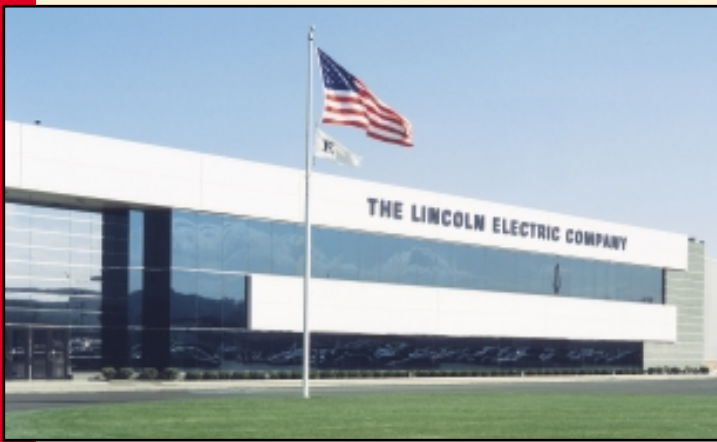


INNERSHIELD® WIRES



Self-Shielded, Flux-Cored Wires



About The Lincoln Electric Company

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

Lincoln is truly your "One Source" when it comes to welding. We're a company that continually rededicates itself to the equally important goals of exceptional quality, and exceptional service. Our field support team — with hundreds of field sales engineers and thousands of knowledgeable and responsive Lincoln distributors in countries all over the world — is the largest in the industry.

Innovative thinking. A quality and service-first attitude. Fresh approaches to design, manufacturing, and packaging. Worldwide strength. That's Lincoln Electric.

Lincoln's Innershield® Wire

Innershield wire by Lincoln Electric is one of the most user-friendly, convenient, versatile wires on earth. This exceptionally feedable and consistent wire includes shielding, slagging and deoxidizing materials built right in to its inner core. That means no external gas bottles or flux on the job! It's a superb choice for bridges, offshore drilling rigs, and other outside welding applications where winds are a factor.

- Shielding, slagging and deoxidizing materials are built right in to the inner core.
- No need for external gas or flux.
- Many Innershield wires to choose from – a perfect wire for every application.
- One of the most user-friendly welding processes on the market today.
- A great choice for use in moderately windy conditions.
- As with all of our wires, Innershield's arc characteristics are outstanding! That's because we pay more attention to chemistry, quality of raw materials, and manufacturing processes than any wire manufacturer in the world!
- Best of all, Innershield is designed and built by Lincoln Electric. Our company is all about innovative thinking – about listening and responding to the needs of welding professionals – about finding ways to make welding quicker, stronger, and more efficient.

Advantage Lincoln

More precise control. Innershield's open arc process allows the operator to control the placement of the weld metal and the puddle with exceptional accuracy.

More consistent weld deposits. Innershield performs better because Innershield is built better. The best raw materials, The best manufacturing processes. The best quality control systems.

Versatility. No matter what welding positions your job requires, there's an Innershield wire specifically designed to handle it. We've provided individual wire descriptions in this brochure that will make it easy for you to choose the right Innershield product for your needs.

Better portability. Because Innershield is completely self-contained – with shielding, slagging and deoxidizing materials built right in to the wire's core – there's no need for flux feeding systems or gas bottles. That means increased portability of your rigs, and more efficient welding operations.

Better feedability. We've coated Innershield wire with specially designed lubricants that keep the wire feeding beautifully – inch after inch, coil after coil.

Typical Applications

Innershield wire is a great choice for a wide range of applications, including:

- Automotive
- Truck & Trailers
- Construction, Farm & Mining Equipment
- Bridges
- Buildings
- Storage Tanks
- Ships & Barges
- Offshore Oil Drilling Platforms
- Pipelines
- Structural Fabrication
- Maintenance & Repair



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INNERSHIELD® ELECTRODE SELECTION GUIDE

Electrode Name	AWS Classification	General Description	Page No.
High Speed Single Pass Welding			
Innershield NR-1 & NR-5	E70T-3	Good for high speed flat and horizontal single pass automatic welding applications, especially circumferential welds with overlapping. Recommended for materials with a thickness not greater than 3/16" (4.8mm).	6-7
Innershield NR-131	E70T-10	For automatic and semiautomatic high speed, single pass welding on sheet metal with a thickness of .11" (2.8mm) or more. A solid performer for twin arc welding applications, especially in flat, horizontal, and automatic roundabout positions. Good deposition rates and travel speeds.	8-9
Innershield NR-152	E71T-14	Designed for high speed, single pass automatic and semiautomatic welding on materials from .030 - 3/16" (0.8 - 4.8mm). A good choice for bare, galvanized, specialty zinc-coated, Galvanneal, aluminized, or carbon steels.	10-11
General Purpose Welding			
Innershield NR-202	E71T-7	Excellent for all position welding. Can make very small welds at high travel speeds. Cost-effective tacking wire than can join carbon steel with other higher strength steels.	12-13
Innershield NR-211-MP	E71T-11	Versatile wire suitable for all position welding of light gauge steel or thin plate up to 1/2" (12.7mm). Low spatter and excellent weld appearance make it a favorite with operators.	14-15
Innershield NR-212	E71TG-G	A good choice for general purpose, all position welding. Produces smooth welds with excellent appearance. Designed for single and multiple pass semiautomatic and automatic welding of mild steel, sheet metal, plate and coated steel. Low spatter level. Handles poor fit-up well.	16-17
Structural Fabrication Welding			
Innershield NR-203M ⁽¹⁾	E71T-8J	Use in flat, horizontal, vertical up and overhead positions on mild and low alloy steels. Good arc action and low spatter. Meets minimum Charpy V-Notch properties for seismic applications.	18-19
Innershield NR-203MP ⁽¹⁾	E71T-8J	Great for all position, single and multiple pass welding with mild steel and some low alloy steels. Handles poor fit-up on heavy wall tubes and gaps up to 3/8" (9.5mm) with 1/4" (6.4mm) offset. Meets minimum Charpy V-Notch properties for seismic applications.	20-21
Innershield NR-203 Nickel (1%) ⁽¹⁾	E71T8-Ni1	Use for all position, single and multiple pass welding on mild steel and some low alloy steels. Performs well in automatic and semiautomatic applications. Produces a nickel bearing weld deposit with Charpy V-Notch properties at low temperatures. Can weld gaps up to 3/8" (9.5mm). Meets minimum Charpy V-Notch properties for seismic applications.	22-23

⁽¹⁾ Meets minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997.

INNERSHIELD® ELECTRODE SELECTION GUIDE

Electrode Name	AWS Classification	General Description	Page No.
Structural Fabrication Welding - Cont'd			
Innershield NR-203 Nickel C	E61T8-K6	Designed for single and multiple pass welding in automatic and semiautomatic applications. Good for low temperature alloys. Produces a nickel bearing weld deposit with good Charpy V-Notch properties at low temperatures.	24-25
Innershield NR-203 Ni C Plus ⁽¹⁾	E71T8-K2	Similar to NR-203 Nickel C, but with increased capability to join higher strength steels. Handles poor fit-up in the vertical up position and welds gaps up to 1/4" (6.4mm) with offsets up to 1/4" (6.4mm).	26-27
Innershield NR-232 ⁽¹⁾	E71T-8	A popular choice because of its high deposition rates with out-of-position welding. Designed for single and multiple pass welding of 3/16" (4.8mm) and heavier mild steel, as well as some low alloy steels. Self-peeling slag. Excellent Charpy V-Notch properties.	28-29
Innershield NR-305 ⁽¹⁾	E70T-6	Great for downhand welding applications where high deposition rates and good penetration are desired. Designed for use with mild steel and some low alloy steels on single and multiple pass, automatic and semiautomatic welding. Excellent operator appeal.	30-31
Innershield NR-311	E70T-7	Very high deposition rates and fast travel speeds. Welds thicker mild steels and some low alloy steels. Good bead shape and easy slag removal. Resists weld cracking.	32-33
Innershield NR-311 Ni ⁽¹⁾	E70T7-K2	Similar to NR-311, but with Charpy V-Notch properties. Designed for downhand, flat and horizontal welding on 1/8" (3.2mm) and thicker mild steel and some low alloy steels. High deposition rates and fast travel speeds. Produces a 1.5% nickel deposit for good low temperature notch toughness. Good Charpy V-Notch properties.	34-35
Innershield NS-3M	E70T-4	Extremely high deposition rate wire designed for automatic and semiautomatic welding on mild steel and some low alloy steels. Resistant to cracking on high sulfur steel and porosity on mildly rusty, oily or dirty plates. Soft, low penetrating arc.	36-37
Pipe Fabrication			
Innershield NR-207 & NR-207-H	E71T8-K6	Optimum performance on vertical down, hot, fill and cap passes on standard cross-country pipelines and arctic grade pipe. Excellent crack resistance and CTOD and Charpy V-Notch properties. Meets API Pipe Grade X42 and X70 requirements.	38-39
Innershield NR-208-H	E91T8-G	Similar to NR-207-H, but with lower hydrogen and higher strength. Produces weld deposits exceeding 80,000 psi yield strength with excellent low temperature impacts. Meets API Pipe Grade X80 requirements.	40-41

⁽¹⁾ Meets minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997.

Great choices for flat and horizontal single pass automatic welds on sheet metal with a thickness of 3/16" (4.8mm) or less.

Both electrodes are built to perform in high speed automatic welding applications. NR-1 is especially designed for circumferential welds where the weld's finish overlaps its start.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Designed for high travel speeds – up to 170 inches (4.3m) per minute.

- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

NR-1

- Straight welds.
- Roundabouts that overlap the start.
- Through welds on material up to 12 gauge.
- Joints susceptible to slag trapping.

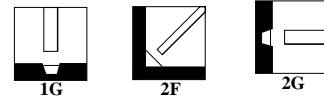
NR-5

- 3-o'clock position welds.
- Can also be used for welds that require 100% penetration with copper back-up.
- NR-5 (3/32") diameter can also be used in semiautomatic applications.

NOTES:

- NR-1 and NR-5 are not recommended for welding steel that is more than 3/16" (4.8mm) thick.
- NR-1 and NR-5 are also not recommended for welding that requires multiple passes.

