



FASTER WELDING ON FIELD
WITH INNERSHIELD®

LINCOLN
ELECTRIC

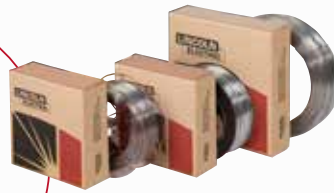
www.lincolnelectriceurope.com

HIGH PRODUCTIVITY SOLUTION

INNERSHIELD®
wires



A COMPLETE PORTFOLIO FOR SEVERAL APPLICATIONS



TOTAL SOLUTION TO WORK WITH INNERSHIELD®

INNERSHIELD® GUNS



COMPLETE RANGE OF PPE FOR YOUR PROTECTION



SELF-POWERED CARRIAGES FOR MECHANIZED ALL POSITIONAL WELDING

EQUIPMENT PACKAGES TO SATISFY YOUR REQUIREMENTS

DIY

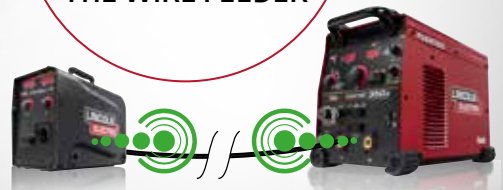


OUTDOOR

OUTDOOR/
INDOOR



CROSSLINC® TECHNOLOGY TO REGULATE WELDING PARAMETERS FROM THE WIRE FEEDER



LINCOLN ELECTRIC INVENTED THE FIRST SELF-SHIELDED FLUX-CORED WIRE

Patented
in 1958

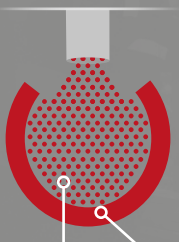
1. Green Rod or Strip



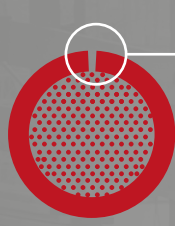
2. Formation



3.



4.



Butt Seam
Lap Seam

5.



Outer Steel Sheath

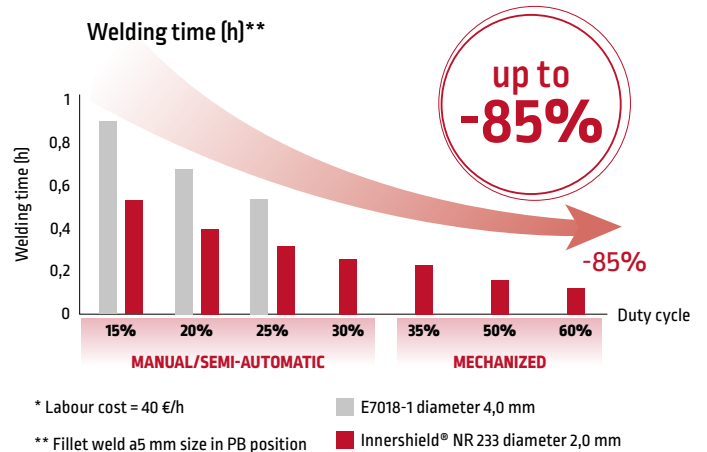
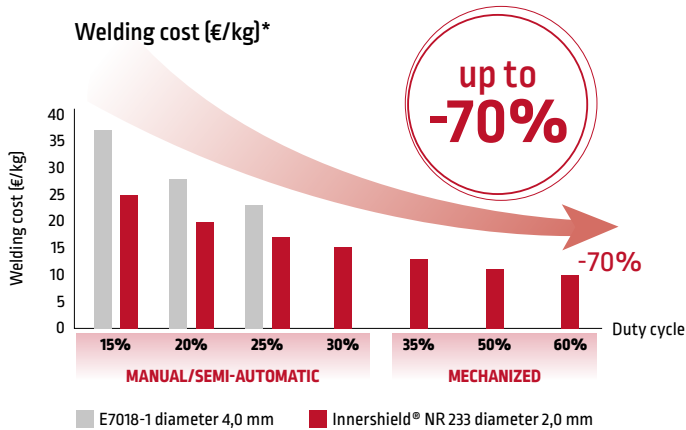
Inner Flux Core

INNERSHIELD®
THE RIGHT SOLUTION
FOR OUTDOOR WELDING, ADVANTAGES
OVER OTHER COMMON PROCESSES

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INNERSHIELD® – THE RIGHT SOLUTION FOR OUTDOOR WELDING OVER STICK WELDING PROCESS



INNERSHIELD® ADVANTAGES OVER STICK WELDING PROCESS

- Continuous process
- Longer Arc time and increased operating factor
- Higher deposition rates
- Increased productivity
- Fewer stops and starts = fewer defects



COST SAVING EXAMPLE BETWEEN INNERSHIELD® AND SMAW PROCESSES

APPLICATION
BASE MATERIAL: S355
Thickness: 10 mm
Joint type: A5 FW in PB [2F]

			SMAW BASIC 7018-1	FCAW-S NR-233
PROCESS	Welding modality		manual	semi-automatic
	Current	Amperage	140-180	240-250
	Diameter	[mm]	4,0	1,6
	Deposition rate	[kg/h]	1,7	2,7
COST STUDY FOR 1000 METERS OF WELD PER YEAR				
WELDING COST	Wire	[€/kg]	3	15,00
	Efficiency	[%]	0,65	0,80
	Weight per meter weld	[kg/m]	0,23	0,23
	Cost per meter weld	[€/m]	1,1	4,3
	Total cost	[€/kg]	5	19
PRODUCTION COST	Labour cost	[€/h]	40	40
	Duty cycle	[%]	18	25
	Weight per meter weld	[kg/m]	0,23	0,23
	Time per meter weld	[h/m]	0,75	0,34
	Cost per meter weld	[€/m]	31	18
		Total welding time (h)	752	341
		Total cost (€)	31,127	17,942

EFFICIENCY
+23%

DEPOSITION RATE
+58%

saving for **1 km** of welding

SAVINGS

TIME
-55%
[-51 days]

COST
-42%
[-13 000 €]



Contact us to calculate your ROI

INNERSHIELD® – SEMI-AUTOMATIC GAS-LESS PROCESS ALLOWS YOU TO SAVE TIME AND COST

FOR MORE PRODUCTIVITY, MOVE FROM SMAW TO FCAW. CHOOSE INNERSHIELD® IF...

