	1.4	4.5	0.5	0.5

## MECHANICAL PROPERTIES <sup>(1)</sup>

1 Layer	Rockwell Hardness (R <sub>C</sub> ) 2 or more Layers
45 - 55	52 - 58

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter mm (Inches)	10 Lb. (4.5 kg) Carton	50 Lb. (22.7 kg) Carton
	(40 Lb. Master)	
3.2 (1/8)	ED021986	ED021987
4.0 (5/32)	ED021988	ED021989
5.0 (3/16)		ED021990

Manufactured in metric diameters, U.S. customary sizes are approximate.

## TYPICAL OPERATING PROCEDURES

Polarity	3.2mm (1/8")	Current (amps)	
		4.0mm (5/32")	5.0mm (3/16")
DC+	100 - 130	140 - 170	170 - 220
AC	100 - 130	140 - 170	170 - 220

Preferred polarity is listed first.

## COMPETITIVE PRODUCTS

**Stoody®**  
Multipass 22

**McKay®**  
Hardalloy 58

## NOTES

In welding with Wearshield MM, a short arc is preferred. After welding is completed, the weldment should be covered and allowed to cool very slowly to near room temperature. Then, once cooled, postweld heat treatment can be used to temper martensite and toughen the deposit.

As deposited, Wearshield MM weld metal is not machinable, although the deposit can be shaped by grinding. Tempering to toughen the deposit is typically accomplished at about 800°F (427°C), which will leave the weld metal near 50 Rockwell C. It can be annealed by heating to about 1400°F (760°C) for several hours, followed by slow cooling. Its hardness will then be less than 30 Rockwell C. In this condition, it can be easily machined.

To fully re-harden, it is best to reheat to about 1750°F (954°C) and hold for several hours to dissolve all carbides and homogenize the steel. Then it can be water or oil quenched (thin sections can be air cooled) to harden, followed by tempering.

A preheat and interpass temperature of 300-500°F (149-260°C) is usually sufficient to prevent cracking. Higher temperatures may be necessary in cases of severe restraint and heavier thicknesses.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Resists Metal-to-Metal Wear**

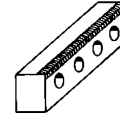
Similar deposit to Type M-1 tool steel to resist metal-to-metal wear. Rebuilds dies and cutting edges of high speed tool steel.

**ADVANTAGE LINCOLN**

- For building up worn tool steel dies or applying a wear resistant surface to carbon steel or low alloy steel parts.
- Restrike is easy, spatter is low and slag removes easily and cleanly.

- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Unlimited layers with proper pre-heat, interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



Die Cast



Guides

- Punch dies
- Trimmers
- Forging dies

**COMPETITIVE PRODUCTS**

**Stoody®**  
102E

**McKay®**  
Hardalloy 61

**NOTES**

After welding is completed, the weldment should be covered and allowed to cool very slowly to near room temperature. Once cooled, postweld heat treatment can be used to temper martensite and toughen the deposit. Tempering at 1000-1100°F (538-593°C) normally provides the best combination of hardness and toughness.

As deposited or tempered, Wearshield T&D weld metal is not machinable, although the deposit can be shaped by grinding. It can be annealed by heating to about 1550°F (843°C) for several hours, then slow cooled.

Hardness will then be less than 30 Rockwell C. In this condition, it can easily be machined.

To re-harden fully, it is necessary to reheat to about 2200°F (1200°C) and hold for several hours to dissolve all carbides and homogenize the steel. Then it can be air cooled to harden, followed by tempering.

Wearshield T&D cannot be cut with the oxy-fuel process. Plasma arc and air-carbon arc processes can cut or gouge the weld deposit successfully. Preheat similar to that for welding may be necessary to prevent cracking along the cut edge.

Preheat and interpass temperatures of 600°F (316°C) or higher may be necessary to avoid cracking.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**DEPOSIT COMPOSITION <sup>(1)</sup>**

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo	%W	%V
2 Layers	0.65	0.4	0.7	3.75	6.0	1.8	1.1

**MECHANICAL PROPERTIES <sup>(1)</sup>**

Rockwell Hardness (R <sub>C</sub> )	
As Welded	Tempered
58 - 62	63 - 65

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**DIAMETERS / PACKAGING**

Diameter mm (Inches)	10 Lb. (4.5 kg) Carton (40 Lb. Master)
2.5 (3/32)	ED021972
3.2 (1/8)	ED021973
4.0 (5/32)	ED021974

Manufactured in metric diameters, U.S. customary sizes are approximate.

**TYPICAL OPERATING PROCEDURES**

Polarity	Current (amps)		
	2.5mm (3/32")	3.2mm (1/8")	4.0mm (5/32")
DC+	80 - 100	110 - 130	130 - 160
AC	80 - 100	110 - 130	130 - 160

Preferred polarity is listed first.

## Resists Metal-to-Metal Wear, Mild Abrasion and Moderate Impact

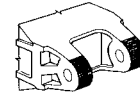
Provides a martensitic deposit with considerable retained austenite. General purpose electrode, a good compromise for metal-to-metal wear, moderate impact and mild abrasion.

### ADVANTAGE LINCOLN

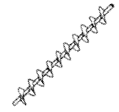
- Can be used on carbon and low alloy steel parts.

- Designed for all-position welding except vertical-down.
- Restrike is easy, slag removes very easily and cleanly and spatter is low, which gives it a high operator appeal.
- Deposits tend to cross check and are usually best limited to two layers.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Boom Heels



Conveyor Screws

- Dipper Lips
- Tractor Grousers
- Ditcher Teeth
- Hammer Mills
- Lumber Equipment

## COMPETITIVE PRODUCTS

**Stoody®**  
Self-Hardening

## NOTES

In welding with Wearshield MI, a short arc or a long arc may be used. The short arc will give greater build-up with each bead. The long arc is ideal for depositing thin layers, though alloy recovery may be reduced. In depositing Wearshield MI, preheat and interpass temperatures of 400°F (200°C) minimum are helpful, as well as limiting deposit to two layers, to reduce cracking and avoid chipping and fragmentation. Weld deposit cannot be cut with oxy-fuel process. Plasma arc and air-carbon arc processes can cut or gouge the weld deposit successfully. Grinding is usually best if the deposit needs to be shaped.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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## DEPOSIT COMPOSITION <sup>(1)</sup>

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo
2 or more Layers	0.9	0.4	0.4	9.5	0.6

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
1 Layer	2 or more Layers
50	54

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter Inches (mm)	3 Lb. (1.4 kg) Tube		10 Lb. (4.5 kg) Carton	50 Lb. (22.7 kg) Carton
	(18 Lb. Master)		(40 Lb. Master)	
1/8 (3.2)	ED025112		ED022003	ED022004
5/32 (4.0)			ED022005	ED022006
3/16 (4.8)			ED022007	ED022008
1/4 (6.4)				ED022009

## TYPICAL OPERATING PROCEDURES

Polarity	Current (amps)			
	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	1/4" (6.4mm)
DC+	70 - 120	110 - 150	150 - 200	225 - 275
AC	70 - 120	110 - 150	150 - 200	225 - 275

Preferred polarity is listed first.

**Resists Moderate and Severe Impact**

For building up austenitic manganese steel and cladding carbon steels. Produces an austenitic manganese deposit that will work harden in service. Lowest cost austenitic manganese stick electrode.

**ADVANTAGE LINCOLN**

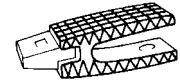
- Rebuilding of manganese parts, as well as joining manganese steel to itself.
- Designed for all-position welding, except vertical down.
- Good resistance to moisture pick-up, which results in resistance to weld porosity.

- Restrike is easy, and spatter is low, for high operator appeal.
- Unlimited layers with proper pre-heat, interpass temperatures and procedures.
- Under high restraint, Wearshield 15CrMn may be more crack resistant than Wearshield Mangjet when joining manganese steel.
- Should not be used for service temperatures over 500°F (260°C) due to embrittlement.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



Dragline Pins



Bucket Tooth

- Dipper Teeth and Lips
- Crusher Screens
- Chain Hooks
- Crusher Rolls
- Hammers
- Shovel Tracks
- Rolling Mill Parts
- Parts for Safes and Vaults
- Manganese Bucket Fronts
- Drive Sprockets

**DEPOSIT COMPOSITION (1)**

On Carbon Steel	%C	%Mn	%Si	%Mo	%S
2 or more Layers	.65	14.5	.14	1.15	.01

**MECHANICAL PROPERTIES (1)**

Rockwell Hardness (R <sub>C</sub> )	
As-welded (2 Layers)	Work Hardened (2 Layers)
18	47

(1) Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	10 Lb. (4.5 kg) Carton	50 Lb. (22.7 kg) Carton
	(40 Lb. Master)	
5/32 (4.0)	ED021975	ED021976
3/16 (4.8)	ED021977	ED021978
1/4 (6.4)		ED021979

**TYPICAL OPERATING PROCEDURES**

Polarity	Current (amps)		
	5/32" (4.0mm)	3/16" (4.8mm)	1/4" (6.4mm)
DC+	120 - 180	160 - 260	200 - 350
AC	125-210	175-275	225 - 375

Preferred polarity is listed first.

**COMPETITIVE PRODUCTS**

**Stoody®**  
Dynamang  
Nicromang

**McKay®**  
Hardalloy 118

**NOTES**

Work-hardened base metal or previously deposited weld metal should be ground off before applying a new deposit, since such areas are more prone to embrittlement and possible cracking. Areas that cannot be easily indented with a center punch should be removed.

When joining manganese steel, the joint should be prepared for 100% penetration. A cutting torch may be used to bevel the edges of the plate which can crack if care is not taken to prevent overheating the base metal. Preheat is not necessary unless work is below room temperature, or if the part is unusually massive or complex in design. In such cases, heating the piece to about room temperature, or 100 - 150°F (38 - 66°C) at the most, should be sufficient.

As with all austenitic manganese welding products, interpass temperatures should be limited to 500°F (260°C) maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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**Resists Severe Impact or Gouging**

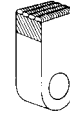
Provides a premium austenitic chromium manganese deposit. Resists severe impact or gouging even in a single layer over carbon steel. Used to join Hadfield manganese steel to itself or to carbon steel.

**ADVANTAGE LINCOLN**

- Excellent resistance to cracking.
- Designed for all-position welding except vertical-down.

- Excellent for build-up on carbon steel prior to chromium carbide hardfacing deposit with an electrode such as Wearshield 60.
- Restrike is easy, slag removes very easily and cleanly and spatter is low, which gives it a high operator appeal.
- Number of layers is unlimited.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



**Crusher Hammers**

- Rebuilding and Joining of Austenitic
- Manganese Plates and Parts
- Earth Moving Equipment

**COMPETITIVE PRODUCTS**

**Stoody®**  
2110

**McKay®**  
Chrome-Mang

**DEPOSIT COMPOSITION (1)**

On Carbon Steel	%C	%Mn	%Si	%Cr
2 or more Layers	0.35	14.0	0.6	15.0

**MECHANICAL PROPERTIES (1)**

Rockwell Hardness (R <sub>C</sub> ) (Single or Multiple Layers)	
As-welded	Work Hardened
18 - 24	40 - 50

(1) Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	10 Lb. (4.5 kg) Carton	
	(40 Lb. Master)	50 Lb. (22.7 kg) Carton
1/8 (3.2)	ED021980	ED021981
5/32 (4.0)	ED021982	ED021983
3/16 (4.8)	ED021984	ED021985

**TYPICAL OPERATING PROCEDURES**

Polarity	1/8" (3.2mm)	Current (amps)	
		5/32" (4.0mm)	3/16" (4.8mm)
DC+	140 - 160	190 - 210	220 - 250
AC	140 - 160	190 - 210	220 - 250

Preferred polarity is listed first.

**NOTES**

In welding with Wearshield 15CrMn, a short arc is preferred. The electrode can easily be dragged without fear of snuffing out the arc. For situations involving severe impact and abrasion, a build-up of Wearshield 15CrMn capped with a single layer of Wearshield 60 or Lincore 60-O can provide excellent service. In depositing Wearshield 15CrMn on itself or on austenitic manganese steel, preheat is generally unnecessary unless the metal is below 60°F (16°C). However, highly hardenable carbon or low alloy steel base metals may require preheat in the 300°F (150°C) - 400°F (204°C) range to avoid heat affected zone cracking. Wearshield 15CrMn deposits work harden rapidly, which makes them difficult to machine. Best results are obtained with carbide or ceramic tool bits. Avoid superficial cuts, and maintain a sharp cutting edge. Grinding can also be done successfully. Because of the high chromium content, Wearshield 15CrMn cannot be cut with oxy-fuel processes. Plasma arc and air carbon arc processes can cut or gouge the weld deposit successfully. Limit interpass temperature to 500°F (260°C) to avoid embrittlement.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

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## Resists Severe Impact

Designed specifically for building up manganese frogs and manganese crossing diamonds in the railroad industry. Provides a high strength high alloy austenitic manganese deposit to handle the increased loading of railroad cars.

- Resistant to deformation and the resultant metal flow.
- Unlimited layers with proper preheat, interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

## ADVANTAGE LINCOLN

- Excellent operator appeal: less spatter, easy slag removal, and reduced grinding time after work hardening.

## DEPOSIT COMPOSITION <sup>(1)</sup>

Wearshield Frogmang	%C	%Mn	%Si	%Cr
6 Layers	1.20	21.0	0.40	5.30

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
As Deposited	Work Hardened
20 - 30	40 - 50

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter Inches (mm)	8 Lb. (3.6 kg)	10 Lb. (4.5 kg)
	Easy Open Cans (48 Lb. Master)	Easy Open Can (60 Lb. Master)
1/8 (3.2)		ED026099
5/32 (4.0)		ED026100
3/16 (4.8)		ED026101
1/4 (6.4)	ED026102	

## TYPICAL OPERATING PROCEDURES

Polarity	Current (amps)			
	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	1/4" (6.4mm)
DC+	110 - 140	140 - 175	175 - 215	235 - 280
AC	120 - 150	150 - 180	185 - 215	235 - 280

Preferred polarity is listed first.

## TYPICAL APPLICATIONS (On Manganese Castings)



Manganese Crossing Diamonds



Manganese Railroad Frogs

## NOTES

**Weld Preparation** Remove all damaged and foreign material by air-carbon arc gouging or grinding. Make sure all defective metal is removed. In the event hairline cracks remain at flangeway depth, use a 1/8" (3.2mm) E308 stainless electrode, such as Blue Max<sup>®</sup> or Red Baron<sup>®</sup> 308L AC-DC to tie up these cracks. This will avoid hot cracking during the build-up process. Apply only thin layers and do not build-up with E308 stainless. This is for emergency situations where no other alternative is available to repair flangeway cracks.

Use DC+ to avoid excessive spatter. When possible, weld at alternate locations (skip weld) to avoid overheating of metal in a localized area. Do not exceed interpass temperature of 500°F (260°C). Use a temperature marker 1/2" (13mm) from the welded area at frequent intervals to ensure that interpass temperature does not exceed 500°F (260°C).

Use a short arc and a stringer bead width of 3/8" to 1/2" (10 to 13 mm).

Finish the casting by grinding to a safe contour. Leave enough weld metal during the welding process to allow a level and even contour after grinding. Make sure all areas are finished and the casting has no further visible defects. Check with straight edge so that the casting is free of low spots.

As with all austenitic manganese welding products, interpass temperatures should be limited to 500°F (260°C) maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up.

Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

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## Resists Abrasion and Moderate Impact

Provides good resistance to abrasion, impact and some metal-to-metal wear. Good hot forging properties. Hardness varies based on cooling rate. Use on carbon, stainless and manganese steels. Low cost general purpose abrasion and impact product.

## ADVANTAGE LINCOLN

- Most versatile electrode of Lincoln's Wearshield line.
- Deposit is primary austenite with austenite-carbide eutectic.

