

WEARTECH® WT-1 SMAW

Cobalt ▪ AWS A5.13 ECoCr-C

KEY FEATURES

- Cobalt, chrome, high tungsten
- Electrode excellent for abrasion and corrosion resistance
- Retains hardness at temperatures exceeding 1400°F (760°C)
These key features can be used on all Weartech WT-1 products - stick, wire, etc.

TYPICAL APPLICATIONS

- Wear Pads
- Mixer Rotors
- Pump Sleeves

WELDING POSITIONS

All

DIAMETERS / PACKAGING

Diameter in (mm)	10 lb (4.5 kg) Carton
3/32 (2.4)	E1010-240X350
1/8 (3.2)	E1010-320X350
5/32 (4.0)	E1010-400X350
3/16 (4.8)	E1010-480X350

DEPOSIT COMPOSITION⁽¹⁾

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.13 ECoCr-C	1.7-3.0	2.0 max	2.0 max	25-33	3.0 max
Typical Results⁽²⁾	2.1	0.6	0.6	28.1	2.4
	%Fe	%Mo	%W	%Co	Hardness, Rc
Requirements AWS A5.13 ECoCr-C	5.0 max	1.0 max	11-14	Balance	Not Required
Typical Results⁽²⁾	4.1	0.1	12.3	50	52

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)	
	1/8 in (3.2 mm)	5/32 in (4.0 mm)
DC+	115-135	145-165

⁽¹⁾Typical undiluted weld metal. ⁽²⁾See test results disclaimer.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARTECH® WT-6 SMAW

Cobalt ▪ AWS A5.13 ECoCr-A

KEY FEATURES

- Cobalt, high chromium, tungsten electrode
- Excellent for corrosion resistance, wear and galling
- Most flexible and widely used of the cobalt alloys due to overall performance
- Retains hardness up to 930°F (500°C)

TYPICAL APPLICATIONS

- Shear Blades
- Fluid Flow Valves
- Extrusion Screws
- Roll Bushings
- High Temperature
- Valve Bearing Surface

WELDING POSITIONS

All

DIAMETERS / PACKAGING

Diameter in (mm)	10 lb (4.5 kg) Carton
3/32 (2.4)	E1060-240X350
1/8 (3.2)	E1060-320X350
5/32 (4.0)	E1060-400X350
3/16 (4.8)	E1060-480X350

DEPOSIT COMPOSITION⁽¹⁾

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.13 ECoCr-A	0.7-1.4	2.0 max	2.0 max	25-32	3.0 max
Typical Results⁽²⁾	1.2	0.9	1.1	27.3	2.5
	%Fe	%Mo	%W	%Co	Hardness, Rc
Requirements AWS A5.13 ECoCr-A	5.0 max	1.0 max	3.0 -6.0	Balance	Not Required
Typical Results⁽²⁾	3.3	0.1	4.60	58	41

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	115-135	145-165	175-195

⁽¹⁾Typical undiluted weld metal. ⁽²⁾See test results disclaimer.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARTECH® WT-12 SMAW

Cobalt ▪ AWS A5.13 ECoCr-B

KEY FEATURES

- Cobalt, very high chromium, high carbon, high tungsten electrode
- Very resistant to wear, corrosion, and galling at high temperatures
- Intermediate alloy between WT-1 and WT-6
- Maintains hardness up to 1300°F (700°C)

TYPICAL APPLICATIONS

- Chain Saw Bars
- Saw Teeth
- Extrusion Dies

WELDING POSITIONS

All

DIAMETERS / PACKAGING

Diameter in (mm)	10 lb (4.5 kg) Carton
3/32 (2.4)	E1120-240X350
1/8 (3.2)	E1120-320X350
5/32 (4.0)	E1120-400X350
3/16 (4.8)	E1120-480X350

DEPOSIT COMPOSITION⁽¹⁾

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.13 ECoCr-B	1.0-1.7	2.0 max	2.0 max	25-32	3.0 max
Typical Results⁽²⁾	1.5	0.9	1.1	28.7	2.6
	%Fe	%Mo	%W	%Co	Hardness, Rc
Requirements AWS A5.13 ECoCr-B	5.0 max	1.0 max	7.0 -9.5	Balance	Not Required
Typical Results⁽²⁾	3.1	0.1	8.5	53	46

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 1/8 in (3.2 mm)
DC+	115-135

⁽¹⁾Typical undiluted weld metal. ⁽²⁾See test results disclaimer.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARTECH® WT-21 SMAW