➤ THE USE OF GAS BOTTLES TYPICAL ISSUES USING GAS

- supply of right gas mixture
- regular delivery of bottles on field
- safe gas bottle handling
- protected store
- continue maintenance of hoses and gas pressure regulators (cost/time lost, gas leakage, dedicated person in charge of)



➤ THE WIND REPRESENTS AN ISSUE

INNERSHIELD® ALLOWS:

- Welding under wind speeds up to 50 km/h and favourable operating characteristics without losing mechanical properties
- Less defects such as porosity and wormholes
- No need to invest in barriers to protect the welding from wind

INNERSHIELD® ADVANTAGES

- Eliminate cylinder rental cost
- Lower maintenance costs: [simpler gun and feeder].
- No requirement for tenting to protect welding point from wind.
- Innershield® wires have excellent feedability and root penetration and allows use of long CTWD to enter in narrow groove.
- Deal with surface contaminants, such mill scale, rust, coating, better than solid wire.



INNERSHIELD® – THE PROCESS

Lincoln Electric Company invented the FCAW-S process in 1958, with the Innershield® line of electrodes (Innershield® wires). Innershield® is an important process for steel fabrication in many industries, particularly when done outdoors. It is a primary welding process for structural steel building erection.

TYPICAL APPLICATIONS

- Steel Structure
- Offshore
- Shipbuilding
- Field Maintenance
- Pipelines
- Heavy plate fabrication
- Sheet metal
- General fabrication
- Rail welding
- Home work – DIY

TYPICALLY MADE IN LARGE DIAMETERS

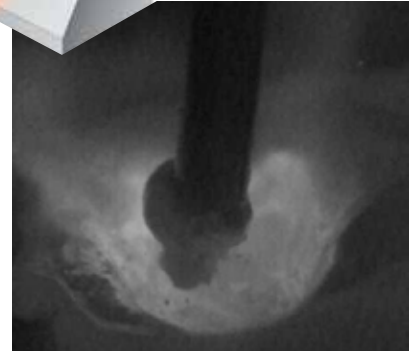
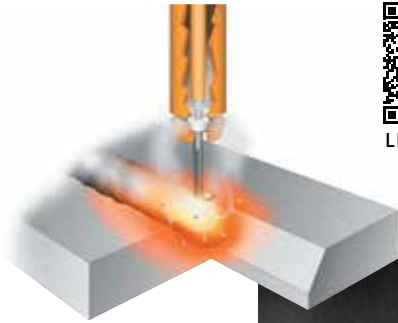
- from 1,6 to 3,0 mm
- some in smaller sizes: 0,9 mm to 1,2 mm

AVAILABLE IN VARIETY OF PACKAGES

- from 0,4 kg to 22,7 kg
- bulk reels & drums 227 kg, 273 kg

AVAILABLE IN VARIETY OF FORMULATIONS FOR:

- mild steel or low-alloy
- flat & horizontal position only or all positions



All Innershield® wire are classified according to EN ISO 17632 and are suitable for welding steel structures according to EN 1090

When required:

- Welders need to be qualified according to EN 287-1; training of 1 week is recommended to master the technique.
- Welding procedure shall be qualified according to EN ISO15614-1. [*]

[*] Lincoln Electric can provide support for welder training and procedure qualification

MAIN INNERSHIELD® TYPES*

	4,5 kg		5,7 kg		6,4 kg		11,3 kg			22,7 kg			
	AVAILABLE IN DIAMETER (mm)												
Innershield® NR®-211-MP	0,9	1,1			1,7	2,0	0,9	1,1	1,7	1,7	2,0		
Innershield® NR®-233			1,6				1,6						
Innershield® NS-3M			2,4		2,0					2,4	3,0		
Innershield® NR®-311Ni							2,4	2,8					
Innershield® NR®-203Ni1										2,0			
Innershield® NR®-440Ni2										1,6	2,0		
Innershield® NR®-555							1,6	2,0					
Pipeliners® NR-208-XP					1,7	2,0							
Innershield® NR®-232					1,7	1,8	2,0	1,7	1,8	2,0	1,7	1,8	2,0
Innershield® NR®-232-H								1,7	1,8				
Innershield® NR®-305										1,7	2,0	2,4	

*Non-exhaustive list. More wires available in www.lincolnelectric.eu



EN ISO 17632



QUALITY CONTROL

Innershield® is a process widely used worldwide in a great variety of applications. Innershield® wires are object of strict quality control in production to grant consistent performances.

Innershield® wires are approved by third parties such as ABS, DNV, LRS (see product data sheet for better reference).

Some Innershield® products are used for building construction in the seismically active regions of the US, where the stringent requirements of AWS D1.1 Structural Welding Code-Steel, and the D1.8 Seismic Welding Supplement apply.