- For maximum resistance to spalling, deposit 1 or more layers of Wearshield 15 CrMn first.
- Designed for all-position welding.
- Deposits limited to two layers.
- Can be forged readily without affecting its mechanical properties.
- Easy slag removal, high operator appeal.
- Manufactured under a quality system certified to ISO 9001 requirements.

## DEPOSIT COMPOSITION <sup>(1)</sup>

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo
2 Layers	2.1	1.1	.75	6.5	.40

## MECHANICAL PROPERTIES <sup>(1)</sup>

1 Layer	Rockwell Hardness (R <sub>C</sub> ) 2 Layers	3 Layers
24 - 53	28 - 53	28 - 55

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

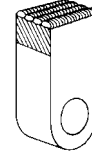
Diameter Inches (mm)	10 Lb. (4.5 kg) Carton (40 Lb. Master)		50 Lb. (22.7 kg) Carton
1/8 (3.2)	ED021996		ED021997
5/32 (4.0)	ED021998		ED021999
3/16 (4.8)	ED022000		ED022001
1/4 (6.4)			ED022002

## TYPICAL OPERATING PROCEDURES

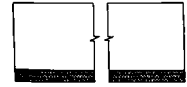
Polarity	Current (amps)			
	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)	1/4" (6.4mm)
DC+	40 - 150	75 - 200	110 - 250	150 - 375
AC	50 - 165	80 - 220	120 - 275	165 - 410

Preferred polarity is listed first.

## TYPICAL APPLICATIONS



Crusher Hammers



Dozer Blades

- Dipper teeth and lips
- Shovel tracks
- Coal mining cutters
- Truck chain and gears
- Plow shares and scraper blades
- Conveyor buckets and rolls

## COMPETITIVE PRODUCTS

Stoody®  
Stoody 77

## NOTES

Wearshield ABR can be forged readily without affecting its mechanical properties. As deposited, Wearshield ABR weld metal is not machinable, although the deposit can be shaped by grinding.

To obtain a deposit that is machinable with carbide tools, heat to about 1380°F (749°C) and hold for one hour per inch of thickness. Air cool to room temperature.

For maximum machinability, heat to 1600-1650°F (870 - 900°C) and hold for one hour per inch of thickness. Furnace cool to 1200°F (650°C) at a rate not exceeding 50°F (10°C) per hour, and air or furnace cool to room temperature. Variation in welding procedures will have little affect on abrasion resistance.

The abrasion resistance can be restored by heating to about 1450°F (790°C), quenching and tempering at 400°F (200°C).

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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## Resists Abrasion and Impact

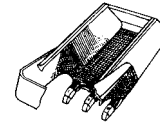
Moderate hardness to resist abrasion with impact up to 1100°F (600°C). Higher alloy results in improved spalling resistance than Wearshield ABR.

## ADVANTAGE LINCOLN

- Can be used on carbon steels, low alloy steels, cast irons, austenitic manganese steels and austenitic stainless steels.
- Crack-free welds can be made on lighter materials up to two layers.

- High operator appeal, with easy restrike, and slag removes very easily.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Limited to 4 layers.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Buckets



Chain Links

- Rolling Mill Guides
- Pulleys
- Ingot Tongs
- Scrapers
- Blades
- Hammers

## DEPOSIT COMPOSITION <sup>(1)</sup>

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo
1 Layer	1.56	.17	.77	19.5	1.92
2 Layers	1.96	.16	.87	24.2	2.48
4 Layers	2.21	.18	.93	27.1	2.86

## MECHANICAL PROPERTIES <sup>(1)</sup>

	Rockwell Hardness (R <sub>C</sub> )		
1 Layer	2 Layers	4 Layers	
	42	47	48

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. (4.5 kg) Carton	40 Lb. Master
1/8 (3.2)	ED024940	
5/32 (4.0)	ED024941	
3/16 (4.8)	ED024942	

## TYPICAL OPERATING PROCEDURES

Polarity	Current (amps)		
	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	120 - 160	150 - 220	190 - 270
AC	130 - 160	180 - 220	220 - 260

Preferred polarity is listed first.

## COMPETITIVE PRODUCTS

Stoody®

McKay®

19, 21, 31, 33

Hardalloy 40TIC

## NOTES

Wearshield 44 electrodes form a deep cup, which permits light dragging of the electrode during welding. The arc is steady with little spatter in the DC+ mode. During AC welding, the arc is also steady, but the usable current range is reduced, and the melt-off rates are reduced at any current. Since the amount of dilution does not affect the microstructure, the impact properties and abrasion resistance will be similar from the first layer to the last.

On cast irons, Wearshield 44 deposits usually check crack. These check cracks should be closely spaced to prevent spalling. This is obtained by using stringer beads.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Metal-to-Earth Abrasion

High alloy produces chrome carbides and austenite. Provides greater abrasion resistance than Wearshield ABR or Wearshield 44.

## ADVANTAGE LINCOLN

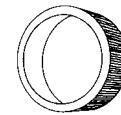
- Designed for downhand welding and horizontal overlay on vertical surfaces.
- Crack-free, single pass welds can be made on lighter materials.
- Low dilution weld metal provides eutectic mix of chromium

carbides and austenite, with limited primary carbides.

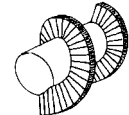
- High dilution on mild or low alloy steel base metal provides higher toughness and lower abrasion resistance.
- To be used on carbon and low alloy, austenitic manganese and austenitic stainless steels.
- Can easily be used with a drag technique for high operator appeal.
- Limited to 4 layers.

- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



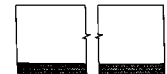
Muller Tires



Augers



Bucket Teeth



Dozer Blades

## DEPOSIT COMPOSITION <sup>(1)</sup>

On Carbon Steel	%C	%Mn	%Si	%Cr
1 Layer	2.5	0.17	0.8	27.0
2 Layers	3.0	0.17	1.0	30.5
3 Layers	3.3	0.16	1.1	32.6

## MECHANICAL PROPERTIES <sup>(1)</sup>

	Rockwell Hardness (R <sub>C</sub> )		
1 Layer	2 Layers	3 Layers	
49	59	59	

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter Inches (mm)	3 Lb. (1.4 kg) Tube (18 Lb. Master)		10 lb. (4.5 kg) Carton (40 Lb. Master)	50 Lb. (22.7 kg) Carton
	1/8 (3.2)	ED025111		ED023323
5/32 (4.0)			ED023324	ED023327
3/16 (4.8)			ED023325	ED023328

## TYPICAL OPERATING PROCEDURES

Polarity	Current (amps)		
	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	125 - 175	175 - 250	220 - 300
AC	130 - 170	180 - 220	230 - 270

Preferred polarity is listed first.

## COMPETITIVE PRODUCTS

**Stoody®**  
Stoody 35

**McKay®**  
Hardalloy 140

## NOTES

Wearshield ME is a heavily coated electrode which forms a deep cup that permits light dragging of the stick during welding. Deposits generally check crack except for single layers on thin base metal. Stringer beads produce a consistent crack spacing of about 1/2-1", (13-25 mm). Wide weaves may produce very widely spaced check cracks which can lead to deposit spalling in multiple layers. Weaving is not recommended. For maximum spalling resistance on carbon and low alloy steels, especially in multiple layers, apply a butter layer of Wearshield 15CrMn, Lincore 15CrMn or an austenitic stainless steel electrode such as Blue Max 309/309L AC-DC, before applying Wearshield ME.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Severe Abrasion

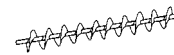
Wearshield 60 is especially designed to resist severe abrasion. It exhibits higher alloy and higher abrasion resistance than Wearshield ABR, Wearshield 44 or Wearshield ME.

## ADVANTAGE LINCOLN

- Can be used on carbon, low alloy, stainless, and manganese steels.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.

- Wearshield 60 deposits consists of primary carbides in a matrix of austenite-carbide eutectic.
- Wearshield 60 has an easily controlled arc, and fully visible weld puddle when arc length is long.
- Deposits should be limited to two layers.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Conveyor Screws



Grader Blades

- Crusher Rolls, Plates and Jaws
- Sleeves
- Brick and Coke Machinery
- Cement Mill Parts

## COMPETITIVE PRODUCTS

### Stoody®

Stoody XHC  
2134, Superchrome

### McKay®

Hardalloy 55

## NOTES

The deposit is not machinable or forgeable. Cooling rate does not significantly influence abrasion resistance. Deposit will usually cross check.

If more than two-layer build-up is required, use Wearshield 15CrMn (preferred), Wearshield BU or Wearshield BU30 for the preliminary layer or layers under Wearshield 60. On manganese steel, use Wearshield Mangjet or Wearshield 15CrMn as build-up. Preheat is not generally necessary except to be sure that work is in room temperature range 75-100°F (25-45°C). However, preheat of 250-400°F (120-200°C) may be necessary to prevent heat affected zone cracking on high carbon steel or low alloy steel base metals. If more than two layers must be used, or if cross checks must be eliminated, preheat to 1200°F (650°C).

Prolonged or repeated heating of manganese steel base metal over 500°F (260°C) can cause embrittlement and spalling. Avoid base metal embrittlement by:

- limiting the temperature 500°F (260°C) at distances of 1/2" (13 mm) away from the weld.
- minimizing the time at elevated temperatures.

The correct welding technique is a vertical electrode with a 1/8" to 3/16" (3.2 - 4.8 mm) arc length. The large ball on the end of the electrode should never touch the puddle. This technique will give a smooth transfer, low spatter and smooth bead.

## DEPOSIT COMPOSITION <sup>(1)</sup>

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo	%V
2 Layers	5.0	0.8	1.0	23.0	2.3	0.6

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
1 Layer	2 Layers
57 -60	60 - 62

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter Inches (mm)	3 Lb. (1.4 kg) Tube (18 Lb. Master)	10 Lb. (4.5 kg) Carton (40 Lb. Master)
	1/8 (3.2)	ED025113
5/32 (4.0)		ED022011
3/16 (4.8)		ED022012

## TYPICAL OPERATING PROCEDURES

Polarity	Current (amps)		
	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	100 - 140	130 - 180	210 - 250
AC	110 - 150	140 - 200	230 - 270

Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Severe Abrasion at High Temperatures

Resists very severe abrasion at temperatures up to 1400°F (760°C). Exhibits the highest abrasion resistance of the Wearshield stick electrodes. Premium complex carbide deposit.

## ADVANTAGE LINCOLN

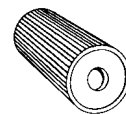
- Can be used with mild steel, low alloy steel, stainless steels and austenitic manganese steels.
- Abrasion resistance is very high on mild steel even with normal dilution in a single layer, due to the high carbide content.

- Wearshield 70 deposits consist of primary chromium carbides along with extra hard premium carbides in a matrix of austenite-carbide eutectic.
- Designed to produce a soft, low penetration arc for minimizing dilution.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Deposits limited to 2 layers .
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Augers



Cement Crushers

- Sinter Crushers
- Furnace Chains
- Screw Conveyors

## COMPETITIVE PRODUCTS

### Stoody®

Stoody 45

## NOTES

Maintain a short arc length. A drag technique is not recommended. Deposit rates are higher using DC+ polarity as compared to AC. Deposit is not slag covered; only a few slag islands, which are easily removed.

Under extremely abrasive conditions or abrasion at high temperatures, two layers of Wearshield 70 will significantly out-perform deposits of a standard primary chromium carbide electrode, such as Wearshield 60. However, under low stress abrasion conditions, two layers of Wearshield 70 or Wearshield 60 will give similar results. But one layer of Wearshield 70 will out-perform one layer of Wearshield 60.

Both stringer and weave welding techniques will result in closely spaced check cracks. A stringer or narrow weave produces more closely spaced check cracks and provides excellent resistance to spalling. Spalling resistance is enhanced when the deposit, immediately under the Wearshield 70 deposit, is austenitic such as Lincore M. For service at temperatures below 500°F (260°C), austenitic manganese steel base metal or weld build-up is very suitable. For a single layer of build-up on carbon or low alloy steel, Wearshield 15CrMn is preferred over the lower alloyed Wearshield Mangjet, because of the austenite stability. For service at higher temperatures, austenitic manganese is generally not advisable for build-up due to its embrittlement at high temperatures. An austenitic stainless steel, such as type 309 or 310, provide a better service as a build-up under Wearshield 70.

## DEPOSIT COMPOSITION <sup>(1)</sup>

On Mild Steel	%C	%Cr	%Mo	%Cb (Nb)	%W	%V
1 Layer	5.5	20.0	6.5	6.5	2.5	1.0

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
1 Layer	65 - 70

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter		10 Lb. (4.5 kg) Carton (40 Lb. Master)
mm	Inches	
3.2	(1/8)	ED024951
4.0	(5/32)	ED024952
5.0	(3/16)	ED024953

Manufactured in metric diameters, U.S. customary sizes are approximate.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (amps)		
	3.2mm (1/8")	4.0mm (5/32")	5.0mm (3/16")
DC+	125 - 165	160 - 230	220 - 300
AC	120 - 160	160 - 210	230 - 300

Preferred polarity is listed first.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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## Resists Abrasion, Corrosion and Moderate Impact

Designed specifically for surfacing cane crushing rolls in the sugar industry. Chrome carbide deposit resists abrasive wear.

- Can be used on carbon and manganese steels.
- Limited to 4 layers.
- Manufactured under a quality system certified to ISO 9001 requirements.

## ADVANTAGE LINCOLN

- Primarily used in the flat and horizontal welding positions.

## DEPOSIT COMPOSITION <sup>(1)</sup>

On Mild Steel	%C	%Mn	%Si	%Cr
1 Layer	2.1	1.5	.50	15.0
2 Layers	3.2	2.0	.70	23.5
3 Layers	3.8	2.4	.75	28.8

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )		
1 Layer	2 Layers	3 Layers
45	60	60

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter mm (Inches)	48 Lb. (21.7 kg) Easy Open Cans	55 lb. (25.0 kg) Easy Open Cans
4.0 (5/32)	ED028568	
5.0 (3/16)		ED028569

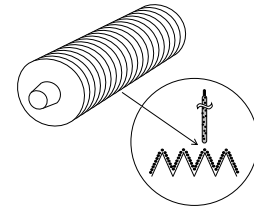
Manufactured in metric diameters, U.S. customary sizes are approximate.

## TYPICAL OPERATING PROCEDURES

Polarity	Current (amps)	
	4.0mm (5/32")	5.0mm (3/16")
DC+	150 - 240	210 - 270
AC	160 - 250	220 - 280

Preferred polarity is listed first.

## TYPICAL APPLICATIONS



### Crushing Rolls

- 2 o'clock position welds, (45-50° angle, from the horizontal).
- Using proper procedures, Wearshield SM80 is designed to produce high spatter levels. This spatter sticks to the surface and offers very high levels of abrasion resistance.

All applications listed above, apply to procedures related to the surfacing/resurfacing of the crushing rolls for the sugar cane industry.

## COMPETITIVE PRODUCTS

**Stoody®**

Sugar 80

## NOTES

When minimum spatter is required, a light drag technique should be employed using the lower end of the recommended current range. Welds can be deposited as stringers or with a narrow weave.

This electrode is used primarily in the flat and horizontal positions. However, limited vertical-up and vertical-down welding procedures may also be used.

A quick motion of "dabbing" the electrode to the roll's teeth, pulling an arc, and repeating this technique in a rapid, sporadic motion gives the high spatter level desired.

The normal arc transfer is "spray". However, a large globule of weld metal will form at the electrode tip during transfer. When this droplet leaves the electrode, it throws the larger desired spatter balls.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Abrasion and Corrosion at High Temperatures

Highest abrasion resistance of the cobalt alloys. Resists abrasion at room temperatures and when temperatures exceed the limits of iron base alloys [1000-1800°F (538-982°C)]. Can be used on screw conveyors moving hot minerals (coke) in a corrosive environment. Available as a coated electrode for stick welding and bare rod for TIG or oxy-fuel applications.

