

# WELDING GUIDE



**VANGUARD STEEL LTD.**

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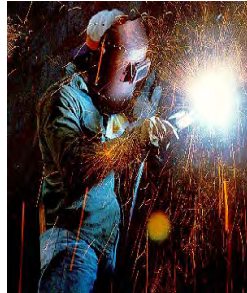
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# WELDING WIRES

## Carbon steel

### E 70 S-6

AWS	A5.18	ER70S-6
EN	440	G422CG3Si1
JIS	Z3312	YGW12
CWB	ER495-6	W48

#### Typical Applications

Butt and fillet welding of vehicles, buildings, ships, machinery and bridges in all positions.

#### Characteristics on Usage

1. Suitable for high speed welding of steel sheets by short circuiting transfer in all positions.
2. Stable arc and low spatter generation.
3. Flow quantity of shielding gas should be 20 liters /min in general.
4. Use a wind-screen against wind.
5. Keep the distance between tip and base metal within 6 ~ 15mm for 250 Amp. and under or within 15 ~ 20 mm for more than 250 Amp. of welding current.
6. Applicable to mixture gas for welding.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	P	S
CO <sub>2</sub>	0.08	0.50	0.05	0.014	0.010
Ar+20%CO <sub>2</sub>	0.07	0.52	1.10	0.014	0.010

#### Typical mechanical properties of all-weld-metal

Shielding Gas	Y.P N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	T.S N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	EI. (%)	Charpy V-notch I.V J {kgf · m}
CO <sub>2</sub>	450 {46}	550 {56}	30	130 {13}
Ar+20%CO <sub>2</sub>	480 {49}	580 {59}	28	100 {10}

(-18°C)

#### Sizes available and recommended currents (DC ⚡)

Dia. (mm)	0.9	1.0	1.2	1.4	1.6
F	50 ~ 200	70 ~ 250	100 ~ 350	140 ~ 400	200 ~ 550
V & OH	50 ~ 120	50 ~ 150	50 ~ 180	100 ~ 250	120 ~ 300

#### Approvals

ABS, BV, DNV, GL, KR, LR, NK, CWB, TUV, CCS, KS, JIS,  
(80% Ar + 20% ABS TUV)

#### Product Codes-Bonarc

0.06 mm	1 kg	6910 0106
0.08 mm	1 kg	6910 0108
0.09 mm	1 kg	6910 0109
1.20 mm	1 kg	6910 0112
0.06 mm	5 kg	6910 0506
0.08 mm	5 kg	6910 0508
0.09 mm	5 kg	6910 0509
1.20 mm	5 kg	6910 0512
0.06 mm	15 kg	6910 2006
0.08 mm	20 kg	6910 2008
0.09 mm	20 kg	6910 2009
1.20 mm	20 kg	6910 2012
0.09 mm	300 kg	6910 0309
1.20 mm	300 kg	6910 0312

#### Product Codes-VGD

0.06 mm	1 kg	6910 0106V
0.08 mm	1 kg	6910 0108V
0.09 mm	1 kg	6910 0109V
1.20 mm	1 kg	6910 0112V
0.06 mm	5 kg	6910 0506V
0.08 mm	5 kg	6910 0508V
0.09 mm	5 kg	6910 0509V
1.20 mm	5 kg	6910 0512V
0.06 mm	15 kg	6910 2006V
0.08 mm	20 kg	6910 2008V
0.09 mm	20 kg	6910 2009V
1.20 mm	20 kg	6910 2012V



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# WELDING WIRES

## Carbon steel

### E 70C-6M

AWS	A5.18	E 70C-6M
EN	758	T 462MM4
JIS	Z3313	YFW-A502M
CWB	W48.01	

#### Typical Applications

Butt and fillet welding of steel structures such as construction machines, industrial machinery, and buildings, etc.

#### Characteristics on Usage

1. 70C-6M is a metal cored wire for use in 75-80% Ar+CO<sub>2</sub> mixture gas.
2. Deposition rate is 10-20% higher than solid wire with excellent mechanical properties.
3. Slag quantity is similar to a solid wire and multi-layer welding can be performed without slag removal.
4. Excellent stable arc and low spatter generation.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	P	S
Ar + 20% CO <sub>2</sub>	0.04	0.6	1.50	0.014	0.017

#### Typical mechanical properties of all-weld- metal

Shielding Gas	Y.P	T.S	El. (%)	Charpy V-notch I.V J {kgf · m}
	N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }		
Ar + 20% CO <sub>2</sub>	530 {54}	610 {62}	27	55 {6} (-29°C)

#### Sizes available and recommended currents (DC ⚡)

Dia. (mm)		1.2	1.6
Amp.	F	160 ~ 350	220 ~ 450
	H - fillets	180 ~ 360	280 ~ 450

#### Approvals

ABS, BV, DNV, GL, LR, RINA, CWB.  
(80% Ar + 20%CO<sub>2</sub> ·TUV CWB)

#### Product Codes

1.20 mm	20 kg	6915 2012
1.40 mm	20 kg	6915 2014
1.60 mm	20 kg	6915 2016



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# WELDING WIRES

## Carbon steel

### E 70 T-1

AWS	A5.20	E 70T-1
EN	758	T 460RC4
JIS	Z3313	YFW-C50DM

#### Typical Applications

Flat and fillet welding of medium and heavy thick plate with higher deposition rate for shipbuilding, steel structures and bridges, etc.

#### Characteristics on Usage

1. Higher deposition rate welding of H-fillets
2. Arc stability is excellent in high current.
3. Low splatter and good porosity resistance.
4. Bead appearance is good and bigger leg of fillet welding easier.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	P	S
CO <sub>2</sub>	0.04	0.41	1.25	0.014	0.011

#### Typical mechanical properties of all-weld- metal

Shielding Gas	Y.P N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	T.S N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	EI. (%)	Charpy V-notch I.V J {kgf · m}
CO <sub>2</sub>	510 {52}	550 {56}	29	94 {10} (0°C), 60 {6} (-20°C)

#### Sizes available and recommended currents (DC $\Theta$ )

Dia. (mm)		1.2	1.6
Amp.	F	120 ~ 300	200 ~ 450
	H - fillets	120 ~ 300	200 ~ 400

#### Approvals

ABS, BV, GL, KR, LR, NK, TUV.

#### Product Codes



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# WELDING WIRES

## Carbon steel

### E 71 T-1/9

AWS	A5.20	E 71T-1
EN	758	T 460RC1
JIS	Z3313	YFW-C50DR
CWB	W48.5	

#### Typical Applications

Butt and fillet welding of mild steel and 490N/mm<sup>2</sup> class high tensile strength steel for machinery, cars, shipbuilding, steel structures and bridges, etc.

#### Characteristics on Usage

1. Good usability for all position.
2. Stable arc, low spatter generation and good bead appearance.
3. Low fume generation.
4. Excellent feedability.
5. Wire extension should be kept within 15 ~ 20mm.
6. Wire should be used as soon as possible after taking out from package.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	P	S
CO <sub>2</sub>	0.04	0.45	1.30	0.015	0.012

#### Typical mechanical properties of all-weld-metal

Shielding Gas	Y.P N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	T.S N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	El. (%)	Charpy V-notch I.V J {kgf · m}
CO <sub>2</sub>	520 {53}	580 {59}	29	50 {5} (-20°C)

#### Sizes available and recommended currents (DC +)

Dia. (mm)		1.2	1.6
Amp.	F	120 ~ 300	200 ~ 450
	H - fillets	120 ~ 300	200 ~ 400
	V	120 ~ 250	180 ~ 220

#### Approvals

ABS, BV, DNV, GL, KR, LR, NK, CWB, CCS  
(80% Ar + 20%CO<sub>2</sub> · TUV CWB)

#### Product Codes

0.09 mm	1 kg	6950 0109
1.20 mm	1 kg	6950 0112
0.09 mm	4.5 kg	6950 0509
1.20 mm	4.5 kg	6950 0512
1.20 mm	20 kg	6950 2012
1.60 mm	20 kg	6950 2016



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# WELDING WIRES

## Carbon steel

### E 71T- GS

AWS	A5.20	E 71T-GS
EN	758	T 42ZVN1
JIS	Z3313	YFW-S50GB

#### Typical Applications

Lap and fillet welding of thin gauge galvanized and mild steel in all position welding.

#### Characteristics on Usage

1. A self-shielding flux cored wire for single-pass applications.
2. Good welding performance in working, smooth arc, full slag covering as well as easy slag removal.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	P	S	Al.
NONE	0.16	0.31	0.82	0.014	0.006	0.13

#### Typical mechanical properties of all-weld-metal

Transverse Tension Test N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	520 (53)
Longitudinal Guided Bend Test	No Defects

#### Sizes available and recommended currents (DC +)

Dia. (mm)		1.2	1.4	1.6
Amp.	F/H - fillets	80 ~ 200	160 ~ 270	180 ~ 280

#### Approvals

#### Product Codes

0.08 mm	0.9 kg	6952 0108
0.09 mm	0.9 kg	6952 0109
1.20 mm	0.9 kg	6952 0112
0.08 mm	4.5 kg	6952 0508
0.09 mm	4.5 kg	6952 0509
1.20 mm	4.5 kg	6952 0512



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# WELDING WIRES

## Carbon steel

### Bonarc VW-61

AWS F7A5-EM12K

JIS FS-BN1XYS-S3

For Welding Steel and 500 N/mm<sup>2</sup> Class High Tensile Steel

#### Applications

Welding of vessels, vehicles, steel structures, and general fabrications

#### Characteristics on Usage

1. Bead appearance and slag removal are excellent under higher welding speed with low current.
2. It provides excellent resistance against porosity and impact properties.