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E70T-3
ASME SFA-5.20: E70T-3

DIAMETERS / PACKAGING

Diameter Inches (mm)	600 Lb. Speed Feed [®] Drum	600 Lb. Speed Feed Reel
NR-1		
.120 (3.0)	EDS12150	
5/32 (4.0)	EDS12153	
NR-5		
3/32 (2.4)	ED012699	ED012701
.120 (3.0)	ED012696	ED012698

MECHANICAL PROPERTIES - As Welded per AWS A5.20

	Transverse Tensile Strength psi (MPa)	Longitudinal Bend Test	Hardness Rockwell B
Requirements AWS E70T-3	70,000 (480) min.	180° over 3/4" Radius No openings exceeding 1/8"	--
Test Results Typical NR-1	72,000 - 79,000 (496 - 545)	Passed	95
Test Results Typical NR-5	73,000 - 81,000 (503 - 558)	Passed	99

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.120" NR-1 DC+ 1-1/4" (32mm) 2.63 lbs/1000"	160 (4.1)	21 - 22	500	25.2 (11.4)	22.0 (10.0)	87
	200 (5.1)	22 - 23	610	31.6 (14.3)	28.0 (12.7)	89
	240 (6.1)	23 - 24	700	37.9 (17.2)	33.0 (15.0)	87
	295 (7.5)	24 - 25	810	46.5 (21.1)	40.0 (18.1)	86
	320 (8.1)	25 - 26	850	50.5 (23.0)	43.0 (19.5)	85
5/32" NR-1 DC+ 1-1/8 - 1-3/8" (28-35mm) 4.07 lbs/1000"	100 (2.5)	21 - 22	630	24.0 (10.9)	19.2 (8.7)	80
	110 (2.8)	22 - 23	680	26.4 (12.1)	21.2 (9.6)	80
	130 (3.3)	23 - 24	780	31.2 (14.2)	25.4 (11.5)	81
	150 (3.8)	24 - 25	860	36.0 (16.3)	29.5 (13.4)	82
	180 (4.6)	25 - 26	960	43.2 (20.1)	35.7 (16.2)	83
3/32" NR-5 DC+ 1" (25mm) 1.60 lbs/1000"	100 (2.5)	22 - 23	500	9.9 (4.5)	7.8 (3.5)	77
	150 (3.8)	23 - 24	435	14.8 (6.7)	12.3 (5.6)	83
	200 (5.1)	24 - 25	510	19.8 (9.0)	16.9 (7.7)	85
	250 (6.4)	25 - 26	575	24.7 (11.2)	21.4 (9.7)	87
.120" NR-5 DC+ 1" (25mm) 2.46 lbs/1000"	130 (3.3)	22 - 23	500	18.0 (8.2)	16.7 (7.6)	93
	165 (4.2)	23 - 24	600	23.0 (10.4)	20.9 (9.5)	91
	205 (6.5)	24 - 25	700	28.5 (12.9)	25.6 (11.6)	90
	255 (6.5)	25 - 26	800	35.5 (16.1)	31.5 (14.3)	90

NOTE: Because of the exceptionally high arc speeds, welding parameters, joint positioning, and electrode wire placement critically affect the weld results, publication C3.2410 should be consulted for important variables that must be controlled for depositing consistently acceptable welds of NR-1. These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al	%Ti
Requirements AWS E70T-3 per A5.20				Not Required			
Test Results⁽¹⁾ NR-1	.21	1.30	.007	.014	.59	.03	.15
Test Results⁽¹⁾ NR-5	.19	.88	.006	.017	.33	.08	.33

⁽¹⁾ Chemistry of single pass welds is highly dependent upon base metal chemistry and dilution. Analysis shown are for information purposes only.

Use NR-131 Innershield wire for automatic and semiautomatic high speed, single pass welds on sheet metal with a thickness of .11" (2.7mm) or more.

Designed to perform well in twin-arc welding applications, especially in flat, horizontal, and automatic roundabout positions.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Excellent deposition rates.
- High travel speeds.
- A great choice for welds that join light steel to heavier members.

- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

Single Arc:

- 1/8" (3.2mm) and 3/16" (4.8mm) fillet welds with travel speeds up to 75 in/min (1.9 m/min).

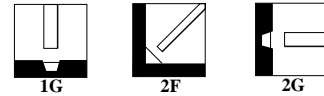
Twin Arc:

- 1/4" (6.4mm) and 5/16" (8.0mm) fillet welds with travel speeds up to 75 in/min (1.9 m/min).
- An excellent performer on fillets and laps. NR-131 is also a good choice for corner, edge and butt joints.

NOTES:

- NR-131 should not be used for applications requiring Charpy V-Notch properties.

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E70T-10
ABS: E70T-10

DIAMETERS / PACKAGING

Diameter Inches (mm)	50 Lb. Coil	600 Lb. Speed Feed® Reel	600 Lb. Speed Feed Drum
NR-131 3/32 (2.4)	EDS12162	ED012163	

MECHANICAL PROPERTIES - As Welded per AWS A5.20

	Transverse Tensile Strength psi (MPa)	Longitudinal Bend Test	Hardness Rockwell B
Requirements AWS E70T-10	70,000 (480) min.	180° over 3/4" Radius No opening exceeding 1/8"	--
Test Results	73,000 - 82,000 (503 - 565)	Passed	90

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
3/32" Single Arc DC- 1-1/4" (32mm) 1.580 lbs/1000"	150 (3.8)	25 - 26	390	14.3 (6.5)	11.6 (5.3)	81
	200 (5.1)	25 - 27	490	19.0 (8.6)	15.6 (7.1)	82
	250 (6.4)	26 - 27	570	23.7 (10.8)	19.6 (8.9)	82
	350 (8.9)	26 - 28	720	33.1 (15.0)	27.6 (12.5)	83
3/32" Twinarc DC- 1-1/2" (38mm) 3.160 lbs/1000"	425 (10.8)	27 - 28	810	40.1 (18.2)	33.6 (15.2)	83
	130 (3.3)	25 - 26	550	24.5 (11.1)	17.9 (8.1)	72
	175 (4.4)	26 - 27	740	33.0 (15.0)	26.4 (12.0)	79
	225 (5.7)	26 - 28	910	42.5 (19.3)	34.8 (15.8)	81
1-1/2" (38mm) 3.160 lbs/1000"	275 (7.0)	27 - 29	1030	51.9 (23.5)	42.0 (19.1)	80
	325 (8.3)	28 - 30	1090	61.4 (27.9)	48.2 (21.9)	78

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements						
AWS E70T-10 per A5.20	.23	.45	/006	.004	.25	1.17
Test Results⁽¹⁾	.252	.53	.008	.009	.21	1.55

⁽¹⁾ Chemistry of single pass welds is highly dependent upon base metal chemistry and dilution. Analysis shown are for information purposes only.

NOTE: NR-131 will not produce weld deposits meeting the minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997. For these and other applications specifying notch toughness, the following Innershield electrodes should be considered: NR-203MP, NR-203 Nickel C Plus, NR-203 Nickel (1%), NR-232, NR-305, NR-311 Ni.

NR-152 is an excellent wire for automatic and semiautomatic welding on steels including bare, galvanized, specialty zinc-coated, Galvanneal^{®(1)}, aluminized, or carbon.

Designed for high speed, single pass welding on materials from .030" to 3/16" (1.2mm - 4.8mm).

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- A great choice for coated steels.
- NR-152's exceptionally soft arc means less burnthrough on thin gauge materials.
- An operator favorite!

- Excellent overlapping capabilities. Use NR-152 for roundabouts, or to repair itself.
- Fast, sure restarts with no end clipping necessary.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

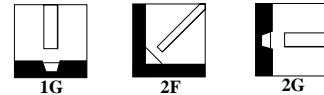
TYPICAL APPLICATIONS

- Spot or stitch welds up to .030" (0.8mm) thick sheet metal.
- Continuous welds on .048" (1.2mm) in a travel speed range of 40-60 in/min (1.0-1.5m/min).
- Continuous welds on coated steels in a travel range of 30-40 in/min (0.7-1.0 m/min).

NOTES:

- NR-152 should not be used for applications requiring Charpy V-Notch properties.
- The preferred drag angle is 15°. However, NR-152 is capable of welding at zero drag angle, facilitating easy fixturing in automatic applications.

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E71T-14

DIAMETERS / PACKAGING

Diameter Inches (mm)	25 Lb. Spool	50 Lb. Coil	500 Lb Speed Feed [®] Drum	600 Lb. Speed Feed Drum	600 Lb. Speed Feed Reel
.045 (1.1)	EDS01702				
.052 (1.3)	EDS01703				
.062 (1.6)	EDS01021	ED012185	ED024301		
.068 (1.7)		ED012186	ED019580		ED019579
5/64 (2.0)		EDS12187		ED024265	

MECHANICAL PROPERTIES - As Welded per AWS A5.20

	Transverse Tensile Strength psi (MPa)	Longitudinal Bend Test	Hardness Rockwell B
Requirements AWS E71T-14	72,000 (497) min.	180° over 3/4" Radius No opening exceeding 1/8"	--
Test Results	72,000 - 82,000 (496 - 565)	Passed	93

(1) Galvanneal is a registered trademark of Keystone Consolidated Industries, Inc., Peoria, IL.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.045" DC- 3/8" (10mm) .392 lbs/1000"	60 (1.5)	15 - 16	95	1.3 (0.5)	1.1 (0.5)	84
	90 (2.3)	16 - 17	135	2.1 (0.9)	1.8 (0.8)	85
	120 (3.0)	17 - 18	160	2.8 (1.2)	2.5 (1.1)	89
	150 (3.8)	18 - 19	180	3.4 (1.5)	3.1 (1.4)	91
.052" DC- 3/8" (10mm) .500 lbs/1000"	55 (1.4)	16 - 17	100	1.7 (0.7)	1.6 (0.7)	94
	90 (2.3)	17 - 18	150	2.6 (1.1)	2.4 (1.1)	92
	110 (2.8)	18 - 19	170	3.5 (1.5)	2.9 (1.3)	82
	130 (3.3)	19 - 20	190	3.8 (1.7)	3.5 (1.6)	92
.062" DC- 3/8" (10mm) .736 lbs/1000"	30 (0.8)	13 - 14	90	1.3 (0.5)	1.2 (0.5)	92
	40 (1.0)	14 - 15	115	1.8 (0.8)	1.6 (0.7)	88
	50 (1.3)	15 - 16	140	2.2 (0.9)	2.0 (0.9)	90
	70 (1.8)	16.5 - 17.5	185	3.1 (1.4)	2.8 (1.3)	90
	110 (2.8)	19 - 20	265	4.8 (2.1)	4.4 (2.0)	91
.068" DC- 1/2" (13mm) .910 lbs/1000"	30 (0.8)	13 - 14	68	1.6 (0.7)	1.4 (0.6)	87
	40 (1.0)	13.5 - 14.5	95	2.2 (0.9)	1.9 (0.9)	86
	50 (1.3)	14.5 - 15.5	120	2.7 (1.2)	2.4 (1.1)	88
	60 (1.5)	15.5 - 16.5	145	3.3 (1.4)	2.9 (1.3)	87
	80 (2.0)	16.5 - 17.5	190	4.4 (1.9)	3.9 (1.8)	88
	110 (2.8)	20 - 21	240	6.0 (2.7)	5.4 (2.4)	90
5/64" DC- 3/4" (19mm) 1.15 lbs/1000"	40 (1.0)	16 - 17	125	2.8 (1.2)	2.5 (1.1)	89
	70 (1.8)	18 - 19	230	4.8 (2.1)	4.3 (1.9)	89
	80 (2.0)	19 - 20	260	5.5 (2.4)	4.9 (2.2)	89
	100 (2.5)	21 - 22	310	6.9 (3.1)	6.1 (2.7)	88
	125 (3.2)	24 - 25	355	8.6 (3.9)	7.6 (3.4)	88

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements AWS E71T-14 per A5.20			Not Required			
Test Results⁽¹⁾						
.062	.30	.99	.013	.007	.24	1.63
.068	.30	.91	.009	.011	.25	1.55
5/64	.26	.82	.008	.015	.21	1.07

⁽¹⁾ Chemistry of single pass welds is highly dependent upon base metal chemistry and dilution. Analysis shown are for information purposes only.