## ADVANTAGE LINCOLN

- A near-eutectic deposit of cobalt alloy and carbides.

- Can be applied over carbon steel, low alloy steel, stainless steel and nickel based alloys.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Wearshield C1 is a coated electrode for stick welding.
- Wearshield C1-Bare is an uncoated electrode for oxy-fuel or TIG hardfacing.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



- Screw components moving hot minerals, coke, etc.

## COMPETITIVE PRODUCTS

**Stoody®**

Stoodite 1

## NOTES

With preheat and slow cooling, up to two layers can be deposited without cracking.

### Coated Stick Electrode

Spatter is slightly less with DC+ polarity. A short arc length or dragging of the electrode lightly on the workpiece is usually most suitable.

### Bare Electrode

Wearshield C1-Bare electrodes can be deposited by TIG or oxy-fuel welding. In oxy-fuel welding, a carburizing flame is recommended, as this promotes superficial base metal melting and improves carbon recovery in the deposit.

A thoriated tungsten electrode that is one size **larger** than would normally be used for joining at the desired welding current, ground to a sharp point (60° or less), combined with a 1/8" (3mm) arc length, will result in a soft diffuse arc which minimizes penetration. DC- polarity is recommended for TIG welding.

## DEPOSIT COMPOSITION <sup>(1)</sup>

Wearshield	%C	%Cr	%Ni	%W	%Cobalt
C1	2.0	28.0	1.0	12.0	Balance
C1-Bare	2.2	29.0	1.0	12.0	Balance

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
C1	C1-Bare
50	50

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Inches (mm)	Wearshield C1 & C1-Bare 14" (355mm) Length			
	1 Lb. (0.45 kg) Tubes		5 Lb. (2.3 kg) Tubes	
	Coated	Bare	Coated	Bare
1/8 (3.2)		ED025360	ED025343	ED025361
5/32 (4.0)	ED025344	ED025363	ED025345	ED025364
3/16 (4.8)	ED025346			

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

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## TYPICAL OPERATING PROCEDURES (COATED ELECTRODES)

Polarity	Current (amps)		
	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	85 - 110	100 - 140	140 - 180
AC	85 - 110	100 - 140	140 - 180

Preferred polarity is listed first.

## Resists Metal-to-Metal Wear and/or Erosion at High Temperatures

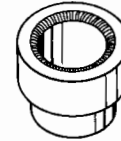
Resists metal-to-metal wear with mild abrasion and erosion at room temperatures and when temperatures exceed the limits of iron base alloys [1000-1800°F (538-982°C)]. Used for valve seats and where galling is a problem. Coated electrode for arc welding or bare rod for TIG or oxy-fuel applications.

## ADVANTAGE LINCOLN

- Can be applied over carbon steel, low alloy steel, stainless steel and nickel base alloys.

- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Large parts or larger clad areas will exhibit undesirable check cracks unless preheat and slow cooling are used.
- Wearshield C6 is a coated electrode for stick welding.
- Wearshield C6-Bare is an uncoated electrode for oxy-fuel or TIG hardfacing.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Valve Seats



Valve Bodies

- Valve seats for self-mated galling resistance.
- Valve faces and valve seats where a tight seal without galling is important.

## COMPETITIVE PRODUCTS

**Stoody®**  
Stoodite 6

## NOTES

### Coated Stick Electrode

Spatter is slightly less with DC+ polarity. A short arc length or dragging of the electrode lightly on the workpiece is usually most suitable.

### Bare Electrode

Wearshield C6-Bare electrodes can be deposited by TIG or oxy-fuel hardfacing. In oxy-fuel hardfacing, a carburizing flame is recommended, as this promotes superficial base metal melting and improves carbon recovery in the deposit.

A thoriated tungsten electrode that is one size **larger** than would normally be used for joining at the desired welding current, ground to a sharp point (60° or less), combined with a 1/8" (3mm) arc length, will result in a soft diffuse arc which minimizes penetration. DC- polarity is recommended for TIG welding.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

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## DEPOSIT COMPOSITION <sup>(1)</sup>

Wearshield	%C	%Cr	%Ni	%W	%Cobalt
C6	1.0	27.0	1.0	4.0	Balance
C6-Bare	1.1	28.0	1.0	4.0	Balance

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
C6	C6-Bare
40	40

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Inches (mm) Diameter	Wearshield C6 & C6-Bare 14" (355mm) Length			
	1 Lb. (0.45 kg) Tubes (5 Lb. Master)		5 Lb. (2.3 kg) Tubes (20 Lb. master)	
	Coated	Bare	Coated	Bare
1/8 (3.2)	ED025348		ED025349	ED025370
5/32 (4.0)	ED025350	ED025372	ED025351	ED025373
3/16 (4.8)	ED025352		ED025353	ED025376

## TYPICAL OPERATING PROCEDURES (COATED ELECTRODES)

Polarity	Current (amps)		
	1/8" (3.2mm)	5/32" (4.0mm)	3/16" (4.8mm)
DC+	85 - 110	100 - 140	140 - 180
AC	85 - 110	100 - 140	140 - 180

Preferred polarity is listed first.



## Metal-to-Metal Wear with Corrosion and/or High Temperatures

Resists metal-to-metal wear in severe corrosive environments at room temperatures and when service temperatures exceed the limits of iron based alloys [1000-1800°F (538-982°C)]. Used for high temperature impact cavitation and galling resistance. Coated electrode for stick welding or bare electrode for TIG welding. Oxy-fuel is not recommended.

## ADVANTAGE LINCOLN

- Can be used to surface carbon steel, low alloy steel, stainless steel and nickel based alloys.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Provides an alloy deposit of solid solution cobalt, chromium, molybdenum and nickel alloy.
- Deposit does not check crack when properly applied.

- Wearshield C21 is a coated electrode for shielded metal arc welding.
- Wearshield C21-Bare is an uncoated electrode for TIG hardfacing.
- Manufactured under a quality system certified to ISO 9001 requirements.

## DEPOSIT COMPOSITION <sup>(1)</sup>

Wearshield	%C	%Cr	%Ni	%Mo	%Cobalt
C21	0.22	26.0	3.0	5.0	Balance
C21-Bare	0.25	27.0	3.0	5.0	Balance

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
C21	C21-Bare
25	25

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

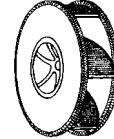
Diameter Inches (mm)	Wearshield C21 & C21-Bare 14" (355mm) Length			
	1 Lb. (0.45 kg) Tube (5 Lb. Master)		5 Lb. (2.3 kg) Tube (20 Lb. Master)	
	Coated	Bare	Coated	Bare
1/8 (3.2)	ED025354	ED025378	ED025355	ED025379
5/32 (4.0)	ED025356	ED025381	ED025357	ED025382
3/16 (4.8)	ED025358	ED025384		ED025385

## TYPICAL OPERATING PROCEDURES (COATED ELECTRODES)

Polarity	1/8" (3.2mm)	Current (amps)	
		5/32" (4.0mm)	3/16" (4.8mm)
DC+	85 - 110	100 - 140	140 - 180
AC	85 - 110	100 - 140	140 - 180

Preferred polarity is listed first.

## TYPICAL APPLICATIONS



Pump Impellers

- Resistance to cavitation erosion, i.e. pump impellers.
- Hot forging dies

## COMPETITIVE PRODUCTS

Stoody®  
Stoodite 21

## NOTES

### Coated Stick Electrode

Spatter is slightly less with DC+ polarity. A short arc length or dragging of the electrode lightly on the workpiece is usually most suitable.

### Bare Electrode

Wearshield C21-Bare electrodes can be easily deposited by TIG hardfacing. A thoriated tungsten electrode that is one size **larger** than would normally be used for joining at the desired welding current, ground to a sharp point (60° or less), combined with a 1/8" (3mm) arc length, will result in a soft diffuse arc which minimizes penetration. DC- polarity is recommended for TIG hardfacing.

Oxy-fuel hardfacing is not recommended, because of carbon pickup in the deposit from the flame.

Wearshield C21-Bare may not be suitable for many flame deposition applications due to its high melting temperature.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Moderate Hardness to Resist Shock and Metal-to-Metal Wear**

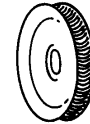
Self-shielded, flux-cored wire provides a tough machinable deposit for build-up or final overlay. Lincore BU delivers non-severe metal-to-metal wear with outstanding crack resistance.

**ADVANTAGE LINCOLN**

- For semiautomatic and automatic welding.
- Tough, machinable build-up deposit on carbon steel and low alloy steel base metal.

- Ideal for rebuilding worn parts to near final dimensions before applying final hardfacing layers which are more wear resistant.
- Can also be used as the final hardfacing layer for non-severe metal-to-metal wear applications.
- Especially outstanding for crack resistance with little or no preheat.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- The number of layers is unlimited.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



Cable Sheaves

- Crane Wheels
- Drums and Pulleys

**COMPETITIVE PRODUCTS**

**Stoody®**  
Build-up

**McKay®**  
BU-0

**DEPOSIT COMPOSITION (1)**

%	6 Layers
C	0.24
Mn	0.50
Si	0.25
Al	1.50

(1) Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil	125 Lb. (57 kg) Speed Feed® Drum
5/64 (2.0)	ED031115	ED022064	
7/64 (2.8)		ED022065	ED022069

**MECHANICAL PROPERTIES (1)**

Rockwell Hardness (R <sub>H</sub> )	
As-welded	Work-hardened
78 - 90	86 - 98

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
5/64" (2.0mm), DC+ 2 (50) 1.09 lbs/1000"	200 (5.1)	29	280	10.1 (4.6)
	240 (6.1)	30	315	12.1 (5.5)
	260 (6.6)	30	330	13.2 (6.1)
	300 (7.6)	31	350	15.2 (6.9)
7/64" (2.8mm), DC+ 2-1/2 (64) 1.91 lbs/1000"	135 (3.4)	26	360	12.6 (5.7)
	150 (3.8)	27	385	13.9 (6.3)
	175 (4.4)	28	420	16.0 (7.3)
	200 (5.1)	29	450	18.1 (8.2)
	235 (5.9)	30	470	21.1 (9.6)

## Moderate Hardness to Resist Shock and Abrasion

Gas-shielded, metal-cored wire delivering deposits with moderate hardness for build-up or as final overlay. Lincore BU-G does provide some resistance to metal-to-metal wear and moderate impact. Can be used for the matrix with the Bulk Tungsten Carbide process.

## ADVANTAGE LINCOLN

- For semiautomatic and automatic welding.

- Recommended gas mixture is 75-90% Argon, 25-10% CO<sub>2</sub> or 98% Argon, 2% O<sub>2</sub>.
- To be used on carbon steels.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- The number of layers is unlimited.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS

- Rolls
- Shafts
- Pump Parts
- Shovel Parts
- Pulverizer
- Plows
- Steel Mill Wobblers
- Pods

## COMPETITIVE PRODUCTS

**Stoody®**

Build Up AP-G

## DIAMETERS / PACKAGING

Diameter Inches (mm)	25 Lb. (11 kg) Plastic Spool
.045 (1.1)	ED029079
1/16 (1.6)	ED029080

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
As-welded	Work-hardened
21 - 33	40 - 42

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Shielding Gas	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
.045" (1.1mm), DC+ 5/8 (16) 75% Ar / 25% CO <sub>2</sub>	200 (5.1)	29	175	3.7 (1.7)
	300 (7.6)	30	240	6.1 (2.8)
	400 (10.2)	32	300	8.6 (3.9)
.045" (1.1mm), DC+ 3/4 (20) 90% Ar / 10% CO <sub>2</sub>	200 (5.1)	25	215	4.7 (2.1)
	300 (7.6)	27	250	6.9 (3.1)
	400 (10.2)	29	285	9.1 (4.1)
.045" (1.1mm), DC+ 3/4 (20) 98% Ar / 2% O <sub>2</sub>	200 (5.1)	25	210	4.5 (2.0)
	300 (7.6)	26	280	7.1 (3.2)
	400 (10.2)	28	315	9.7 (4.4)
1/16" (1.6mm), DC+ 5/8 (16) 75% Ar / 25% CO <sub>2</sub>	150 (3.8)	27	280	5.8 (2.6)
	250 (6.4)	29	370	10.4 (4.7)
	350 (8.9)	31	460	15.1 (6.8)
1/16" (1.6mm), DC+ 3/4 (20) 90% Ar / 10% CO <sub>2</sub>	150 (3.8)	25	270	5.7 (2.6)
	250 (6.4)	27	375	10.8 (4.9)
	350 (8.9)	29	470	15.9 (7.2)
1/16" (1.6mm), DC+ 3/4 (20) 98% Ar / 2% O <sub>2</sub>	150 (3.8)	24	290	6.1 (2.8)
	250 (6.4)	26	390	11.1 (5.0)
	350 (8.9)	28	490	16.1 (7.3)

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	4 Layers
C	0.08
Mn	1.60
Si	0.50
Cr	0.90
Mo	0.30

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Build-up Prior to Hardfacing and Metal-to-Metal Wear**

Self-shielded, flux-cored wire delivers tough machinable deposits for build-up or final overlay intended for metal-to-metal wear. Use for build-up of steel mill parts such as rougher couplings. Also can be used as build-up under harder materials.

**ADVANTAGE LINCOLN**

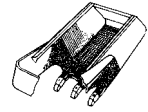
- For semiautomatic and automatic welding build-up.

- Build-up deposit on carbon steel and low alloy steel base metals.
- It is ideal for rebuilding worn parts to near final dimensions before applying final hardfacing layers which are more wear resistant.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- The number of layers is unlimited.
- Manufactured under a quality system certified to ISO 9001 requirements.

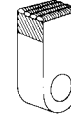
**TYPICAL APPLICATIONS**



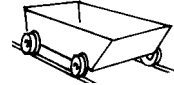
Tractor Rolls & Idlers



Shovel Parts



Mill & Crusher Hammers



Mine Car Wheels

- Dredge Pumps
- Pulverizer Plows
- Cable Drums
- Gears
- Trunnions
- Shafts

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	14 Lb. (6 kg) Coil (56 Lb. Master)		25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil	125 Lb. (57 kg) Speed Feed Drum
	.045 (1.1)			ED031116	
1/16 (1.6)			ED031117		
5/64 (2.0)	ED011237		ED031118	ED011238	
3/32 (2.4)				EDS01197	
7/64 (2.8)				ED011240	ED011239

**MECHANICAL PROPERTIES <sup>(1)</sup>**

No. of Layers	Rockwell Hardness (R <sub>C</sub> )		
	As-welded	Work Hardened	Flame Hardened Water Quenched
1	14 - 30	28 - 34	--
2	26 - 32	32 - 36	38 - 42
3	25 - 34	35 - 38	--

**COMPETITIVE PRODUCTS**

**Stoody<sup>®</sup>**      **McKay<sup>®</sup>**  
Super Buildup      242-O

**DEPOSIT COMPOSITION <sup>(1)</sup>**

%	3 Layers .045" & 1/16" (1.1 & 1.6mm)	3 Layers 5/64" & 7/64" (2.0 & 2.8mm)
	C	.11 - .18
Mn	1.8 - 2.1	2.1 - 2.3
Si	.50 - .75	.45 - .60
Al	1.6 - 1.9	1.45 - 1.70
Cr	1.2 - 1.4	1.1 - 1.4
S	.002 - .005	.002 - .005
P	.004 - .012	.004 - .008

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
.045" (1.1mm), DC+	200 (5.1)	25	80	3.3 (1.5)
1-3/4 (45)	350 (8.9)	28	130	6.0 (2.7)
.342 lbs/1000"	500 (12.7)	31	150	8.7 (3.9)
1/16" (1.6mm), DC+	150 (3.8)	26	125	4.6 (2.1)
1-3/4 (45)	250 (6.4)	29	180	7.8 (3.5)
.633 lbs/1000"	350 (8.9)	32	225	11.1 (5.0)
5/64" (2.0mm), DC+	125 (3.2)	23	200	6.9 (3.1)
2 (50)	200 (5.1)	27	290	10.8 (4.9)
1.04 lbs/1000"	250 (6.4)	29	325	13.4 (6.1)
7/64" (2.8mm), DC+	135 (3.4)	26	360	12.6 (5.7)
2-1/2 (64)	175 (4.4)	28	420	16.0 (7.3)
1.92 lbs/1000"	235 (6.0)	30	470	21.1 (9.6)

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

**BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.**

**Resists Rolling, Sliding and Metal-to-Metal Wear**

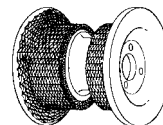
Self-shielded, flux-cored wire with higher hardness for metal-to-metal wear and mild abrasion. Used on transfer rollers and guides, crane wheels and shafts.