#### Typical Chemical Composition of all-weld-metal (%)

C	Si	Mn	BASE METAL	THICKNESS
0.08	0.58	1.52	SM41	19
0.09	0.6	1.45	SM50B	25

#### Typical mechanical properties of all-weld-metal

Y-P N/mm <sup>2</sup> {kfg/mm <sup>2</sup> }	T-S N/mm <sup>2</sup> {kfg/mm <sup>2</sup> }	CHARPY V-notch J{kfg-m}		BASE METAL	THICKNESS (mm)
		40°C	46°C		
480 {49}	550 {56}	80 {8}	60 {6}	SM41	19
530 {54}	570 {58}	100 {10}	70 {7}	SM50B	25

#### Typical Welding Conditions

Thickness (mm)	Wire Diameter (mm)	Amp.	Volt.	Travel speed (cm/min)	PASS
25	4	600	30	40 ~ 50	1 ~ 14
3.2	2.4	350	28	150	1 ~ 2

#### Product Codes





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# WELDING RODS

## Mild steel

### Bonarc E6010

For Welding Storage Tanks and Pressure Pipes

#### Applications

Shipbuilding, pressure pipes, tanks with plain or galvanized surfaces and steel casting repairs.

#### Characteristics on Usage

1. Good penetration combined with freedom from lack of fusion makes this electrode an excellent choice for pipeline welding.
2. This electrode is used in all positions and vertical-down welding.
3. Dry the electrodes at 70-80 deg. Celsius for 30-60 minutes prior to use.

#### Typical chemical composition of all-weld-metal (%)

C	Si	Mn	P	S
0.10	0.2	0.47	0.014	0.012

#### Typical mechanical properties of all-weld-metal

Y-P N/mm2 (kgf/mm2)	T-S N/mm2 (kgf/mm2)	EI (%)	Charpy V Notch J (-29 Deg Celsius) ( kg m )
420 (43)	460 (47)	31	50 (5)

#### Sizes available and recommended currents (DC+)

Dia. (mm)	Length (mm)	Amp	2.6	3.2	4.0	4.5	5.0
			F	V & OH	F	V & OH	F
			300	350	350	350	350
			50-80	70-110	110-150	130-160	160-200
			40-70	60-100	90-130	120-150	140-170

#### Approvals

C.W.B to CSA W48.1  
AWS A5.1  
ASMFE - SFA 5.1, 6011

#### Product Codes

2.6 mm	6178 2400
3.2 mm	6178 3200
4.0 mm	6178 4000
5.0 mm	6178 5000



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# WELDING RODS

## Mild steel

### Bonarc E6011

For Welding Pipes in Buildings

#### Applications

Welding steel sheets, pipes in buildings, ect.

#### Characteristics on usage

1. As the welding in a poor groove fits up and vertically, welding can be performed easily.
2. It is used in all position welding of pipes.
3. Dry the electrodes at 70-80 deg. Celsius for 30-60 minutes, prior to use.

#### Typical Chemical composition of all-weld-metal (%)

C	Si	Mn	P	S
0.08	0.37	0.66	0.015	0.013

#### Typical mechanical properties of all-weld-metal

Y-P N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	T-S N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	EI (%)	Charpy V Notch J (-29 Deg Celsius) (kgf m )
410 (42)	500 (51)	32	50 (5)

#### Sizes available and recommended currents (DC+)

Dia. (mm)	Length (mm)	2.6	3.2	4.0	4.5	5.0
		300	350	350	350	350
Amp	F	50-80	70-110	110-150	130-160	160-200
	V & OH	40-70	60-100	90-130	120-150	140-170

#### Approvals

C.W.B. to CSA W48.1  
AWS A5.1  
ASMFE - SFA 5.1, 6011

#### Product Codes

2.6 mm	6180 2400
3.2 mm	6180 3200
4.0 mm	6180 4000
5.0 mm	6180 5000



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# WELDING RODS

## Mild steel

### Bonarc E6013

For Light Structural Steel

#### Applications

Welding of all kinds of light constructional work in all positions, including pipe welding.

#### Characteristics on usage

1. Excellent striking and restriking properties.
2. Excellent slag removal and arc transfer.
3. Excellent bead appearance without undercut.
4. The smaller diameters are also used in vertical-down welding.
5. Dry the electrodes at 70-100 deg. Celsius for 30-60 minutes prior to use.

#### Typical chemical composition of all-weld-metal (%)

C	Si	Mn	P	S
0.07	0.32	0.45	0.015	0.012

#### Typical mechanical properties of all-weld-metal

Y-P N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	T-S N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	EI (%)	Charpy V Notch J (0 Deg Celsius) ( kgf m )
430(44)	480 (49)	29	70 (7)

#### Sizes available and recommended currents ( AC or DC<sub>+</sub> )

Dia. (mm)	Length (mm)	2.6	3.2	4.0	4.5	5.0	6
		350	350	400	400	400	450
Amp		F	F	F	F	F	F
		60-100	80-130	110-160	140-180	160-220	210-280
		V & OH	V & OH	V & OH	V & OH	V & OH	V & OH
		60-90	80-120	90-140	100-150	120-190	

#### Approvals

C.W.B. to CSA W48.1  
AWS A5.1  
ASMFE - SFA 5.1, 6013

#### Product Codes

2.6 mm	6182 2400
3.2 mm	6182 3200
4.0 mm	6182 4000
5.0 mm	6182 5000



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# WELDING RODS

## Mild steel

### Bonarc E7014

For Highly Efficient Fillet Welding of Sheet Steel

#### Applications

All position fillet welding of ship structures, bridges, structural steels for buildings and general structures.

#### Characteristics on usage

1. An iron powder titania type electrode designed for high efficiency in single pass and multiple pass welding.
2. Excellent slag removal and good bead appearance.
3. Dry the electrodes at 70-100 deg. Celsius for 30-60 minutes prior to use.

#### Typical chemical composition of all-weld-metal (%)

C	Si	Mn	P	S
0.08	0.35	0.6	0.015	0.01

#### Typical mechanical properties of all-weld-metal

Y-P N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	T-S N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	EI (%)	Charpy V Notch J (0 Deg Celsius) ( kgf m )
470 (48)	550 (56)	30	80 (8)

#### Sizes available and recommended currents ( AC or DC<sub>±</sub> )

Dia. (mm) Length (mm) Amp		2.6	3.2	4.0	4.5	5.0	6
			350	350	400	400	400
	<b>F</b>	60-100	90-140	140-220	170-220	190-240	250-310
	<b>V &amp; OH</b>	50-80	80-130	110-170	130-190	150-200	

#### Approvals

C.W.B to CSA W48.1  
AWS A5.1  
ASMFE - SFA 5.1, 7014

#### Product Codes

2.6 mm	6184 2400
3.2 mm	6184 3200
4.0 mm	6184 4000
5.0 mm	6184 5000



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# WELDING RODS

## Mild steel

### Bonarc E7018

For Highly Efficient Welding of 500N/mm<sup>2</sup> Class High Tensile Steel.

#### Applications

Welding of mild steel and 500N/mm<sup>2</sup> class high tensile steel of ships, bridges, storage tanks, buildings, industrial machinery and mining machinery.

#### Characteristics on usage

1. An iron powder and low hydrogen type electrode designed for heavy duty structures in all positions.
2. Excellent usability with direct current applications.
3. Dry the electrodes at 300-350 deg. Celsius for 60 minutes prior to use.
4. Keep the arc as short as possible.

#### Typical chemical composition of all-weld-metal (%)

C	Si	Mn	P	S
0.07	0.57	0.97	0.012	0.01

#### Typical mechanical properties of all-weld-metal

Y-P N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	T-S N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	EI (%)	Charpy V Notch J ( Deg Celsius) ( kgf m )
480 (49)	570 (58)	30	90 (9)

#### Sizes available and recommended currents ( AC or DC + )

Dia. (mm)	Length (mm)	2.6	3.2	4.0	4.5	5.0	6
		350	350	400	400	400	450
Amp	F	60-100	90-130	130-180	170-230	200-250	250-310
	V & OH	50-80	80-120	110-170	130-190	160-210	

#### Approvals

C.W.B. to CSA W48.1  
AWS A5.1  
ASMFE - SFA 5.1, 7018

#### Product Codes

2.6 mm	6188 2400
3.2 mm	6188 3200
4.0 mm	6188 4000
5.0 mm	6188 5000



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# WELDING RODS

## Mild steel

### Bonarc E7018-1

For Aluminum-killed Steel for Low Temperature

#### Applications

Welding of pressure vessels, LPG tankers, LPG storage tanks and similar installations at low temperatures.

#### Characteristics on usage

1. Remove water, rust, oil, and all foreign matter prior to use.
2. It is suitable for offshore construction in cold districts.
3. Dry the electrodes at 300-350 deg. Celsius for 30-60 minutes prior to use.
4. Keep the arc as short as possible

#### Typical chemical composition of all-weld-metal (%)

C	Si	Mn	Ni	Ti	B
0.07	0.58	1.38	0.15	0.023	0.003

#### Typical mechanical properties of all-weld-metal

Y-P N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	T-S N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	EI (%)	Charpy V Notch J (-45 Deg Celsius) ( kgf m )
510 (52)	590 (60)	32	130 (13)

#### Sizes available and recommended currents ( AC or DC<sub>+</sub> )

Dia. (mm)	Length (mm)	Amp	2.6	3.2	4.0	4.8	5.0	6
			F	F	F	F	F	F
			70-100	90-130	150-190	160-220	160-220	180-230
		V & OH	60-90	85-120	110-160	130-180	130-180	170-200

#### Approvals

C.W.B. to CSA W48.1  
AWS A5.1  
ASMFE - SFA 5.1, 7018-1

#### Product Codes

2.6 mm	6189 2400
3.2 mm	6189 3200
4.0 mm	6189 4000
5.0 mm	6189 5000



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# WELDING RODS

## Mild steel

### Bonarc E7024

For Highly Efficient Fillet Welding

#### Applications

Horizontal and flat welding of ship structures, bridges, structural steels for buildings and general structures.