Innershield NR-202 is a cost-effective wire that produces consistently good looking weld beads.

Designed for semiautomatic welding.

An excellent tacking wire.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- A great wire to use when cost is a primary issue, and no impact properties are required.

- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

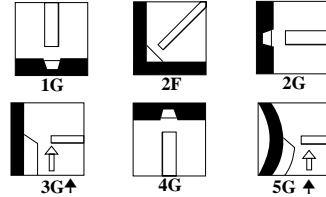
- Structural fabrication where no seismic requirements are present.
- Vertical and overhead plate welding.
- Fabrication of machinery parts and hoppers.
- Short assembly welds on brackets and clips.
- Roundabout groove welds.

NOTES:

- NR-202 should not be used for applications requiring Charpy V-Notch properties.

WELDING POSITIONS

- Smaller diameter wires are generally used for out-of-position.
- Larger diameter wires are generally used for flat and horizontal welding.



CONFORMANCE

AWS A5.20-95: E71T-7
ABS: E71T-7

DIAMETERS / PACKAGING

Diameter Inches (mm)	14 Lb. Coil	50 Lb. Coil
5/64 (2.0)	ED012287	ED012288

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.20

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Hardness Rockwell B
Requirements AWS E71T-7	58,000 (400) min.	70,000 (480) min.	22 min.	--
Test Results	60,000 - 75,000 (414 - 517)	72,000 - 95,000 (497 - 655)	22 - 27	87 - 93

⁽¹⁾The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.068" DC- 1" (25mm) .842 lbs/1000"	55 (1.4)	19 - 20	130	2.8 (1.3)	1.7 (0.8)	61
	100 (2.5)	20 - 21	190	5.0 (2.3)	3.7 (1.7)	74
	150 (3.8)	21 - 22	245	7.6 (3.4)	6.0 (2.7)	79
	175 (4.4)	22 - 23	270	8.8 (4.0)	7.1 (3.2)	81
	210 (5.3)	23 - 24	300	10.6 (4.8)	8.7 (3.9)	82
5/64" DC- 1" (25mm) 1.09 lbs/1000"	50 (1.3)	19 - 20	150	3.4 (1.5)	2.0 (0.9)	59
	100 (2.5)	20 - 21	235	6.8 (3.1)	5.1 (2.3)	75
	150 (3.8)	21 - 22	305	10.2 (4.6)	8.3 (3.8)	81
	175 (4.4)	22 - 23	335	11.9 (5.4)	9.9 (4.5)	83
	200 (5.1)	22 - 23	365	13.6 (6.2)	11.4 (5.2)	84
	230 (5.8)	23 - 24	400	15.7 (7.1)	13.3 (6.0)	85

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements						
AWS E71T-7 per A5.20-95	Report Only	1.75 max.	.03 max.	.03 max.	.60 max.	1.80 max.
Test Results	.19	.72	.007	.003	.20	1.34

NOTE: NR-202 will not produce weld deposits meeting the minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997. For these and other applications specifying notch toughness, the following Innershield electrodes should be considered: NR-203MP, NR-203 Nickel C Plus, NR-203 Nickel (1%), NR-232, NR-305, NR-311 Ni.

One of our most popular all-purpose Innershield wires.

A terrific choice for light gauge steel or thin plate. Performs well on coated steels.

Restricted to 1/2" (12.7mm) maximum plate thickness for .068, 5/64" and 3/32" diameters, and 5/16" (7.9mm) maximum plate thickness for .035 and .045 diameters.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- An extremely popular wire with excellent operator appeal, low spatter, and good weld appearance.
- NR-211-MP is an extremely versatile wire – suitable for all position welding.

- A good choice when poor fitup is an issue.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

- Single or multiple pass welding.
- Structural fabrication where no seismic requirements are present.
- Robotic welding applications.
- Fabrication and repair of machinery parts, trucks, auto bodies, saddles, tanks and hoppers.
- Welding on racks, scaffolding, light angle structurals, joists, and small roundabout applications.

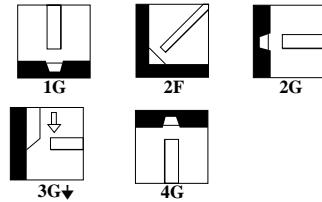
NOTES:

- NR-211-MP should not be used for applications requiring Charpy V-Notch properties.

RECOMMENDED MAXIMUM PLATE THICKNESS

Diameter Inches (mm)	Max. Plate Thickness
.035 & .045 (0.9 & 1.1)	5/16" (7.9mm)
.068, 5/64, & 3/32 (1.7, 2.0 & 2.4)	1/2" (12.7mm)

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E71T-11
 ASME SFA-5.20: E71T-11
 ABS: E71T-11 (.068 - 3/32" only)
 CWB: E4801T-11-CH

DIAMETERS / PACKAGING

Diameter Inches (mm)	1 Lb Spool	10 Lb Spool	14 Lb Coil	25 Lb Readi-Reel®	50 Lb Coil	50 Lb. Readi-Reel	300 Lb. Speed-Feed Reel	600 Lb Speed-Feed® Reel
.035 (0.9)	ED027641	ED016354		ED016364				
.045 (1.1)		ED016363		ED016365		EDS01040	EDS01522	
.068 (1.7)			ED012506	ED017827	ED012507			
5/64 (2.0)			ED012508	ED017828	ED012509			
3/32 (2.4)					ED013869			EDS14358

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.20

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Hardness Rockwell B
Requirements E71T-11	58,000 (400) min.	70,000 (480) min.	20 min.	--
Test Results Typical NR-211MP	58,000 - 69,000 (400- 476)	72,000 - 95,000 (497 - 655)	22 - 25	85 - 95

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.035" DC- 3/8" (10mm) .250 lbs/1000"	50 (1.3) 70 (1.8) 90 (2.3) 110 (2.8)	14 - 15 15 - 16 16 - 17 16.5 - 17.5	30 60 90 120	0.8 (0.4) 1.2 (0.5) 1.7 (0.8) 2.1 (1.0)	0.7 (0.3) 1.0 (0.5) 1.4 (0.6) 1.7 (0.8)	81 83 82 81
.045" DC- 3/8" (10mm) .393 lbs/1000"	70 (1.8) 90 (2.3) 110 (2.8) 130 (3.3)	15 - 16 16 - 17 17 - 18 18 - 19	120 140 160 170	1.6 (0.7) 2.2 (1.0) 2.7 (1.2) 3.2 (1.5)	1.1 (0.5) 1.7 (0.8) 2.3 (1.0) 2.7 (1.2)	69 77 85 84
.068" DC- 1/2 - 1" (13 - 25mm) .889 lbs/1000"	40 (1.0) 75 (1.9) 130 (3.3) 175 (4.4)	15 - 16 18 - 19 20 - 21 23 - 24	125 190 270 300	2.1 (1.0) 4.0 (1.8) 7.0 (3.2) 9.4 (4.3)	1.7 (0.8) 3.4 (1.5) 6.1 (2.8) 8.4 (3.8)	81 85 88 89
5/64" DC- 1/2 - 1" (13 - 25mm) 1.17 lbs/1000"	50 (1.3) 75 (1.9) 120 (3.0) 160 (4.1)	16 - 17 18 - 19 20 - 21 22 - 23	180 235 290 325	3.5 (1.6) 5.3 (2.4) 8.4 (3.8) 11.2 (5.1)	2.9 (1.3) 4.5 (2.0) 7.4 (3.4) 10.0 (4.5)	83 85 88 89
3/32" DC- 1/2 - 1" (13 - 25mm) 1.66 lbs/1000"	50 (1.3) 75 (1.9) 100 (2.5) 130 (3.3)	16 - 17 19 - 20 20 - 21 22 - 23	245 305 365 400	5.0 (2.3) 7.5 (3.4) 10.0 (4.5) 12.9 (5.9)	4.2 (1.9) 6.4 (2.9) 8.7 (3.9) 11.3 (5.1)	84 85 87 88

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements AWS E71T-11 per A5.20	Report Only	1.75 max.	.03 max.	.03 max.	.60 max.	1.8 max.
Test Results (.068, 5/64, 3/32)	.21 - .30	.45 - .65	.005 - .012	.003 - .010	.10 - .25	1.20 - 1.80
(.035 & .045)	.21	.50 - .75	.003 - .010	.001 - .008	.10 - .25	1.20 - 1.80

NOTE: NR-211MP will not produce weld deposits meeting the minimum Charpy V-Notch impact properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997. For these and other applications specifying notch toughness, the following Innershield electrodes should be considered: NR-203MP, NR-203Nickel C Plus, NR-203 Nickel (1%), NR-232, NR-305, NR-311 Ni.

An excellent general purpose, all position wire for automatic and semiautomatic applications.

Designed for single and multiple pass welding on mild steel, sheet metal and plate. Also performs well on coated steel.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- A good choice when poor fitup is an issue.
- NR-212 is an extremely versatile wire. Weld in any position, on a wide range of materials including coated steel. Not recommended for vertical up.
- Alternative to NR-211-MP when thicker applications are involved.

- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

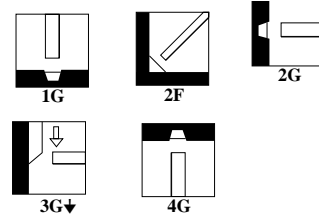
TYPICAL APPLICATIONS

- Single or multiple pass, all position welding on materials 1.1mm and thicker.
- Can be used on weathering steels where a color match is important.
- Structural fabrication where no seismic requirements are present.
- Short assembly welds.
- Coated steel welds.
- Fabrication and repair of truck bodies, tanks, hoppers, racks, scaffolding and light angle structurals.
- Robotic applications.

NOTES:

- NR-212 should not be used for applications requiring Charpy V-Notch properties.