Cobalt ▪ AWS A5.13 ECoCr-E

KEY FEATURES

- Cobalt, high chromium, molybdenum electrode
- Excellent for corrosion resistance, galling, cavitation, and metal-to-metal wear resistance
- Not recommended for severe abrasion

TYPICAL APPLICATIONS

- Steam Valves
- Hot Shears
- Chemical and Petrochemical Valves
- Cavation Repair
- Forging Dies

WELDING POSITIONS

All

DIAMETERS / PACKAGING

Diameter in (mm)	10 lb (4.5 kg) Carton
3/32 (2.4)	E1210-240X350
1/8 (3.2)	E1210-320X350
5/32 (4.0)	E1210-400X350
3/16 (4.8)	E1210-480X350

DEPOSIT COMPOSITION⁽¹⁾

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.13 ECoCr-E	0.15-0.40	1.5 max	2.0 max	24-29	2.0 -4.0
Typical Results⁽²⁾	0.23	0.8	0.8	27.7	2.8
	%Fe	%Mo	%W	%Co	Hardness, Rc
Requirements AWS A5.13 ECoCr-E	5.0 max	4.5-6.5	0.50 max	Balance	Not Required
Typical Results⁽²⁾	2.4	5.5	0.05	59	28

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps)		
	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	115-135	145-165	175-195

⁽¹⁾Typical undiluted weld metal. ⁽²⁾See test results disclaimer.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® BU

Build-Up

KEY FEATURES

- 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
- Unlimited layers with proper preheat, interpass temperatures and procedures
- Use on mild and low alloy steels

WELDING POSITIONS

Flat & Horizontal

TYPICAL APPLICATIONS

For Build-Up

- Shovel and bucket lips
- Pump impellers and housings
- Pulverizer plows
- Mill hammers

For Hardfacing

- Trunnions, tractor rolls, cranes and gears

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Carton 40 lb (18.1 kg) Master Carton
5/32 (4.0)	14 (350)	ED021991
3/16 (4.8)	14 (350)	ED021993

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c)		
1 Layer	2 Layers	3 Layers
15-20	18-23	23-28

DEPOSIT COMPOSITION⁽¹⁾

	%C	%Mn	%Si	%Cr	%S	%P
2 or more layers	0.14	1.15	0.60	1.40	0.025	0.015

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)	
	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	145-210	180-280
AC	155-225	200-290

⁽¹⁾Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾Preferred polarity is listed first.

NOTE: Using a short arc with a slight weave motion, deposit beads about 1/2 in - 3/4 in (13-19 mm) wide with the 5/32 in and 3/16 in (4.0-4.8 mm) electrode diameters, and about 1 in (25 mm) wide with the 1/4 in (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 21 °C (70 °F). Preheating above 40 °C (100 °F) is usually not required. Preheating depends largely on the base metal composition. On large, complex, or restrained parts, a preheat of 150° - 260 °C (300° - 500 °F) may be necessary.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® MI

Metal-to-Metal

KEY FEATURES

- Provides a martensitic deposit with considerable retained austenite
- General purpose electrode, a good compromise for metal-to-metal wear, moderate impact and mild abrasion
- Can be used on carbon and low alloy steel parts
- Deposits tend to cross check crack and are usually best limited to two layers

WELDING POSITIONS

All, except vertical down

TYPICAL APPLICATIONS

- Boom heels
- Conveyor screws
- Dipper lips
- Tractor grousers
- Ditcher teeth
- Lumber equipment
- Hammer mills

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Carton 40 lb (18.1 kg) Master Carton
1/8 (3.2)	14 (350)	ED022003
5/32 (4.0)	14 (350)	ED022005
3/16 (4.8)	14 (350)	ED022007

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c)	
1 Layer	2 or More Layers
50	54

DEPOSIT COMPOSITION⁽¹⁾

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

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)		
	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	70-120	110-150	150-200
AC	70-120	110-150	150-200

⁽¹⁾Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾Preferred polarity is listed first.