#### Characteristics on usage

1. An iron powder titania electrode that is designed for high efficiency in single pass welding.
2. Quiet and stable arc.
3. A good weld appearance with low spatter loss.
4. Easy slag removal, mostly self-releasing.
5. In the case of horizontal fillet welding, keep the optimum elongation of bead among 1.0-1.5
6. Excessive moisture absorption will cause an undercut and irregular bead.
7. Dry the electrodes at 70-100 deg. Celsius for 30-60 minutes prior to use.

#### Typical chemical composition of all-weld-metal (%)

C	Si	Mn	P	S
0.09	0.35	0.78	0.016	0.012

#### Typical mechanical properties of all-weld-metal

Y-P N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	T-S N/mm <sup>2</sup> (kgf/mm <sup>2</sup> )	EI (%)	Charpy V Notch J (0 Deg Celsius) ( kgf m )
480 (49)	570 (58)	28	70 (7)

#### Sizes available and recommended currents ( AC or DC<sub>+</sub> )

Dia. (mm) Length (mm) Amp	F H-Fil	3.2	4	4.5	5	5.5	6
		400	450-550	450-550	450-700	450-700	450-700
		100-150	140-190	180-230	220-250	230-270	260-300

#### Approvals

C.W.B. to CSA W48.1  
AWS A5.1 ASMFE-SFA 5.1,7024

#### Product Codes

2.6 mm	6190 2400
3.2 mm	6190 3200
4.0 mm	6190 4000
5.0 mm	6190 5000



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# WELDING WIRES

## Hard Surfacing

Brand name	Dia (mm)	Welding positions Product Code	Type of current	Shielding gas	Typical chemical composition of all-weld-metal (%)					Typical hardness of all-weld-metal (HV)	Applications
					C	Si	Mn	Cr	Mo		
K-250HT	1.2 1.6	F, H	DC (+)	CO <sub>2</sub>	0.07	0.5	1.59	1.3		260	for metal-to-metal wear and impact. Hardfacing of shafts,wheels, gears and cars
K-300HT	1.2 1.6	F, H	DC (+)	CO <sub>2</sub>	0.09	0.68	1.54	1.1		300	for metal-to-metal wear. Hardfacing of rollers, shafts & wheels
K350HT	1.2 1.6	F, H	DC (+)	CO <sub>2</sub>	0.12	0.45	1.37	1.3	0.2	360	For wear and abrasion. Hardfacing of rollers, shafts,tires and idlers
K-450HT	1.2 1.6	F, H	DC (+)	CO <sub>2</sub>	0.24	0.51	1.2	2	0.6	450	For wear and abrasion. Hardfacing of rollers, idlers,screws and links
K600-HT	1.2 1.6	F, H <b>68362012</b> <b>68362016</b>	DC (+)	CO <sub>2</sub>	0.25	2.18	0.36	6.5	0.03	590	For wear and abrasion. Hardfacing fo shafts, bulldozer blades and bucket lips,etc.
K-700HT	1.2 1.6	F, H	DC (+)	CO <sub>2</sub>	0.3	2.4	0.5	7.0	W:0.7	690	For wear and abrasion. Hardfacing of rollers, conveyor screws and impeller, etc.
K-800HT	1.2 1.6	F, H	DC (+)	CO <sub>2</sub>	0.44	1.5	0.55	8.6	W:0.5	780	For wear and abrasion. Hardfacing of bucket lips,impeller,etc..





VANGUARD STEEL LTD.



# WELDING WIRES

## Hard Surfacing

Brand name	Dia (mm)	Welding positions Product Code	Type of current	Shielding gas	Typical chemical composition of all-weld-metal (%)					Typical hardness of all-weld-metal (HV)	Applications
					C	Si	Mn	Cr	Mo		
K-CXA-40HT	1.2 1.6	F, H	DC (+)	Ar	0.05	0.25	0.3	12	Ni:4.2	370	For wear and corrosion-resistance. Hardfacing of valves, rollers and shafts,etc.
K-CXA-41HT	1.2 1.6	F, H	DC (+)	Ar	0.05	0.39	0.49	12.1	1.1 Ni:3.9	370	For wear and corrosion-resistance. Hardfacing of valves, rollers and shafts,etc.



VANGUARD STEEL LTD.



# WELDING RODS

## Stainless Steel

### E308

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.06	20.00	9.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
94.000 psi.	70.000 psi.	38%

For welding similar steels such as AISI 301, 302, 303, 308 as well as ferritic types (13% Cr). Smooth beads, easy slag removal. Service temperature of up to C 300° (F 570°).

#### Product Codes

2.4 mm	6007 2409
3.2 mm	6007 3209
4.0 mm	6007 4009
5.0 mm	6007 5009

### E309Cb

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Cb	Mn	Si
0.09	23.00	13.00	0.90	1.7	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
102.000 psi	82.000 psi.	38%

Similar to type 309, Cb addition to prevent carbide precipitation at high temperatures. Service temperature up to C 1000° (F 1800°)

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E308L (\*)

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	20.50	10.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.000 psi.	64.000 psi	43%

For welding extra low carbon grades similar to Type 308 with improved resistance against intergranular corrosion. Service temperature of up to C 350° (F 660°).

#### Product Codes

2.4 mm	6008 2409
3.2 mm	6008 3209
4.0 mm	6008 4009
5.0 mm	6008 5009

### E309L (\*)

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	23.50	12.50	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
87.000 psi.	68.000 psi	36%

Extra low carbon type similar to 309 for buffer layers when cladding as well as for joining of dissimilar steels. Improved resistance against hot-cracking.

#### Product Codes

2.4 mm	6012 2409
3.2 mm	6012 3209
4.0 mm	6012 4009
5.0 mm	6012 5009



VANGUARD STEEL LTD.



# WELDING RODS

## Stainless Steel

### E309

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	20.50	10.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
91.000 psi.	68.000 psi	35%

For welding heat-resistant steels of Type 309 as well as ferritic Cr-Si-Al types. Also for dissimilar materials providing alloy content is high enough for a ductile weld deposit. Scale resistance at service temperatures of up to C 1000° (F1800°)

#### Product Codes

2.4 mm	6011 2409
3.2 mm	6011 3209
4.0 mm	6011 4009
5.0 mm	6011 5009

### E309MoL

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.03	23.00	12.00	3.00	1	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
105.000 psi.	84.000 psi	32%

Similar to 309 ELC, molybdenum has been added for buffering of steel pipe 316. Also for joining of dissimilar steels. Crack resistant.

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E310

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.15	27.50	21.00	2.50 max	0.75 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
93.000 psi.	68.000 psi.	36%

For welding Type 310 as well as straight Cr steels to dissimilar metals. Scale resistance at extreme temperatures C-196° to 1200° (F-320° to 2200°).

#### Product Codes

2.4 mm	6012 2409
3.2 mm	6012 3209
4.0 mm	6012 4009
5.0 mm	6012 5009

### E310Mo

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.10	26.50	21.00	3.00	2.50 max	0.75 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
97.000 psi.	64.000 psi.	33%

Similar to Type 310, high temperature creep properties were improved through molybdenum addition.

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009



VANGUARD STEEL LTD.



# WELDING RODS

## Stainless Steel

### E310Cb

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Cb	Mn	Si
0.12	27.50	20.50	0.80	2.50 max	0.75 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
96.500 psi.	71.000 psi	30%

Similar to Type 310, Cb addition to prevent carbide precipitation at high temperatures. Service temperature up to C 1200° (F 2200°)

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E310HC

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.32	25.00	20.50	2.50 max	0.75 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
114.00 psi.	85.000 psi.	15%

Similar to 310 with high carbon content to produce higher mechanical values (tensile and yield strength)

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E312

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.10	29.00	9.00	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
117.500 psi.	98.500 psi	25%

For joining dissimilar steels with higher tensile values. Crack resistant, also in problem steels. Wear-resistant buildups and buffer layers for hard-facing. Welds are unaffected at service temperature of up to C 350° (F 660°)

#### Product Codes

2.4 mm	6020 2409
3.2 mm	6020 3209
4.0 mm	6020 4009
5.0 mm	6020 5009

### E316

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.05	19.50	11.50	2.30	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
90.000 psi.	71.000 psi.	38%

For welding of Type 316 steel. Mo content increases resistance against corrosion at severe chemical attack in chemical, pulp and paper industry. Service temperature of up to C 300° (F 570°).

#### Product Codes

2.4 mm	6028 2409
3.2 mm	6028 3209
4.0 mm	6028 4009
5.0 mm	6028 5009



VANGUARD STEEL LTD.



# WELDING RODS

## Stainless Steel

### E316L(\*)

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.03	19.50	12.00	2.30	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.500 psi.	68.000 psi	40%

Extra low carbon type similar to 316 with additionally increased resistance against intergranular corrosion. Service temperature up to C 350° (F 660°). Smooth beads and easy slag removal.