Product: **Innershield® NR®-440Ni2**
 Classification: E71T8-Ni2-JH8
 E71T8-A4-Ni2-H8
 Specification: AWS A5,29:2010, ASME SFA-5,29
 AWS A5,36:2016, ASME SFA-5,36

Product: **Innershield® NR®-233**
 Classification: E71T-8-H8
 E71T8-A2-CS3-H8
 Specification: AWS A5,20:2005, ASME SFA-5,20
 AWS A5,36:2016, ASME SFA-5,36

Operating Settings	E71T-8-H8 Requirements	RESULTS
Required Size for Classification	1/16 in	1/16 in (1,6 mm)
Current Type/Polarity	DC-	DC-
Wire Feed Speed, cm/min (in/min)		622 (245)
Nominal Voltage, V		23
Nominal Current, A		270
Average Heat Input, kJ/mm (kJ/in)	(25-55)	1,3 (32,5)
Travel Speed, cm/min (in/min)		29 (1,46)
Contact Tip to Work Distance, mm (in)		22 (7/8)
Pass/Layers		20/6
Preheat Temperature, °C (°F)	(60 min.)	25 (73)
Interpass Temperature, °C (°F)	(325 max.)	165 (325)
Postweld Heat Treatment	As-welded	As-welded

Operating Settings	E71T8-Ni2-JH8 Requirements	RESULTS
Required Size for Classification	1/16 in	1/16 in (1,6 mm)
Current Type/Polarity	DC-	DC-
Nominal Voltage, V		20
Nominal Current, A		200
Wire Feed Speed, cm/min (in/min)		330 (130)
Average Heat Input, kJ/mm (kJ/in)	(25-55)	1,6 (40)
Travel Speed, cm/min (in/min)		15 (5,93)
Contact Tip to Work Distance, mm (in)		22 (7/8)
Pass/Layers		16/8
Preheat Temperature, °C (°F)	(275-325)	135 (275)
Interpass Temperature, °C (°F)	(275-325)	135 (275)
Postweld Heat Treatment	As-welded	As-welded

Mechanical Properties of Weld Metal

Tensile Strength, MPa (ksi)	(70-90)	550 (79)
Yield Strength, 0,2% Offset, MPa (ksi)	(58 min.)	460 (67)
Elongation %	20 min.	27

Average Impact Energy Joules @ -40°C (ft-lbs @ -40°F)	(20 min.)	338 (249) 241, 353, 420 (178, 260, 310)
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Average Hardness, HRB	Info. Only	82
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Mechanical Properties of Weld Metal

Tensile Strength, MPa (ksi)	(70-90)	580 (84)
Yield Strength, 0,2% Offset, MPa (ksi)	(58 min.)	450 (65)
Elongation %	22 min.	26

Average Impact Energy Joules @ -29°C (ft-lbs @ -20°F)	(20 min.)	49 (36) 48, 49, 50 (35, 36, 37)
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Average Hardness, HRB	Info. Only	87
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Chemical Composition of Weld Metal (weight %)

C	0,12 max.	0,02
Mn	1,50 max.	1,06
Si	0,80 max.	0,18
S	0,030 max.	<0,003
P	0,030 max.	0,010
Ni	1,75-2,75	1,94
Al	1,8 max.	0,8

Diffusible Hydrogen (per AWS A4,3)	E71T8-Ni2-JH8 Requirements	RESULTS
Required Size for Classification		1/16 in (1,6 mm)
Current Type/Polarity		DC-
Nominal Voltage, V		19
Nominal Current, A		178
Diffusible Hydrogen, ml/100g	8,0 max.	5,3
Abs. Humidity (gr moisture/lb dry air)		65

Chemical Composition of Weld Metal (weight %)

C	0,30 max.	1,7
Mn	1,75 max.	0,65
Si	0,60 max.	0,21
S	0,03 max.	0,00
P	0,03 max.	0,01
Al	1,8 max.	0,7

Diffusible Hydrogen (per AWS A4,3)	E71T-8-H8 Requirements	RESULTS
Required Size for Classification		1/16 in (1,6 mm)
Current Type/Polarity		DC-
Nominal Voltage, V		23
Nominal Current, A		291
Diffusible Hydrogen, ml/100g	8,0 max.	3,9
Abs. Humidity (gr moisture/lb dry air)		76

**CVN up to
-50°C
(for specific
products)**

MAIN PRODUCTS

Mild steel – all position welding capability

Innershield® NR®-211-MP

- Versatile welding capability on a variety of base materials
- High operator appeal and good bead appearance
- Easy slag removal
- Fast freezing characteristics accommodate poor fit-up
- Restricted to 12 mm plate thickness

Applications

- Sheet or thin gauge metal
- Galvanized sheet metal
- Robotic/hard automation
- General fabrication



Specifications

Classifications		Approvals	Chemistry					Mechanical Properties		
AWS A5,36	EN ISO 17632-B		C	Mn	Si	S	P	RP0,2	RM	Elongation (%)
E71T11-AZ-CS3	T49ZT11-1NA-H15	CE, ABS, CWB, TUV, DB	0,21	0,65	0,25	0,003	≤0,010	450	610	22

Innershield® NR®-233

- New design increases wire stiffness to aid feedability and promotes smooth arc transfer
- High deposition rates for out-of-position welding
- Meets AWS D1,8 requirements
- Welders of all skill levels benefit from the easy to control arc and forgiving weld puddle even out of position

Applications

- General & Seismic structural steel erection and fabrication
- Ship and barge fabrication
- Vertical up and overhead fillets and groove welds



Specifications

Classifications		Approvals	Chemistry					Mechanical Properties			
AWS A5,36	EN ISO 17632-B		C	Mn	Si	S	P	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -29°C
E71T8-A2-CS3-H8	T 49 3 T8-1 N A-UH10	CE, ABS, AWS D1,8, JIS Z 3313	0,15-0,20	0,61-0,65	0,17-0,21	≤0,03	≤0,01	435-455	575-595	22	34-54