**ADVANTAGE LINCOLN**

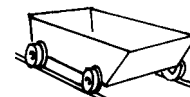
- For semiautomatic and automatic welding.
- Can be used on low carbon, and low alloy steels.

- Intended for downhand welding and horizontal stringer beads on sloped surfaces.
- Unlimited layers with proper preheat and interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



**Tractor Rolls**



**Mine Car Wheels**

- Bucket Links
- Bucket Bases
- Guide Rollers
- Tractor Rollers
- Actuating Cams
- Steel Shafts
- Crane Wheels

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil	250 Lb. (113 kg) Speed-Feed Drum
5/64 (2.0)	ED031119	ED025907	
7/64 (2.8)		ED025908	ED025910

**MECHANICAL PROPERTIES <sup>(1)</sup>**

Rockwell Hardness (R <sub>C</sub> )		
1 Layer	2 Layers	3 Layers
36	41	38

**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
5/64" (2.0mm), DC+ 1-3/4 (45) 1.04 lbs/1000"	125 (3.2)	24	218	7.0 (3.2)
	200 (5.1)	27	282	11.1 (5.0)
	250 (6.4)	30	327	13.9 (6.3)
7/64" (2.8mm), DC+ 2-3/4 (70) 1.96 lbs/1000"	90 (2.3)	25	258	8.2 (3.7)
	150 (3.8)	28	338	14.1 (6.4)
	175 (4.4)	30	371	16.6 (7.5)

**COMPETITIVE PRODUCTS**

**Stody®**  
105-G

**McKay®**  
242-O

**DEPOSIT COMPOSITION <sup>(1)</sup>**

%	1 Layer	2 Layers	3 Layers
C	.18	.20	.21
Mn	1.25	1.46	1.55
Si	.53	.67	.76
Al	1.34	1.72	1.97
Cr	2.51	3.25	3.52
Mo	.32	.42	.46

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**NOTES**

Area to be overlaid should be clean and free of rust, oil, etc. Any previous hardfacing deposit that has been embrittled by severe work hardening should be removed. Cracks and other irregularities should be properly repaired.

Cold parts should be warmed to at least 75° F (25° C). Higher preheat of 300 - 500°F (150-260°C) may be necessary on thick parts or heavy sections. Interpass temperature between 300°F (150°C) and 400°F (200°C) do not affect the hardness of Lincore 55 significantly.

Cross Checking information can be found on page 49.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Resists Rolling, Sliding, Metal-to-Metal Wear and Mild Abrasion**

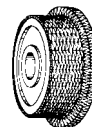
Self-shielded, flux-cored wire delivers a deposit which resists metal-to-metal rolling or sliding wear as well as mild abrasion. Produces a martensitic deposit.

**ADVANTAGE LINCOLN**

- For automatic and semiautomatic operation.
- To be used on carbon steel, low alloy steel and manganese steel.

- May be used with Lincolnweld 803 neutral flux to improve bead shape and minimize smoke.
- Intended for downhand use and for horizontal stringer beads on sloped surfaces.
- Unlimited layers with proper preheat and interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



Crane Wheels



Blower Blades

- Rail Ends
- Skip Guides
- Cams
- Transfer Tables

**COMPETITIVE PRODUCTS**

**Stoody®**  
965-G

**Hobart®**  
Fabtuf 960

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	14 Lb. (6 kg) Coil (56 Lb. Master)		25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil	125 Lb. (57 kg) Speed Feed Drum
.045 (1.1)			ED031120		
1/16 (1.6)			ED031121		
5/64 (2.0)	ED011277		ED031122	ED011278	
7/64 (2.8)				ED011280	ED011279

**MECHANICAL PROPERTIES <sup>(1)</sup>**

No. of Layers	Rockwell Hardness (R <sub>C</sub> )			
	As-welded	Work Hardened	350°F (180°C) Interpass Temp.	Flame Hardened Water Quenched
1	50 - 59	53 - 62	50 - 55	—
2	50 - 60	56 - 62	55 - 59	52 - 54

**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)		Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)	
.045" (1.1mm), DC+	1-3/4" (45)	200 (5.1)	25	85	3.6	(1.6)
	.354 lbs/1000"	350 (8.9)	28	125	6.6	(3.0)
		500 (12.7)	31	165	9.4	(4.3)
1/16" (1.6mm), DC+	1-3/4" (45)	150 (3.8)	26	125	4.8	(2.2)
	.656 lbs/1000"	250 (6.4)	29	195	8.4	(3.8)
		350 (8.9)	32	245	12.1	(5.5)
5/64" (2.0mm), DC+	1-3/4" (45)	125 (3.2)	24	190	7.0	(3.2)
	1.06 lbs/1000"	200 (5.1)	27	295	11.0	(5.0)
		250 (6.4)	30	330	13.7	(6.2)
7/64" (2.8mm), DC+	2-3/4" (70)	90 (2.3)	25	280	8.4	(3.8)
	1.97 lbs/1000"	125 (3.2)	27	350	11.5	(5.2)
		175 (4.4)	30	420	16.0	(7.3)

**DEPOSIT COMPOSITION <sup>(1)</sup>**

%	.045" & 1/16"	5/64" & 7/64"
C	.45	.45
Mn	1.3	1.4
Si	.53	.60
Al	1.4	1.4
Cr	5.3	5.3
Mo	.80	.80
S	.004	.004
P	.010	.010

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**NOTES**

Area to be overlaid should be clean and free of rust, oil, etc. Any previous hardfacing deposit that has been embrittled by severe work hardening should be removed. Cracks and other irregularities should be properly repaired.

Cold parts should be warmed to at least 75° F (25° C). Higher preheat of 300-500°F (150-260°C) may be necessary on thick parts or heavy sections. Interpass temperature between 300°F (150°C) and 400°F (200°C) do not affect the hardness of Lincore 55 significantly.

Cross Checking information can be found on page 49.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Resists Rolling, Sliding, Metal-to-Metal Wear, Metal-to-Earth Wear and Mild Abrasion**

Gas-shielded, metal-cored wire produces a deposit which resists metal-to-metal wear and mild abrasion. The deposit results in an even harder material when used with the Bulk Tungsten Carbide process.

**ADVANTAGE LINCOLN**

- For automatic and semiautomatic operation.

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	25 Lb. (11 kg) Spool	500 Lb. (227 kg) Accu-Trak Drum
.045 (1.2)	ED028176	ED031154
1/16 (1.6)	ED028177	ED031155

**MECHANICAL PROPERTIES <sup>(1)</sup>**

Shielding Gas	Rockwell Hardness (R <sub>C</sub> )		
	1 Layer	2 Layers	4 Layers
75%Ar/25%CO <sub>2</sub>	50 - 51	53 - 54	54 - 55
98%Ar/2%O <sub>2</sub>	54 - 55	55 - 56	56 - 57

**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Shielding Gas	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
.045" (1.2mm), DC+ 75%Ar/25%CO <sub>2</sub>	200 (5.1)	27	165	4.3 (2.0)
	300 (7.6)	29	225	6.7 (3.0)
	400 (10.2)	31	290	9.2 (4.2)
.045" (1.2mm), DC+ 3/4 (20) 90%Ar/10%CO <sub>2</sub>	200 (5.1)	25	145	4.7 (2.1)
	300 (7.6)	28	195	7.2 (3.3)
	400 (10.2)	30	245	9.7 (4.4)
.045" (1.2mm), DC+ 3/4 (20) 98%Ar/2%O <sub>2</sub>	200 (5.1)	25	145	5.1 (2.3)
	300 (7.6)	27	200	7.5 (3.4)
	350 (8.9)	28	225	8.7 (3.9)
400 (10.2)	29	250	9.8 (4.4)	
1/16" (1.6mm), DC+ 5/8 (16) 75%Ar/25%CO <sub>2</sub>	150 (3.8)	28	260	5.8 (2.6)
	250 (6.4)	30	340	10.4 (4.7)
	350 (8.9)	32	420	15.1 (6.8)
1/16" (1.6mm), DC+ 3/4 (20) 90%Ar/10%CO <sub>2</sub>	150 (3.8)	25	230	6.0 (2.7)
	250 (6.4)	27	315	10.7 (4.9)
	350 (8.9)	29	400	15.4 (7.0)
1/16" (1.6mm), DC+ 3/4 (20) 98%Ar/2%O <sub>2</sub>	150 (3.8)	24	220	6.4 (2.9)
	250 (6.4)	26	315	11.0 (5.0)
	350 (8.9)	28	410	15.7 (7.1)

- To be used on carbon steel, and low alloy steel.
- Recommended gas mixture is 75% Argon, 25% CO<sub>2</sub>.
- Intended for downhand welding, but can be used in the vertical down and vertical up positions.
- Deposit is virtually slag free and requires little cleaning.
- Can be used with bulk tungsten carbide systems to increase the hardness level.
- Unlimited layers with proper preheat and interpass temperatures and procedures. See Notes below.
- Manufactured under a quality system certified to ISO 9001 requirements.

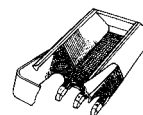
**TYPICAL APPLICATIONS**



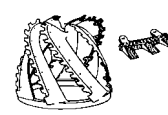
Crane Wheels



Blower Blades



Bucket Lips



Dredge Parts

- Tillage Tools
- Extruder Screws
- Skip Guides
- Chisel Plows
- Tamper Feet
- Cams

**COMPETITIVE PRODUCTS**

**Stoody®**  
965-G

**DEPOSIT COMPOSITION <sup>(1)</sup>**

%	2 Layers			
	.045" Ar/CO <sub>2</sub>	.045" Ar/O <sub>2</sub>	1/16 Ar/CO <sub>2</sub>	1/16" Ar/O <sub>2</sub>
C	.39	.47	.41	.45
Mn	1.24	1.30	1.24	1.25
Si	.93	1.18	.95	1.10
Cr	5.61	6.44	5.69	5.81
Mo	.55	.65	.57	.58

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**NOTES**

Work area should be clean, with any previous hardfacing deposit removed, and cracks properly repaired.

Cold parts should be warmed to at least 75° F (25° C). Higher preheat of 300-500° F (150-260° C) on thick parts or heavy sections.

Cross Checking information can be found on page 49.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Resists Metal-to-Metal Wear at High Temperatures**

Self-shielded, flux-cored wire delivers a deposit similar to H12 tool steel. For build-up of tool steel dies and edges, or applying wear resistance surface on carbon or low alloy steels.

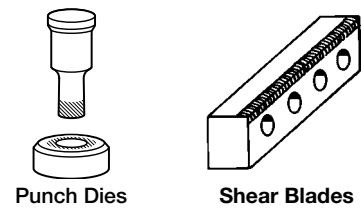
**ADVANTAGE LINCOLN**

- Designed for automatic and semiautomatic welding.
- To be used on carbon steel, low alloy steel or tool steel.

- Provides a hot work steel deposit similar to Type H12 tool steel, for building up worn tool steel dies or applying a wear-resistant surface to carbon steel or low alloy steel parts.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Unlimited layers with proper preheat and interpass temperatures and procedures.

- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



**DIAMETERS / PACKAGING**

Diameter Inches (mm)	25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil
1/16 (1.6)	ED031134	
7/64 (2.8)		ED022057

**MECHANICAL PROPERTIES <sup>(1)</sup>**

Rockwell Hardness (R <sub>C</sub> )	
As Welded	Tempered at 1000°F (540°C)
48 - 55	55 - 65

**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage <sup>(1)</sup> (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
1/16", DC+ 1-1/4" (32) .707 lbs/1000"	150 (3.8)	22	170	5.4 (2.4)
	200 (5.1)	23	210	7.9 (3.6)
	250 (6.4)	24	250	8.9 (4.1)
	300 (7.6)	25	270	10.8 (4.9)
7/64", DC+ 1-3/4" (45) 2.09 lbs/1000"	350 (8.9)	26	300	12.0 (5.4)
	100 (2.5)	26	340	10.4 (4.7)
	125 (3.2)	27	380	12.3 (5.6)
	150 (3.8)	28	430	15.3 (6.9)
2.09 lbs/1000"	175 (4.4)	29	480	17.6 (8.0)
	200 (5.1)	30	500	20.0 (9.1)
	7/64", DC+ 2-3/4" (70) 2.09 lbs/1000"	200 (5.1)	30	450
250 (6.4)		31	510	25.2 (11.4)
300 (7.6)		33	560	31.3 (14.2)

<sup>(1)</sup> Above voltages are starting points and may be adjusted as required.

**COMPETITIVE PRODUCTS**

**McKay®**  
Tube Alloy 258-0

**DEPOSIT COMPOSITION <sup>(1)</sup>**

%	6 Layers Open Arc	6 Layers w/802 Flux
C	0.65	0.50
Mn	1.5	1.9
Si	0.8	1.0
Al	1.8	1.0
Cr	7.0	7.0
Mo	1.4	1.4
W	1.6	1.6

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**NOTES**

Minimum preheat and interpass temperatures of 600° F (315° C) are essential for crack-free welding on mild steel or low alloy steel. For crack-free welding on tool steel parts, preheat of 1000° F (538° C) or higher may be necessary. After welding, very slow cooling to 250° F (121° C) is usually required. This can be followed by post-weld heat treating at 1000-1100° F (538-593° C) to develop maximum hardness.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

**BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.**



**Resists Severe Impact and Moderate Abrasion**

The deposit of this self-shielded, flux-cored wire resists severe impact as well as moderate abrasion. Produces an austenitic manganese deposit that work-hardens. Recommended for build-up and repair of Hadfield-type austenitic manganese materials as well as carbon and low alloy steels.

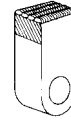
**ADVANTAGE LINCOLN**

- Designed for automatic and semi-automatic operation for self-shielded, flux-cored welding.

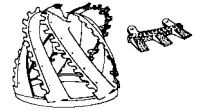
- Lincore M in 5/64" or 7/64" diameter can be used with Lincoln 801 or 803 flux for submerged arc welding in the flat and horizontal position. A 1-3/4" ESO is recommended under flux.
- For cladding and build-up of austenitic manganese steel, carbon steel and low alloy steel. Work-hardens rapidly.
- Unlimited layers with proper preheat and interpass temperatures and procedures.