#### Product Codes

2.4 mm	6029 2409
3.2 mm	6029 3209
4.0 mm	6029 4009
5.0 mm	6029 5009

### E318

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Cb	Mn	Si
0.03	18.50	12.50	2.3	0.4	1.5	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
105.000 psi.	80.000 psi.	28%

For welding Type 318. Service temperature of up to C 400° (F 750°).

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E317

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.06	19.00	13.00	3.50	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
104.000 psi.	80.000 psi	32%

For welding Type 317 steels. Increased Mo content further improves resistance against severe corrosion attack by, for instance, sulphuric acid.

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E320

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Cb	Cu	Mn	Si
0.04	21.00	35.00	2.50	0.50	3.00	2.20	0.4

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
89.000 psi.	60.000 psi.	38%

For welding ANTINIT SAS 20, Carpenter 20, 20, Cb, 20 Cb-3 Worthite Stainless, Durimet 20, Aloyco 20. These alloys were developed to give improved resistance against sulphuric and phosphoric acids. The weld deposit resists pitting and stress corrosion cracking.

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009



VANGUARD STEEL LTD.



# WELDING RODS

## Stainless Steel

### E317L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.03	19.60	12.00	3.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
104.000 psi.	80.000 psi	32%

Similar to 317. Extra low carbon type with increased resistance against intergranular corrosion and against corrosion from chloride ions. Service temperature up to C 350° (F 660°). Smooth beads and easy slag removal.

#### Product Codes

2.4 mm	6033 2409
3.2 mm	6033 3209
4.0 mm	6033 4009
5.0 mm	6033 5009

### E330

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.12	16.00	36.00	2.30	0.40

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.000 psi.	58.000 psi.	35%

For welding Type 330 for high temperature service, fine thermo shock resistance. Service temperature up to C 1100° (F 2000°).

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E347(\*)

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Cb	Mn	Si
0.03	20.50	10.50	0.40	1.00	0.70

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
88.000 psi.	65.500 psi.	41%

Cb addition improves intergranular corrosion resistance compared with 308 types. Smooth beads, easy slag removal. Service temperature of up to C 400° (F 750°).

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E502

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Mo	Mn	Si
0.05	5.00	0.50	0.80	0.6

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
72.000 psi.	34.000 psi.	30%

For welding 5% Cr-Mo type steels. For creep and hot hydrogen resistant pressure vessels and pipe steels. Welds unaffected by temperature as high as C 600° (F 1100°).

#### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009



VANGUARD STEEL LTD.



# WELDING RODS

## Stainless Steel

### E410

Average Weld Deposit % (All Weld Metal)

C	Cr	Mn	Si
0.08	12.50	0.60	0.70

Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
87.000 psi.	55.000 psi	28%

For welding similar steels such as 403, 405, and 410. Requires preheat of C 200°-300° (F 400°-570°). Post-heat treatment can be given and should be approximately C 750° (F 1380°). Service temperature up to C 450° (F 840°).

### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E505

Average Weld Deposit % (All Weld Metal)

C	Cr	Mo	Mn	Si
0.05	9.00	1.00	0.60	0.06

Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
100.000 psi.	70.000 psi.	22%

For welding 9% Cr 1% Mo steels. Intended for hot hydrogen service namely in the petroleum industry. Creep resistant at service temperature of up to C 600° (F 1100°).

### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### E430

Average Weld Deposit % (All Weld Metal)

C	Cr	Mn	Si
0.07	17.00	0.70	0.50

Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
80.000 psi.	55.000 psi.	26%

For welding similar steels such as AISI 430, 431, 448 B and C as well as cladding by buildup; sealing faces of carbon and low-alloy steel for gas, water & steam service. We recommend a preheat temperature of C 200° -300° (F 400°-570°). Postheat can be given at C 750° (F1380°).

### Product Codes

2.4 mm	2409
3.2 mm	3209
4.0 mm	4009
5.0 mm	5009

### Recommended Amperage

DIA	AMP	VOLT
1/16"	25-40	21-24
5/64"	40-60	22-25
3/32"	50-80	22-25
1/8"	80-110	23-26
5/32"	110-140	24-27
3/16"	140-180	25-28
1/4"	180-220	25-28



VANGUARD STEEL LTD.



# WELDING RODS

## Stainless Steel

Listed below are the average analysis of BONARC STAINLESS STEEL WELDING ELECTRODES to ASME Section IIC SFA 5.4, AWS A 5.4-78 and CSA W 48.2-77.

GRADE	C	Si	Mn	Cr	Ni	Mo	Cu	Cb+Ta	v	Ti
<b>AUSTENITIC</b>										
E307-16	0.11	0.9	4.0	19.5	9.5	0.7	0.5			
E308-16	0.06	0.9	1.10	20.0	9.5	0.1	0.1			
E308L-16 (*)	0.03	0.9	1.10	20.5	10.5	0.1	0.1	0.05	< 0.1	< 0.005
E309-16	0.12	0.9	2.0	23.5	12.5	0.1	0.1			
E309L-16 (*)	0.03	0.9	1.0	23.5	12.5	0.1	0.1	0.05	< 0.1	< 0.005
E309MoL-16	0.03	0.9	1.0	23.0	12.0	3.0	0.1	0.05		
E309Cb-16	0.09	0.8	1.7	23.0	13.0	0.1	0.1	0.9		
E310-16	0.15	0.7	2.5	27.5	21.0	0.1	0.1			
E310Cb-16	0.12	0.7	2.4	28.0	22.0	0.1	0.1	0.8		
E310Mo-16	0.1	0.7	2.4	26.5	21.0	3.0	0.1			
E312-16	0.1	0.8	1.0	29.0	9.0	0.1	0.1			
E316-16	0.05	0.9	1.0	19.5	11.5	2.3	0.1			
E316L-16 (*)	0.03	0.9	1.0	19.5	12.0	2.3	0.1	0.04	< 0.1	< 0.005
E317L-16	0.03	0.9	1.1	19.6	12.0	3.5	0.1			
E318-16	0.03	0.9	1.5	18.5	12.5	2.3	0.1	0.4		
E320-15	0.04	0.4	2.2	21.0	35.0	2.5	3.0	0.5		
E330-16	0.12	0.4	2.3	16.0	36.0	0.6	0.1			
E347-16 (*)	0.03	0.7	1.0	20.5	10.5	0.1	0.1	0.4	< 0.1	< 0.005
<b>MARTENSITIC</b>										
E410-16	0.08	0.7	0.6	12.5	0.3	0.5	0.5			
<b>FERRITIC</b>										
E430-15	0.07	0.5	0.7	17.0	0.6	0.5	0.5			
<b>CHROMIUM/MOLYBDENUM</b>										
E502-15	0.05	0.6	0.8	5.0	0.4	0.5	0.5			
E502-16	0.07	0.4	0.5	5.7	0.3	0.6	0.5			
E505-15	0.05	0.6	0.8	9.0	0.4	1.0	0.5			

### OTHER BONARC WELDING PRODUCTS:

STAINLESS STEEL

TIG FILLER RODS  
MIG FILLER WIRES  
SUBARC FILLER WIRES  
FLUX CORED SELF-SHIELDED WIRES

NICKEL & COPPER BASE  
MAINTENANCE & REPAIR  
TOOL STEEL & HARDFACING

ELECTRODES  
&  
WIRES





VANGUARD STEEL LTD.



# MIG Wires

## Stainless Steel

### E308L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	20.50	10.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.000 psi.	64.000 psi	43%

For welding extra low carbon grades similar to Type 308 with improved resistance against intergranular corrosion. Service temperature of up to C 350° (F 660°).

#### Product Codes

0.8 mm	6206 0800
0.9 mm	6206 0900
0.12 mm	6206 1200
0.16 mm	6206 1600

### E308 HISIL

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	20.50	10.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.000 psi.	64.000 psi	43%

For welding extra low carbon grades similar to Type 308 with improved resistance against intergranular corrosion. Service temperature of up to C 350° (F 660°).

#### Product Codes

0.8 mm	6207 0800
0.9 mm	6207 0900
0.12 mm	6207 1200
0.16 mm	6207 1600

### E309L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	23.50	12.50	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
87.000 psi.	68.000 psi	36%

Extra low carbon type similar to 309 for buffer layers when cladding as well as for joining of dissimilar steels. Improved resistance against hot-cracking.

#### Product Codes

0.8 mm	6211 0800
0.9 mm	6211 0900
0.12 mm	6211 1200
0.16 mm	6211 1600

### E309 HISIL

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	23.50	12.50	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
87.000 psi.	68.000 psi	36%

Extra low carbon type similar to 309 for buffer layers when cladding as well as for joining of dissimilar steels. Improved resistance against hot-cracking.

#### Product Codes

0.8 mm	0800
0.9 mm	0900
0.12 mm	1200
0.16 mm	1600



VANGUARD STEEL LTD.



# MIG Wires

## Stainless Steel

### E310

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.15	27.50	21.00	2.50 max	0.75 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
93.000 psi.	68.000 psi.	36%

For welding Type 310 as well as straight Cr steels to dissimilar metals. Scale resistance at extreme temperatures C-196° to 1200° (F-320° to 2200°).

#### Product Codes

0.8 mm	6214 0800
0.9 mm	6214 0900
0.12 mm	6214 1200
0.16 mm	6214 1600

### E312

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.10	29.00	9.00	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
117.500 psi.	98.500 psi	25%

For joining dissimilar steels with higher tensile values. Crack resistant, also in problem steels. Wear-resistant buildups and buffer layers for hard-facing. Welds are unaffected at service temperature of up to C 350° (F 660°)

#### Product Codes

0.8 mm	0800
0.9 mm	0900
0.12 mm	1200
0.16 mm	1600

### E316L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.03	19.50	12.00	2.30	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.500 psi.	68.000 psi	40%

Extra low carbon type similar to 316 with additionally increased resistance against intergranular corrosion. Service temperature up to C 350° (F 660°). Smooth beads and easy slag removal.

