

**# 1 Bare**

Specifications: AWS A5.21-2001

Classification: ERCoCr-C

**Description:**

# 1 Bare rod has the highest hardness of the standard # cobalt alloys and is used in elevated temperature wear applications. It has a large volume of chromium carbides in a cobalt matrix giving the alloy excellent resistance to abrasion and solid particle erosion. It can be machined with difficulty using carbide tools or ground. It bonds well with stainless and other weldable grade steels.

Typical Deposit Analysis					
C	Cr	Fe	Mn	Mo	Ni
2.3	30.0	3.0 max	1.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	13.0	Rem	0.50 max		

Typical Deposit Characteristics	
Abrasion Resistance	Excellent
Impact Resistance	Fair
Corrosion Resistance	Good
Hardness	HRC 48 - 56
Hot Hardness	Very Good

**# 6 Bare**

Specifications: AWS A5.21-2001

Classification: ERCoCr-A

**Description:**

# 6 Bare rod provides resistance to many forms of chemical and mechanical degradation over a wide temperature range. It is the most versatile and widely used cobalt alloy, with a good balance of abrasion and impact resistance. Particular attributes of # 6 Bare are it's outstanding anti-galling properties, high temperature hardness and high resistance to cavitation erosion that results in its wide use as a valve seat material. It bonds well to all weldable grade steels and stainless.

Typical Deposit Analysis					
C	Cr	Fe	Mn	Mo	Ni
1.1	28.0	3.0 max	1.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	4.7	Rem	0.50 max		

Typical Deposit Characteristics	
Abrasion Resistance	Very Good
Impact Resistance	Very Good
Corrosion Resistance	Good
Hardness	HRC 38 - 46
Hot Hardness	up to 1200°F

**# 12 Bare**

Specifications: AWS A5.21-2001

Classification: ERCoCr-B

**Description:**

# 12 Bare rod is slightly harder than # 6 Bare rod with better abrasive and metal-to-metal wear resistance. It produces a high hardness cobalt-chromium deposit. The chromium carbides contained in the deposit provide excellent resistance to many forms of chemical and mechanical degradation, including galling. It bonds well with all weldable steels, including stainless.

Typical Deposit Analysis					
C	Cr	Fe	Mn	Mo	Ni
1.4	29.0	3.0 max	1.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	8.0	Rem	0.50 max		

Typical Deposit Characteristics	
Abrasion Resistance	Excellent
Impact Resistance	Good
Corrosion Resistance	Good
Hardness	HRC 44 - 50
Hot Hardness	Excellent

Data contained in this catalog are typical of the products described, but are not suitable for specifications.



## # 21 Bare

Specifications: AWS A5.21-2001

Classification: ERCoCr-E

### Description:

# 21 Bare rod deposits a low carbon austenitic cobalt type alloy with excellent work hardenability, high temperature, strength, and impact resistance. These deposits are quite stable during thermal cycling, making them a favorite for hot die materials. They have good strength and ductility in temperatures up to 2100° F. Resistance to galling (self-mated) corrosion and cavitation erosion make # 21 Bare is a good choice for valve trim on steam and fluid control valve bodies and seats. It bonds well to all weldable steels, including stainless.

### Typical Deposit Analysis

C	Cr	Fe	Mn	Mo	Ni
0.3	27.0	3.0 max	1.5 max	5.0	2.5
Si	W	Co	Other		
1.5 max	0.5 max	Rem	0.50 max		

### Typical Deposit Characteristics

Abrasion Resistance	Fair
Impact Resistance	Excellent
Corrosion Resistance	Good
Hardness (2 Layers)	HRC 22 - 26
Hardness: Work Hardened	HRC 40 - 45
Hot Hardness	Excellent

COBALT BARE ROD

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## # 1 Coated

Specifications: AWS 5.13, ASME SFA 5.13

Classification: ECoCr-C

### Description:

# 1 Coated is the highest hardness standard cobalt alloy in the group of cobalt alloys used for elevated temperature abrasive wear associated with corrosion. Deposits of this alloy have a large volume of chromium carbides that impart outstanding abrasive wear resistance. The addition of tungsten enhances high temperature hardness and matrix toughness for excellent adhesive and solid particle erosion wear resistance. It bonds well with all steels including stainless.

Typical Deposit Analysis					
C	Cr	Fe	Mn	Mo	Ni
2.1	29.6	5.0 max	2.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	12.1	Rem	1.0 max		

Typical Deposit Characteristics	
Abrasion Resistance	Excellent
Impact Resistance	Fair
Corrosion Resistance	Good
Hardness	HRC 48 - 56
Hot Hardness	Very Good

## # 6 Coated

Specifications: AWS 5.13, ASME SFA 5.13

Classification: ECoCr-A

### Description:

# 6 Coated electrodes produce a medium hardness cobalt-chromium deposit for high temperature applications with good abrasive wear and good impact resistance. # 6 Coated is the most versatile and widely used cobalt alloy with a good balance of abrasion and impact resistance. Chromium carbides contained in the deposit have excellent resistance to many forms of chemical and mechanical degradation, including galling and cavitation erosion. It bonds well with all weldable steels, including stainless.

Typical Deposit Analysis					
C	Cr	Fe	Mn	Mo	Ni
1.1	28.8	5.0 max	2.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	5.0	Rem	1.0 max		

Typical Deposit Characteristics	
Abrasion Resistance	Very Good
Impact Resistance	Very Good
Corrosion Resistance	Good
Hardness	HRC 38 - 46
Hot Hardness	up to 1200°F

## # 12 Coated

Specifications: AWS 5.13, ASME SFA 5.13

Classification: ECoCr-B

### Description:

# 12 Coated electrodes produce a high hardness cobalt-chromium deposit for high temperature applications with good abrasive wear associated with corrosion. It is similar to the # 6 coated electrode except for a slightly higher carbide content. Chromium carbides contained in the deposit provide excellent resistance to many forms of chemical and mechanical degradation, including galling. It bonds well with all weldable steels, including stainless.