NOTE: 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 200°C (400°F) 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 some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® MANGJET®

Metal-to-Metal

KEY FEATURES

- For building up austenitic manganese steel and cladding carbon steels
- Produces an austenitic manganese deposit that will work harden in service
- Unlimited layers with proper preheat, interpass temperatures and procedures

WELDING POSITIONS

All, except vertical down

TYPICAL APPLICATIONS

- Dragline pins
- Dipper teeth
- Crusher screens and rolls
- Chain hooks
- Hammers
- Bucket teeth

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	50 lb (22.7kg) Carton
5/32 (4.0)	14 (350)	ED021976
3/16 (4.8)	14 (350)	ED021978
1/4 (6.4)	18 (450)	ED021979

MECHANICAL PROPERTIES⁽¹⁾

As-Welded (2 Layers)		Rockwell Hardness (R _c)	Work Hardened (2 Layers)	
18			47	

DEPOSIT COMPOSITION⁽¹⁾

On Carbon Steel	%C	%Mn	%Si	%Mo	%S
2 or More Layers	0.65	14.5	0.14	1.15	0.01

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)		
	5/32 in (4.0 mm)	3/16 in (4.8 mm)	1/4 in (6.4 mm)
DC+	120-180	160-260	200-350
AC	125-210	175-275	225-375

⁽¹⁾ Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾ Preferred polarity is listed first.

NOTE: 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 38° - 66°C (100° - 150°F) at the most, should be sufficient.

As with all austenitic manganese welding products, interpass temperatures should be limited to 260°C (500°F) 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 some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® 15CRMN

Severe Impact

KEY FEATURES

- 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
- Excellent for build-up on carbon steel prior to chromium carbide hardfacing deposit with an electrode such as Wearshield® 60
- Unlimited layers

TYPICAL APPLICATIONS

- Crusher hammers
- Rebuilding and joining of austenitic manganese plates and parts
- Earth moving equipment

WELDING POSITIONS

All, except vertical down

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Carton 40 lb (18.1 kg) Master Carton
1/8 (3.2)	14 (350)	ED021980
5/32 (4.0)	14 (350)	ED021982
3/16 (4.8)	14 (350)	ED021984

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c) (Single or Multiple Layers)	
As-Welded	Work Hardened
18-24	40-50

DEPOSIT COMPOSITION⁽¹⁾

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

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)		
	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	140-160	190-210	220-250
AC	140-160	190-210	220-250

⁽¹⁾ Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾ Preferred polarity is listed first.

NOTE: 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® 60-0 can provide excellent service. In depositing Wearshield® 15CrMn on itself or on austenitic manganese steel, preheat is generally unnecessary unless the metal is below 16 °C (60 °F). However, highly hardenable carbon or low alloy steel base metals may require preheat in the 150 °C - 204 °C (300 ° - 400 °F) 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 260 °C (500 °F) to avoid embrittlement.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® FROG MANG®

Severe Impact

KEY FEATURES

- 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
- Unlimited layers with proper preheat, interpass temperatures and procedures
- Resistant to deformation and the resultant metal flow

TYPICAL APPLICATIONS

- Manganese crossing diamonds
- Manganese railroad frogs

WELDING POSITIONS

All, except vertical down

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Easy Open Can 30 lb (13.6 kg) Master Carton	12 lb (5.4 kg) Easy Open Can 36 lb (16.3 kg) Master Carton
5/32 (4.0)	14 (350)	ED033134	ED033133
3/16 (4.8)	14 (350)	ED033135	
1/4 (6.4)	18 (450)		

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c)	
As-Welded	Work Hardened
20 - 30	40 - 50

DEPOSIT COMPOSITION⁽¹⁾

On Carbon Steel	%C	%Mn	%Si	%Cr
6 Layers	1.20	21.0	0.4	5.3

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)		
	5/32 in (4.0 mm)	3/16 in (4.8 mm)	1/4 in (6.4 mm)
DC+	140 - 175	175 - 215	235 - 280
AC	150 - 180	185 - 215	235 - 280

⁽¹⁾Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾Preferred polarity is listed first.

NOTE: 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 3.2 mm (1/8 in) E308 stainless electrode, such as Blue Max® or Red Baron® 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 260 °C (500 °F). Use a temperature marker 13 mm (1/2 in) from the welded area at frequent intervals to ensure that interpass temperature does not exceed 260 °C (500 °F).