#### Product Codes

0.8 mm	6217 0800
0.9 mm	6217 0900
0.12 mm	6217 1200
0.16 mm	6217 1600

### E316HISIL

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.03	19.50	12.00	2.30	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.500 psi.	68.000 psi	40%

Extra low carbon type similar to 316 with additionally increased resistance against intergranular corrosion. Service temperature up to C 350° (F 660°). Smooth beads and easy slag removal.

#### Product Codes

0.8 mm	6218 0800
0.9 mm	6218 0900
0.12 mm	6218 1200
0.16 mm	6218 1600



VANGUARD STEEL LTD.



# MIG Wires

## Stainless Steel

### E317L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.03	19.60	12.00	3.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
104.000 psi.	80.000 psi	32%

Similar to 317. Extra low carbon type with increased resistance against intergranular corrosion and against corrosion from chloride ions. Service temperature up to C 350° (F 660°). Smooth beads and easy slag removal.

#### Product Codes

0.8 mm	6220 0800
0.9 mm	6220 0900
0.12 mm	6220 1200
0.16 mm	6220 1600

### E347

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Cb	Mn	Si
0.03	20.50	10.50	0.40	1.00	0.70

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
88.000 psi.	65.500 psi.	41%

Cb addition improves intergranular corrosion resistance compared with 308 types. Smooth beads, easy slag removal. Service temperature of up to C 400° (F 750°).

#### Product Codes

0.8 mm	6325 0800
0.9 mm	6325 0900
0.12 mm	6325 1200
0.16 mm	6325 1600



VANGUARD STEEL LTD.



# TIG Wires

## Stainless Steel

### E308L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	20.50	10.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.000 psi.	64.000 psi	43%

For welding extra low carbon grades similar to Type 308 with improved resistance against intergranular corrosion. Service temperature of up to C 350° (F 660°).

#### Product Codes

1.2mm	6306 1200V
1.6 mm	6306 1600V
2.4 mm	6306 2400V
3.2 mm	6306 3200V
4.0 mm	6306 4000V

### E309L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mn	Si
0.03	23.50	12.50	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
87.000 psi.	68.000 psi	36%

Extra low carbon type similar to 309 for buffer layers when cladding as well as for joining of dissimilar steels. Improved resistance against hot-cracking.

#### Product Codes

1.6 mm	6309 1600V
2.4 mm	6309 2400V
3.2 mm	6309 3200V
4.0 mm	6309 4000V

### E316L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.03	19.50	12.00	2.30	1.00	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
86.500 psi.	68.000 psi	40%

Extra low carbon type similar to 316 with additionally increased resistance against intergranular corrosion. Service temperature up to C 350° (F 660°). Smooth beads and easy slag removal.

#### Product Codes

1.2mm	6318 1200V
1.6 mm	6318 1600V
2.4 mm	6318 2400V
3.2 mm	6318 3200V
4.0 mm	6318 4000V

### E317L

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Mo	Mn	Si
0.03	19.60	12.00	3.50	1.10	0.90 max

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
104.000 psi.	80.000 psi	32%

Similar to 317. Extra low carbon type with increased resistance against intergranular corrosion and against corrosion from chloride ions. Service temperature up to C 350° (F 660°). Smooth beads and easy slag removal.

#### Product Codes

1.6 mm	6320 1600V
2.4 mm	6320 2400V
3.2 mm	6320 3200V
4.0 mm	6320 4000V



VANGUARD STEEL LTD.



## TIG Wires

### Stainless Steel

#### E347

#### Average Weld Deposit % (All Weld Metal)

C	Cr	Ni	Cb	Mn	Si
0.03	20.50	10.50	0.40	1.00	0.70

#### Average Mechanical Properties

Tensile Strength	Yield Strength 0.2	Elongation in 2"
88.000 psi.	65.500 psi.	41%

Cb addition improves intergranular corrosion resistance compared with 308 types. Smooth beads, easy slag removal. Service temperature of up to C 400° (F 750°).

#### Product Codes

1.6 mm	6325 1600V
2.4 mm	6325 2400V
3.2 mm	6325 3200V
4.0 mm	6325 4000V



VANGUARD STEEL LTD.



# WELDING WIRE

## Flux Cored Stainless Steel

### E-308L T-1

AWS A5.22 E308LT1-1 / -4

JIS Z3323 YF308LC

#### Typical Applications

Welding of 18%Cr-8%Ni stainless steel for chemical containers, low C content has excellent corrosion resistance.

#### Characteristics on Usage

1. E-308LT is a flux cored wire for use in CO<sub>2</sub> or AR+CO<sub>2</sub> gas and produce low carbon 18%Cr-8%Ni all-weld-metal.
2. Low spatter generation, easy slag removal, excellent bead shape and appearance.
3. High efficiency welding is obtained in flat and horizontal fillets welding.
4. The weld metals contain optimum ferrite contents in their austenitic structures, therefore their weldability is excellent with lower crack susceptibility.
5. After using a welding wire, do not keep it in a hygroscopic place.
6. E-308LT has excellent intergranular corrosion resistance.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	Cr	Ni
CO <sub>2</sub>	0.03	0.62	1.56	19.5	10.5
Ar+20%CO <sub>2</sub>	0.04	0.79	1.90	19.5	10.2

#### Typical mechanical properties of all-weld-metal

Shielding Gas	T - S	El. (%)
	N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	
CO <sub>2</sub>	570 {58}	42
Ar+20%CO <sub>2</sub>	610 {62}	35

#### Sizes available and recommended currents (DC +)

Dia. (mm)	1.2	1.6
Amp.	100 ~ 220	180 ~ 320
Electrode extension (mm)	10 ~ 20	15 ~ 25

#### Approvals

ABS, BV, KR, CWB, TUV

#### Product Codes

0.9 mm	6291 0900
1.2 mm	6291 1200
1.6 mm	6291 1600



VANGUARD STEEL LTD.



# WELDING WIRE

## Flux Cored Stainless Steel

### E-309L T-1

AWS A5.22 E309LT1-1 / -4

JIS Z3323 YF309LC

#### Typical Applications

Welding of 22%Cr-12%Ni stainless steel and depositing buffer layers for various stainless steels for chemical engineering, textile industries, shipbuilding, and atomic power plant industries.

#### Characteristics on Usage

1. E-309LT is a flux cored wire for use in CO<sub>2</sub> or AR+CO<sub>2</sub> gas and can produce low carbon 22%Cr-12%Ni all-weld-metal.
2. Low spatter generation, easy slag removal, and excellent bead shape and appearance.
3. High efficiency welding is obtained in flat and horizontal fillets welding.
4. Welding of dissimilar joints consisting of stainless steel, carbon steel or low alloy steel.
5. It provides better weldability with superior heat resistance and corrosion resistance.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	Cr	Ni
CO <sub>2</sub>	0.03	0.60	1.4	23.6	13.1
Ar+20%CO <sub>2</sub>	0.04	0.8	1.92	23.8	13.3

#### Typical mechanical properties of all-weld-metal

Shielding Gas	T - S N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	El. (%)
CO <sub>2</sub>	550 {56}	41
Ar+20%CO <sub>2</sub>	600 {61}	34

#### Sizes available and recommended currents (DC +)

Dia. (mm)	1.2	1.6
Amp.	100 ~ 220	180 ~ 320
Electrode extension (mm)	10 ~ 20	15 ~ 25

#### Approvals

ABS, BV, DNV, KR, CWB, TUV, RINA

#### Product Codes

0.9 mm	6292 0900
1.2 mm	6292 1200
1.6 mm	6292 1600



VANGUARD STEEL LTD.



# WELDING WIRE

## Flux Cored Stainless Steel

### E-316L T-1

AWS A5.22 E316LT1-1 / -4

JIS Z3323 YF316LC

#### Typical Applications

Welding of low carbon 18%Cr-12%Ni-Mo stainless steel for chemical engineering and clad side of low carbon 18%Cr-12%Ni-Mo.

#### Characteristics on Usage

1. E-316LY is a flux cored wire for use in CO<sub>2</sub> or AR+CO<sub>2</sub> gas, and can produce low carbon 18%Cr12%Ni-Mo all-weld-metal.
2. E-316LT makes excellent weldability with superior corrosion resistance.
3. E-316LT has better intergranular corrosion resistance due to low carbon contents.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	Cr	Ni	Mo
CO <sub>2</sub>	0.03	0.65	1.2	18.3	12.2	2.8
Ar+20%CO <sub>2</sub>	0.03	0.75	1.85	18.7	11.4	2.5

#### Typical mechanical properties of all-weld-metal

Shielding Gas	T - S N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	El. (%)
CO <sub>2</sub>	550 {56}	40
Ar+20%CO <sub>2</sub>	620 {63}	36

#### Sizes available and recommended currents (DC +)

Dia. (mm)	1.2	1.6
Amp.	100 ~ 220	180 ~ 320
Electrode extension (mm)	10 ~ 20	15 ~ 25

#### Approvals

ABS, BV, DNV, KR, CWB, TUV, RINA

#### Product Codes

0.9 mm	6294 0900
1.2 mm	6294 1200
1.6 mm	6294 1600





VANGUARD STEEL LTD.