WELDING POSITIONS



CONFORMANCE

AWS A5.29-98: E71TG-G
ASME SFA-5.29: E71TG-G

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb. Spool	14 Lb. Coil	25 Lb. Readi-Reel®	50 Lb. Coil
.045 (1.1)	ED026090		ED026091	
.068 (1.7)		ED027803	ED026859	ED026861
5/64 (2.0)		ED027794	ED026860	ED026858
3/32 (2.4)	<i>(See your local Lincoln Representative for packaging information for 3/32" .)</i>			

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.29

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)
Requirements AWS E71TG-G	58,000 (400) min.	70,000 - 90,000 (480 - 620) min.	20 min.
Test Results Typical NR-212	67,500 (465)	86,200 (594)	27

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.29-80. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.045" DC- 3/8" (10mm) .393 lbs/1000"	55 (1.4)	14 - 15	75	1.3 (0.6)	1.1 (0.5)	84
	70 (1.8)	15 - 16	90	1.6 (0.7)	1.4 (0.6)	87
	90 (2.3)	16 - 17	115	2.1 (0.9)	1.8 (0.8)	85
	110 (2.8)	17 - 18	135	2.6 (1.2)	2.2 (1.0)	84
	130 (3.3)	18 - 19	155	3.1 (1.4)	2.6 (1.2)	83
.068" DC- 3/4" (19mm) .820 lbs/1000"	150 (3.8)	19 - 20	170	3.5 (1.6)	3.0 (1.4)	85
	60 (1.5)	16 - 17	145	3.1 (1.4)	2.4 (1.1)	77
	75 (1.9)	18 - 19	180	3.8 (1.7)	3.2 (1.4)	84
	90 (2.3)	19 - 20	200	4.5 (2.0)	3.8 (1.7)	84
	120 (3.0)	20 - 21	230	6.0 (2.7)	5.2 (2.3)	86
5/64" DC- 3/4" (19mm) 1.064 lbs/1000"	150 (3.8)	21 - 22	255	7.4 (3.3)	6.4 (2.9)	86
	175 (4.4)	22 - 23	275	8.7 (3.9)	7.5 (3.4)	86
	60 (1.5)	16 - 17	200	3.8 (1.7)	3.3 (1.5)	86
	75 (1.9)	18 - 19	225	4.7 (2.1)	4.1 (1.8)	87
	90 (2.3)	19 - 20	245	5.7 (2.6)	5.0 (2.3)	87
3/32" DC- 1" (25mm) 1.583 lbs/1000"	110 (2.8)	20 - 21	275	7.1 (3.2)	6.2 (2.8)	87
	130 (3.3)	21 - 22	300	8.3 (3.7)	7.3 (3.3)	87
	150 (3.8)	22 - 23	325	9.6 (4.3)	8.4 (3.8)	87
	75 (1.9)	19 - 20	270	7.3 (3.3)	6.2 (2.8)	84
	100 (2.5)	21 - 22	330	9.8 (4.4)	8.5 (3.8)	86
125 (3.2)	23 - 24	375	12.3 (5.5)	10.7 (4.8)	86	
	150 (3.8)	25 - 26	420	14.9 (6.7)	12.6 (5.7)	84

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn*	%P	%S	%Si*	%Al	%Ni*
Requirements							
AWS E71TG-G per A5.29	Report Only	1.75 min.	.04 max.	.03 max.	.80 max.	1.8 max.	.50 max.
Test Results	.10	.97	.007	.003	.31	1.52	1.10

NOTE: In order to meet the alloy requirements of the G group, the weld deposit needs to have the minimum, as specified in the table, of only one of the elements marked with an asterisk.

NOTE: NR-212 will not produce weld deposits meeting the minimum Charpy V-Notch impact properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997. For these and other applications specifying notch toughness, the following Innershield electrodes should be considered: NR-203MP, NR-203 Nickel C Plus, NR-203 Nickel (1%), NR-232, NR-305, NR-311 Ni.

Designed for flat, horizontal, vertical up and overhead position welding.

A good choice for automatic and semiautomatic applications. Performs well on mild steel and some low alloy steels.

Meets Charpy V-Notch properties.⁽¹⁾

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Easy slag removal.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

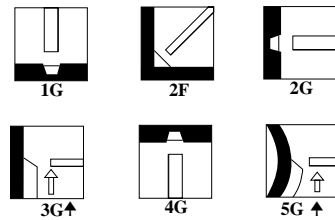
- General plate fabrication, including bridge construction, hull plate and stiffener welding on ships and barges.
- Fabrication of storage tanks.
- A good fast freeze electrode for vertical up and overhead welding. (We recommend the use of NR-203MP where vertical down is necessary.)
- Performs well on out-of-position groove welds – especially on large diameter, heavy wall tubular construction.

⁽¹⁾Will meet minimum Charpy V-Notch properties recommended in the “Seismic Provisions for Structural Steel Buildings” by AISC, dated April 15, 1997.

CONFORMANCE

AWS A5.20-95: E71T-8 & E71T-8J
 ASME SFA-5.20: E71T-8 & E71T-8J
 ABS: 3SA-3YSA
 Lloyd’s: 3S-3YS
 CWB: E4801T-8-CH

WELDING POSITIONS



DIAMETERS / PACKAGING

Diameter Inches (mm)	14 Lb Coil	50 Lb Coil
5/64 (2.0)	ED012295	ED012296
3/32 (2.4)		ED012294

MECHANICAL PROPERTIES⁽²⁾ - As Welded per AWS A5.20

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules) @ -20°F (-29°C) @ -40°F (-40°C)		Hardness Rockwell B
Requirements AWS E71T-8	58,000 (400) min.	70,000 (480) min.	22 min.	20 (27) min.	--	--
AWS E71T-8J	58,000 (400) min.	70,000 (480) min.	22 min.	--	20 (27) min.	--
Test Results	60,000 - 69,000 (414 - 476)	72,000 - 83,000 (496 - 572)	22 - 30	120 - 160 (161 - 215)	130 - 150 (175 - 201)	86
Stress Relieved ⁽³⁾	53,000 - 55,000 (365 - 379)	68,000 - 70,000 (469 - 480)	28 - 31	75 - 120 (102 - 163)	-- --	--

⁽²⁾ The strength and elongation properties reported were obtained from a .505” tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

⁽³⁾ Stress relieved 1 hour at 1150°F (621°C).

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
5/64"	50 (1.3)	16 - 17	145	3.2 (1.5)	2.5 (1.1)	78
DC-	70 (1.8)	17 - 18	180	4.5 (2.0)	3.4 (1.5)	76
3/4" (19mm)	90 (2.3)	18 - 19	220	5.8 (2.6)	4.4 (2.0)	76
1.07 lbs/1000"	140 (3.6)	21 - 22	300	9.0 (4.1)	6.7 (3.0)	74
3/32"	50 (1.3)	16 - 17	200	4.7 (2.1)	3.5 (1.6)	74
DC-	95 (2.4)	20 - 21	310	8.9 (4.0)	6.7 (3.0)	75
3/4" (19mm)	110 (2.8)	21 - 22	330	10.3 (4.7)	7.8 (3.5)	76
1.56 lbs/1000"	120 (3.0)	22 - 23	350	11.2 (5.1)	8.8 (3.9)	79

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements						
AWS E71T-8 per A5.20	Report only	1.75 max.	.03 max.	.03 max.	.60 max.	1.8 max.
Test Results	.08	1.50	.010	.005	.25	.80

RADIOGRAPHIC GUIDELINES

The opacity of NR-203M slag to x-ray is such that slag inclusions will normally appear lighter than the weld. Voids will normally appear darker than the weld. When using gamma-radiography, slag inclusions and voids will normally appear darker than the weld. Improved x-ray film readability usually can be obtained by slight over-exposure at an excitation potential consistent with good x-ray practice, but not over 240 KV. For detailed information on welding techniques, procedure adjustments, and their effects on weld appearance and quality, request publication C3.2400 "Innershield Electrode - Semiautomatic Production Welding Guide".

Designed for all position, single and multiple pass welding including vertical down.

Performs well in automatic and semi-automatic applications. Appropriate for use on mild steel and some low alloy steels.

A constant voltage power source is recommended.

Meets Charpy V-Notch properties⁽¹⁾.

ADVANTAGE LINCOLN

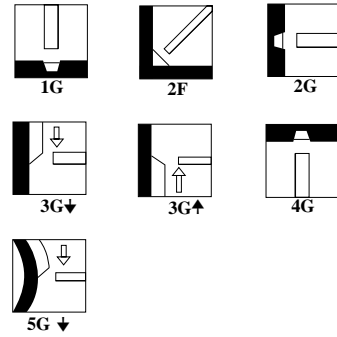
- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Fast freezing slag system facilitates all position welding, including vertical down.
- Handles poor fit-up on heavy wall tubes. Gaps up to 3/8" (9.5mm) with 1/4" (6.35mm) offset are weldable with NR-203MP.

- Makes root beads in groove welds without backup bars.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

- General plate fabrication, including bridge construction, hull plate and stiffener welding on ships and barges.
 - Fabrication of storage tanks.
 - Structural fabrication, including applications involving seismic requirements⁽¹⁾.
- ⁽¹⁾Will meet minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997.

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E71T-8J
 ASME SFA-5.20: E71T-8J
 ABS: 3SA-3YSAH15
 Lloyd's: 3S-3YH15
 DNV: III YMSH15
 GL: 3YSH15
 BV: SA3YMH
 NK: KSW53NH10

DIAMETERS / PACKAGING

Diameter Inches (mm)	10 Lb Spool	14 Lb Coil	22 Lb Readi-Reel®	50 Lb Coil
.040 (1.0) ⁽¹⁾	EDS25039			
.068 (1.7)		ED025041	ED025040	ED025042
5/64 (2.0)		ED021604		ED021601
3/32 (2.4)				

⁽¹⁾ Manufactured in metric diameter, U.S. customary size approximate.

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.20

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules)		Hardness Rockwell B
				@ -20°F (-29°C)	@ -40°F (-40°C)	
Requirements AWS E71T-8J	58,000 (400) min.	70,000 (480) min.	22 min.	20 (27) min.	Not Specified	--
Test Results Typical NR-203MP	60,000 - 65,000 (414 - 448)	72,000 - 80,000 (496 - 552)	28 - 31	50 - 200 (68 - 271)	66 (90)	82 - 92

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.068" DC- 3/4" (19mm) .782 lbs/1000"	70 (1.8)	16 - 17	145	3.3 (1.5)	2.3 (1.0)	69
	90 (2.3)	18 - 19	180	4.2 (1.9)	3.2 (1.5)	76
	120 (3.0)	20 - 21	225	5.6 (2.5)	4.3 (2.0)	76
	140 (3.5)	21 - 22	255	6.4 (2.9)	4.8 (2.2)	75
	150 (3.8)	23 - 24	265	6.8 (3.1)	5.1 (2.3)	75
5/64" DC- 3/4" (19mm) 1.032 lbs/1000"	50 (1.3)	16 - 17	130	3.1 (1.4)	1.9 (0.9)	61
	70 (1.8)	18 - 19	180	4.3 (2.0)	2.9 (1.3)	67
	90 (2.3)	19 - 20	220	5.6 (2.5)	4.2 (1.9)	75
	110 (2.8)	20 - 21	260	6.8 (3.1)	5.3 (2.4)	77
	120 (3.0)	21 - 22	280	7.4 (3.4)	5.9 (2.7)	79
140 (3.6)	22 - 23	310	8.7 (3.9)	6.8 (3.1)	78	
3/32" DC- 3/4" (19mm) 1.46 lbs/1000"	50 (1.3)	18 - 19	210	4.4 (2.0)	3.3 (1.5)	75
	70 (1.8)	19 - 20	260	6.2 (2.8)	4.8 (2.2)	77
	95 (2.4)	21 - 22	320	8.4 (3.8)	6.6 (3.0)	78
	110 (2.8)	22 - 23	350	9.7 (4.4)	7.7 (3.5)	79
	130 (3.3)	23 - 24	390	11.4 (5.2)	9.1 (4.1)	79

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements						
AWS E71T-8J per A5.20	Report only	1.75 max.	.03 max.	.03 max.	.60 max.	1.8 max.
Test Results	.075	1.45	<.010	<.003	.33	.80

RADIOGRAPHIC GUIDELINES

The opacity of NR-203MP slag to x-ray is such that slag inclusions will normally appear lighter than the weld. Voids will normally appear darker than the weld. When using gamma-radiography, slag inclusions and voids will normally appear darker than the weld. Improved x-ray film readability usually can be obtained by slight over-exposure at an excitation potential consistent with good x-ray practice, but not over 240 KV. For detailed information on welding techniques, procedure adjustments, and their effects on weld appearance and quality, request publication C3.2400 "Innershield Electrode - Semiautomatic Production Welding Guide".