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

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 260 °C (500 °F) 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 some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® SUPER RAIL®

Severe Impact

KEY FEATURES

- Reduce carbon steel repairs by 50%
- Low material distortion on impact
- Work hardens faster without cracking

TYPICAL APPLICATIONS

- Rail Ends/ Points
- Rail Crossing Points

WELDING POSITIONS

Flat and Horizontal

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Carton 40 lb (18.1 kg) Master Carton
3/16 (4.8)	14 (350)	ED035352

DEPOSIT COMPOSITION⁽¹⁾

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo	%Ni
4 Layers	<1	<5	<2	<5	<1	<3

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps) 3/16 in (4.8 mm)
DC+	175 - 215
AC	185 - 215

⁽¹⁾Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾Preferred polarity is listed first.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® ABR

Abrasion and Impact

KEY FEATURES

- Provides good resistance to abrasion, impact and some metal-to-metal wear
- Good hot forging properties
- Use on carbon, stainless and manganese steels
- Deposits limited to two layers
- Can be forged readily without affecting its mechanical properties

TYPICAL APPLICATIONS

- Crusher hammers
- Dozer blades
- Dipper teeth and lips
- Coal mining cutters
- Truck chain and gears

WELDING POSITIONS

All

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Carton 40 lb (18.1 kg) Carton
1/8 (3.2)	14 (350)	ED021996
5/32 (4.0)	14 (350)	ED021998
3/16 (4.8)	14 (350)	ED022000

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c)	
1 Layer	2 Layers
24-53	28-53

DEPOSIT COMPOSITION⁽¹⁾

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo
2 Layers	2.1	1.1	0.75	6.5	0.40

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)		
	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	40-150	75-200	110-250
AC	50-165	80-220	120-275

⁽¹⁾Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾Preferred polarity is listed first.

NOTE: 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 749°C (1380°F) and hold for one hour per inch of thickness. Air cool to room temperature.

For maximum machinability, heat to 870° - 900°C (1600° - 1650°F) and hold for one hour per inch of thickness. Furnace cool to 650°C (1200°F) at a rate not exceeding 10°C (50°F) 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 790°C (1450°F), quenching and tempering at 200°C (400°F).

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® 44

Abrasion and Impact

KEY FEATURES

- Moderate hardness to resist abrasion with impact up to 600°C (1100°F)
- Higher alloy results in improved spalling resistance than Wearshield® ABR
- Can be used on carbon steels, low alloy steels, cast irons, austenitic manganese steels and austenitic stainless steels

TYPICAL APPLICATIONS

- Buckets
- Chain links
- Rolling mill guides
- Pulleys
- Ingot tongs

WELDING POSITIONS

Flat & Horizontal

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Carton 40 lb (18.1 kg) Master Carton
1/8 (3.2)	14 (350)	ED024940
5/32 (4.0)	14 (350)	ED024941

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c)		
1 Layer		4 Layers
42		48

DEPOSIT COMPOSITION⁽¹⁾

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo
1 Layer	1.56	0.17	0.77	19.5	1.92
2 Layers	1.96	0.16	0.87	24.2	2.48
4 Layers	2.21	0.18	0.93	27.1	2.86

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)	
	1/8 in (3.2 mm)	5/32 in (4.0 mm)
DC+	120 - 160	150 - 220
AC	130 - 160	180 - 220

⁽¹⁾Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾Preferred polarity is listed first.

NOTE: 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 some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m ³ maximum exposure guideline for general welding fume.
BEFORE USE, READ AND UNDERSTAND THE SAFETY DATA SHEET (SDS) FOR THIS PRODUCT AND SPECIFIC INFORMATION PRINTED ON THE PRODUCT CONTAINER.

WEARSHIELD® ME

Metal-to-Earth Wear

KEY FEATURES

- High alloy produces chrome carbides and austenite
- Provides greater abrasion resistance than Wearshield® ABR or Wearshield® 44
- Low dilution weld metal provides eutectic mix of chromium carbides and austenite, with limited primary carbides.
- To be used on carbon and low alloy, austenitic manganese and austenitic stainless steels

TYPICAL APPLICATIONS

- Muller tires
- Augers
- Bucket teeth
- Dozer blades

WELDING POSITIONS

Flat & Horizontal

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Carton 40 lb (18.1 kg) Master Carton
1/8 (3.2)	14 (350)	ED023323
5/32 (4.0)	14 (350)	ED023324
3/16 (4.8)	14 (350)	ED023325

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c)	
1 Layer	3 Layers
49	55

DEPOSIT COMPOSITION⁽¹⁾

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

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)		
	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	125 - 175	175 - 250	220 - 330
AC	130 - 170	180 - 220	230 - 270

⁽¹⁾ Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾ Preferred polarity is listed first.

NOTE: 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 13-25 mm (1/2-1 in).