- Lincore M is intended for down-hand use, but can also be used for horizontal stringer beads on sloped surfaces.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



Hammers



Dredge Parts

- Crushers
- Buckets
- Breaker Bars

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	25 Lb. (11 kg)		50 Lb. (23 kg)		Speed Feed Drums		
	Steel Spool		Coil		125 Lb. (57 kg)	300 Lb. (136 kg)	600 Lb. (272 kg)
.045 (1.1)	ED031128						
1/16 (1.6)	ED031129						
5/64 (2.0)	ED031130		ED011160				
7/64 (2.8)			ED011164		ED011163	ED011161	ED011162

**MECHANICAL PROPERTIES <sup>(1)</sup>**

Rockwell Hardness (R <sub>C</sub> )	
As Welded	Work-Hardened
18 - 28	30 - 48

**TYPICAL OPERATING PROCEDURES**

Wire, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
.045" (1.1mm), DC+ 1" (25) .370 lbs/1000"	200 (5.1)	22	80	3.3 (1.5)
	350 (8.9)	24	145	6.5 (2.9)
	500 (12.7)	26	185	9.6 (4.4)
1/16" (1.6mm), DC+ 1-1/8" (30) .685 lbs/1000"	150 (3.8)	23	130	4.9 (2.2)
	250 (6.4)	25	200	8.6 (3.9)
	350 (8.9)	27	250	12.4 (5.6)
5/64" (2.0mm), DC+ 1-1/4" (32) 1.10 lbs/1000"	125 (3.2)	24	240	6.4 (2.9)
	175 (4.4)	27	300	9.3 (4.2)
	250 (6.4)	29	360	13.6 (6.2)
7/64" (2.8mm), DC+ 1-3/4" (45) 2.08 lbs/1000"	75 (1.9)	25	240	7.8 (3.5)
	125 (3.2)	27	360	13.6 (6.2)
	150 (3.8)	28	395	16.6 (7.5)
7/64" (2.8mm), DC+ 2-1/2" (64) 2.08 lbs/1000"	75 (1.9)	25	240	8.0 (3.6)
	175 (4.4)	30	400	19.5 (8.8)
	225 (5.7)	32	455	25.6 (11.6)

**COMPETITIVE PRODUCTS**

**Stoody®**  
Nicro Mang  
Dyna Mang

**McKay®**  
218-0

**DEPOSIT COMPOSITION <sup>(1)</sup>**

	Open Arc	w/803 Flux
C	0.6	0.5
Mn	13.0	13.0
Si	0.4	0.4
Cr	4.9	4.3
Ni	0.5	0.5

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**NOTES**

As with all austenitic manganese welding products, interpass temperatures should be limited to 500°F (260°C) maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Resists Severe Impact and Moderate Abrasion**

This self-shielded, flux-cored wire is recommended for the same applications as Lincore M. However, M-1 produces less slag.

**ADVANTAGE LINCOLN**

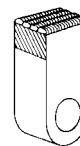
- Designed for automatic and semiautomatic operation.
- For cladding and build-up of austenitic manganese steel, carbon steel and low alloy steel. Work-hardens rapidly.

- Layers are unlimited, with proper preheat and interpass temperatures and procedures.
- Lincore M-1 is intended for downhand use, but can also be used for horizontal stringer beads on sloped surfaces.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



Chain Hooks



Crusher Hammers & Rolls

- Dipper teeth & lips
- Manganese bucket fronts
- Dragline pins & links
- Rolling mill parts
- Drive sprockets
- Dredge parts

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	50 Lb. (23 kg) Coil	600 Lb. (272 kg) Speed Feed Drum
7/64 (2.8)	ED028724	ED029926

**MECHANICAL PROPERTIES <sup>(1)</sup>**

Rockwell Hardness (R <sub>C</sub> )	
As-Welded	Work-Hardened
20	43

**COMPETITIVE PRODUCTS**

**Stoody<sup>®</sup>**      **McKay<sup>®</sup>**  
 Dyna Mang      218-O  
 Nicro Mang

**DEPOSIT COMPOSITION <sup>(1)</sup>**

%	4 Layers
C	0.9
Mn	15.0
Si	0.3
Cr	6.0
Ni	0.7
Mo	1.1

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**TYPICAL OPERATING PROCEDURES**

Wire, Polarity ESO Inches (mm)	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
7/64", DC+ 1-3/4" (45)	100 (2.5)	26	340	9.0 (4.1)
	150 (3.8)	27	415	13.4 (6.1)
	180 (4.6)	28	465	16.3 (7.4)
	200 (5.1)	29	490	17.7 (8.1)
	220 (5.6)	30	510	19.2 (8.7)
	240 (6.1)	31	540	21.6 (9.8)
	260 (6.6)	32	555	23.9 (10.8)
	280 (7.1)	33	580	25.9 (11.8)
	300 (7.6)	34	610	26.9 (12.2)

**NOTES**

As with all austenitic manganese welding products, interpass temperatures should be limited to 500°F (260°C) maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

**BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.**

## Resists Severe Impact and Gouging

This self-shielded, flux-cored wire deposits an austenitic manganese deposit which exhibits very good crack resistance. Work-hardens for overlay or joining austenitic manganese steel to itself or to carbon steel. Can be used as a build-up layer before capping with abrasion resistant alloys.

## ADVANTAGE LINCOLN

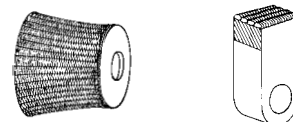
- Designed for semiautomatic and automatic welding.
- Lincore 15Cr Mn can be used with Lincoln 801 flux for submerged arc welding in the flat

and horizontal position. A 1-3/4" electrical stickout is recommended under flux.

- Work-hardens rapidly and has outstanding capabilities for both hardfacing and joining.
- Can be used in open arc mode for joining austenitic manganese steel to carbon steel, low alloy steel, austenitic manganese steel, or stainless steel.
- Lincore 15CrMn provides enough alloy so that the first layer of deposit (even on carbon steel) will be austenitic, which makes it resistant to "pull-out" or fusion line separation.

- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Unlimited layers with proper preheat and interpass temperatures and procedures.
- Can be used to add a tough build-up deposit over a high abrasion resistant deposit such as Lincore 60-O.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Spreader Cones Crusher Hammers

- Austenitic manganese parts

## COMPETITIVE PRODUCTS

**Stoody®**  
110

**McKay®**  
AP-O

## DIAMETERS / PACKAGING

Diameter Inches (mm)	25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil	125 Lb. (57 kg) Speed Feed Drum
5/64 (2.0)	ED031126	ED022060	
7/64 (2.8)		ED022061	ED022068

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>c</sub> )	
As-Welded	Work-Hardened
18 - 22	40 - 50

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
5/64", DC+ 1-1/4 (32) 1.190 lbs/1000"	125 (3.2)	26	210	7.3 (3.3)
	200 (5.1)	29	280	11.7 (5.3)
	250 (6.4)	30	320	15.1 (6.8)
	350 (8.9)	32	380	21.3 (9.7)
7/64", DC+ 1-3/4 (45) 1.915 lbs/1000"	75 (1.9)	26	250	5.5 (2.5)
	125 (3.2)	28	320	11.3 (5.1)
	150 (3.8)	29	350	14.6 (6.6)
	175 (4.4)	30	380	16.4 (7.5)
7/64", DC+ 2-1/2 (65) 1.915 lbs/1000"	150 (3.8)	30	320	14.9 (6.7)
	200 (5.1)	33	390	19.2 (8.7)
	225 (5.7)	34	410	21.7 (9.8)
	250 (6.4)	35	425	25.1 (11.4)

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	Six Layers Open Arc	Six Layers Under 801 Flux
C	0.4	0.4
Mn	15.0	15.0
Si	0.25	0.6
Cr	16.0	16.0

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## NOTES

As with all austenitic manganese welding products, interpass temperatures should be limited to 500°F (260°C) maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Severe Impact and Gouging

Self-shielded, flux-cored with with the same characteristics as Lincore 15CrMn but with lighter slag, that allows welding additional layer(s) without removing slag from the prior pass.

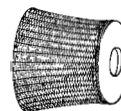
## ADVANTAGE LINCOLN

- Use on Hadfield manganese steels or as overlay on carbon steels.
- Lincore 15Cr Mn LS can be used with Lincoln 801 flux for

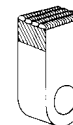
submerged arc welding in the flat and horizontal position. A 1-3/4" electrical stickout is recommended under flux.

- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Unlimited layers with proper pre-heat and interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

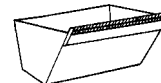
## TYPICAL APPLICATIONS



Spreader Cones



Crusher Hammers



Lift Buckets

- Track ends
- Railroad switches & crossings

## DIAMETERS / PACKAGING

Diameter Inches (mm)	25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil	125 Lb. (57 kg) Speed Feed Drum
5/64 (2.0)	ED031127		
7/64 (2.8)		ED029064	ED029558

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )	
As-Welded	Work-Hardened
18 - 24	40 - 50

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm)	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
5/64", DC+ 1-1/4 (32)	100 (2.5)	26	195	4.4 (2.0)
	150 (3.8)	27	250	7.5 (3.4)
	200 (5.1)	28	300	10.6 (4.8)
	250 (6.4)	28	340	13.7 (6.2)
7/64", DC+ 1-1/2" (38)	350 (8.9)	30	410	19.9 (9.0)
	100 (2.5)	26	280	9.1 (4.2)
	150 (3.8)	27	350	14.4 (6.5)
	200 (5.1)	29	415	19.0 (8.6)
	300 (7.6)	34	510	27.8 (12.6)

## COMPETITIVE PRODUCTS

**Stoody®**  
110

**McKay®**  
AP-O

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	Six Layers 5/64" Open Arc	Six Layers 7/64" Open Arc
C	0.41	0.47
Mn	13.0	14.8
Si	0.15	0.14
Cr	16.7	18.1

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## NOTES

As with all austenitic manganese welding products, interpass temperatures should be limited to 500°F (260°C) maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

### Resists Severe Impact

Self-shielded, flux-cored wire designed for repair of manganese frogs and manganese crossing diamonds in the railroad industry. High alloy austenitic manganese deposit.

### ADVANTAGE LINCOLN

- This higher strength electrode can easily handle the increased loading of railroad cars, therefore reducing the frequency of repairs.

- Excellent operator appeal: low smoke level, less spatter, easy slag removal, and reduced grinding time after work hardening.
- Reduced deformation and flow.
- Unlimited layers with proper preheat and interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

### TYPICAL APPLICATIONS (On Manganese Castings)



Manganese Crossing Diamonds



Manganese Railroad Frogs

### COMPETITIVE PRODUCTS

**Stoody®**  
Nicro Mang  
Track Mang  
Track Wear

**Trackweld®**  
Frogweld 570  
**McKay®**  
219-0

### DIAMETERS / PACKAGING

Diameter Inches (mm)	25 Lb. (11 kg) Plastic Spool
1/16 (1.6)	ED026106
5/64 (2.0)	ED026105
3/32 (2.4)	ED026104
7/64 (2.8)	ED026103

### MECHANICAL PROPERTIES <sup>(1)</sup>

As Welded	Rockwell Hardness (R <sub>C</sub> )	
	Work Hardened	
20 - 30	40 - 50	

### TYPICAL OPERATING PROCEDURES

Diameter ESO Inches (mm) Wire Weight	Polarity	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
1/16", DC+ 1" (25) .700" lbs/1000"		200 (5.1)	27	220	6.7 (3.0)
		250 (6.4)	29	250	8.7 (4.0)
		325 (8.3)	32	300	11.6 (5.3)
5/64", DC+ 1-1/4" (32) 1.10 lbs/1000"		150 (3.8)	27	240	7.4 (3.4)
		200 (5.1)	29	290	10.7 (4.9)
		250 (6.4)	31	340	14.0 (6.4)
3/32", DC+ 1-1/2" (38) 1.60 lbs/1000"		100 (2.5)	25	240	7.5 (3.4)
		150 (3.8)	27	310	11.6 (5.3)
		200 (5.1)	29	380	15.6 (7.1)
7/64", DC+ 1-1/2" (38) 2.10 lbs/1000"		75 (1.9)	25	255	6.9 (3.1)
		125 (3.2)	27	350	12.2 (5.5)
		150 (3.8)	28	400	14.8 (6.7)

### DEPOSIT COMPOSITION <sup>(1)</sup>

%	6 Layers
C	1.07
Mn	25.5
Cr	4.59
Si	0.17

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

### NOTES

Remove all damaged and foreign material by the air-carbon arc gouging process and grinding. Make sure all defective metal is removed. In the event hairline cracks remain at flangeway depth, use a 1/8" diameter E308 stainless product, such as Blue Max or Red Baron 308L AC-DC to tie up these cracks and avoid hot cracking during the build-up process. Use only light amounts and do not build-up with E308 stainless. It is for use in emergency situations where no other alternative is available to repair flangeway cracks. As with all austenitic manganese welding products, interpass temperatures should be limited to 500°F (260°C) maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

#### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

### Resists Severe Impact

Gas-shielded, metal-cored wire, designed for repair of manganese frogs and manganese crossing diamonds in the railroad industry. High alloy austenitic manganese deposit.

### ADVANTAGE LINCOLN

- This higher strength electrode can easily handle the increased loading of railroad cars, therefore reducing the frequency of repairs.

- Spatter and slag are minimal.
- Recommended gas mixture is 90% Argon, 10% CO<sub>2</sub> or 98% Argon, 2% CO<sub>2</sub> in the spray transfer mode.
- Reduced deformation and flow.
- Unlimited layers with proper preheat and interpass temperatures and procedures.
- Manufactured under a quality system certified to ISO 9001 requirements.

### TYPICAL APPLICATIONS (On Manganese Castings)



Manganese Crossing  
Diamonds



Manganese  
Railroad Frogs

### DIAMETERS / PACKAGING

Diameter Inches (mm)		50 Lb. (23 kg) Coil
5/64	(2.0)	ED028172
3/32	(2.4)	ED028173

### MECHANICAL PROPERTIES <sup>(1)</sup>

As Welded	Rockwell Hardness (R <sub>C</sub> )	
		Work Hardened
20 - 30		40 - 50

### TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)	
5/64, DC+ 1 (25) 1.10 lbs/1000" 90% Ar/10% CO <sub>2</sub>	150 (3.8)	27	295	9.1	(4.1)
	200 (5.1)	29	365	12.5	(5.7)
	250 (6.4)	31	430	15.9	(7.2)
3/32, DC+ 1 (25) 1.600lbs/1000" 90% Ar/10% CO <sub>2</sub>	125 (3.2)	26	335	10.6	(4.8)
	150 (3.8)	27	379	13.0	(5.9)
	200 (5.1)	29	462	17.8	(8.1)

### DEPOSIT COMPOSITION <sup>(1)</sup>

%	6 Layers
C	0.92
Mn	22.0
Cr	4.50
Si	0.05

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

### NOTES

Remove all damaged and foreign material by the air-carbon arc gouging process and grinding. Make sure all defective metal is removed if possible. In the event hairline cracks remain at flangeway depth, use a 1/8" (3.2mm) diameter E308 stainless product, such as Blue Max or Red Baron 308L AC-DC to tie up these cracks and avoid hot cracking during the build-up process. Use only light amounts and do not build-up with E308 stainless. It is for use in emergency situations where no other alternative is available to repair flangeway cracks.

As with all austenitic manganese welding products, interpass temperatures should be limited to 500°F (260°C) maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

#### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Resists Abrasion and Moderate Impact**

Self-shielded, flux-cored wire delivers an abrasion resistant deposit, even under conditions of moderate impact. Larger wire diameter sizes may be used for the submerged arc process.

**ADVANTAGE LINCOLN**

- For semiautomatic and automatic welding.

- Can be used on low carbon, medium carbon, low alloy, manganese and stainless steels.
- The 5/64" & 7/64" (2.0 & 2.8 mm) diameters may be used with Lincolnweld 801, 803 or 860 flux to improve bead appearance and to minimize smoke.
- The .045" & 1/16" (1.1 & 1.6mm) diameters are especially suitable for overlaying thin gauge materials, building up edges, horizontal

stringer beads on sloped surfaces, or where minimum heat input is required.

- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Limited to 4 layers.
- Manufactured under a quality system certified to ISO 9001 requirements.