Designed for all position, single and multiple pass welding including vertical down on mild steel and some low alloy steels. Performs well in automatic and semiautomatic applications.

Produces a nickel bearing weld deposit with good Charpy V-Notch properties at low temperatures⁽¹⁾.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Produces a nickel weld deposit (.80 - 1.1% Ni).
- Handles poor fit-up in the vertical up position. Welds gaps up to 3/8" (9.5mm).

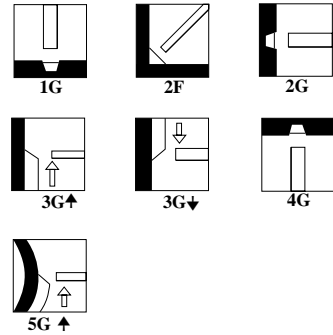
- Makes root beads in groove welds without backup bars.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

- Roundabout groove welds on heavy wall tubular construction
- Offshore welding applications.
- A good choice for use on weathering steels where color match is important.
- Bridges and other outdoor structural components with weathering steel.

⁽¹⁾Will meet minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997.

WELDING POSITIONS



CONFORMANCE

AWS A5.29-98: E71T8-Ni1
 ASME SFA-5.29: E71T8-Ni1
 ABS: 3SA-3YSA
 Lloyd's: 3S-3YSH15
 DNV: III YMSH15

DIAMETERS / PACKAGING

Diameter Inches (mm)	14 Lb Coil (56 Lb. Carton)	50 Lb Coil
5/64 (2.0)	ED012385	ED012386
3/32 (2.4)	ED012383	ED012384

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.29

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules)	
				@ -20°F (-29°C)	@ -40°F (-40°C)
Requirements AWS E71T8-Ni1	58,000 min. (400)	70,000 - 90,000 (483 - 620)	20 min.	20 (27) min.	Not Specified
Test Results	66,000 - 75,000 (455 - 517)	72,000 - 85,000 (496 - 585)	20 - 30	24 - 111 (33 - 151)	42 - 87 (57 - 118)
Stress-Relieved ⁽²⁾	61,000 - 70,000 (421 - 483)	67,000 - 74,000 (462 - 510)	27 - 30	70 - 99 (95 - 134)	

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.29-80. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

⁽²⁾ Stress relieved 1 hour at 1150°F (621°C).

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
5/64" DC- 3/4" (19mm) 1.015 lbs/1000"	50 (1.3)	16 - 17	145	3.0 (1.4)	2.3 (1.0)	76
	70 (1.8)	18 - 19	195	4.3 (2.0)	3.3 (1.5)	76
	90 (2.3)	19 - 20	240	5.5 (2.5)	4.3 (2.0)	78
	110 (2.8)	20 - 21	275	6.7 (3.0)	5.3 (2.4)	79
	120 (3.1)	21 - 22	290	7.3 (3.3)	5.8 (2.6)	79
3/32" DC- 3/4" (19mm) 1.518 lbs/1000"	140 (3.6)	22 - 23	310	8.5 (3.9)	6.9 (3.1)	81
	50 (1.3)	18 - 19	215	4.6 (2.1)	3.6 (1.6)	78
	70 (1.8)	19 - 20	260	6.4 (2.9)	5.1 (2.3)	79
	95 (2.4)	21 - 22	315	8.7 (3.9)	7.0 (3.2)	80
	110 (2.8)	22 - 23	345	10.0 (4.5)	8.1 (3.7)	81
130 (3.3)	23 - 24	385	11.8 (5.4)	9.6 (4.4)	81	

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%Ni	%P	%S	%Si	%Al	%V	%Cr	%Mo
Requirements										
AWS E71T8-Ni1 per A5.29	0.12 max.	1.50 max.	.80 - 1.10	0.03 max.	0.03 max.	0.80 max.	1.8 max.	0.05 max.	0.15 max.	0.35 max.
Test Results	.081	1.17	.96	.006	.003	.27	.88	<.01	.03	.02

RADIOGRAPHIC GUIDELINES

The opacity of NR-203 Nickel (1%) slag to x-ray is such that slag inclusions will normally appear lighter than the weld. Voids will normally appear darker than the weld. When using gamma-radiography, slag inclusions and voids will normally appear darker than the weld. Improved x-ray film readability usually can be obtained by slight over-exposure at an excitation potential consistent with good x-ray practice, but not over 240 KV. For detailed information on welding techniques, procedure adjustments, and their effects on weld appearance and quality, request publication C3.2400 "Innershield Electrode - Semiautomatic Production Welding Guide".

An all position wire designed for welding low temperature alloys.

Single and multiple pass welding. Automatic and semiautomatic applications.

Produces a nickel-bearing weld deposit with good Charpy V-Notch properties at low temperatures⁽¹⁾.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

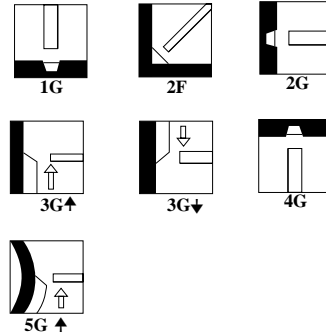
- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Produces a nickel weld deposit (.80-1.1% Ni).
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

- Applications requiring good CTOD properties and Charpy V-Notch properties.
- Offshore welding applications.
- Storage, pipe, transportation and other applications involving low temperature alloys.
- Roundabout groove welds on heavy wall tubular construction.
- General plate fabrication including bridges.
- Hull plate and stiffener welding on ships and barges.

⁽¹⁾Will meet minimum Charpy V-Notch properties recommended in the “Seismic Provisions for Structural Steel Buildings” by AISC, dated April 15, 1997.

WELDING POSITIONS



CONFORMANCE

AWS A5.29-98: E61T8-K6
 ABS: 3SA
 Lloyd’s: 3SH15
 DNV: III MS(H15)

DIAMETERS / PACKAGING

Diameter Inches (mm)	14 Lb Coil
5/64 (2.0)	ED012310

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.29

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules)		Hardness Rockwell B
				@ -20°F (-29°C)	@ -40°F (-40°C)	
Requirements AWS E61T8-K6	50,000 min. (345)	60,000 - 80,000 (414 - 551)	22 min.	20 (27) min.	Not Required	--
Test Results Typical NR-203 Nickel C	58,000 (400)	71,000 (489)	29	80 - 264 (108 - 358)	50 - 175 (68 - 237)	80

⁽¹⁾ The strength and elongation properties reported were obtained from a .505” tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.29-80. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
5/64"	50 (1.3)	16 - 17	120	3.2 (1.5)	2.1 (1.0)	66
DC-	70 (1.8)	17 - 18	170	4.5 (2.0)	3.2 (1.5)	71
3/4" (19mm)	90 (2.3)	19 - 20	210	5.8 (2.6)	4.3 (2.0)	74
1.062 lbs/1000"	110 (2.8)	20 - 21	240	7.0 (3.2)	5.4 (2.4)	77

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al	%V	%Ni	%Cr	%Mo
Requirements										
AWS E61T8-K6 per A5.29	0.15 max.	.50 - 1.50	.03 max.	.03 max.	.80 max.	1.8 max.	.05 max.	.40 - 1.00	.20 max.	.15 max.
Test Results	.058	.83	.004	<.003	.05	.73	<.01	.57	.08	<.01

RADIOGRAPHIC GUIDELINES

The opacity of NR-203 Nickel C slag to x-ray is such that slag inclusions will normally appear lighter than the weld. Voids will normally appear darker than the weld. When using gamma-radiography, slag inclusions and voids will normally appear darker than the weld. Improved x-ray film readability usually can be obtained by slight over-exposure at an excitation potential consistent with good x-ray practice, but not over 240 KV. For detailed information on welding techniques, procedure adjustments, and their effects on weld appearance and quality, request publication C3.2400 "Innershield Electrode - Semiautomatic Production Welding Guide".

Similar to NR-203 Nickel C, but with increased capability to join high-strength steels.

Designed for all position welding. Single and multiple pass. Automatic and semiautomatic applications.

Produces a nickel bearing weld deposit with excellent Charpy V-Notch properties⁽¹⁾.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Produces a nickel weld deposit (.80-1.1% Ni).
- A good choice for welding weathering steels.

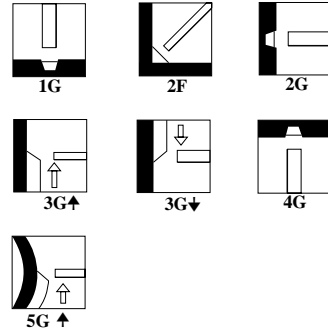
- Handles poor fit-up in the vertical up position. Successfully welds gaps up to 1/4" with offsets up to 1/4".
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

- Applications requiring good Charpy V-Notch properties.
- Roundabout groove welds on heavy wall tubular construction.
- Offshore welding applications.
- Structural fabrication, including those with seismic requirements⁽¹⁾.
- General plate fabrication including bridges.
- Hull plate and stiffener welding on ships and barges.

⁽¹⁾Will meet minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997.

WELDING POSITIONS



CONFORMANCE

AWS A5.29-98: E71T8-K2

DIAMETERS/PACKAGING

Diameter Inches (mm)	14 Lb. Coil
5/64 (2.0)	ED020227

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.29

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules) @ -20°F (-29°C)
Requirements AWS E71T8-K2	58,000 min. (400)	70,000 - 90,000 (490 - 620)	20 min.	20 min. (27)
Test Results	61,000 - 72,000 (421 - 496)	72,000 - 84,000 (496 - 579)	22 - 30	102 - 212 (137 - 285)

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.29-80. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
5/64"	50 (1.3)	16 - 17	115	3.2 (1.5)	2.3 (1.0)	72
DC-	70 (1.8)	17 - 18	170	4.5 (2.0)	3.3 (1.5)	73
3/4" (19mm)	90 (2.3)	19 - 20	210	5.8 (2.6)	4.4 (2.0)	76
1.091 lbs/1000"	110 (2.8)	20 - 21	245	7.0 (3.2)	5.5 (2.5)	79

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al	%V	%Ni	%Cr	%Mo
Requirements										
AWS E71T8-K2 per A5.29	0.15 max.	0.5 - 1.75	0.03 max.	0.03 max.	0.80 max.	1.8 max.	0.05 max.	1.00 - 2.00	0.15 max.	0.35 max.
Test Results	.05	.85	.009	<.003	.07	1.08	<.01	1.27	.14	.02

RADIOGRAPHIC GUIDELINES

The opacity of NR-203 Ni C Plus slag to x-ray is such that slag inclusions will normally appear lighter than the weld. Voids will normally appear darker than the weld. When using gamma-radiography, slag inclusions and voids will normally appear darker than the weld. Improved x-ray film readability usually can be obtained by slight over-exposure at an excitation potential consistent with good x-ray practice, but not over 240 KV. For detailed information on welding techniques, procedure adjustments, and their effects on weld appearance and quality, request publication C3.2400 "Innershield Electrode - Semiautomatic Production Welding Guide".