Low alloy steel – all position welding capability

Innershield® NR®-203 Nickel (1%)

- Designed to produce a nickel bearing weld deposit
- Produces weld deposits with impact toughness exceeding 27 J at 29°C
- Color match on weathering steels
- Handles poor fit-up
- Root bead capability

Applications

- Roundabout groove welds on heavy wall tubular construction
- Offshore
- Bridges and other structural components made from weathering steels
- Structural fabrication
- NACE applications



Specifications

Classifications		Approvals	Chemistry					Mechanical Properties				
AWS A5,36	EN ISO 17632-A		C	Mn	Si	Ni	S	P	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -29°C
E71T8-A2-Ni1-H16	T42 3 1Ni Y N	CE, DNV, CWB, DB, TUV, ABS, LR	0,08	1,1	0,27	0,9	0,003	0,008	465	540	26	115

Innershield® NR®-555

- Impact 100J@-50°C
- Self-shielded electrode designed for welding in structural applications
- Welder friendly operability and flat bead face in out-of-position fillets and groove welds
- Meets AWS D1,8 seismic lot waiver requirements
- ProTech® foil bag packaging shields against moisture, prevents rust and prolongs storage life

Applications

- Structural
- General Fabrication



Specifications

Classifications		Approvals	Chemistry					Mechanical Properties				
AWS A5,36	EN ISO 17632-A		C	Mn	Si	Ni	S	P	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -29°C
E81T8-A5-K8-H	T46 5 Z Y N 1 H10	CE, AWS D1,8	0,05	1,84	0,17	1,12	0,001	0,011	550	630	25	54

Low alloy steel – flat and horizontal welding capability

Innershield® NR®-311Ni

- Designed for improved handling of poor fit-up on heavy wall tubes and gaps up to 9,5 mm with 6,4 mm offset
- Fast freezing slag with excellent wash-in
- Root bead capability without back-up bars

Applications

- Fillet and lap welds
- Horizontal and square edge butt welds, such as column-to-column structural connections
- Deep groove welds
- Structural fabrication
- Weathering steels



Specifications

Classifications		Approvals	Chemistry					Mechanical Properties			
AWS A5,36	EN ISO 17632-B		C	Mn	Si	S	Ni	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -29°C
E70T7-A2-K2-H16, E80TG-A2-K2-	T42 2 1,5Ni W N 5	ABS, LR, DNV, BV, DB, AWS D1,8, CE	0,06-0,08	1,25-1,40	0,18-0,22	≤0,003	1,29-1,56	470-515	575-615	27-30	41-87

Mild steel – all position, except vertical down welding capability

Innershield® NR®-232

- Self shielded: easiest equipment arrangement
- Deposit rate up to 3 kg/h, out of position
- Excellent low temperature impact toughness
- Ideal for fillet welding and filling
- For single and multi-pass welds
- Size diameter 1,7mm suitable for contaminated or primed plate

Applications

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



Specifications

Classifications		Approvals	Chemistry						Mechanical Properties			
AWS A5,20 / AWS A5,36	EN ISO 17632-A		C	Mn	Si	S	P	Al	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -29°C
E71T-8 E71T8-A2-CS3-H16	T 42 3 Y N 2 H15	ABS, BV, DNV, LR, TÜV, DB, CWB	0,18	0,65	0,27	0,004	0,006	0,55	440	570	26	27-35

Innershield® NR®-232-H

- High deposition rates for out-of-position welding
- Penetrating arc
- Fast freezing, easy to remove slag system
- Lower level of diffusible Hydrogen than NR-232

Applications

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



Specifications

Classifications		Approvals	Chemistry						Mechanical Properties			
AWS A5,20 / AWS A5,36	EN ISO 17632-A		C	Mn	Si	S	P	Al	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -29°C
E71T-8-H8 E71T8-A2-CS3-H8	T 42 2 Y N 2 H10	CWB	0,18	0,65	0,27	0,004	0,006	0,55	460-520	575-615	25-31	47-75

Mild steel – flat and horizontal welding capability

Innershield® NR®-305

- NR-305 is a self-shielded flux cored wire
- Not intended for out-of-position welding, but can be used on 15° max. downhill and 5° max. uphill applications
- High deposit rates and fast travel speed
- Easy handling
- Recommended for maximum productivity, downhand welding

Applications

- General plate fabrication
- Structural fabrication, including those subject to seismic requirements
- Shipyards, stiffener welding on barges
- Bridges and offshore rigs
- Welding over tack welds made with stick electrode

Specifications

Classifications		Chemistry					Mechanical Properties			
AWS A5,20 / AWS A5,36	C	Mn	Si	S	P	Al	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -29°C
E70T-6-H16 E70T6-A2-CS3-H16	0,09	0,9	0,2	0,008	0,007	0,80	470	550	24-28	27-40

INNERSHIELD® FOR SPECIAL APPLICATIONS: OFF-SHORE, RAIL, PIPELINE

⇒ RAIL TRACK

Innershield® NS-3M

- Versatile welding capability on a variety of base materials
- High operator appeal and good bead appearance
- Easy slag removal
- Fast freezing characteristics help accommodate poor fit-up

Specifications

Classifications		Approvals	Chemistry					Mechanical Properties		
AWS A5,20 / AWS A5,36	EN ISO 17632-A		C	Mn	Si	S	P	RP0,2	RM	Elongation (%)
E70T-4	T38 Z V N 3	CE, CWB, DB	0,15-0,20	0,61-0,65	0,17-0,21	≤0,03	≤0,01	415-450	580-620	25-28

