The Lincoln Electric Company
22801 St. Clair Avenue
Cleveland, Ohio 44117-1199

CERTIFICATE OF CONFORMANCE

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Product: **Innershield® NR®-232**
Electrode Lot Number: **14938332**
Classification: **E71T-8-H16**
Specification: **AWS D1.8:2009**
Date **January 04, 2017**

This is to certify that the above listed product was manufactured to meet the Class T4 requirement of AWS A5.01 as required by clause 6.3.8.1 of AWS D1.8:2009.

The product stated herein was manufactured and supplied in accordance with the Quality System Program of The Lincoln Eletric Co., Cleveland, Ohio, U.S.A. as outlined in our Quality Assurance Manual. The Quality System Program of The Lincoln Electric Co. has been accepted by ASME, ABS and approved by VdTUV, and is certified to ISO 9001:2013

Operating Settings	AWS D1.8 Requirements	High Heat Input Results	Low Heat Input Results
Electrode Size		.068" (1.7 mm)	.068" (1.7 mm)
Current Type/Polarity		DC-	DC-
Nominal Voltage, V		20	21
Wire Feed Speed, cm/min (in/min)		381 (150)	330 (130)
Nominal Current, A		225	215
Average Heat Input, kJ/mm (kJ/in)		2.8 (71)	1.1 (28)
Contact Tip to Work Distance, mm (in)		25 (1)	25 (1)
Travel Speed, cm/min (in/min)		10 (4)	23 (9)
Pass/Layers		8/5	23/8
Preheat Temperature, °C (°F)		135 (275)	20 (72)
Interpass Temperature, °C (°F)		230 (450)	120 (250)
Weld Position		3G	1G
Mechanical properties of weld deposits			
Tensile Strength, MPa (ksi)	(70 min.)	560 (81)	600 (87)
Yield Strength, 0.2% Offset, MPa (ksi)	(58 min.)	410 (60)	470 (69)
Elongation %	22 min.	29	26
Average Impact Energy	(40 min.)	116 (86)	144 (106)
Joules @ 21 °C (ft-lbs @ 70 °F)		110,117,121 (81,86,89)	144,144,144 (106,106,106)
Average Impact Energy	(40 min.)	68 (50)	86 (63)
Joules @ -18 °C (ft-lbs @ 0 °F)		66,66,72 (49,49,53)	83,86,89 (61,63,66)

1. This product satisfies the requirements of AWS D1.8:2009, Annex E, after exposure for 1 week at 80°F / 80% relative humidity.
2. The Charpy V-notch impact values reported at -18 °C (0 °F) are required when the Lowest Anticipated Service Temperature (LAST) is -29 °C (-20 °F).
3. The Charpy V-notch impact values reported at 21 °C (70 °F) are required when the Lowest Anticipated Service Temperature (LAST) is 10 °C (50 °F).
4. The strength and elongation properties reported here were obtained from tensile specimens artificially aged at 105°C (220°F) for 48 hours.
5. Strength values in SI units are reported to the nearest 10 MPa converted from actual data. Preheat and interpass temperature values in SI units are reported to the nearest 5 degrees.

Toronto Cunningham — January 04, 2017
Toronto Cunningham, Certification Supervisor — Date

Jonathan S. Ogborn — January 09, 2017
Jon Ogborn, Manager, Consumable Compliance — Date

Cert. No. 22320

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CERTIFICATE OF CONFORMANCE

(APPLIES ONLY TO U.S. PRODUCTS)

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Product: **Innershield® NR®-232**
Electrode Lot Number: **13725380**
Classification: **E71T-8-H16**
Specification: **AWS D1.8:2009**
Date **August 28, 2014**

This is to certify that the above listed product was manufactured to meet the Class T4 requirement of AWS A5.01 as required by clause 6.3.8.1 of AWS D1.8:2009.

The product stated herein was manufactured and supplied in accordance with the Quality System Program of The Lincoln Eletric Co., Cleveland, Ohio, U.S.A. as outlined in our Quality Assurance Manual. The Quality System Program of The Lincoln Electric Co. has been accepted by ASME, ABS and approved by VdTUV, and is certified to ISO 9001:2013