The highest deposition rates of any Innershield wire for out-of-position welding.

An extremely popular wire designed for single and multiple pass welding of 3/16" (4.8mm) and heavier mild steel, as well as some low alloy steels.

NR-232's weld deposits meet Charpy V-Notch requirements⁽¹⁾.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Fast freezing slag system supports high deposition rates on out-of-position welding.
- Self peeling slag.

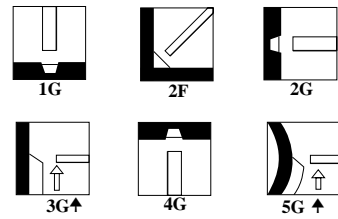
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

- Structural fabrication, including those subject to seismic requirements⁽¹⁾.
- General plate fabrication including bridges.
- Hull plate and stiffener welding on ships and barges.
- Machinery parts, tanks, hoppers, racks and scaffolding.

⁽¹⁾Will meet minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997.

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E71T-8
 ABS: 3SA-3YSAH
 Lloyd's: 3S-3YSH15
 DNV: III YMSH15
 G.L.: 3YSH10
 N.K.: KSW 53NH10
 MIL Spec: MIL-71T-8AS
 B.V.: SA3YMH

DIAMETERS / PACKAGING

Diameter Inches (mm)	13.5 Lb. Coil	22 Lb. Readi-Reel®	50 Lb. Coil
.068 (1.7)	ED012518		ED012519
.072 (1.8)	ED012522	ED012521	ED012523
5/64 (2.0)	ED012525	ED012524	ED012526

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.20

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules) @ -20°F (-29°C)	Hardness Rockwell B
Requirements AWS E71T-8	58,000 (400) min.	70,000 (480) min.	22 min.	20 (27)	--
Test Results ⁽¹⁾	60,000 - 74,000 (414 - 510)	72,000 - 87,000 (496 - 600)	22 - 30	20 - 69 (27 - 94)	88-90

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.068" DC- 1/2-1" (12-25mm) .755 lbs/1000"	110 (2.7)	18 - 20	195	5.0 (2.3)	3.9 (1.8)	78
	130 (3.3)	19 - 21	225	6.2 (2.8)	4.6 (2.0)	74
	150 (3.8)	19 - 21	250	7.1 (3.2)	5.3 (2.4)	75
	170 (4.3)	20 - 22	270	7.8 (3.5)	6.1 (2.8)	78
	195 (5.0)	23 - 24	300	9.4 (4.3)	7.0 (3.2)	74
	250 (6.4)	23 - 24	350	11.8 (5.4)	9.0 (4.0)	76
.072" DC- 1/2-1" (12-25mm) .778 lbs/1000"	320 (7.4)	25 - 27	400	15.2 (6.9)	11.4 (5.2)	75
	80 (2.0)	16 - 18	130	4.0 (1.8)	3.3 (1.5)	83
	140 (3.6)	18 - 21	225	6.8 (3.1)	5.5 (2.5)	81
	155 (3.9)	19 - 22	240	7.2 (3.3)	6.0 (2.7)	83
	170 (4.3)	20 - 23	255	8.0 (3.6)	6.5 (2.9)	81
5/64" DC- 1/2-1" (12-25mm) 1.000 lbs/1000"	250 (6.4)	22 - 24	315	11.7 (5.3)	9.6 (4.3)	82
	290 (7.4)	23 - 25	350	13.6 (6.2)	11.0 (5.0)	81
	60 (1.5)	16 - 17	145	3.7 (1.7)	2.7 (1.2)	73
	115 (2.9)	19 - 20	260	7.0 (3.2)	5.5 (2.5)	78
	120 (3.0)	19 - 20	270	7.3 (3.3)	5.7 (2.6)	78
130 (3.3)	20 - 21	285	7.8 (3.5)	6.2 (2.8)	79	
180 (4.6)	22 - 23	365	10.9 (5.0)	8.7 (3.9)	80	

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements AWS E71T-8 per A5.20	Report only	1.75 max.	.03 max.	.03 max.	.60 max.	1.8 max.
Test Results	.17	.72	.007	.003	.31	.71

An extremely high deposition rate wire, designed for single and multiple pass, automatic and semiautomatic welding of mild steel and some low alloy steels.

NR-305 has very good penetration.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- A great choice for downhand welding applications where high deposition rates and good penetration are desired.
- Low spatter.
- Excellent operator appeal.
- Welds well on lightly rusted or primed plate.
- A constant voltage power source is recommended.

- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

- General plate fabrication including bridges and offshore rigs.
- Shipyards.
- Stiffener welding on ships and barges.
- Welding over tack welds made with stick electrodes.

(1)Will meet minimum Charpy V-Notch properties recommended in the “Seismic Provisions for Structural Steel Buildings” by AISC, dated April 15, 1997.

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E70T-6
 ABS: 2SA, 2YSA
 DNV: II YMS
 GL: 2YS
 BV: SA2YM

DIAMETERS / PACKAGING

Diameter Inches (mm)	22 Lb Readi-Reel	50 Lb Coil
5/64 (2.0)	ED028696	
3/32 (2.4)		ED012593

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.20

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules)	
				@ 0°F (-18°C)	@ -20°F (-29°C)
Requirements AWS E70T-6	58,000 (400) min.	70,000 (480) min.	22 min.	--	20 (27) min.
Test Results As Welded	62,000 - 76,000 (427 - 524)	72,000 - 89,000 (496 - 614)	23 - 32	21 - 54 (28 - 73)	21 - 35 (28 - 47)
Stress Relieved ⁽²⁾	54,000 - 62,000 (372 - 427)	71,000 - 84,000 (489 - 579)	28 - 37	34 - 60 (46 - 81)	20 - 56 (27 - 76)

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.
⁽²⁾ Stress relieved 1 hour at 1150°F (621°C).

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
5/64"	200 (5.1)	22 - 23	385	12.8 (5.8)	10.0 (4.5)	78
DC+	250 (6.4)	24 - 26	430	16.0 (7.2)	13.0 (5.8)	81
7/8" (22mm)	350 (8.8)	28 - 33	450	22.5 (10.2)	18.8 (8.5)	83
1.07 lbs/1000"	450 (11.4)	30 - 35	545	28.9 (13.1)	24.5 (11.1)	84
3/32"	160 (4.1)	21 - 23	330	13.3 (6.0)	11.0 (5.0)	82
DC+	240 (6.1)	24 - 26	425	20.0 (9.1)	16.7 (7.6)	83
1-1/2 - 2-1/2" (38 - 63mm)	300 (7.6)	27 - 29	475	25.0 (11.3)	21.0 (9.5)	84
1.39 lbs/1000"	400 (10.2)	33 - 35	525	33.4 (15.2)	28.0 (12.7)	83

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements						
AWS E70T-6 per A5.20	Report Only	1.75 max.	.03 max.	.03 max.	.60 max.	1.8 max.
Test Results	.08	1.26	.012	.005	.23	1.19

One of our most popular wires, with a very high deposition rate and excellent penetration..

Designed for single and multiple pass, automatic and semiautomatic welding of thicker mild steels and some low alloy steels.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Very high deposition rates and fast travel speeds.
- Resists weld cracking on high sulfur steels.
- Smooth operation. Good bead shape.

- Easy slag removal in deep grooves.
- Deep penetration.
- Excellent operator appeal.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

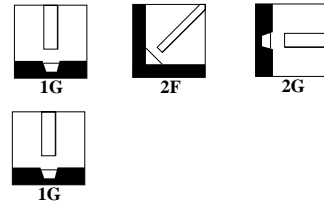
TYPICAL APPLICATIONS

- Fillet, lap and butt welds on 1/8” (3.2mm) and thicker steels.
- Horizontal butt welds such as column-to-column structural connections not subject to seismic requirements.
- General fabrication and assembly welding.

NOTES:

- NR-311 should not be used for applications requiring Charpy V-Notch properties.

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E70T-7
 ASME SFA-5.20: E70T-7
 ABS: E70T-7 per AWS A5.20-95

DIAMETERS / PACKAGING

Diameter Inches (mm)	14 Lb. Coil	22 Lb. Readi-Reel®	50 Lb. Coil	600 Lb. Speed-Feed® Reel	600 Lb. Speed-Feed Drum
5/64 (2.0)	ED014464	ED014515	ED014459		
3/32 (2.4)	ED025740		ED012629	ED012630	ED012628
7/64 (2.8)			ED012632	ED012633	ED012631

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.20

Condition	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Hardness Rockwell B
Requirements AWS E70T-7	58,000 (400) min.	70,000 (480) min.	22 min.	--
Test Results	60,000 - 66,000 (414 - 455)	82,000 - 90,000 (565 - 620)	22 - 26	87 - 92

⁽¹⁾ The strength and elongation properties reported were obtained from a .505” tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
5/64" DC- 1-1/4" (32mm) 1.07 lbs/1000"	100 (2.5)	21	190	6.4 (2.9)	5.0 (2.3)	78
	160 (4.1)	25	275	10.3 (4.7)	8.0 (3.6)	78
	240 (6.1)	26	355	15.4 (7.0)	12.4 (5.6)	80
	300 (7.6)	28	410	19.3 (8.8)	15.8 (7.2)	82
3/32" DC- 1-1/2" (38mm) 1.62 lbs/1000"	75 (1.9)	21	200	7.0 (3.2)	5.4 (2.5)	77
	135 (3.4)	24	300	13.1 (5.9)	10.2 (4.6)	78
	150 (3.8)	25	325	14.6 (6.6)	11.4 (5.2)	78
	210 (5.3)	27	400	20.4 (9.3)	16.5 (7.5)	81
7/64" DC- 1-1/2" (38mm) 2.05 lbs/1000"	270 (6.9)	30	450	26.2 (11.9)	22.0 (10.0)	84
	100 (2.5)	23.5	325	12.0 (5.4)	10.0 (4.5)	83
	145 (3.7)	25.5	400	17.8 (8.1)	14.5 (6.6)	82
	175 (4.4)	27	450	21.5 (9.8)	18.0 (8.2)	83
2.05 lbs/1000"	240 (6.1)	30.5	550	29.5 (13.4)	25.5 (11.6)	86
	300 (7.6)	33	625	36.9 (16.7)	33.0 (15.0)	89

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements	Report	1.75	.03	.03	.60	1.8
AWS E70T-7 per A5.20-95	Only	max.	max.	max.	max.	max.
Test Results	.25	.50	.008	<.003	.10	1.46

NOTE: NR-311 will not produce weld deposits meeting the minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997. For these and other applications specifying notch toughness, the following Innershield electrodes should be considered: NR-203MP, NR-203Nickel C Plus, NR-203 Nickel (1%), NR-232, NR-305, NR-311 Ni.

Similar to NR-311 wire, but with Charpy V-Notch properties⁽¹⁾.

Designed for downhand, flat, and horizontal welding on 1/8" (3.2mm) and thicker mild steel and some low alloy steels. Automatic and semiautomatic.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- High deposition rates and fast travel speeds.
- Produces a 1.5% Nickel deposit for good low temperature notch toughness.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

TYPICAL APPLICATIONS

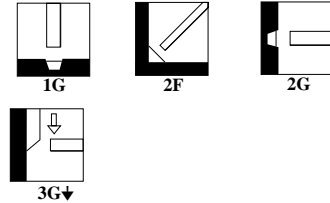
- General fabrication and assembly welding.
- Structural fabrication, including applications involving seismic requirements⁽¹⁾.
- Single and multiple pass welds.
- Fillet and lap welds.
- Horizontal butt welds such as column-to-column structural connections.
- Deep groove welds.
- Square edge butt welds.