⇒ OFFSHORE

Innershield® NR®-440Ni2

- Designed help provide provide optimal weldability in narrow TKY joints and poor fit up conditions
- Expect fast travel speeds and a flat bead face when using vertical-up or vertical-down welding techniques
- Low temperature impact toughness, meets ABS 4YSA and AWS J classification
- Meets H8 diffusible hydrogen requirements over a range of humidity levels

Specifications

Classifications	Approvals	Chemistry						Mechanical Properties			
		C	Mn	Si	Ni	S	P	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -40°C
E71T8-Ni2-JH8	ABS, DNV, LR	0,01-0,03	0,74-1,12	0,13-0,17	1,77-2,10	0,002-0,004	0,007-0,012	400-485	490-570	22-36	215-460

⇒ PIPELINE

Pipeliner® NR®-208-XP

- Vertical down hot, fill and cap pass welding of up to X80 grade pipe
- Capable of producing weld deposits with impact toughness exceeding 122 J at -40°C

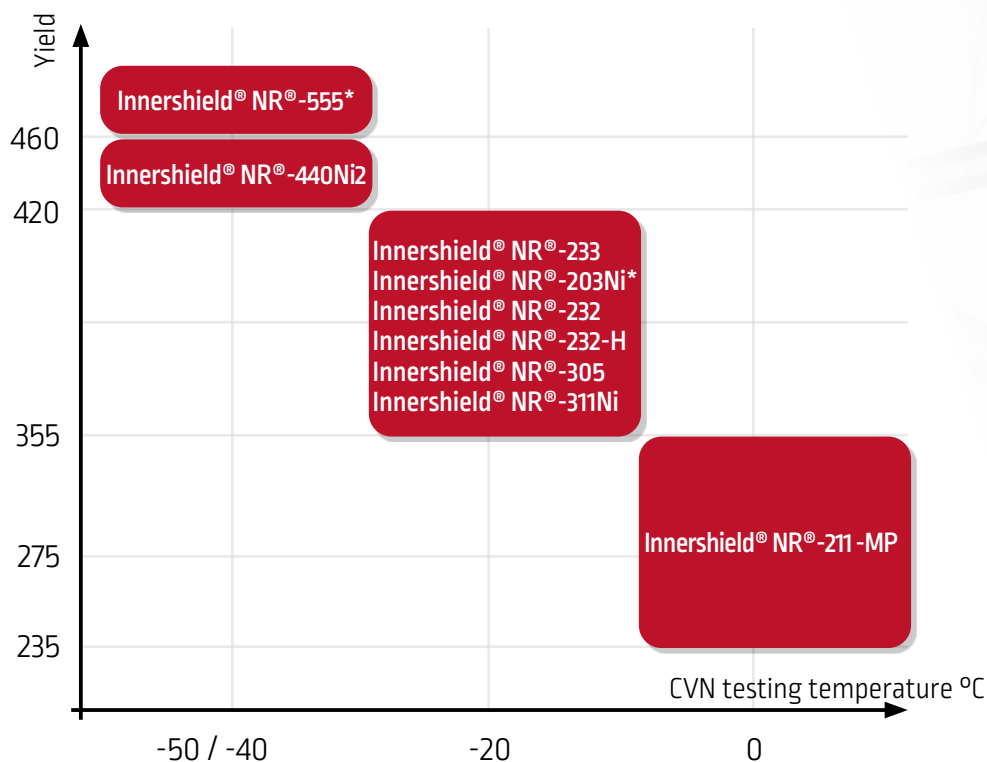
Specifications

Classifications	Chemistry					Mechanical Properties				
AWS A5,36	C	Mn	Si	S	P	RP0,2	RM	Elongation (%)	Impact ISO-V (J) -40°C	
E81T8-A4-K12	≤0,02	2,10-2,20	0,12-0,13	<0,003	0,004-0,007	500-550	575-615	21-28	88-143	



INNERSHIELD® SELECTION CRITERIA

SELECTION BASED ON MECHANICAL PROPERTIES OF STRUCTURAL STEEL



Innershield® NR®-555:

EN 10025-4: S460ML, EN 10025-3: S460NL, EN 10025-4: S420ML, EN 10025-3: S420NL, EN 10025-4: S460M, EN 10025-3: S460N, EN 10025-4: S420M, EN 10025-3: S420N

Innershield® NR®-440Ni2:

EN 10025-4: S355ML, EN 10025-3: S355NL, EN 10025-4: S275ML, EN 10025-3: S275NL

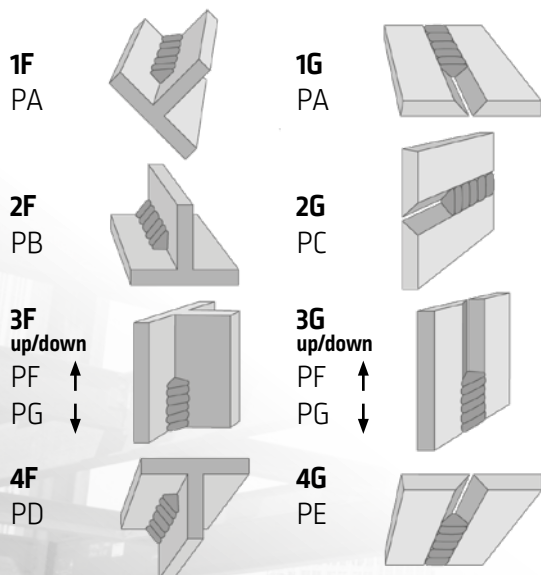
Innershield® NR®-233, Innershield® NR®-203Ni, Innershield® NR®-232 & 232-H, Innershield® NR®-305, Innershield® NR®-311Ni:

EN 10025-4: S355M, EN 10025-3: S355N, EN 10025-2: S355J2, EN 10025-2: S355K2, EN 10025-2: S355JR, EN 10025-4: S275M, EN 10025-3: S275N, EN 10025-2: S275J2, EN 10025-2: S235J2

Innershield® NR®-211MP:

EN 10025-2: S355JR, EN 10025-2: S355J0, EN 10025-2: S275JR, EN 10025-2: S275J0, EN 10025-2: S235JR, EN 10025-2: S235J0

* Suitable for weathering steel according to AWS D1.1 & D1.5



SELECTION BASED ON WELDING POSITION:

Product	Welding position
Innershield® NR®-233	All except vertical down
Innershield® NR®-203Ni	ALL
Innershield® NR®-440Ni2	ALL
Innershield® NR®-555	ALL
Innershield® NR®-211-MP	All except vertical up
Innershield® NR®-311Ni*	Flat and horizontal
Pipelinor® 208-XP	Only vertical down
Innershield® NR®-232 & 232-H	All except vertical down
Innershield® NR®-305*	Flat and horizontal
Innershield® NS-3M	Flat and horizontal

* Innershield® for high deposition rate

WHICH EQUIPMENT AND ACCESSORIES FOR WELDING WITH INNERSHIELD®?

1 DIY

Speedtec® 180C/200C

- Multiprocess
- Easy to change polarity
- 220A/1phase
- Portable



Output Input

CV **1**
PHASE

DC **50/60**
Hz



2 OUTDOOR /INDOOR

Flextec® 350X

- Easy to setup and easy to operate
- Rugged and flexible enough to be used in most construction, fabrication, shipbuilding and other heavy-duty applications

with LN25X or ACTIV8X – rugged, compact and connected wire feeders:

- CrossLinc Technology allows for remote output control over the welding leads. No control cable needed!
- True Voltage Technology™ (TVT™) automatically compensates for voltage drops across long welding cables.



Output Input

CC CV **3**
PHASE

DC **50/60**
Hz

Output Input

CC CV **15-110**
VDC



3 OUTDOOR

Vantage® 410 with LN-25 PRO

- Reliable Engine 4 cylinder 1800 RPM Kubota diesel engine runs smooth and quiet
- Low Noise 97,0dB sound power, one of quietest 400 amps engine-driven welders available



Output Input

CC CV **D**

DC

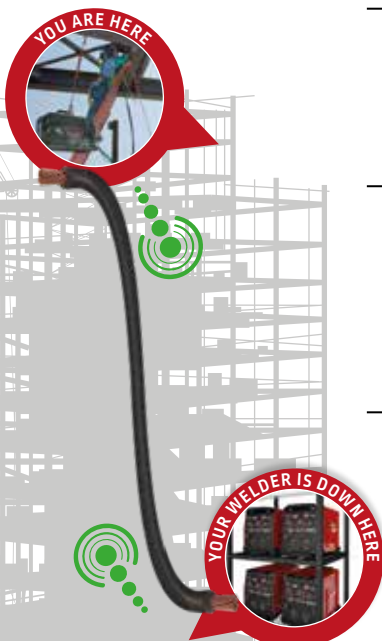
Output Input

CC CV **15-110**
VDC



CROSSLINC® TECHNOLOGY

CrossLinc technology feeders enable voltage control at the feeder, while eliminating the extra cable. The result helps improve safety greater safety, quality, and productivity on the work site.



	Pros	Cons
<p>ACROSS-THE-ARC</p>	<ul style="list-style-type: none"> • Fewer cables • Low cost • Less jobsite cable clutter 	<ul style="list-style-type: none"> • No voltage control at feeder • Difficult to adjust procedures
<p>CONTROL CABLE</p>	<ul style="list-style-type: none"> • Voltage control at feeder • Correct procedures for every weld • Easier to adjust for voltage drop 	<ul style="list-style-type: none"> • More cables • More jobsite clutter • Greater expense • More difficult movement
<p>CROSSLINC® TECHNOLOGY</p>	<ul style="list-style-type: none"> • Voltage control at feeder • Fewer cables • Less jobsite clutter • Correct procedures for every weld • Easy adjustment for voltage drop • Increased arc time 	

THE ULTIMATE IN WELDER PROTECTION



Flip'air LS / Zephyr LS

Electronic autodarkening helmets with air flow system.

Cleanspace 2™

This unique method of personal respiratory protection delivers significant benefits to workers in industry.

Helmet standard
CE EN 175
Cell standard
CE EN 379



DEDICATED GUNS FOR INNERSHIELD®

Lincoln Electric offers a complete line of guns designed specifically for Innershield® process. Unlike MIG guns, Innershield® guns do not need to utilize the flow of shielding gas through them to help dissipate heat. Innershield® guns are rugged and durable, yet lightweight. Bestsellers among the Innershield® guns are the K126™ classic and K115.

- Rugged
- Durable
- Lightweight
- Easy to handle

K115 & K126
your choice for
rugged and
durable guns



K115
450A, Ø 2,4 to 3,0



GO TO WEB PAGE



K126® Classic
350A, Ø 1,6 to 2,4



GO TO WEB PAGE



To connect the Innershield® torch with feeder having EUROconnector, use the adapter code **K10343**

INDUSTRIAL APPLICATIONS: SOME EXAMPLES

OIL / WATER STORAGE TANKS



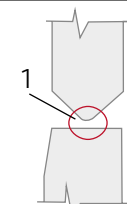
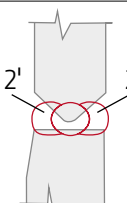
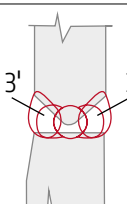
For the welding of large tanks, to improve the welder productivity, consider Innershield® over SMAW or GMAW processes.