Typical Deposit Analysis					
C	Cr	Fe	Mn	Mo	Ni
1.4	28.8	5.0 max	2.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	8.5	Rem	1.0 max		

Typical Deposit Characteristics	
Abrasion Resistance	Excellent
Impact Resistance	Good
Corrosion Resistance	Good
Hardness	HRC 44 - 50
Hot Hardness	Excellent

Data contained in this catalog are typical of the products described, but are not suitable for specifications.

## # 21 Coated

Specifications: AWS 5.13, ASME SFA 5.13

Classification: ECoCr-E

### Description:

# 21 Coated electrodes deposit a low carbon austenitic type cobalt alloy with excellent work hardenable high temperature strength and impact resistance. These deposits are quite stable during thermal cycling, making them a favorite for hot die materials. They have good strength and ductility in temperatures up to 1600° F. Resistance to galling (self-mating), corrosion, and cavitation erosion make # 21 Coated a good choice for valve trim on steam and fluid control valve bodies and seats. It bonds well to all weldable steels, including stainless.

### Typical Deposit Analysis

C	Cr	Fe	Mn	Mo	Ni
0.3	27.0	5.0 max	1.5 max	5.2	2.5
Si	W	Co	Other		
1.5 max	0.50 max	Rem	1.0 max		

### Typical Deposit Characteristics

Abrasion Resistance	Fair
Impact Resistance	Excellent
Corrosion Resistance	Good
Hardness (2 Layers)	HRC 22 - 26
Hardness: Work Hardened	HRC 40 - 45
Hot Hardness	Excellent

**# 1-M**Specifications: AWS A5.21-2001Classification: ERCCoCr-C**Description:**

# 1-M is the tubular wire version of the highest hardness standard cobalt alloy used with chromium carbides that impart outstanding abrasive wear resistance. The addition of tungsten enhances high temperature hardness and matrix toughness for excellent adhesive and solid particle erosion wear resistance. It bonds well with all weldable steels, including stainless. Typical applications include screw components, cross heads, hydropulper disc segments, soaking pit-tong bits, mixer rotors, bodies and tip sides, pump sleeves and valves & pumps

**Typical Deposit Analysis**

C	Cr	Fe	Mn	Mo	Ni
2.6	29.0	5.0 max	2.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	12.0	Rem	1.0 max		

**Typical Deposit Characteristics**

Abrasion Resistance	Excellent
Impact Resistance	Fair
Corrosion Resistance	Good
Hardness	HRC 48 - 56
Hot Hardness	Very Good

**# 6-M**Specifications: AWS A5.21-2001Classification: ERCCoCr-A**Description:**

# 6-M is the tubular wire version of a cobalt alloy that produces a medium hardness cobalt-chromium deposit for high temperature applications with good abrasive wear and good impact resistance. It is the most versatile and widely used cobalt alloy. Chromium carbides contained in the deposit provide excellent resistance to many forms of chemical and mechanical degradation, including galling and cavitation erosion. It bonds well with all weldable steels, including stainless.

**Typical Deposit Analysis**

C	Cr	Fe	Mn	Mo	Ni
1.2	28.1	5.0 max	2.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	5.0	Rem	1.0 max		

**Typical Deposit Characteristics**

Abrasion Resistance	Very Good
Impact Resistance	Very Good
Corrosion Resistance	Good
Hardness	HRC 38 - 46
Hot Hardness	up to 1200°F

**# 12-M**Specifications: AWS A5.21-2001Classification: ERCCoCr-B**Description:**

# 12-M is the tubular fabricated wire version of a cobalt alloy that produces a high hardness cobalt-chromium deposit for high temperature applications with good abrasive wear associated with corrosion. Chromium carbides contained in the deposit provide excellent resistance to many forms of chemical and mechanical degradation, including galling. It bonds well with all weldable steels, including stainless.

**Typical Deposit Analysis**

C	Cr	Fe	Mn	Mo	Ni
1.4	28.5	5.0 max	2.0 max	1.0 max	3.0 max
Si	W	Co	Other		
2.0 max	9.0	Rem			

**Typical Deposit Characteristics**

Abrasion Resistance	Excellent
Impact Resistance	Good
Corrosion Resistance	Good
Hardness	HRC 44 - 50
Hot Hardness	Excellent

Data contained in this catalog are typical of the products described, but are not suitable for specifications.

## # 21-M

Specifications: AWS A5.21-2001

Classification: ERCCoCr-E

### Description:

# 21-M wire deposits a low carbon austenitic cobalt type alloy with excellent work hardenability, high temperature, strength, and impact resistance. These deposits are quite stable during thermal cycling, making them a favorite for hot die materials. They have good strength and ductility in temperatures up to 2100° F. Resistance to galling (self-mated) corrosion and cavitation erosion make # 21-M a good choice for valve trim on steam and fluid control valve bodies and seats. It bonds well to all weldable steels, including stainless.

### Typical Deposit Analysis

C	Cr	Fe	Mn	Mo	Ni
0.3	27.4	5.0 max	2.0 max	5.4	2.0
Si	W	Co	Other		
2.0 max	0.5 max	Rem	1.0 max		

### Typical Deposit Characteristics

Abrasion Resistance	Fair
Impact Resistance	Excellent
Corrosion Resistance	Good
Hardness (2 Layers)	HRC 22 - 26
Hardness: Work Hardened	HRC 40 - 45
Hot Hardness	Excellent

Data contained in this catalog are typical of the products described, but are not suitable for specifications.