NOTES:

- ⁽¹⁾Meets minimum Charpy V-Notch properties recommended in the "Seismic Provision for Structural Steel Buildings", by AISC, dated April 15, 1997.

- We recommend 5/64" (2.0mm) wire for vertical-down welding.
- 7/64" (2.8mm) wire is limited to approximately 20° downhill.

WELDING POSITIONS



CONFORMANCE

AWS A5.29-98: E70T7-K2
 Lloyd's: 2S-2YS
 DNV: ILYMS
 GL: 2YS
 BV: SA2YM
 NKK: KSW 52 NH10

DIAMETERS / PACKAGING

Diameter Inches (mm)	22 Lb. Readi-Reel®	50 Lb. Coil
5/64 (2.0)	ED017819	
3/32 (2.4)		ED017822
7/64 (2.8)		ED017824

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.29

Condition	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch		Hardness Rockwell B
				ft-lbs (Joules) @ -20°F	(-29°C)	
Requirements AWS E70T7-K2	58,000 (400) min.	70,000 (482) min.	20 min.	20 min.	(27) min.	--
Test Results	64,000 - 75,000 (441 - 517)	80,000 - 89,000 (551 - 613)	22 - 31	20 - 50	(27 - 68)	87 - 92

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.29-80. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
5/64" DC- 1" (25mm) 0.930 lbs/1000"	100 (2.5)	21 - 23	170	5.5 (2.5)	3.9 (1.8)	70
	130 (3.3)	24 - 26	205	7.2 (3.3)	5.2 (2.4)	72
	160 (4.0)	25 - 27	235	8.8 (4.0)	6.5 (2.9)	73
	200 (5.0)	26 - 28	270	11.0 (5.0)	8.3 (3.8)	75
	240 (6.1)	27 - 29	295	13.3 (6.1)	10.0 (4.5)	75
3/32" DC- 1-1/4" (32mm) 1.39 lbs/1000"	75 (1.9)	20 - 22	200	6.2 (2.8)	4.2 (1.9)	67
	100 (2.5)	21 - 23	245	8.3 (3.8)	5.9 (2.7)	71
	125 (3.1)	23 - 25	285	10.4 (4.7)	7.5 (3.4)	72
	150 (3.8)	25 - 27	330	12.5 (5.7)	9.1 (4.1)	72
	175 (4.4)	26 - 28	365	14.5 (6.6)	10.8 (4.9)	74
200 (5.0)	27 - 29	390	16.6 (7.6)	12.3 (5.6)	74	
7/64" DC- 1-1/2" (38mm) 1.89 lbs/1000"	100 (2.5)	22 - 24	310	11.4 (5.2)	8.4 (3.8)	73
	140 (3.5)	24 - 26	370	15.8 (7.2)	11.8 (5.4)	74
	170 (4.3)	26 - 28	430	19.5 (8.9)	14.5 (6.6)	74
	200 (5.0)	28 - 30	470	22.8 (10.4)	17.0 (7.7)	74
	240 (6.1)	29 - 31	520	27.2 (12.4)	20.4 (9.2)	75

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al	%Ni	%Mo	%Cr	%V
Requirements										
AWS E70T7-K2 per A5.29	.15 max.	.50 - 1.75	.03 max.	.03 max.	.80 max.	1.8 max.	1.00 - 2.00	.35 max.	.15 max.	.05 max.
Test Results	.06	1.23	.005	<.003	.20	1.24	1.28	<.01	.03	<.01

A very high deposition rate wire, designed for automatic and semiautomatic welding on mild steel and some low alloy steels.

Can also be used to join sulfur or high carbon steels.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- High deposition rates for excellent productivity.
- Resists cracking on high sulfur steel.
- Resists porosity on mildly rusty, oil or dirty plate.
- Easy slag removal – even in deep grooves.

- Soft, low penetration arc.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

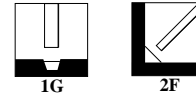
TYPICAL APPLICATIONS

- General fabrication.
- Structural fabrication where no seismic requirements exist.
- Machinery bases.
- Heavy equipment repair.
- Multiple pass fillet and lap welds.
- Corner welds and single pass butt welds.
- Single pass 1/4 - 1/2" (6.4 - 12.7mm) fillet and lap welds.

NOTES:

- NS-3M should not be used for applications requiring Charpy V-Notch properties.

WELDING POSITIONS



CONFORMANCE

AWS A5.20-95: E70T-4
 ASME SFA-5.20: E70T-4
 ABS: E70T-4 per AWS A5.20-95

DIAMETERS / PACKAGING

Diameter Inches (mm)	14 Lb. Coil	22 Lb. Readi-Reel®	50 Lb. Coil	600 Lb. Speed-Feed® Reel	600 Lb. Speed-Feed Drum
5/64 (2.0)	ED012739	ED017905	ED012740		
3/32 (2.4)			ED012736		ED012735
.120 (3.0)			ED012732	ED012734	ED012731

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.20

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Hardness Rockwell B
Requirements AWS E70T-4	58,000 (400) min.	70,000 (480) min.	22 min.	--
Test Results Typical NS-3M	60,000 - 70,000 (414 - 483)	72,000 - 93,000 (497 - 641)	22 - 30	85 - 95

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout) Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
5/64" DC+	200 (5.1)	29 - 31	280	12.2 (5.5)	10.1 (4.6)	83
2" (51mm)	240 (6.1)	30 - 32	315	14.8 (6.7)	12.1 (5.5)	82
1.03 lbs/1000"	260 (6.6)	30 - 32	330	16.0 (7.3)	13.2 (6.0)	83
	300 (7.6)	31 - 33	350	18.6 (8.4)	15.2 (6.9)	82
3/32" DC+	110 (2.8)	28 - 30	250	10.1 (4.6)	8.2 (3.7)	81
2-3/4" (70mm)	150 (3.8)	29 - 31	300	14.0 (6.4)	11.7 (5.3)	84
1.53 lbs/1000"	185 (4.7)	30 - 32	350	17.4 (7.9)	14.6 (6.6)	84
	230 (5.8)	31 - 33	400	21.6 (9.8)	18.3 (8.3)	85
	275 (7.0)	32 - 34	450	26.0 (11.8)	22.0 (10.0)	85
.120 DC+	140 (3.6)	28 - 30	380	19.8 (9.0)	15.5 (7.0)	78
2-3/4" (70mm)	175 (4.4)	29 - 31	450	24.6 (11.2)	20.0 (9.1)	81
2.34 lbs/1000"	200 (5.1)	30 - 32	500	28.0 (12.7)	23.2 (10.5)	83
	225 (5.7)	31 - 33	550	31.4 (14.2)	26.2 (11.9)	83
.120 DC+	210 (5.3)	35 - 37	450	29.0 (13.2)	25.0 (11.3)	86
3-3/4" (95mm)	250 (6.4)	36 - 38	500	34.5 (15.6)	29.0 (13.2)	84
2.34 lbs/1000"	300 (7.6)	37 - 39	550	41.5 (18.8)	34.0 (15.4)	82
	355 (9.0)	38 - 40	600	49.0 (22.2)	39.5 (18.0)	81

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al
Requirements						
AWS E70T-4 per A5.20	Report Only	1.75 max.	.03 max.	.03 max.	.60 max.	1.8 max..
Test Results						
Typical NS-3M	.25	.45	.006	<.003	.29	1.59

NOTE: NS-3M will not produce weld deposits meeting the minimum Charpy V-Notch properties recommended in the "Seismic Provisions for Structural Steel Buildings" by AISC, dated April 15, 1997. For these and other applications specifying notch toughness, the following Innershield electrodes should be considered: NR-203MP, NR-203 Nickel C Plus, NR-203 Nickel (1%), NR-232, NR-305, NR-311 Ni.

Designed for optimum performance on vertical down hot, fill and cap passes on standard cross-country pipelines and arctic grade pipe.

Excellent crack resistance, plus outstanding CTOD and Charpy V-Notch properties. Both wires also meet API Pipe Grade X42 and X70 requirements.

NR-207-H is a baked wire with a lower hydrogen level for higher strength steels.

A constant voltage power source is recommended.

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.

- Use these wires instead of stick for improved productivity on pipeline projects.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

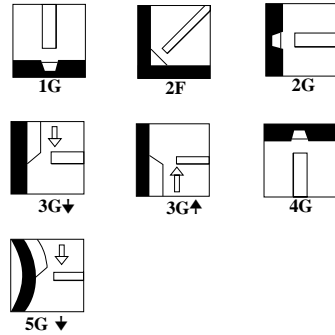
TYPICAL APPLICATIONS

- Standard cross country pipelines.
- Arctic grade pipe.

NOTES:

- NR-207-H will deposit weld material with diffusible hydrogen levels of less than 8.0 ml/100g.

WELDING POSITIONS



CONFORMANCE

AWS A5.29-98: E71T8-K6
 ABS: E71T8-K6
 DNV: IIIYMSH15
 BV: SA3YMH
 GL: 3YSH15

DIAMETERS / PACKAGING

Diameter Inches (mm)	14 Lb. Coil (56 Lb. Carton)	14 Lb. Coil (56 Lb. Pail)	22 Lb. Readi-Reel
NR-207			
.068 (1.7)	ED016280	ED016312	
5/64 (2.0)	ED012437	ED012438	
NR-207-H			
.068 (1.7)		EDS19565	ED019566
5/64 (2.0)		EDS19568	

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.20

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules)		Hardness Rockwell B
				@ -20°F (-29°C)	@ -40°F (-40°C)	
Requirements AWS E71T-8J	58,000 (400) min.	70,000 - 90,000 (483 - 620)	20 min.	20 (27) min.	Not Specified	--
Test Results Typical NR-203MP	58,000 - 64,000 (400 - 441)	75,000 - 80,000 (517 - 551)	20 - 33	130 - 170 (176 - 230)	109 (147)	84 - 90

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metal-lurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.068" DC- 3/4" (19mm) 0.078 lbs/1000"	80 (2.0)	17 - 18	190	3.8 (1.7)	3.0 (1.3)	79
	105 (2.6)	18 - 19	230	5.0 (2.2)	4.0 (1.8)	80
	120 (3.0)	19 - 20	245	5.7 (2.5)	4.5 (2.0)	79
	145 (3.6)	21 - 22	275	6.8 (3.0)	5.5 (2.4)	81
	170 (4.3)	21 - 22	295	8.0 (3.6)	6.4 (2.9)	80
5/64" DC- 3/4" (19mm) 1.04 lbs/1000"	70 (1.7)	17 - 18	205	4.5 (2.0)	3.4 (1.5)	76
	80 (2.0)	18 - 19	225	5.1 (2.3)	3.9 (1.7)	76
	90 (2.2)	18 - 19	240	5.8 (2.6)	4.5 (2.0)	78
	110 (2.7)	20 - 21	275	7.0 (3.1)	5.5 (2.4)	79
	130 (3.3)	20 - 21	300	8.3 (3.7)	6.5 (2.9)	78

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn	%P	%S	%Si	%Al	%Ni	%Cr	%Mo	%V
Requirements										
AWS E71T8-K6 per A5.29	.15 max.	.50- 1.50	.03 max.	.03 max.	.80 max.	1.8 max.	.40- 1.00	.20 max.	.15 max.	.05 max.
Test Results										
Typical NR-207	.06	.94	.005	<.003	.26	.1.07	.76	.02	.02	<.01

Similar to NR-207-H wire, with lower hydrogen and higher strength.