Typical parameters for 2G position welding using Innershield® NR-232 diam. 1,7 mm.

Thickness range: 13-18 mm

Equipment: Flextec 350, feeder LN 25X with crossLinc technology.

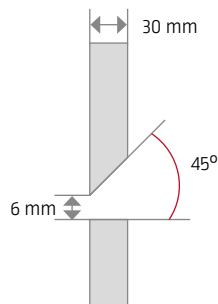
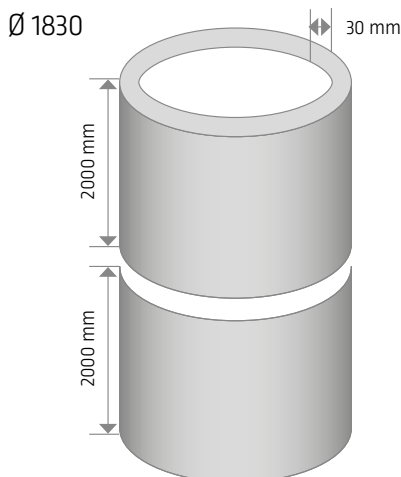
Approximate welding parameters for 2G position using mechanization.

Pass	Weld Joint with Passes	Polarity	Voltage, Volts	WFS, m/min, [amps]	Stickout, mm
Root		DC-	18,0-21,0	2,8-3,6 [200-250]	12-28
Fill		DC-	18,0-21,0	2,8-3,6 [200-250]	12-20
Cap		DC-	18,0-21,0	2,8-3,6 [200-250]	12-20

TO REDUCE WELDING TIME VERSUS SMAW PROCESS, STEEL PILING CAN BE WELDED WITH INNERSHIELD.

Filler metal: Innershield® NR®-311Ni diam. 2,4 mm
Thickness: 30 mm

**Innershield®
to improve
productivity vs.
SMAW**



Run	Wire feed speed (m/min) / Amperage [A]	Voltage [V]	Travel speed (cm/min)
1-4	3,8 / 310-330	26-27	45-47
filling	4,4 / 350-370	27-29	60-62
capping	3,2 / 270-300	21-23	50-52

OFF SHORE

INNERSHIELD® NR®-440Ni2

Innershield® NR®-440Ni2 is a best in class electrode primarily for use in the offshore industry on T-Y-K connections and poor fit up conditions.

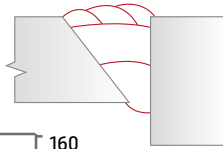
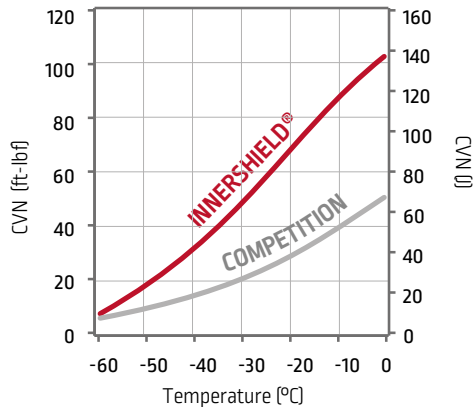
- Excellent Charpy V-Notch toughness: >200 J @-40°C in AWS joint configuration
- CTOD tested up to @-10°C
- Low diffusible hydrogen levels: Meets Agency H5 level (ABS, LRS, DNV)
- Great weldability in all positions: Has both vertical up and vertical down welding capability
- Higher deposition rate than SMAW process



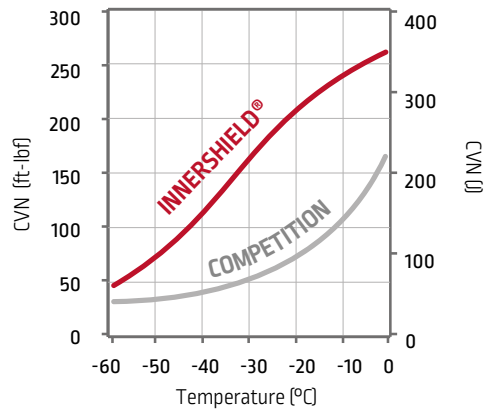
**lower cost
using Innershield®
NR 440Ni2 over
stick electrode**

INNERSHIELD® NR®-440Ni2 VS. COMPETITOR'S FCAW-S

Impact Toughness in TKY Joint (3G position)



Impact Toughness in 3G ABS Butt Joint

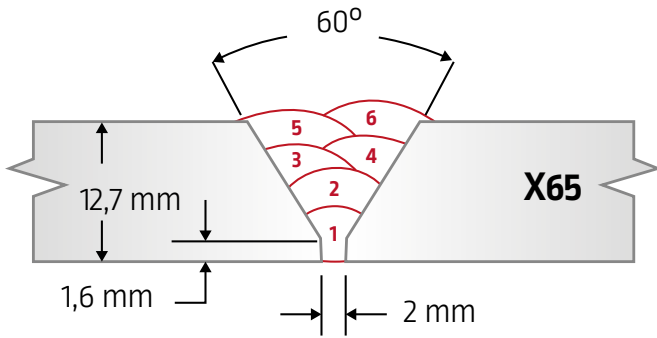


**PROTECH™
VACUUM PACK**

PIPELINE

PIPELINER® NR-208-XP

Pipeliners® NR-208-XP is the Innershield® wire for pipeline welding, it deposits lower hydrogen weld metal in a pipe joint using a downhill progression technique similar to cellulosic pipe welding technique. Ideal for cross-country pipelines.