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 some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARSHIELD® 60

Severe Abrasion

KEY FEATURES

- Designed to resist severe abrasion
- It exhibits higher alloy and higher abrasion resistance than Wearshield® ABR, Wearshield® 44 or Wearshield® ME
- Can be used on carbon, low alloy, stainless, and manganese steels
- Deposits consist of primary carbides in a matrix of austenite-carbide eutectic
- Deposits should be limited to two layers

TYPICAL APPLICATIONS

- Conveyor screws
- Grader blades
- Crusher rolls, plates and jaws
- Sleeves
- Brick and coke machinery

WELDING POSITIONS

Flat & Horizontal

DIAMETERS / PACKAGING

Diameter in (mm)	Length in (mm)	10 lb (4.5 kg) Carton 40 lb (18.1 kg) Master Carton
1/8 (3.2)	14 (350)	ED022010
5/32 (4.0)	14 (350)	ED022011
3/16 (4.8)	14 (350)	ED022012

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c)	
1 Layer	2 Layers
57 - 60	60 - 62

DEPOSIT COMPOSITION⁽¹⁾

On Carbon Steel	%C	%Mn	%Si	%Cr	%Mo	%V
2 Layers	5.0	0.80	1.0	23.0	2.3	0.6

TYPICAL OPERATING PROCEDURES

Polarity ⁽²⁾	Current (Amps)		
	1/8 in (3.2 mm)	5/32 in (4.0 mm)	3/16 in (4.8 mm)
DC+	100 - 140	130 - 180	210 - 250
AC	110 - 150	140 - 200	230 - 270

⁽¹⁾Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material. ⁽²⁾Preferred polarity is listed first.

NOTE: 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 25° - 45°C (75° - 100°F). However, preheat of 120° - 200°C (250° - 400°F) 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 650°C (1200°F).

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

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

The correct welding technique is a vertical electrode with a 3.2 - 4.8 mm (1/8 - 3/16 in) 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.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

WEARTECH® SHS® 9700E

Severe Abrasion

KEY FEATURES

- Lower cost while maintaining a near nanoscale (submicron) microstructure
- Provides exceptional wear resistance lasting significantly longer than most chrome carbide and complex carbide alloys
- Maintains high hardness after exposure to elevated temperatures
- Limited to 2 layers max

TYPICAL APPLICATIONS

- Wearplate
- Crusher rolls
- Ore Chutes
- Screw augers

WELDING POSITIONS

Flat & Horizontal

DIAMETERS / PACKAGING

Diameter in (mm)	10 lb (4.5 kg) Carton
5/32 (4.0)	ED035669

MECHANICAL PROPERTIES⁽¹⁾

Rockwell Hardness (R _c)	Wear Resistance
67-70	ASTM G65-04 Procedure A 0.13 g mass loss

DEPOSIT COMPOSITION⁽¹⁾

	%Fe	%C	%Cr	%B
Requirements	Balance	<3	<18	<6
	%Nb	%Al	%Mn	%Si
Requirements	<10	<5	<2	<2

TYPICAL OPERATING PROCEDURES

Diameter, Polarity in (mm)	Current (Amps)
5/32 in (4.0mm), DC+	150-175

⁽¹⁾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 some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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

BLUE MAX[®] 2100

Maintenance and Repair

KEY FEATURES

- High resistance to cracking
- High strength
- Designed for joining difficult to weld steel

TYPICAL APPLICATIONS

- High carbon, low alloy, high strength, manganese steels
- Base for hardfacing or stainless steel cladding

WELDING POSITIONS

All, except vertical down

DIAMETERS / PACKAGING

Diameter mm (in)	Length in (mm)	10 lb (4.5 kg) Easy Open Can
2.5 (3/32)	14 (350)	ED032298
3.2 (1/8)	14 (350)	ED032299

MECHANICAL PROPERTIES⁽¹⁾

	Yield Strength ⁽²⁾ MPa (ksi)	Tensile Strength MPa (ksi)	Elongation %	Ferrite Number
Typical Results ⁽³⁾	670 (97)	805 (117)	22	> 50

TYPICAL OPERATING PROCEDURES

Polarity ⁽⁴⁾	Current (Amps)	
	2.4 mm (3/32 in)	3.2 mm (1/8 in)
DC+	40 - 80	75 - 110
AC	40 - 80	75 - 110

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

⁽²⁾Measured with 0.2% offset ⁽³⁾See test results disclaimer ⁽⁴⁾Preferred polarity is listed first.

IMPORTANT: SPECIAL VENTILATION AND/OR EXHAUST REQUIRED

Fumes from the normal use of some welding products can contain significant quantities of components - such as chromium and manganese - which can lower the 5.0 mg/m³ maximum exposure guideline for general welding fume.

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