Operating Settings	AWS D1.8 Requirements	High Heat Input Results	Low Heat Input Results
Electrode Size		0.068 inch	0.068 inch
Polarity		DC-	DC-
Voltage, V		20	21
Wire Feed Speed, cm/min (in/min)		381 (150)	330 (130)
Current, A		230	225
Average Heat Input, kJ/mm (kJ/in)		2.8 (70)	1.2 (30)
Contact Tip to Work Distance, mm (in)		25 (1)	25 (1)
Travel Speed, cm/min (in/min)		10 (4)	23 (9)
Pass/Layers		8/5	25/8
Preheat Temperature, °C (°F)		135 (275)	25 (73)
Interpass Temperature, °C (°F)		230 (450)	120 (250)
Weld Position		3G	1G
Mechanical properties of weld deposits			
Tensile Strength, MPa (ksi)	(70 min.)	620 (90)	620 (90)
Yield Strength, 0.2% Offset, MPa (ksi)	(58 min.)	470 (69)	480 (70)
Elongation %	22 min.	28	28
Average Impact Energy	(40 min.)	99 (73)	120 (88)
Joules @ 21 °C (ft-lbs @ 70 °F)		97,99,101 (71,73,74)	117,121,122 (86,89,90)
Average Impact Energy	(40 min.)	65 (48)	74 (54)
Joules @ -18 °C (ft-lbs @ 0 °F)		60,66,68 (45,49,50)	71,75,76 (52,56,56)

1. This product satisfies the requirements of AWS D1.8:2009, Annex E, after exposure for 1 week at 80°F / 80% relative humidity.
2. The Charpy V-notch impact values reported at -18 °C (0 °F) are required when the Lowest Anticipated Service Temperature (LAST) is -29 °C (-20 °F).
3. The Charpy V-notch impact values reported at 21 °C (70 °F) are required when the Lowest Anticipated Service Temperature (LAST) is 10 °C (50 °F).
4. Test assembly constructed of ASTM A572 Grade 50 steel.
5. The strength and elongation properties reported here were obtained from tensile specimens artificially aged at 105°C (220°F) for 48 hours.
6. Strength values in SI units are reported to the nearest 10 MPa converted from actual data. Preheat and interpass temperature values in SI units are reported to the nearest 5 degrees.

Toronto Cunningham — August 28, 2014
Toronto Cunningham, Certification Supervisor — Date

David A Fink — August 28, 2014
Dave Fink, Manager, Compliance Engineering, Consumable R&D — Date

Cert. No. 22320

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CERTIFICATE OF CONFORMANCE

(APPLIES ONLY TO U.S. PRODUCTS)

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Product: **Innershield®NR®-232**
Lot Number: **12335874**
Classification: **E71T-8-H16**
Specification: **AWS D1.8:2009**
Date **March 14, 2011**

This is to certify that the above listed product was manufactured to meet the Class T4 requirement of AWS A5.01 as required by clause 6.3.8.1 of AWS D1.8:2010.

The product stated herein was manufactured and supplied in accordance with the Quality System Program of The Lincoln Eletric Co., Cleveland, Ohio, U.S.A. as outlined in our Quality Assurance Manual. The Quality System Program of The Lincoln Electric Co. has been accepted by ASME, ABS and approved by VdTUV, and is certified to ISO 9001:2008

Operating Settings	AWS D1.8 Requirements	High Heat Input Results	Low Heat Input Results
Electrode Size		0.068 inch	0.068 inch
Polarity		DC-	DC-
Voltage, V		20	21
Wire Feed Speed, cm/min (in/min)		381 (150)	330 (130)
Current, A		220	214
Average Heat Input, kJ/mm (kJ/in)		2.9 (73)	1.2 (30)
Contact Tip to Work Distance, mm (in)		25 (1)	25 (1)
Pass/Layers		9/6	23/1
Preheat Temperature, °C (°F)		135 (275)	20 (71)
Interpass Temperature, °C (°F)		230 (450)	120 (250)
Postweld Heat Treatment	As-welded	As-welded	As-welded
Weld Position		3G	1G
Mechanical properties of weld deposits			
Tensile Strength, MPa (ksi)	(70 min.)	560 (81)	590 (85)
Yield Strength, 0.2% Offset, MPa (ksi)	(58 min.)	420 (62)	460 (67)
Elongation	22 min.	29	29
Average Impact Energy	(40 min.)	126 (93)	137 (101)
Joules @ 21 °C (ft-lbs @ 70 °F)		122,127,129 (90,94,95)	134,136,141 (99,100,104)

1. This product satisfies the requirements of AWS D1.8:2009, Annex E, after exposure for 1 week at 80°F / 80% relative humidity.
2. The Charpy V-notch impact values reported at 21 °C (70 °F) are required when the Lowest Anticipated Service Temperature (LAST) is 10 °C (50 °F).
3. Test assembly constructed of ASTM A572 steel.
4. The strength and elongation properties reported here were obtained from tensile specimens artificially aged at 105°C (220°F) for 48 hours.
5. Strength values in SI units are reported to the nearest 10 MPa converted from actual data. Preheat and interpass temperature values in SI units are reported to the nearest 5 degrees.

Richard J Bollas — March 14, 2011
Rich Bollas, Certification Supervisor — Date

David Fink — March 21, 2011
Dave Fink, Manager, Compliance Engineering, Consumable R&D — Date

Cert. No. 22320