# WELDING WIRE

## Flux Cored Stainless Steel

### E-317L T-1

AWS A5.22 E317LT1-1 / -4

JIS Z3323 YF317LC

#### Typical Applications

Welding of AISI type 317(L) stainless steel and chemical industries.

#### Characteristics on Usage

1. E-317LT is a flux cored wire for use in CO<sub>2</sub> gas, and can produce low carbon 18%Cr-12%Ni-3.5%Mo all-weld-metal.
2. Further reduce susceptibility to pitting corrosion because of high molybdenum contents compared to type 316L.
3. Low spatter generation, easy slag removal, and excellent bead shape and appearance.

#### Typical chemical composition of all-weld-metal (%)

Shielding Gas	C	Si	Mn	Cr	Ni	Mo
CO <sub>2</sub>	0.03	0.65	1.25	18.8	13.7	3.5

#### Typical mechanical properties of all-weld-metal

Shielding Gas	T - S N/mm <sup>2</sup> {kgf/mm <sup>2</sup> }	El. (%)
CO <sub>2</sub>	610 {62}	33

#### Sizes available and recommended currents (DC +)

Dia. (mm)	1.2	1.6
Amp.	100 ~ 220	180 ~ 320
Electrode extension (mm)	10 ~ 20	15 ~ 25

#### Approvals

ABS

#### Product Codes

0.9 mm	0900
1.2 mm	1200
1.6 mm	1600



VANGUARD STEEL LTD.



# WELDING WIRES PAIL PACK

## Characteristics

### IMPROVED WELDS

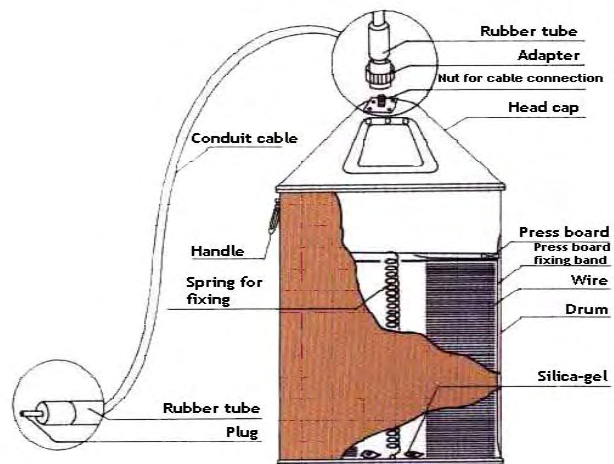
The carefully balanced helix, cast and column strength of our pail pack system wire prevents the vibration (of the wire) found in case of using conventional spooled or coiled wire.

### MORE COST EFFICIENT

Our pail pack system lowers your production costs by reducing downtime and decreasing liner and contact tip wear.

### ROBOTIC APPLICATION

Our pail pack system is good enough for robotic equipped facilities and can be utilized without change of expensive equipment since it can be easily attached to any feeding unit.



## Type and Packing Options

	MIG Wires		Flux Cored Wires	
	Weight (kg)	Dimensions of pack Outer Dia x Height (mm)	Weight (kg)	Dimensions of pack Outer Dia x Height (mm)
0.8	200, 250	510 x 810	/	/
0.9	200, 250	510 x 810	/	/
1.0	200, 250	510 x 810	/	/
1.2	200, 250	510 x 810	100, 200/250	510x810 / 663x810
1.4	/	/	100, 200/250	510x810 / 663x810
1.6	200, 250	510 x 810	250	663 x 810

## Usage Process

1. Remove the silica-gel and the spring.  
(They must be removed from the pack, as they are possible to be obstacles to proper pay-out of the wire)
2. Cover the pail pack with the head cap and connect the cable.
3. Connect the cable fixing equipment to the spool shaft
4. Pay out the wire from the start welding.



VANGUARD STEEL LTD.



## WELDING WIRES

### Aluminum

- All-position aluminum MIG electrode
- Superior wire surface finish ensures trouble free welding
- Superior cleanliness ensures sound weldments
- Conforms to: AWSA5.10, CWB, ABS

#### CHEMICAL COMPOSITION LIMITS AND PHYSICAL PROPERTIES (1)

Alloy	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Other Each (2)	Other Total (2)	Melting range F	Density Lbs/cu.in.	Post Anodiz Colour
1100	(3)	(3)	.05-.20	0.05	-	-	0.1	-	0.05	0.15	1190-1215	0.098	Light golden
4043	4.5-6.0	0.8	0.3	0.05	0.05	-	0.1	0.2	0.05	0.15	1065-1170	0.097	Gray
5183	0.4	0.4	0.1	.50-1.0	4.3-5.2	.05-.25	0.25	0.15	0.05	0.15	1075-1180	0.096	White
5356	0.25	0.4	0.1	.05-.20	4.5-5.5	.05-.20	0.1	.06-.20	0.05	0.15	1060-1175	0.096	White
5554	0.25	0.4	0.1	.50-1.0	2.4-3.0	.05-.20	0.25	.05-.20	0.05	0.15	1115-1195	0.097	White
5556	0.25	0.4	0.1	.50-1.0	4.7-5.5	.05-.20	0.25	0.5-.20	0.05	0.15	1065-1175	0.096	White
5654	(4)	(5)	0.05	0.01	3.1-3.9	.15-.35	0.2	.05-.15	0.05	0.15	1100-1190	0.096	White

- (1) Single-value shown are maximum percentage, except minimum is specified
- (2) Beryllium shall not exceed 0.0008%
- (3) Silicon plus iron shall not exceed 0.95%
- (4) Silicon plus iron shall not exceed 0.45%



VANGUARD STEEL LTD.



# WELDING WIRES

## Aluminum

### TYPICAL MECHANICAL PROPERTIES OF GAS-SHIELDED ARC WELDED GROOVE JOINTS IN HEAT TREATED ALUMINUM ALLOYS

Base Alloy Temper	Melting range  Degree F	Base alloy  UTS (1000) psi (1)	Base alloy  Y S (1000) psi (2)	Elongation  % in 2 in.	Filler alloy	As welded		Elongation  % in 2 in.	Post weld		Elongatio n  %in 2 in.
						UTS (1000)  psi	YS (1000)  psi		heat treated  UTS (1000)p si	Heat treated  YS (1000)p si	
6061-T4, T451	1080- 1205	35	21	22	ER4043	27	18	8	35 (3)	-	8(3)
6061-T6, T651	1080- 1205	45	40	12	ER4043	27	18	8	44	40	5
6061-T6, T651	1080- 1205	45	40	12	ER5356	30	19	11	-	-	-
6063-T4	1140- 1210	25	13	22	ER4043	20	10	12	3-	-	13
6063-T6	1140- 1210	35	31	12	ER4043	20	12	8	30	-	13
6063-T6	1140- 1210	35	31	12	ER5356	30	19	11	-	-	-
7039-T61	890- 1180	60	50	14	ER5183	47	32	10	-	-	-
7039-T64	890- 1180	60	50	14	ER5356	45	31	11	-	-	-

- (1) Reduced section tensile
- (2) 0.2% offset in 2 inch gauge
- (3) Postweld aged only



VANGUARD STEEL LTD.



# WELDING WIRES

## Aluminum

### Product codes

#### MIG Wire

<b>4043</b>	1 lb	0.030	6520 0108
	1 lb	0.035	6520 0109
	1 lb	3/64"	6520 0112

<b>4043</b>	13 lb	0.030	6520 1508
	13 lb	0.035	6520 1509
	13 lb	3/64"	6520 1512
	13 lb	1/16"	6520 1516

<b>5356</b>	1 lb	0.030	6530 0108
	1 lb	0.035	6530 0109
	1 lb	3/64"	6530 0112

<b>5356</b>	13 lb	0.030	6530 1508
	13 lb	0.035	6530 1509
	13 lb	3/64"	6530 1512
	13 lb	1/16"	6530 1516

#### TIG Rods

<b>4043</b>	5 lb	1/16"	6570 1016
	5 lb	3/32"	6570 1024
	5 lb	1/8"	6570 1032
	5 lb	5/32"	6570 1040

<b>5356</b>	5 lb	1/16"	6580 1016
	5 lb	3/32"	6580 1024
	5 lb	1/8"	6580 1032
	5 lb	5/32"	6580 1040



VANGUARD STEEL LTD.



# WELDING WIRES

## Mig / Mag Welding Trouble Shooting Guide

### Fault or defect:

### Probable cause:

#### Porosity

Oil, heavy rust or mill scale on plate.  
Failure to clean between passes.  
Welding over slag from stick electrode.

**Porosity caused by plate contamination appears as a series of holes near the center of the weld bead.**

Shielding gas problems;  
wind, clogged nozzle, insufficient  
or excessive gas flow or poor torch angle.

**Porosity caused by lack of shielding appears as a very crusty surface with many small holes covering the weld bead.**

#### Lack of Penetration

Joint too narrow.  
Current too low, or too much stick out.  
Poor technique with torch, poor angle.

#### Lack of Fusion

Voltage/current too low.  
Wrong polarity  
Travel speed too slow.  
Poor torch angle.

#### Undercutting

Travel speed too high.  
Voltage/current too high.  
Insufficient dwell at bead edge.

#### Cracking

Using the wrong wire.  
Weld bead is too small  
Lack of preheat

#### Unstable Arc

Contact tip is worn, liner plugged or loose.  
Drive rolls worn out.  
Brake pressure too tight.



VANGUARD STEEL LTD.