Mechanical test results (weld metal, as-welded)

Tensile (ASTM E8) All weld metal, 6,35mm (0,250 in) diameter	
	average
$R_{p0.2}$ (YS _{0.2%})	515MPa
R_m (UTS)	609MPa
A_4 (Elong.)	27%
Charpy V-Notch (ASTM E23) Mid-wall, 10mm	
-29°C [-20°F]	45J
CTOD (BS 7448 part 2) NP, SENB Bx2B	
-10°C [+14°F]	0,49mm



REDUCED ARC TIME, CONTROLLED HEAT INPUT AND LOW HYDROGEN LEVEL CAN HELP TO REALIZE SOUND WELDS AND IMPROVE PRODUCTIVITY

Welding Procedures

Pass 1 (Root)	1,2 mm Pipeliners® 70S-G (ER70S-G) STT process
Pass 2 (Hot) Pass 3-5 (Fill) Pass 6 (Cap)	2,0mm Pipeliners® NR-208-XP (E81T8-G) 200A, 19,5V DC- 200A, 19,5V DC- 200A, 19,5V DC-
Position	5G Horizontal Fixed
Progression	Vertical-down all passes

Up to 2,0 Kg/h of deposition rate in PG position with Pipeliners® 208xp 2,0 mm diameter and higher operating factor than SMAW process.





RAIL TRACK WELDING

How to weld a rail track type "70" [Rm 685 N/mm²]



Allignment and preheat



Rail foot welding using NS-3M diam. 2,0mm



Rail web welding

Recommended filler metal for rail track

Rail track	"70" [Rm 685 N/mm ²]	"90" [Rm 885 N/mm ²]
Joint	Innershield® NS-3M	Innershield® NS-3M
Surfacing	Innershield® NS-3M	Lincore 33 Wearshield BU

How to weld a rail track type "70" [Rm 685 N/mm²]

In case of rail track type "90" [Rm 885 N/mm²], the last 6mm have to be welded with harfacing filler metal such us Lincore 33 (FCAW-S) or Wearshield BU (SMAW) to grant proper resistance to wearing.

MAINTENANCE WORK, REPARATION, GRATING, FENCE, GALVANIZED GUARDRAIL...

Use Innershield® NR®-211-MP with Speedtec® 180C / 200C very smooth spray arc transfer for easier operation, minimal spatter and easy slag removal.

Welding with NR®-211-MP diameter 0,9 mm can be done using normal GMAW torch (LGS 150 G). It is recommended to use the appropriate nozzle for Innershield® K10468



EXAMPLES OF MECHANIZED APPLICATIONS

WELDYCAR AND INNERSHIELD®

Effective mechanization can help improve productivity



VISIT WEB PAGE



the duty cycle up to **70 %**

EXAMPLE OF COST SAVING ACHIEVMENT USING INNERSHIELD® AND MECHANIZATION VERSUS MANUAL WELDING

APPLICATION

BASE MATERIAL: S275

Thickness: 12 mm

Joint type: a5 Fillet Weld in PB (2F)

			SMAW BASIC 7018-1	FCAW-S NR-305
PROCESS	Welding modality		manual	mechanized
	Current	Amperage	140-180	320-330
	Diameter	[mm]	4,0	1,7
	Deposition rate	[kg/h]	1,7	4,6
COST CALCULATION FCAW-SS VS MMA				
WELDING COST	Wire	[€/kg]	3	15,00
	Efficiency	[%]	0,65	0,80
	Weight per meter weld	[kg/m]	0,23	0,23
	Cost per meter weld	[€/m]	1,1	4,3
	Total cost	[€/kg]	5	19
PRODUCTION COST	Labour cost	[€/h]	40	40
	Operating factor	[%]	18	60
	Weight per meter weld	[kg/m]	0,23	0,23
	Time per meter weld	[h/m]	0,75	0,08
	Cost per meter weld	[€/m]	31	8

EFFICIENCY
+23%

DEPOSITION
RATE
x2,5

COST UP TO
-23€/m

Innershield® NR305 for high deposition rate in flat welding position

Diameter, Polarity	CTWD (mm)	Wire Feed Speed (m/min)	Voltage (V)	Approx. Current (A)	Deposition rate (kg/h)
2,0 mm, DC+	35-51	4,4	20-22	300	4,0
		5,6	21-23	330	5,0
		6,6	22-24	360	5,9
		7,6	24-26	375	6,9
		8,3	25-27	400	7,4
2,4 mm, DC+	41-54	4,1	21-23	330	5,0
		6,1	24-26	425	7,6
		7,6	27-29	475	9,5
		10,2	33-35	525	12,7



Want to learn more?

Please contact us to book an appointment.



On overall it is important that Innershield® wires are welded following appropriate guidelines, for this reason please consult our brochure "Innershield® wire: FCAW-s welding guide" or ask directly



SEE THE BROCHURE



BEING PRESENT LOCALLY MAKES US MORE AWARE GLOBALLY

125
YEARS OF EXPERIENCE

325+
GLOBAL R&D TEAM

38
SOLUTION CENTERS

3.0
BILLION USD REVENUE

11 000
EMPLOYEES WORLDWIDE



-  Global Headquarters
-  Solution Centers

TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels were obtained from a weld produced and tested according to prescribed standards, and should not be assumed to be the expected results in a particular application or weldment. Actual results will vary depending

on many factors, including, but not limited to, weld procedure, plate chemistry and temperature, weldment design and fabrication methods. Users are cautioned to confirm by qualification testing, or other appropriate means, the suitability of any welding consumable and procedure before use in the intended application.

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 information or advice about their use of our products. Our employees respond to inquiries to the best of their ability based on information provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or advice. Moreover, the provision of such information or advice does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from

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www.lincolnelectriceurope.com