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil	125 Lb. (57 kg) Speed-Feed Drum
.045 (1.1)	ED031123	ED020828	
1/16 (1.6)	ED031124	ED020829	
5/64 (2.0)	ED031125	ED017825	
7/64 (2.8)		ED011275	ED011274

**MECHANICAL PROPERTIES <sup>(1)</sup>**

Rockwell Hardness (Rc)	1 Layer	2 Layers	3 Layers
On Mild Steel	34 - 37	44 - 48	48 - 52
On .50% Carbon Steel	41 - 43	47 - 50	50 - 53
On Austenitic Mn Steel	--	43 - 45	48 - 50
Under 801 Flux	38 - 43	47 - 52	48 - 56

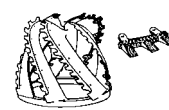
**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Approx. Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
.045", DC+ 1 (25)	200 (5.1)	19 - 21	120	4.2 (1.9)
.385 lbs/1000"	400 (10.2)	23 - 25	190	8.5 (3.9)
	600 (15.2)	27 - 29	250	12.8 (5.8)
1/16", DC+ 1 (25)	150 (3.8)	22 - 24	175	5.9 (2.7)
.720 lbs/1000"	350 (8.4)	29 - 31	325	13.6 (6.2)
	450 (11.4)	32 - 34	365	17.5 (7.9)
5/64", DC+ 1-1/4 (32)	125 (3.2)	27	210	7.4 (3.4)
1.10 lbs/1000"	200 (5.1)	31	325	11.9 (5.4)
	250 (6.4)	33	380	14.9 (6.8)
7/64", DC+ 1-1/4 (32)	80 (2.0)	26	315	8.6 (3.9)
2.11 lbs/1000"	100 (2.5)	27	375	10.7 (4.9)
	130 (3.3)	29	450	14.0 (6.4)
7/64", DC+ 2-1/2 (65)	100 (2.5)	27	315	10.7 (4.9)
2.11 lbs/1000"	130 (3.3)	29	370	14.0 (6.4)
	175 (4.4)	31	450	19.0 (8.6)
<b>Under Flux</b>				
7/64", DC+ 1-1/4 (32)	100 (2.5)	29	400	11.4 (5.2)
2.11 lbs/1000"	120 (3.0)	30	450	13.7 (6.2)
	175 (4.4)	33	540	20.0 (9.1)

**TYPICAL APPLICATIONS**



Crusher Rolls



Dredge Cutter Teeth

- Ore chute baffles
- Muller plows & tires
- Coal mining cutting teeth
- Conveyor buckets
- Drill pipe collars
- Screw flights
- Rolling mill guides

**COMPETITIVE PRODUCTS**

Stoody®	McKay®
117	240-O
121	244-O

**DEPOSIT COMPOSITION <sup>(1)</sup>**

	Open Arc		Under Flux		
	.045, 1/16	5/64, 7/64	(801) 5/64, 7/64	(803) 5/64, 7/64	(860) 5/64, 7/64
C	2.4	2.0	2.5	2.5	2.5
Mn	1.3	0.9	1.1	1.8	2.0
Si	1.0	1.0	1.3	1.2	1.7
Al	0.6	0.6	0.4	0.2	0.2
Cr	11.4	9.2	10.1	11.1	11.0
Mo	—	0.5	0.5	0.5	0.5

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Severe Abrasion and Moderate Impact

This self-shielded, flux-cored wire features higher alloy levels than Lincore 50. Its deposits resist both abrasion and moderate impact. Lincore 60-O can be used at temperatures up to 1300°F (704°C).

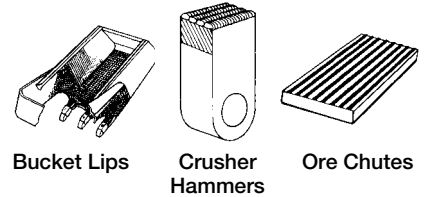
## ADVANTAGE LINCOLN

- For automatic and semiautomatic operation.

- To be used on carbon, low alloy, manganese and stainless steels and cast iron. Deposits check crack.
- May be used with Lincolnweld 803 neutral flux to improve bead shape and minimize smoke.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Deposit is limited to two layers.

- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



- Dozer blades
- Ripper teeth

## COMPETITIVE PRODUCTS

Stoody®	McKay®
100HC	255-0
101HC	

## DIAMETERS / PACKAGING

Diameter	Speed Feed Drums		Speed Feed Drums		
	25 Lb. (11 kg) Steel Spool	50 Lb. (23 kg) Coil	125 Lb. (57 kg)	300 Lb. (136 kg)	600 Lb. (272 kg)
.045 (1.1)	ED031131				
1/16 (1.6)	ED031132				
5/64 (2.0)	ED031133	ED019887	ED020803		
7/64 (2.8)		ED019888	ED020805	ED020807	ED019890
.120 (3.0)		ED020800			ED019889

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )
55 - 60

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	2 Layers Open Arc	2 Layers Under 803 Flux
C	4.2	4.8
Mn	1.6	4.1
Si	1.3	1.2
Al	0.6	0.2
Cr	25.4	25.8

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
.045, DC+	200 (5.1)	21	125	4.1 (1.9)
3/4 (20)	400 (10.2)	25	185	8.2 (3.7)
.364 lbs/1000"	500 (12.7)	27	210	10.3 (4.7)
1/16, DC+	200 (5.1)	28	240	7.6 (3.4)
7/8 (22)	300 (7.6)	31	300	11.2 (5.1)
.664 lbs/1000"	450 (11.4)	33	350	16.6 (7.5)
5/64, DC+	125 (3.2)	26	250	7.4 (3.4)
1-1/4 (32)	200 (5.1)	30	350	12.0 (5.4)
1.05 lbs/1000"	250 (6.4)	32	400	15.1 (6.9)
7/64, DC+	75 (1.9)	27	250	7.4 (3.4)
1-1/8 (30)	125 (3.2)	30	340	11.9 (5.4)
1.87 lbs/1000"	175 (4.4)	32	420	16.5 (7.5)
.120, DC+	50 (1.3)	28	215	5.8 (2.6)
1-1/8 (30)	300 (7.6)	36	580	32.5 (14.7)
2.23 lbs/1000"	700 (17.8)	42	900	76.0 (34.5)
<b>Under Flux</b>				
7/64, DC+	100 (2.5)	30	295	9.6 (4.4)
1-1/8 (30)	125 (3.2)	32	340	11.9 (5.4)
1.87 lbs/1000"	175 (4.4)	34	420	16.5 (7.5)

## NOTES

Deposit thickness limit is two layers unless high travel speed is used to obtain very closely spaced check cracks. Many layers can be used with high travel speed and small bead sizes to ensure close-spaced check cracks. Lincore 60-0 deposit cross cracks (commonly called cross-checking) on cooling. This is desirable, since cross-cracking of the deposit relieves cooling stresses and prevents spalling.

*Additional Cross Checking information can be found on page 49.*

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.



**Resists Severe Abrasion with Light Impact**

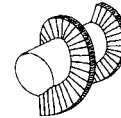
This gas-shielded, metal-cored wire features higher alloy levels than Lincore 50. The deposits resist both higher levels of abrasion and moderate impact. Lincore 60-G can be used at temperatures up to 1300°F (704°C).

**ADVANTAGE LINCOLN**

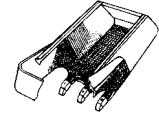
- For automatic and semiautomatic operation.
- To be used on carbon, low alloy, manganese and stainless steels and cast iron. Deposits check crack.

- May be used with Lincolnweld 803 neutral fluxes to improve bead shape and minimize smoke.
- Recommended gas mixture is 75% Argon, 25% CO<sub>2</sub>.
- Welds in the flat and horizontal positions as well as horizontal beads on a vertical surface.
- Deposit is limited to two layers.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



**Augers**



**Bucket Lips & Sides**

- Loaders
- Brushing & Grinding Equipment
- Shaper Sides & Blades
- Tillage Tools
- Conveyor Screws
- Fans & Blades

**COMPETITIVE PRODUCTS**

**Stoody®**  
101HC-G

**McKay®**  
255-G

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	10 Lb. (5 kg) Plastic Spool	25 Lb. (11 kg) Plastic Spool
.045 (1.1)	ED029937	ED029936

**MECHANICAL PROPERTIES <sup>(1)</sup>**

Rockwell Hardness (R <sub>C</sub> )	
1 Layer	2 Layers
58	60

**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Shielding Gas	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)
.045", DC+ 3/4 (20) 75% Ar /25% CO <sub>2</sub>	200 (5.1)	23 - 24
	300 (7.6)	25 - 26
	400 (10.2)	27 - 28
.045", DC+ 3/4 (20) 90% Ar /10% CO <sub>2</sub>	200 (5.1)	22 - 23
	300 (7.6)	24 - 25
	400 (10.2)	26 - 27
.045", DC+ 3/4 (20) 98% Ar /2% O <sub>2</sub>	200 (5.1)	22 - 23
	300 (7.6)	24 - 25
	400 (10.2)	26 - 27

**DEPOSIT COMPOSITION <sup>(1)</sup>**

%	1 Layer	2 Layers
C	4.6	5.5
Mn	1.2	1.3
Si	0.5	0.6
Cr	13.8	17.3

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

**Resists Severe Abrasion with Light Impact**

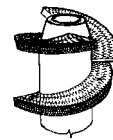
Deposits of this self-shielded, flux-cored wire resist severe abrasion and light impact. These deposits include higher carbon and chrome levels than Lincore 60-O. It is recommended for use on wear plate, coal pulverizer rolls, earth engaging tools, and on slurry pipe and elbows.

**ADVANTAGE LINCOLN**

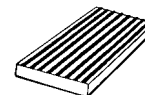
- Highest abrasion resistance and hardness of all the Lincore flux-cored line.

- To be used on carbon, low alloy, manganese, stainless steels and cast iron.
- Intended for downhand welding and for horizontal stringer beads on sloped surfaces.
- Limited to 4 layers.
- Manufactured under a quality system certified to ISO 9001 requirements.

**TYPICAL APPLICATIONS**



Screw Augers



Ore Chutes and Wearplates

- Crusher Rolls
- Ripper Teeth

**COMPETITIVE PRODUCTS**

<b>Stoody®</b>	<b>McKay®</b>
100HD	263-O
100XHD	

**DIAMETERS / PACKAGING**

Diameter Inches (mm)	50 Lb. (23 kg) Coil	125 Lb. (57 kg) Speed Feed Drum	200 Lb. (91 kg) Speed Feed Drum	500 Lb. (227 kg) Speed Feed Drum
7/64 (2.8)	ED026077	ED026079	ED026081	ED026083
1/8 (3.2)	ED026076	ED026078	ED026080	ED026082

**MECHANICAL PROPERTIES <sup>(1)</sup>**

1 Layer	Rockwell Hardness (R <sub>C</sub> )	
	2 Layers	4 Layers
57	60	64

**TYPICAL OPERATING PROCEDURES**

Diameter, Polarity ESO Inches (mm) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
7/64", DC+ 1-1/2 (38) 1.80 lbs/1000"	75 (1.9)	27	225	7.0 (3.2)
	100 (2.5)	28	280	9.6 (4.4)
	150 (3.8)	30	360	16.6 (7.5)
	200 (5.1)	31	420	19.7 (8.9)
	250 (6.4)	32	480	24.4 (11.1)
1/8", DC+ 1-1/2 (38) 2.3 lbs/1000"	300 (7.6)	33	500	29.8 (13.5)
	75 (1.9)	28	290	10.5 (4.8)
	100 (2.5)	30	360	14.0 (6.4)
	150 (3.8)	31	440	20.9 (9.5)
	200 (5.1)	32	530	27.9 (12.7)
250 (6.4)	33	600	34.9 (15.8)	

**DEPOSIT COMPOSITION <sup>(1)</sup>**

%	1 Layer	2 Layers	4 Layers
C	3.7	4.8	5.7
Mn	1.3	1.6	1.8
Si	0.7	1.0	1.1
Cr	19.9	26.2	30.8

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

**NOTES**

Postweld heat treatment up to 1400°F (760°C) will not affect abrasion resistance very significantly, but will affect hardness to some extent. Typical results are shown below:

<b>4 layers of Lincore 65-O</b>	
	<b>Rockwell Hardness C</b>
<b>Condition</b>	
As-Welded	63
Aged at 1200°F (650°C) for 2 hours	56
Aged at 1400°F (760°C) for 2 hours	54

Cross Checking information can be found on page 49.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Build-up and Metal-to-Metal Wear with Moderate Hardness

This metal-cored wire is intended for build-up before final overlay, and as a final surface for metal-to-metal wear with moderate impact. Lincore 30-S is recommended for use with Lincolnweld 801 flux.

### ADVANTAGE LINCOLN

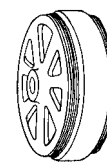
- Metal-cored hardfacing wire for submerged arc applications.
- For automatic and semiautomatic operation on mild and low alloy steels.
- Recommended flux is Lincolnweld 801. Can also be used with 802 and 860<sup>(1)</sup>.

- Recommended as final overlay where medium hardness and good machinability are required.
- Lincore 30-S with 801 flux provides excellent resistance to impact and cold deformation.
- Good resistance to cross checking.
- Welds in flat, horizontal and circumferential positions only.
- Deposit thickness is unlimited.
- Manufactured under a quality system certified to ISO 9001 requirements.

<sup>(1)</sup> 802 and 860 standard flux are not sized for semiautomatic applications; however, they can be ordered in special sizing.

## TYPICAL APPLICATIONS

### For Build-up:



- Tractor Rollers
- Trunnions
- Crane Wheels

Idlers

### For Hardfacing:



- Track Rails
- Idlers

Shafts

## COMPETITIVE PRODUCTS

**Stoody®**  
104

**McKay®**  
BU-S

## DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (23 kg) Coil	Speed Feed Drums	
		300 Lb. (136 kg)	600 Lb. (272 kg)
3/32 (2.4)	ED011200	ED015890	ED011199
1/8 (3.2)	ED015889		ED015891

## MECHANICAL PROPERTIES <sup>(2)</sup>

Rockwell Hardness (R <sub>C</sub> )	
6 Layers Under 801 or 802 Flux	6 layers Under 860 Flux
27	27

## TYPICAL OPERATING PROCEDURES

Wire, Polarity ESO Inches (mm) Process	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
3/32", DC+ 1-1/2" (38) Under 801 Flux	60 (1.5)	26	220	6.0 (2.7)
	120 (3.0)	27	360	11.5 (5.2)
	180 (4.6)	28	500	17.0 (7.7)
1/8", DC+ 1-5/8" (40) Under 801 Flux	50 (1.3)	27	310	7.5 (3.4)
	80 (2.0)	28	450	14.0 (6.4)
	110 (2.8)	28	600	20.0 (9.1)

## DEPOSIT COMPOSITION <sup>(2)</sup>

%	6 Layers Under 801 or 802	6 Layers Under 860
C	.11	.11
Mn	2.5	2.7
Si	.40	.60
Mo	.50	.50

<sup>(2)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

### NOTE

Cross Checking information can be found on page 49.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Build-up and Metal-to-Metal Wear for Moderate Hardness

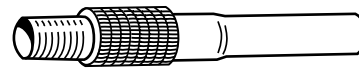
This metal-cored wire is designed for build-up on 4140 drill stems in the deep hole drilling industry. It is recommended for use with Lincolnweld 802 flux.

### ADVANTAGE LINCOLN

- Metal-cored hardfacing wire for submerged arc applications.
- For automatic and semiautomatic operation.
- Recommended flux is Lincolnweld 802. Can also be used with 803 flux.