# WELDING WIRES

## Mig / Mag Welding Trouble Shooting Guide

### Fault or defect:

### Probable cause:

#### Poor Weld Starts

Voltage too low.  
Too much stick out (stubbing).  
Wire not clipped on an angle (stubbing).

#### Excessive Spatter

Voltage too low.  
Change gas selection ( from CO-2 to Steelmix )  
Change polarity.

#### Burn Through

Current too high.  
Travel speed too slow.  
Too large a gap  
Change gas selection ( from CO-2 to Steelmix )

#### Convex Bead

Voltage/current too low.  
Too much stick out.  
Voltage loss due to poor connections.

**The two most common causes of wire feeding problems are;  
Worn Contact tips &  
a plugged or improperly installed liner.**

### Weld Parameters;

#### Short Arc .035 wire

16 to 17 volts  
90 to 160 amps  
1/4" stick out

#### Spray Arc .045 wire

26 to 29 volts  
220 + amps  
5/8" stick out



VANGUARD STEEL LTD.



# METINOX

The complete range of surface treatment for stainless steel, nickel and copper-nickel alloys

## Metinox® 71E

### Pickling Paste

A translucent paste containing hydrofluoric and nitric acid, thickened to give a highly active paste economical in use.

#### APPLICATION

To remove oxide scale and clean heat affected zones.



Product Code	
2 kg	7201 0002
10 kg	7201 0010

## Metinox® 73E

### Spray Pickle

A translucent creamy liquid containing hydrofluoric and nitric acid. Thixotropic properties enable vertical surfaces to be effectively coated by spraying.

#### APPLICATION

To remove oxide scale, to clean heat affected zones and to pickle large surfaces in one operation. Final surface quality comparable with bath pickling.



Product Code	
10 kg	7202 0010
30 kg	7202 0030

## Metinox® 73E Plus

### Spray Pickle

Enhanced formula for even better pickling

#### APPLICATION

See above, same as for Metinox 73E.



Product Code	
10 kg	7202 0010
30 kg	7202 0030

## Metinox M1 Spray Pump

A compressed air operated, double-membrane pump made of synthetic acid resistant materials, Maximum allowable air pressure: 7 bar. Air pressure for spraying Metinox 73E: 2-4 bar.

## Metinox® 75E

### Surface Cleaner

A mild solution containing phosphoric acid and surfactants for cleaning and brightening surfaces which are dirty and greasy.

#### APPLICATION

To clean and brighten the surface and to remove rust marks, grease, oil and other contaminants.



Product Code	
1 kg	7203 0001
5 kg	7203 0005

## Metinox® 76E

### Pickle Cleaner

For mat and shining stainless steel surfaces.

#### APPLICATION

To remove foreign corrosion and to brighten metal surfaces. Remove heat tint on shining stainless steel surfaces. Cleans and degreases without making the surface mat. Metinox 76E is suitable for the cleaning of aluminium.







VANGUARD STEEL LTD.



# METINOX

The complete range of surface treatment for stainless steel, nickel and copper-nickel alloys

<b>Metinox® 80E</b>	<b>APPLICATION</b>		<table border="1"> <tr><th colspan="2">Product Code</th></tr> <tr><td>5 kg</td><td>7204 0005</td></tr> <tr><td>25 kg</td><td>7204 0030</td></tr> </table>	Product Code		5 kg	7204 0005	25 kg	7204 0030
Product Code									
5 kg	7204 0005								
25 kg	7204 0030								
<p><b>Bath Pickle</b></p> <p>A liquid containing nitric acid.</p>	<p>To remove oxide scale, to clean heat affected zones and surface on items which require treatment by dipping. Will give uniform surface finish. Application only in accordance with operating instructions. Please request.</p>								
<b>Metinox® 90E</b>	<b>APPLICATION</b>		<table border="1"> <tr><th colspan="2">Product Code</th></tr> <tr><td>5 kg</td><td>7205 0005</td></tr> <tr><td>30 kg</td><td>7205 0030</td></tr> </table>	Product Code		5 kg	7205 0005	30 kg	7205 0030
Product Code									
5 kg	7205 0005								
30 kg	7205 0030								
<p><b>Passivating Solution</b></p> <p>A liquid containing nitric acid.</p>	<p>To accelerate the formation of chromium oxide passive layer after mechanical surface finishing.</p>								
<b>Metinox® NP</b>	<b>APPLICATION</b>		<table border="1"> <tr><th colspan="2">Product Code</th></tr> <tr><td>2 kg</td><td>7206 0002</td></tr> <tr><td>10 kg</td><td>7206 0010</td></tr> </table>	Product Code		2 kg	7206 0002	10 kg	7206 0010
Product Code									
2 kg	7206 0002								
10 kg	7206 0010								
<p><b>Neutralizing Paste</b></p> <p>A white creamy paste, slightly alkaline with no harmful ingredients.</p>	<p>To neutralize strongly acidic, hydrofluoric pickling pastes for safe removal and disposal.</p>								



VANGUARD STEEL LTD.



## METINOX

The complete range of surface treatment for stainless steel, nickel and copper-nickel alloys

### ANTOX® 71 E

Translucent Pickling Paste for Stainless Steels

A Product of the Chemetall Group



### Field of Application

The Removal of high temperature oxide scale and annealing colors in the areas of weld seams and heat-influenced zones.

### Working Tools

- Antox pickling brushes of acid-resistant materials for repeated use or
- Antox disposable brushes of synthetic materials (see separate working tools list).

### Application and Procedure

Before commencing work, safety precautions must be observed and protective equipment made use of.

Antox 71 E is to be stirred with a plastic or wood stirrer before use, or shaken briefly.

Antox 71 E is to be painted generously on the pickling positions. The reaction time should be observed. Neutralization is then to be undertaken with Antox NP, after consulting the relative application instructions (see Notes on Antox NP). Upon completion, the processed surface is to be rinsed under cold water, using a high pressure water jet appliance (at pressure at least 120 bar).

The rinsing effect can be improved and enhanced by employing plastic or stainless steel wire brushes.

### Reaction Time Periods

Rusty and acid-resistant steels, stainless steels	15 - 60 minutes
Nickel and nickel alloys	5 - 20 minutes
Copper-nickel alloys	5 - 20 minutes

The reaction time period is dependent on the quality of the working materials treated as well as on the ambient air-and materials-temperature. The optimal pickling temperature is around 18° - 22° C. Work routines should be avoided in direct sunlight (due to hazard of premature drying).

### Yield

1 kg of Antox 71 E is sufficient for 50 - 80 running meters approx. of weld seam with heated area.



**VANGUARD STEEL LTD.**



## **METINOX**

**The complete range of surface treatment for  
stainless steel, nickel and copper-nickel alloys**

### **General Remarks**

Antox 71 E contains no hydrochloric acid and no chloride.

### **Notes on hazards and suggestions for safety precautions**

Antox 71 E contains hydrofluoric acid and nitric (azotic) acid.

Extremely toxic when inhaled or swallowed. Contact with the skin can cause severe acid burns. Work routines should be carried out in a well ventilated area. Store also in a well ventilated enclosure (the cans should be tightly closed). Breathing apparatus should be used when ventilation facilities are insufficient. Appropriate protective goggles, gloves and clothing should be worn while working.

Contact with eyes should be treated by thorough rinsing with water and thereafter a doctor should be consulted. Contaminated and soaked protective clothing should be immediately changed. A doctor should be consulted if nausea is experienced. (the physician should be shown the notes on safety precautions, the product notes or the product label).

Please also observe the detailed information given in the German DIN Standard "SIDA" safety data sheet.

These products should not be accessible by children. The products are only intended for commercial and industrial use.

### **Disposal of Waste**

Neither Antox 71 E nor the rinsing water may be disposed of in the public sewers in an untreated state. The waste water is acidic and contains alloy residue solids from the treated metal. Appropriate treatment should be carried out in suitable neutralisation plant or disposal undertaken via a licensed waste disposal enterprise. All local waste water public sewerage regulation are to be observed.

**This edition replaces all previous editions, which then lose their validity. The information and details are given to the best of our knowledge and belief, and conform, at the time of going to print, to the forementioned experience in laboratory situations and in practice. These are however only to be understood as non-binding guidelines, which will all have to be adjusted individually to meet the requirements of every situation in practice. As the application and use of our products are outside our control and influence, we can only accept liability for the irreproachable, standard quality of the products at the moment in time of delivery. Any consequential damage will only be addressed when the possibility of such as been previously agreed in writing before application and use, by making reference to the advertised and warranted characteristics and effects.**



VANGUARD STEEL LTD.



## METINOX

The complete range of surface treatment for stainless steel, nickel and copper-nickel alloys

### ANTOX® 71 E Extra

Translucent Pickling Paste for Stainless Steels

A Product of the Chemetall Group



#### Field of application

The removal of high temperature oxide scale and annealing colors in the areas of weld seams and heat-influenced zones.

#### Working Tools

- Antox pickling brushes of acid-resistant materials for repeated use or
- Antox disposable brushes of synthetic materials (see separate working tools list).

#### Application and Procedure

Before commencing work, safety precautions must be observed and protective equipment made use of.

Antox 71 E Extra is to be stirred with a plastic or wood stirrer before use, or shaken briefly

Antox 71 E Extra is to be painted generously on the pickling positions. The reaction time should be observed.

Neutralization is then to be undertaken with antox NP, after consulting the relative application instructions (see Notes on Antox NP). Upon completion, the processed surface is to be rinsed under cold water, using a high pressure water jet appliance (at a pressure of at least 120 bar). The rinsing effect can be improved and enhanced by employing plastic or stainless steel wire brushes.