Designed for optimum performance on vertical down hot, fill and cap passes on standard cross country pipelines and arctic grade pipe.

Meets API Pipe Grade X80 requirements.

A constant voltage power source is recommended

ADVANTAGE LINCOLN

- Self-shielded, flux-cored. No need for external gas or flux.
- Produces quality welds in moderate wind conditions with no tenting.
- Use instead of stick for improved productivity on pipeline projects.

- Produces weld deposits exceeding 80,000 psi yield strength.
- Our quality driven manufacturing system – certified to ISO 9002 – and our exceptionally high grade raw materials mean every coil of Innershield delivers great arc characteristics and superior feedability.

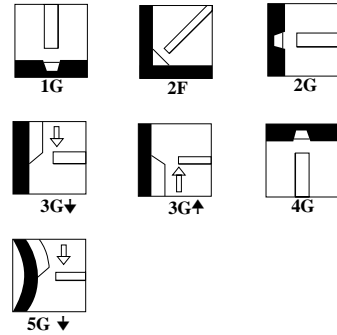
TYPICAL APPLICATIONS

- Standard cross-country pipelines.
- Arctic-grade pipe.

NOTES:

- NR-208-H will deposit weld material with diffusible hydrogen levels of less than 8.0 ml/100g.

WELDING POSITIONS



CONFORMANCE

AWS A5.29-98: E91T8-G
ASME: SFA-5.20: E91T8-G

DIAMETERS / PACKAGING

Diameter Inches (mm)	14 Lb. Coil (56 Lb. Pail)
.068 (1.7)	EDS22113
5/64 (2.0)	ED023366

MECHANICAL PROPERTIES⁽¹⁾ - As Welded per AWS A5.29

	Yield Strength psi (MPa)	Tensile Strength psi (MPa)	Elongation (%)	Charpy V-Notch ft-lbs (Joules)		Hardness Rockwell B
				@ -20°F (-29°C)	@ -40°F (-40°C)	
Requirements AWS E71T-8J	78,000 (538) min.	90,000 - 110,000 (620 - 758)	17 min.	Not Specified	Not Specified	--
Test Results Typical NR-203MP	81,000 - 86,000 (558 - 593)	94,000 - 99,000 (648 - 682)	25 - 27	50 (67)	44 (59)	90 - 96

⁽¹⁾ The strength and elongation properties reported were obtained from a .505" tensile specimen artificially aged at 220°F (104°C) for 48 hours, as permitted by AWS A5.20-95. A naturally aged tensile specimen may take months to achieve the specified properties. See AWS A5.20-95, paragraph A8.3. The time required for the natural aging of weld deposits is dependent upon ambient conditions, weldment geometry, the metallurgical structure of the weld deposit and other factors.

TYPICAL OPERATING PROCEDURES

Wire, Polarity Electrical Stickout Wire Weight	Wire Feed Speed in/min (m/min)	Arc Voltage (volts)	Approx. Current (amps)	Melt-Off Rate lbs/hr (kg/hr)	Deposition Rate lbs/hr (kg/hr)	Efficiency (%)
.068" DC- 3/4" (19mm) 0.80 lbs/1000"	70 (1.7)	15 - 16	165	3.2 (1.5)	2.6 (1.1)	82
	90 (2.2)	17 - 18	195	4.0 (1.8)	3.3 (1.5)	82
	120 (3.0)	19 - 20	225	5.4 (2.5)	4.5 (2.0)	83
	145 (3.6)	20 - 21	255	6.7 (3.0)	5.5 (2.5)	82
	170 (4.3)	21 - 22	278	7.7 (3.5)	6.3 (2.8)	82
5/64" DC- 3/4" (19mm) 1.04 lbs/1000"	70 (1.7)	16 - 17	195	4.0 (1.8)	3.2 (1.4)	81
	80 (2.0)	17 - 18	220	4.6 (2.1)	3.9 (1.7)	84
	90 (2.2)	18 - 19	235	5.4 (2.4)	4.5 (2.0)	84
	110 (2.7)	19 - 20	270	6.5 (2.9)	5.5 (2.4)	85
	130 (3.3)	19 - 20	295	7.6 (3.5)	6.5 (2.9)	85

NOTE: These are typical operating procedures and are not intended to serve as specific procedures for any applications.

DEPOSIT COMPOSITION

	%C	%Mn*	%P	%S	%Si*	%Al	%Ni*	%Cr*	%Mo*	%V*
Requirements AWS E91T8-G per A5.29	Report only	1.75 min.	.03 max.	.03 max.	.80 min.	1.8 min..	.50 min..	.30 min.	.20 min.	.10 min.
Test Results	.05	2.13	.011	<.002	.25	1.13	.79	.02	<.01	<.01

NOTE: In order to meet the alloy requirements of the G group, the weld deposit needs to have the minimum, as specified in the table, of only one of the elements marked with an asterisk.

AGENCY APPROVALS⁽¹⁾

Innershield® Wire ⁽¹⁾	AWS/ASME	ABS Grade	Lloyd's Grade	DNV Grade	BV Grade	CWB/CSA Grade	GL Grade	Military	Other
NR-203 Nickel C	E61T8-K6	3SA	3SH15	IIIMSH15 ⁽³⁾					JIS
NR-1	E70T-3								
NR-5	E70T-3								
NS-3M	E70T-4					E4802T-4-CH			JIS
NR-305	E70T-6	2SA-2YSA		IYMS ⁽²⁾	SA2YM ⁽²⁾	E4802T-6-CH	2YS ⁽²⁾		JIS
NR-311	E70T-7					E4802T-7-CH			JIS
NR-131	E70T-10								JIS
NR-311 Ni	E70TG-K2	2SA-2YSA	2S-2YS	IYMS	SA2YM		2YS		JIS
NR-202	E71T-7								
NR-203MP	E71T-8J	3SA-3YSAH15	3S-3YSH15	IIIMSH15	SA3YMH	E4801T-8-CH	3YSH15		JIS
NR-203M	E71T-8J	3SA-3YSA	3S-3YS						
NR-232	E71T-8	3SA-3YSAH15	3S-3YSH15	IIIMSH15	SA3YMH	E4801T-8-CH	3YSH10	MIL-71T-8AS	JIS, TUV
NR-203 Ni C Plus	E71T8-K2								JIS
NR-207	E71T8-K6			IIIMSH15	SA3YMH	E71T8-K6-H16	3YSH15		JIS, TUV
NR-207-H	E71T8-K6								JIS, TUV
NR-203 Nickel 1%	E71T8-Ni1	3SA-3YSA	3S-3YSH15	IIIMSH15		E71T8-Ni1-H16	3YSH15		JIS, TUV
NR-211-MP	E71T-11					E4801T-11-CH			JIS
NR-212	E71TG-G					E71TG-G-CH			JIS
NR-152	E71T-14								JIS
NR-208-H	E91T8-G								JIS, TUV

ABS: American Bureau of Shipping
 Lloyd's: Lloyd's Register of Shipping
 DNV: Det Norske Veritas
 GL: Germanischer Lloyd
 BV: Bureau Veritas

⁽¹⁾ Approvals are updated periodically. Consult your local Lincoln district office for the latest Approval/Grade revision.

⁽²⁾ 3/32" diameter only.

⁽³⁾ Tested at -40°F.

In general, Innershield electrodes will produce weld deposits which achieve hydrogen levels below 16 ml per 100 grams deposited metal. These products, like other products which produce deposits low in hydrogen, must be protected from exposure to the atmosphere in order to maintain hydrogen levels as low as possible, preventing rusting of the product and prevent porosity during welding. Accordingly, the following storage conditions are recommended for Innershield electrodes in their original, unopened boxes and plastic bags.

The recommended storage conditions are such that they maintain condition of 90 grains of moisture per pound of dry air. Examples of storage conditions that will meet this requirement are given below:

Ambient Temperature		Maximum Relative Humidity
Fahrenheit	Celsius	
60° - 70°	(16° - 21°)	80%
70° - 80°	(21° - 27°)	60%
80° - 90°	(27° - 32°)	45%
90° - 100°	(32° - 38°)	30%

For best results, electrode should be consumed as soon as practicable. However, it may be stored up to three years from the date of manufacture. Consult your Lincoln distributor or sales representative if there is a question as to when the electrode was made.

Once the electrode packaging is opened, Innershield electrodes can be subject to contamination from atmospheric moisture. Care has been taken in the design of these products to select core ingredients that are essentially resistant to moisture pick-up; however, condensation of the moisture from the atmosphere onto the surface of the electrode can be sufficient enough to degrade the product.

The following minimum precautions should be taken to safeguard product after opening the original package. Electrode should be used within approximately 1 week after opening the original package. Opened electrode should not be exposed to damp, moist conditions or extremes in temperature and/or humidity where surface condensation can occur. Electrodes mounted on wire feeders should be protected against condensation. It is recommended that electrode removed from its original packaging be placed in poly bags (4 mil minimum thickness) when not in use.

Innershield electrodes will evidence high moisture levels in the form of gas tracks, higher spatter and porosity. Any rusty electrode should be discarded.

Innershield Products Used for Applications Requiring More Restrictive Hydrogen Control

The AWS specifications for flux-cored electrodes, ANSI/AWS A5.20, states that "Flux-cored arc welding is generally considered to be a low hydrogen welding process". To further clarify the issue, this specification makes available optional supplemental designators for maximum diffusible hydrogen levels of 4, 8 and 16 ml per 100 grams of deposited weld metal.

Some Innershield products have been designed and manufactured to produce weld deposits meeting more stringent diffusible hydrogen requirements. These electrodes are usually distinguished by an "H" added to the product name. These electrodes will remain **relatively** dry under recommended storage conditions in their original, unopened package or container.

For critical applications in which the weld metal hydrogen must be controlled (usually H8 or lower), or where shipping and storage conditions are not controlled or known, only hermetically sealed packaging is recommended. Innershield electrodes are available in hermetically sealed packages on a Special Order basis.

Once the package has been opened, the electrode should not be exposed to conditions exceeding 80% relative humidity for a period greater than 16 hours, or any less humid condition for greater than 24 hours. Conditions that exceed 80% RH will decrease the maximum 16 hour exposure period.

After exposure, hydrogen levels can be reduced by conditioning the electrode. Electrode may be conditioned at a temperature of 230°F (110°C) ± 25°F (-3.8°C) for a period of 6 to 12 hours, cooled and then stored in sealed poly bags (4 mil minimum thickness) or equivalent. Electrode on plastic spools should not be heated at temperatures in excess of 150°F. Electrode that is rusty should be discarded.

Customer Assistance Policy

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

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying this type of fabrication methods and service requirements.

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