- To be used on carbon and low alloy steels.
- Good resistance to cross checking.
- Welds in flat, horizontal and circumferential positions only.
- Deposit thickness is unlimited.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Drillstems

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	2 Layers Under 802	2 Layers Under 803	2 Layers On 4140 Steel Under	
	802	803	802	803
C	.05	.04	.13	.11
Mn	2.20	2.50	2.11	2.31
Si	.60	.33	.51	.24
Cr	1.80	1.80	1.63	1.57
Mo	.33	.35	.30	.29
Ni	.07	.08	.09	.10

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (23 kg) Coil	300 Lb. (136 kg) Speed Feed Drum	600 Lb. (272 kg) Speed Feed Drum
3/32 (2.4)	ED025655	ED025656	
1/8 (3.2)	ED025129	ED025130	ED025131

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )			
2 Layers Under 802 Flux	2 Layers Under 803 Flux	2 Layers on 4140 Steel Under 802 Flux	2 Layers on 4140 Steel Under 803 Flux
28	24	33	32

### NOTE

Cross Checking information can be found on page 49.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Process	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
3/32", DC+ 1-1/4" (32) Under 802 Flux	75 (1.9)	25	350	7.5 (3.4)
	100 (2.5)	25	400	10.0 (4.5)
	130 (3.3)	25	460	13.0 (5.9)
	165 (4.2)	25	510	16.5 (7.5)
1/8", DC+ 1-1/4" (32) Under 802 Flux	50 (1.3)	28	370	8.5 (3.9)
	100 (2.5)	28	540	17.5 (7.9)
	125 (3.2)	28	630	21.1 (9.6)
	150 (3.8)	28	720	26.0 (11.8)

## Resists Rolling, Sliding and Metal-to-Metal Wear

This metal-cored wire is intended for rolling and sliding metal-to-metal wear with moderate impact and abrasion. Use on crane and mine car wheels, rollers and shafts. Also can be used for build-up on continuous caster rolls prior to a stainless overlay. Recommended flux is Lincolnweld 801.

## ADVANTAGE LINCOLN

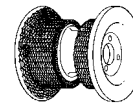
- Metal-cored hardfacing wire for submerged arc applications.
- For automatic and semiautomatic operation.

- Recommended flux is Lincolnweld 801. Can also be used with 802 and 880.
- To be used on mild steel and low alloy steel parts.
- Recommended as final overlay where medium hardness and good machinability are required.
- Good resistance to cross checking.
- Welds in flat, horizontal and circumferential positions only.
- Deposit thickness is unlimited.
- Lincore 35-S with 801 flux provides excellent resistance to impact and cold deformation.

- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS

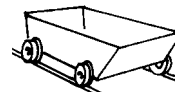
### For Build-up:



Tractor Roller

- Idlers
- Trunnions
- Crane Wheels
- Caster Rolls

### For Hardfacing:



Mine Car Wheels

- Track Rails
- Shafts
- Bearing Journals

## DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (23 kg) Coil	600 Lb. (136 kg) Speed Feed Drum
3/32 (2.4)	ED019880	ED019883
1/8 (3.2)	ED019881	ED019884
5/32 (4.0)	ED019882	ED019885

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )
39

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Process	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
3/32", DC+	50 (1.3)	25	230	5.0 (2.3)
1-1/2" (38) Under 801 Flux	100 (2.5) 150 (3.8)	25	350 460	9.0 (4.1) 13.0 (5.9)
1/8", DC+	50 (1.3)	28	340	8.0 (3.6)
1-5/8" (40) Under 801 Flux	100 (2.5) 150 (3.8)	28	500 660	16.5 (7.5) 25.0 (11.3)
5/32", DC+	50 (1.3)	28	480	13.0 (5.9)
1-5/8" (40) Under 801 Flux	75 (1.9) 100 (2.5)	28	620 750	18.5 (8.4) 24.0 (10.9)

## COMPETITIVE PRODUCTS

**Stoody®**  
107

**McKay®**  
242-S

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	Under 801 Flux
C	.19
Mn	1.7
Si	.60
Cr	2.0
Mo	.50

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## NOTE

Cross Checking information can be found on page 49.

### IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Rolling, Sliding and Metal-to-Metal Wear

This metal-cored wire is designed for rebuilding heavy equipment undercarriages. The deposit resists rolling and sliding metal-to-metal wear. It is also machinable and hot forgeable. Recommended flux is Lincolnweld 801.

## ADVANTAGE LINCOLN

- Resists metal-to-metal wear in rolling and sliding applications.
- Subarc tubular wire containing metal alloys and deoxidizers within the core.
- Full automatic is recommended.
- Recommended flux is 801<sup>(1)</sup>. Can also be used with 802<sup>(1)</sup> or 880.

- If desired, deposit can be made more resistant to metal-to-metal wear with reduced hardness levels by heat treating.
- Use on carbon and low alloy steels.
- Very good puddle control on roundabout welding.
- Easy slag removal and good resistance to cross checking.
- Welds in flat, horizontal and circumferential positions only.
- Limited to 4 layers maximum.
- Deposits can be machined and hot forged.

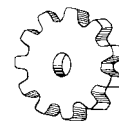
- Manufactured under a quality system certified to ISO 9001 requirements.

<sup>(1)</sup> 801 and 802 standard flux are not sized for semiautomatic applications, however, they can be ordered in special sizing.

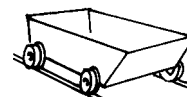
## TYPICAL APPLICATIONS



Idlers



Drive Sprockets



Mine Car Wheels

## DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (23 kg) Coil	300 Lb. (136 kg) Speed Feed Drum	300 Lb. (136 kg) Speed Feed Reel	600 Lb. (272 kg) Speed Feed Drum
1/8 (3.2)	ED015892	ED015945	ED016262	ED015909

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )
3 or More Layers after 2 Hours Post Weld Heat Treat
39-42

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Process	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
1/8", DC+ 1-1/4" (32) Under 801 Flux	65 (1.7)	27	330	9.6 (4.4)
	90 (2.3)	28	425	12.9 (5.9)
	120 (3.0)	29	525	17.3 (7.8)
1/8", DC+ 2-1/2" (65) Under 801 Flux	80 (2.0)	29	345	11.5 (5.2)
	110 (2.8)	30	425	16.0 (7.3)
	145 (3.7)	31	500	20.8 (9.4)
1/8", DC+ 3-1/2" (90) Under 801 Flux	100 (2.5)	31	375	14.3 (6.5)
	130 (3.3)	32	435	18.9 (8.6)
	180 (4.6)	33	520	26.1 (11.9)

## COMPETITIVE PRODUCTS

**Stoody**<sup>®</sup>  
105B/105

**McKay**<sup>®</sup>  
242-S

## DEPOSIT COMPOSITION <sup>(2)</sup>

%	Under 801 Flux
C	0.12
Mn	2.75
Cr	3.30
Si	.50
Mo	0.85

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## NOTE

Cross Checking information can be found on page 49.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

## Resists Rolling, Sliding and Metal-to-Metal Wear

This metal-cored wire is designed for rebuilding heavy equipment undercarriages. The deposit exhibits enhanced crack resistance and toughness compared to Lincore 40-S. It is intended to resist rolling and sliding metal-to-metal wear. Recommended flux is Lincolnweld 801.

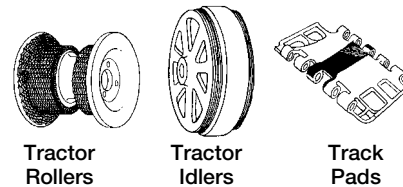
## ADVANTAGE LINCOLN

- Intended primarily for overlaying tractor undercarriage components such as tractor rollers, tractor idlers and track pads.

- Metal-cored hardfacing wire for submerged arc applications.
- For automatic and semiautomatic operation.
- Designed for use with Lincolnweld 801. Can also be used with 802 or 880 flux.
- For applications that require a machinable deposit that is resistant to rolling and sliding wear.
- Good resistance to cross checking.
- Welds in flat, horizontal and circumferential positions only.
- Unlimited layers with proper preheat and interpass temperatures and procedures.

- To be used on carbon and low alloys steels.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



## COMPETITIVE PRODUCTS

**Stoody®** Thermaclad 42  
**McKay®** 242-S

## DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (23 kg) Coil	300 Lb. (136 kg) Speed Feed Drum	600 Lb. (272 kg) Speed Feed Drum
3/32 (2.4)	EDS29162	EDS29298	EDS29164
1/8 (3.2)	ED029159	ED029264	ED029161

## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )
1 Layer
40

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Process	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
3/32", DC+ Under 801 Flux	75 (1.9)	27	295	7.1 (3.2)
3/4" (20) Under 801 Flux	125 (3.2)	29	440	11.7 (5.3)
3/32", DC+ Under 801 Flux	175 (4.4)	31	525	16.2 (7.3)
3/4" (20) Under 801 Flux	75 (1.9)	27	275	7.6 (3.4)
3/4" (20) Under 801 Flux	125 (3.2)	29	375	12.0 (5.4)
3/4" (20) Under 801 Flux	175 (4.4)	31	480	16.3 (7.4)
1/8", DC+ Under 801 Flux	50 (1.3)	27	350	8.4 (3.8)
3/4 (20) Under 801 Flux	100 (2.5)	28	565	16.5 (7.5)
3/4 (20) Under 801 Flux	125 (3.2)	29	675	20.5 (9.3)
1/8", DC+ Under 801 Flux	50 (3.2)	27	325	8.3 (3.8)
1-5/8 (40) Under 801 Flux	100 (2.5)	28	510	16.6 (7.5)
1-5/8 (40) Under 801 Flux	125 (3.2)	29	605	20.8 (9.4)

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	1/8" Diameter (3/4" ESO) Under 801 Flux			
	1 Layer	2 Layers	4 Layers	6 Layers
C	.14	.12	.11	.10
Mn	2.13	2.70	3.33	3.51
Si	.34	.39	.44	.46
Cr	1.45	2.22	2.95	3.20
Mo	.43	.66	.84	.80

%	1/8" Diameter (1-5/8" ESO) Under 801 Flux			
	1 Layer	2 Layers	4 Layers	6 Layers
C	.14	.13	.13	.13
Mn	2.49	3.05	3.41	3.55
Si	.33	.42	.47	.51
Cr	2.02	2.96	3.15	3.31
Mo	.60	.84	.99	1.06

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## NOTE

Cross Checking information can be found on page 49.

**IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED**

Fumes from the normal use of certain hardfacing welding products contain significant quantities of components such as chromium and manganese which can lower the 5.0 mg/m<sup>3</sup> maximum exposure guideline for general welding fume.

**BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.**

## Resists Severe Abrasion with Light Impact

Metal-cored wire which resists severe abrasion with mild impact. Can be used on carbon, low alloy, manganese and stainless steels as well as cast iron. Many layers can be applied using high travel speeds and small bead sizes, to promote close spaced cross check cracks. Recommended flux is Lincolnweld 803.

## ADVANTAGE LINCOLN

- Metal-cored hardfacing wire for submerged arc applications.
- For automatic and semiautomatic operation.
- Recommended flux is Lincolnweld 803. Can also be used with 802 flux.

- To be used on carbon steel, low alloy steels, manganese steels, stainless steels and cast iron.
- Lincore 60-S wire will produce an outstanding combination of deposit hardness, resistance to abrasion and moderate impact, operator appeal and consistent chemistry.
- Welds in flat, horizontal and circumferential positions only.
- Many layers can be deposited using high travel speeds and small bead sizes, to ensure close spaced check cracks.
- Manufactured under a quality system certified to ISO 9001 requirements.

## DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. (23 kg) Coil	600 Lb. (272 kg) Speed Feed Drum
1/8 (3.2)	ED016879	
5/32 (4.0)	EDS16880	ED016884

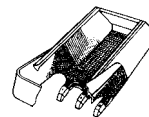
## MECHANICAL PROPERTIES <sup>(1)</sup>

Rockwell Hardness (R <sub>C</sub> )
55 - 60

## TYPICAL OPERATING PROCEDURES

Diameter, Polarity ESO Inches (mm) Process	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
1/8", DC+	60 (1.5)	26	350	7.5 (3.4)
1-1/2 (38)	80 (2.0)	28	400	10.0 (4.5)
Under 803 Flux	90 (2.3)	30	450	11.4 (5.2)
5/32", DC+	40 (1.0)	26	375	7.8 (3.5)
1-1/2 (38)	55 (1.4)	28	450	10.6 (4.8)
Under 803 Flux	65 (1.7)	30	500	12.8 (5.8)

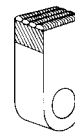
## TYPICAL APPLICATIONS



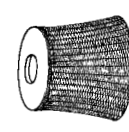
Bucket Lips



Ore Chutes



Crusher Hammers



Coal Crusher Rolls

- Pump Casings
- Pump Impellers
- Blast Furnace Bells and Hoppers

## COMPETITIVE PRODUCTS

Stoody®  
103

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	Under 803 Flux		
	2 Layers	4 Layers	6 Layers
C	4.0	4.5	5.0
Mn	1.7	1.9	2.1
Si	0.5	0.5	0.5
Cr	22.0	26.0	27.0

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

## NOTES

Lincore 60-S/803 deposit cross checks on cooling. This is desirable, since cross checking of the deposit relieves cooling stresses and prevents spalling.

Cross Checking information can be found on page 49.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

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## CROSS CHECKING

Special precautions should be taken with any build-up or hardfacing product on applications that are inherently crack sensitive, such as high carbon or alloy steels, previously hardfaced parts, highly stressed parts, and work hardened parts. The hardfacing of heavy cylinders, massive parts and parts having complex shapes are all examples of applications exhibiting high internal stresses that may result in delayed cracking.

These applications may require one or more of the following:

- Higher preheat temperatures
- Higher interpass temperatures
- Controlled slow cooling between passes and/or layers
- Stress relieving
- Minimizing layer thickness

The table below will help determine if special precautions need to be taken with specific Lincore wires:

### SPECIAL PRECAUTIONS

Application	Lincore Product									
	55	55-G	65-O	60-O	30-S	32-S	35-S	40-S	42-S	60-S
<b>Higher Preheat Temp.<sup>(1)</sup></b> 300 - 500° F (150 - 260 ° C) 400 - 500° F (200 - 260 ° C)	✓	✓	✓	✓						✓
<b>Higher Interpass Temp.</b> 400 - 600° F (200 - 320° C)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>Controlled Cooling Between Passes/Layers</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	
<b>Stress Relieving 800 - 900° F (430 - 480° C)<sup>(2)</sup></b> Every 1/4" (6.4mm) Thickness of Deposit Every 3/8-1/2" (10-13mm) Thickness of Deposit	✓	✓		✓	✓					
<b>Minimize Layer Thickness</b>				✓	✓	✓	✓	✓	✓	

<sup>(1)</sup> Preheat depends on the base material chemistry and thickness, as well as the weld metal chemistry.

<sup>(2)</sup> Stress relieving in temperatures in excess of 900°F (482°C) will result in a "softening" of the deposit.

## Resists Metal-to-Metal Wear with Corrosion

- Lincore's product line for repairing caster rolls consists of metal-cored wires designed for subarc welding with Lincolnweld neutral fluxes.
- With the recommended flux, virtually 100% of the alloy, including carbon, is recovered in the weld deposit so that undiluted weld metal composition does not vary with welding conditions.
- Slag removal is clean and complete, ripple is minimal, and tie-in is smooth on rolls and flat surfaces.
- Manufactured under a quality system certified to ISO 9001 requirements.

## TYPICAL APPLICATIONS



Caster Rolls

### For Build-up

#### Lincore 20

Metal-cored wire with moderate hardness for build-up before stainless overlay. Good crack resistance and high compressive strength.

Recommended flux is Lincolnweld 801. Can also be used with 802 and 880.

#### Lincore 8620

Metal-cored wire for build-up on worn rolls. A little softer than Lincore 20, for easier machining. Recommended flux is 801. Can also be used with 802 and 880.

#### Lincore 4130

Metal-cored wire for general build-up. Can be flame hardened to 38 Rockwell C. Also used on mining components such as cable drums, sheaves, gears and shafts. Recommended flux is 801.

### For Hardfacing

#### Lincore 410

Metal-cored wire with a 410 martensitic stainless steel deposit. Low carbon content and high corrosion resistance. Soft and easily machined. Flux recommendation is 801. Can also be used with 802.

#### Lincore 410NiMo

Metal-cored wire with low carbon deposit, which forms softer, tougher martensite than other roll alloys. Recommended flux is 801. Can also be used with 802.

#### Lincore 424A

Metal-cored wire with a higher nickel content than 41NiMo alloy. Flux recommendation is 801. Can also be used with 802.

#### Lincore 423L

Metal-cored wire, provides a softer "as-welded" deposit than Lincore 420, with more resistance to softening during tempering above 900°F (482°C). Recommended flux is 802.