#### Reaction Time Periods

Rusty and acid-resistant steels, stainless steels	15 - 60 minutes
Nickel and nickel alloys	5 - 20 minutes
Copper-nickel alloys	5 - 20 minutes

The reaction time period is dependent on the quality of the working materials treated as well as on the ambient air-and materials-temperature. The optimal pickling temperature is around 18° - 22° C. Work routines should be avoided in direct sunlight (due to hazard of premature drying).

#### Yield

1 kg of Antox 71 E Extra is sufficient for 50 - 80 running meters approx. of weld seam with heated area.



**VANGUARD STEEL LTD.**



## **METINOX**

**The complete range of surface treatment for  
stainless steel, nickel and copper-nickel alloys**

### **General Remarks**

Antox 71 E Extra contains no hydrochloric acid and no chlorides.

### **Notes on hazards and suggestions for safety precautions**

Antox 71E Extra contains hydrofluoric acid and nitric (azotic) acid.

Very toxic when breathed in and swallowed. Contact with the skin causes severe acid burns.

Process and store in a well-ventilated place (the cans should be tightly closed.) Breathing apparatus should be used when ventilation facilities are insufficient. Appropriate protective goggles, gloves and clothing should be worn while working.

Contact with eyes should be treated by thorough rinsing with water and thereafter a doctor should be consulted. Contaminated and soaked protective clothing should be immediately changed. A doctor should be consulted if nausea is experienced. (the physician should be shown the notes on safety precautions, the product notes or the product label).

Please also observe the detailed information given in the German DIN Standard "SIDA" safety data sheet.

These products should not be accessible by children. The products are only intended for commercial and industrial use.

### **Disposal of Waste**

Neither Antox 71 E Extra nor the rinsing water may be disposed of in the public sewers in an untreated state. The waste water is acidic and contains alloy residue solids from the treated metal. Appropriate treatment should be carried out in suitable neutralisation plant or disposal undertaken via a licensed waste disposal enterprise. The local waste water regulations are to be observed.

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VANGUARD STEEL LTD.



## METINOX

The complete range of surface treatment for stainless steel, nickel and copper-nickel alloys

### ANTOX® 75 E

Pickling Cleaner

A Product of the Chemetall Group



### Field of application

For the removal of extraneous rust and brightening of metal surfaces. Cleans without corroding the surface of the stainless steels.

### Working Tools

- Antox pickling brushes of acid-resistant materials for repeated use or
- Antox disposable brushes of synthetic materials for application by hand
- Pickling hand spray, of resistant plastic, irrespective of a compressed air connection, for applying in the spray method.

### Application and Procedure

Before commencing work, safety precautions must be observed and protective equipment made use of.

Antox 75 E is ready to use and is applied unthinned to the dry surface by means of a brush or pickling hand spray.

The effect of Antox 75 E can be supported by the use of an abrasive fabric. The reaction time should be observed.

Upon completion, the processed surface is to be rinsed under cold water. Rinse until the water is neutral (check with indicator paper).

### Reaction Time Periods

Rust and acid-resistant steels, stainless steels	20 - 30 minutes
15 - 60 minutes	5 - 20 minutes.

The reaction time period is dependent on the quality of the working materials treated as well as on the temperature of the ambient air and materials. The optimal cleaning temperature is around 18 - 22°C. Work routines should be avoided in direct sunlight ( due to hazard of premature drying)

### Yield

1 kg of antox 75 E is sufficient for approx. 20 m<sup>2</sup> of surface area.



**VANGUARD STEEL LTD.**



## **METINOX**

**The complete range of surface treatment for  
stainless steel, nickel and copper-nickel alloys**

### **General Remarks**

Antox 75 E contains no hydrochloric acid and no chlorides.

### **Notes on hazards and suggestions for safety precautions**

Antox 75 E contains phosphoric acid.

Extremely toxic when swallowed. Contact with the skin causes acid burns.

Process and store in a well-ventilated place ( the cans should be tightly closed). Breathing apparatus should be used when ventilation facilities are insufficient. Appropriate protective goggles, gloves and clothing should be worn while working. Contact with eyes should be treated by thorough rinsing with water and thereafter a doctor should be consulted. Contaminated and soaked protective clothing should be immediately changed. A doctor should be consulted if nausea is experienced ( the doctor should be shown the notes on safety precautions, the product notes or product label).

Please also observe the detailed information given in the German DIN standard "SIDA" safety data sheet. These products should not be accessible to children. For commercial and industrial use only.

### **Disposal of Waste**

Neither Antox 75 E nor the rinsing water may be disposed of on the public sewers in an untreated state. The waste water is acidic and contains metal oxides from the treated metal. Appropriate treatment should be carried out in suitable neutralisation plant or disposal undertaken via a licensed waste disposal enterprise. The local waste water regulations are to be observed.

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**VANGUARD STEEL LTD.**



## **METINOX**

**The complete range of surface treatment for  
stainless steel, nickel and copper-nickel alloys**

### **General Remarks**

Antox 80 E contains no hydrochloric acid and no chlorides.

### **Notes on hazards and suggestions for safety precautions**

Antox 80 E contains hydrofluoric acid and nitric (azotic) acid.

Very toxic when breathed in and swallowed. Contact with the skin causes severe acid burns.

Process and store in a well-ventilated place ( the cans should be tightly closed). Breathing apparatus should be used when ventilation facilities are insufficient. Appropriate protective goggles, gloves and clothing should be worn while working. Contact with eyes should be treated by thorough rinsing with water and thereafter a doctor should be consulted. Contaminated and soaked protective clothing should be immediately changed. A doctor should be consulted if nausea is experienced ( the doctor should be shown the notes on safety precautions, the product notes or product label).

Please also observe the detailed information given in the German DIN standard "SIDA" safety data sheet. These products should not be accessible to children. For commercial and industrial use only.

### **Disposal of Waste**

Neither Antox 80 E nor the rinsing water may be disposed of in the public sewers in an untreated state. The waste water is acidic and contains alloy residue solids from the treated metal.

Appropriate treatment should be carried out in a suitable neutralisation plant or disposal undertaken via a licensed waste disposal enterprise. The local waste water regulations are to be observed.

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**VANGUARD STEEL LTD.**



## **METINOX**

**The complete range of surface treatment for  
stainless steel, nickel and copper-nickel alloys**

### **General Remarks**

Antox 90 E contains no hydrochloric acid and no chlorides.

### **Notes on hazards and suggestions for safety precautions**

Antox 90 E contains nitric (azotic) acid.

Very toxic when breathed in and swallowed. Contact with the skin causes severe acid burns.

Process and store in a well-ventilated place ( the cans should be tightly closed). Breathing apparatus should be used when ventilation facilities are insufficient. Appropriate protective goggles, gloves and clothing should be worn while working. Contact with eyes should be treated by thorough rinsing with water and thereafter a doctor should be consulted. Contaminated and soaked protective clothing should be immediately changed. A doctor should be consulted if nausea is experienced ( the doctor should be shown the notes on safety precautions, the product notes or product label).

Please also observe the detailed information given in the German DIN standard "SIDA" safety data sheet. These products should not be accessible to children. For commercial and industrial use only.

### **Disposal of Waste**

Neither Antox 90 E or the rinsing water may be disposed of in the public sewers in an untreated state. The waste water is acidic and contains alloy residue solids from the treated metal.

Appropriate treatment should be carried out in a suitable neutralisation plant or disposal undertaken via a licensed waste disposal enterprise. The local waste water regulations are to be observed.

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VANGUARD STEEL LTD.



## METINOX

The complete range of surface treatment for stainless steel, nickel and copper-nickel alloys

### ANTOX® NP

Neutralizing Paste

A Product of the Chemetall Group



### Field of Application

Neutralizes very acidic stainless steel pickling pastes containing hydrofluoric acid.

### Working Tools

- Antox pickling brushes of acid-resistant materials for repeated use or
- Antox disposable brushes of synthetic materials (see separate working tools list.)

### Application and Procedure

Before commencing work, safety precautions must be observed and protective equipment made use of.

Antox NP is to be stirred with a plastic or wood stirrer before use, or shaken briefly.

After the pickling process, Antox NP is applied with the brush onto the areas treated with the stainless steel pickling paste (e.g. Antox 71 E ) and mixed well with the residues of the pickling paste. The reaction time should be observed.

Upon completion, the processed surface is to be rinsed under cold water, using a high pressure water jet appliance ( at pressure of at least 120 bar ). The rinsing effect can be improved and enhanced by employing plastic or stainless steel wire brushes.

### Reaction Time Periods

Neutralization has ended when no more bubbles are seen to be formed.

The optimal application temperature is around 18 - 20°C. Work routines should be avoided in direct sunlight ( due to hazard of premature drying ).

### Yield

Sufficient neutralization requires roughly the same quantity of Antox NP ( 1kg = approx. 50 - 80 running meters) as stainless steel pickling paste is applied for pickling.



**VANGUARD STEEL LTD.**



## **METINOX**

**The complete range of surface treatment for  
stainless steel, nickel and copper-nickel alloys**

### **Notes on hazards and suggestions for safety precautions**

Antox NP is mildly alkaline.

Please observe the detailed information given in the German DIN standard "SIDA" safety data sheet. These products should not be accessible to children. For commercial and industrial use only.

### **Disposal of Waste**

Neither Antox NP nor the rinsing water may be disposed of in the public sewers in an untreated state. The waste water is acidic and contains alloy residue solids from the treated metal. Appropriate treatment should be carried out in a suitable neutralisation plant or disposal undertaken via a licensed waste disposal enterprise. The local waste water regulations are to be observed.

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