#### Lincore 423Cr

Metal-cored wire with a higher chrome deposit than Lincore 423L for improved corrosion resistance. Recommended flux 802.

#### Lincore 420

Metal-cored wire that is most widely used for caster roll rebuilding. Flux recommendation is 801. Can also be used with 802.

#### Lincore 96S

Metal-cored wire which produces a high carbon, 420 stainless steel deposit. Use where a higher hardness is required. Can be used on work rolls and backup rolls when water spray causes pitting on tool steel deposits. Recommended flux is 801. Can also be used with 802.

#### Lincore 102W

Metal-cored wire which produces a tool steel deposit that retains hardness at high working temperatures. Used for guide rolls, and work rolls. Can also be used as the seat on blast furnace bells and hoppers. 802 flux is recommended. Can also be used with 801.

#### Lincore 102HC

Metal-cored wire with a higher carbon content than Lincore 102W. Will give a higher hardness tool steel deposit. Deposit is "hot" [above 400°F (204°C)] machinable, for easy sizing after welding. Recommended flux is 802.

## MECHANICAL PROPERTIES <sup>(1)</sup>

	Rockwell Hardness (R <sub>C</sub> )											
	Lincore Product											
	20	8620	4130	102W	102HC	96S	410	410NiMo	420	423L	423Cr	424A
	23-28	16-20	17-21	48-54	54-60	48-54	27-32	32-40	46-50	41-47	41-47	36-42

## DEPOSIT COMPOSITION <sup>(1)</sup>

%	Lincore Product											
	20	8620	4130	102W	102HC	96S	410	410NiMo	420	423L	423Cr	424A
C	.05	.09	.12	.28	.40	.23	.08	.05	.20	.15	.15	.09
Mn	.60	.80	1.10	1.50	2.10	1.20	.80	.80	1.20	1.20	1.20	.80
Si	.40	.30	.30	.40	1.60	.40	.40	.50	.50	.40	.40	.40
Cr	1.40	.45	.80	6.50	6.70	13.00	12.50	13.00	12.00	11.50	13.50	13.00
Ni	2.40	.55	—	—	—	.20	—	2.00	—	2.00	2.00	4.50
Mo	.40	.15	.20	1.00	1.60	—	—	1.00	—	1.00	1.00	1.00
V	—	—	—	.15	.20	—	—	—	—	.15	.15	—
W	—	—	—	1.00	1.30	—	—	—	—	—	—	—

<sup>(1)</sup> Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

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BEFORE USE, READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

# LINCORE WIRES FOR ROLL REBUILDING

## DIAMETERS / PACKAGING

Product Diameter Inches (mm)	50 Lb. (22.7 kg) Coil	600 Lb. (272 kg) Speed Feed Drum	Product Diameter Inches (mm)	50 Lb. (22.7 kg) Coil	600 Lb. (272 kg) Speed Feed Drum
<b>Lincore 20</b>			<b>Lincore 410NiMo</b>		
3/32 (2.4)	EDS18565	EDS18568	3/32 (2.4)	ED018589	EDS18592
1/8 (3.2)	EDS18566	ED018569	1/8 (3.2)	ED018590	ED018593
5/32 (4.0)		EDS18570	5/32 (4.0)	EDS18591	ED018594
<b>Lincore 8620</b>			<b>Lincore 420</b>		
3/32 (2.4)	ED020787		3/32 (2.4)	ED015260	ED015261
1/8 (3.2)	ED020788	ED020791	1/8 (3.2)	ED015262	ED015268
5/32 (4.0)	EDS20789	ED020792	5/32 (4.0)	EDS15263	ED015264
<b>Lincore 4130</b>			<b>Lincore 423L</b>		
3/32 (2.4)	ED015265	ED015532	3/32 (2.4)	ED018547	EDS18550
1/8 (3.2)	ED015266	ED015405	1/8 (3.2)	ED018548	ED018551
<b>Lincore 102W</b>			<b>Lincore 423Cr</b>		
3/32 (2.4)	ED018577		3/32 (2.4)	EDS18553	EDS18556
1/8 (3.2)	ED018578	ED018581	1/8 (3.2)	EDS18554	ED018557
5/32 (4.0)		ED018582	5/32 (4.0)	EDS18555	ED018558
<b>Lincore 102HC</b>			<b>Lincore 424A</b>		
3/32 (2.4)	ED026084	ED026086	3/32 (2.4)	EDS18559	EDS18562
1/8 (3.2)	ED026085	ED026087	1/8 (3.2)	ED018560	
<b>Lincore 96S</b>			5/32 (4.0)	EDS18561	EDS18564
3/32 (2.4)		ED018574			
1/8 (3.2)	ED018572	ED018575			
5/32 (4.0)	EDS18573	ED018576			
<b>Lincore 410</b>					
3/32 (2.4)	ED018583	ED018586			
1/8 (3.2)	ED018584	EDS18587			
5/32 (4.0)		ED018588			

## RECOMMENDED FLUX

	Primary Flux Recommendation			Secondary Flux Recommendation		
	801 Flux	802 Flux	880 Flux	801 Flux	802 Flux	880 Flux
Lincore 20	✓				✓	✓
Lincore 8620	✓				✓	✓
Lincore 4130	✓				✓	✓
Lincore 102W		✓		✓		
Lincore 102HC		✓		✓		
Lincore 96S	✓				✓	
Lincore 410	✓				✓	
Lincore 410NiMo	✓				✓	
Lincore 420	✓				✓	
Lincore 423L		✓				
Lincore 423Cr		✓				
Lincore 424A	✓				✓	

# LINCORE WIRES FOR ROLL REBUILDING

## TYPICAL OPERATING PROCEDURES

Product Dia., Polarity ESO Inches (mm)	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)	Product Dia., Polarity ESO Inches (mm)	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Deposition Rate lbs/hr (kg/hr)
<b>Lincore 20/8620</b> 3/32", DC+ 1-1/2" (38)	65 (1.7)	24	270	6.7 (3.0)	<b>Lincore 423Cr</b> 3/32", DC+ 1-1/2" (38)	65 (1.7)	24	250	6.0 (2.7)
	120 (3.0)	28	400	12.4 (5.6)		120 (3.0)	28	350	11.0 (5.0)
	175 (4.4)	31	500	18.1 (8.2)		175 (4.4)	31	450	16.0 (7.3)
1/8", DC+ 1-5/8" (40)	60 (1.5)	26	400	10.4 (4.7)	1/8", DC+ 1-5/8" (40)	60 (1.5)	26	375	9.9 (4.5)
	100 (2.5)	28	550	17.3 (7.8)		100 (2.5)	28	540	16.5 (7.5)
	140 (3.6)	30	680	24.2 (11.0)		140 (3.6)	30	640	23.1 (10.5)
5/32", DC+ 1-5/8" (38)	55 (1.4)	27	520	14.6 (6.6)	5/32", DC+ 1-5/8" (40)	55 (1.4)	27	525	13.7 (6.2)
	85 (2.2)	30	725	22.5 (10.2)		85 (2.2)	30	675	21.1 (9.6)
	115 (2.9)	32	880	30.4 (13.8)		115 (2.9)	32	800	28.5 (12.9)
<b>Lincore 410</b> 3/32", DC+ 1-1/2", (38)	65 (1.7)	24	250	6.5 (2.9)	<b>Lincore 424A</b> 3/32", DC+ 1-1/2", (38)	65 (1.7)	24	225	5.8 (2.6)
	120 (3.0)	28	375	12.0 (5.4)		120 (3.0)	28	325	10.7 (4.9)
	175 (4.4)	31	450	17.5 (7.9)		175 (4.4)	31	450	15.6 (7.1)
1/8", DC+ 1-5/8" (40)	60 (1.5)	26	350	9.5 (4.3)	1/8", DC+ 1-5/8" (40)	60 (1.5)	26	350	9.5 (4.3)
	100 (2.5)	28	500	15.8 (7.2)		100 (2.5)	28	500	15.8 (7.2)
	140 (3.6)	30	625	22.1 (10.0)		140 (3.6)	30	610	22.1 (10.0)
5/32", DC+ 1-5/8" (40)	55 (1.4)	27	475	13.1 (5.9)	5/32", DC+ 1-5/8" (40)	55 (1.4)	27	425	12.8 (5.8)
	85 (2.2)	30	650	20.2 (9.2)		85 (2.2)	30	600	19.8 (9.0)
	115 (2.9)	32	800	27.3 (12.4)		115 (2.9)	32	725	26.8 (12.2)
<b>Lincore 420</b> 3/32", DC+ 1-1/2" (38)	65 (1.7)	24	250	6.5 (2.9)	<b>Lincore 96S</b> 3/32", DC+ 1-1/2" (38)	65 (1.7)	24	250	5.7 (2.6)
	120 (3.0)	28	375	12.0 (5.4)		100 (2.5)	28	525	15.7 (7.1)
	175 (4.4)	31	450	17.5 (7.9)		175 (4.4)	31	450	15.5 (7.0)
1/8", DC+ 1-5/8" (40)	60 (1.5)	26	350	9.5 (4.3)	1/8", DC+ 1-5/8" (40)	60 (1.5)	26	360	9.4 (4.3)
	100 (2.5)	28	500	15.8 (7.2)		100 (2.5)	28	525	15.7 (7.1)
	140 (3.6)	30	625	22.1 (10.0)		140 (3.6)	30	635	22.0 (10.0)
5/32", DC+ 1-5/8" (40)	55 (1.4)	27	475	13.1 (5.9)	5/32", DC+ 1-5/8" (40)	55 (1.4)	27	450	12.9 (5.9)
	85 (2.2)	30	650	20.2 (9.2)		85 (2.2)	30	650	20.0 (9.1)
	115 (2.9)	32	800	27.3 (12.4)		115 (2.9)	32	775	27.1 (12.3)
<b>Lincore 4130</b> 3/32", DC+ 1-1/2" (38)	65 (1.7)	24	300	6.5 (2.9)	<b>Lincore 102W/102HC</b> 3/32", DC+ 1-1/2" (38)	65 (1.7)	24	240	6.2 (2.8)
	120 (3.0)	28	410	12.0 (5.4)		120 (3.0)	28	400	11.5 (5.2)
	175 (4.4)	31	520	17.5 (7.9)		175 (4.4)	31	500	16.8 (7.6)
1/8", DC+ 1-5/8" (40)	60 (1.5)	26	350	8.5 (3.9)	1/8", DC+ 1-5/8" (40)	60 (1.5)	26	390	9.8 (4.4)
	100 (2.5)	28	465	16.0 (7.2)		100 (2.5)	28	540	16.4 (7.4)
	140 (3.6)	30	590	23.5 (10.6)		140 (3.6)	30	680	23.0 (10.4)
<b>Lincore 423L</b> 3/32", DC+ 1-1/2" (38)	65 (1.7)	24	250	6.0 (2.7)	5/32", DC+ 1-5/8" (40)	55 (1.4)	27	500	14.2 (6.4)
	120 (3.0)	28	360	11.1 (5.0)		85 (2.2)	30	685	21.9 (9.9)
	175 (4.4)	31	460	16.2 (7.3)		115 (2.9)	32	850	29.6 (13.4)
1/8", DC+ 1-5/8" (40)	60 (1.5)	26	350	9.3 (4.2)	<b>Lincore 410NiMo</b> 3/32", DC+ 1-1/2" (38)	65 (1.7)	24	250	5.8 (2.6)
	100 (2.5)	28	500	15.5 (7.0)		120 (3.0)	28	325	10.7 (4.9)
	140 (3.6)	30	610	21.7 (9.8)		175 (4.4)	31	425	15.6 (7.1)
5/32", DC+ 1-5/8" (40)	55 (1.4)	27	475	13.5 (6.1)	1/8", DC+ 1-5/8" (40)	60 (1.5)	26	325	9.4 (4.3)
	85 (2.2)	30	650	20.8 (9.4)		140 (3.6)	30	575	21.8 (9.9)
	115 (2.9)	32	800	27.3 (12.4)		55 (1.4)	27	440	12.8 (5.8)
					85 (2.2)	30	575	19.8 (9.0)	
					115 (2.9)	32	700	26.8 (12.2)	

# LINCOLNWELD HARDFACING FLUXES

## Hardfacing Neutral Fluxes

Lincoln defines neutral fluxes as those which will not produce any significant changes in the all weld metal composition as a result of a large change in the arc voltage, and thus the arc length. The following are the neutral fluxes used for hardfacing:

### Lincolnweld 801

- Provides smooth beads and excellent slag removal.
- Fast-freezing.
- Use with Lincore 20, 30-S, 35-S, 40-S, 42-S, 4130, 8620, 410, 410NiMo, 420 and 96S.

### Lincolnweld 802

- Excellent hot slag removal with wire containing columbium, vanadium or very high chrome levels.
- Use with Lincore 102W, 423L, 423Cr and 102HC.

### Lincolnweld 803

- Specially designed for Lincore 60-S on high speed welding applications, such as the resurfacing of coal crusher rolls and blast furnace bells and hoppers.

### Lincolnweld 880

- Can be used in applications similar to 801 and 802 and may improve slag removal.

## Hardfacing Alloy Fluxes

Hardfacing is one of the primary uses of alloy fluxes. Lincoln defines alloy fluxes as those which are used with a plain carbon steel electrode to make alloy weld deposits. The alloys for the weld deposit are added as ingredients in the flux.

The following are the alloy fluxes used for hardfacing with Lincolnweld® L-60 mild steel wire:

### Lincolnweld H-535

- Produces a deposit with good abrasion resistance, allows some machinability.
- Low carbon martensitic deposit.
- Hardness range is 24-45 Rockwell C, depending upon the actual welding procedure used.

### Lincolnweld A-96-S

- Modified Type 420 stainless deposit with a carbon content near the high side for as-welded hardness.
- Carbon will be about .23%, with about 13% chromium, with proper procedures.

### Lincolnweld H-560

- High alloy flux depositing primary carbides in a martensitic matrix.
- Excellent material for severe abrasion applications.
- Resistance to abrasion is 50 to 60 times that of plain carbon steel.

### NOTE

Deposit carbon, alloy content and hardness depend upon the ratio of flux melted to wire melted. High voltage promotes high carbon and alloy contents, while low voltage promotes lower carbon and alloy content.

## PACKAGING

Product Name	50 Lb. (22.7 kg) Foil Bag	50 Lb. (22.7 kg) Bag	100 Lb. (45.4 kg) Bag	450 Lb. (204 kg) Steel Drum	550 Lb. (249 kg) Steel Drum	2700 Lb. (1225 kg) Bulk Bag	3000 Lb. (1361 kg) Bulk Bag
<b>Lincolnweld Alloy Fluxes</b>							
A96S	ED027863						
H-535		ED027865					
H-560			ED010345				
<b>Lincolnweld Neutral Fluxes</b>							
801		ED019588		ED023403		EDS30786	
802		ED019457			ED023365		EDS30787
803		ED019799					
880		ED027866			ED028322		

## PACKAGING TYPES



Lincoln Wearshield stick electrode and Lincore wire are available in a variety of packaging options to meet your specific welding requirements.

### Wearshield

Packaging available includes packages as small as 1 lb. (.47 kg) tubes to 50 lb. (22.7 kg) cartons.

### Lincore

Bulk packaging includes Speed-Feed drums and reels built to deliver consistent performance in conventional automation and robotic applications, as well as semiautomatic applications.

Small packaging configurations include coils and spools in quantities from 10 lbs. (4.5 kg) to 60 lbs. (27.2 kg).

### Hardfacing Flux

Bulk packaging consists of steel drums from 450 to 600 lbs. (204 to 272 kg), and bulk bags in 2700 and 3000 lbs. (1225 and 1361 kg) Also available are 50 lb. (22.7 kg) and 100 lb. (45.5 kg) bags.



#### CUSTOMER ASSISTANCE POLICY

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products.

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