WELDING CONSUMABLES

PRODUCT CATALOGUE | Australia & New Zealand

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Who We Are and What We Do

Lincoln Electric is the world leader in the design, development and manufacture of arc welding products, robotic arc welding systems, plasma and oxyfuel cutting equipment and has a leading global position in the brazing and soldering alloys market.

Innovation

Lincoln Electric provides cutting-edge products and solutions, and has a long history of innovation in new technology and processes for arc welding equipment and consumables. Lincoln Electric operates the industry's most comprehensive research and product development program, supported by it's R&D centres around the world.

Serving the World

Lincoln Electric's technologies and products play an important role in welding and cutting around the world. Industry segments that Lincoln Electric serves include general & structural fabrication, mining, pipelines, automotive, transportation, LNG, wind power, repair & maintenance and others.

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Catalogue User Guide

Easyarc™ 7018

Stick Electrode - Low Hydrogen / Iron Powder

Key Features

- Smooth running low hydrogen stick electrode
- Suitable for AC/DC operation
- Soft and stable low spatter arc, easy slag removal
- Excellent crack resistance & X-ray performance

Typical Applications

- Suitable for a wide range of mild and low allow steels
- Used for general construction welding applications such as bridges, buildings and pressure vessels
- Workhorse low hydrogen electrode for repair of mining and farming equipment

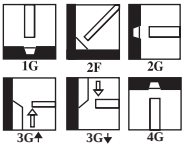
Conformances

AWS A5.1/A5.1M	E7018 / E4918
AS/NZS 4855-B	E4918A
Lloyd's Register	Pending

Diameter / Packaging

Diameter mm	Length mm	Outer Carton 13.5kg
2.5	350	70182550
3.2	350	70183250
4.0	350	70184050

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS	400 min	490 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	27
Typical Results - As Welded	455	555	33	150

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	<0.08	1.00-1.20	0.30-0.45	<0.025	<0.020

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC	50-85	80-140	130-180

Stick Electrodes

WELDING CONSUMABLES CATALOGUE

1. **Brand Name** – The name of each product appears in the top left or right corner of each page.
2. **Product Category within Section** – Each consumable section of the catalogue has subcategories to further define each product.
3. **Conformances** – Specifications and conformances to which the product is tested.
4. **Key Features** – Top features of each product.
5. **Typical Applications** – List of where the product is typically used.
6. **Welding Positions** – Flat and Horizontal or All Position capability.
7. **Diameters & Packaging Chart** – Diameters and packaging available for each product.
8. **Mechanical Properties** – Details the AWS and/or AS/NZS mechanical property requirements and typical test results for each products' weld deposit.
9. **Chemical Composition** – Details the AWS chemical composition content requirements and typical wire composition or deposit composition results.
10. **Typical Operating Procedures** – Recommended operating ranges and resulting deposition rates for each product diameter.
11. **Product Category Tab** – For easy reference.

Q Lot Certifications

Certification to Meet Your Needs

Lincoln Electric offers three levels of QLot® Certification. While each is indicative of a unique set of tests, traceabilities and records, all QLot® Certs share a common heritage grounded in chemical composition control and Lincoln Electric's Six Sigma driven production system. No matter which QLot® Cert you require – from our standard Q1 Lot® Cert to our comprehensive and exacting Q3 Lot® Cert, you get the peace-of-mind that comes from knowing that you can count on the performance of your welding consumables.

	Q1	Q2	Q3
Lincoln Electric standard ISO manufacturing system	■	■	■
Certificates of conformance	■	■	■
Lincoln Electric Q Lot number on product meets AWS A5.01 lot definition requirements	■	■	■
Link Q Lot number to certificate of conformance	■	■	■
Traceable to Lincoln manufacturing date, shift and operator	■	■	■
Recorded flux/mix chemistry	■	■	■
Items below represent additional agency requirements for testing and traceability			
Independent verification of records		■	■
Recorded steel chemistry		■	■
Lot control number per a specification (ASME code, for instance)		■	■
Testing per specification (when required)		■	■
Independent verification of all tests		■	■
Test results traceable to Lincoln archived records		■	■
Certification with test results issued to customer			■
Certification with test results traceable from Lincoln Electric to customer			■
Lincoln Electric keeps records on file			■
Certification issued to customer			■

Q Lot Certifications

Lincoln Electric's Quality System is derived from controlled chemical composition of steel. Our QLot® System is comprised of 3 comprehensive levels:

Q1 Lot® – Lincoln Electric's standard manufacturing and Quality Assurance System. We start by evaluating the raw materials, analysing the nose and tail end of each green rod coil for chemical composition ensuring it meets Lincoln Electric's stringent requirements. Our tight tolerances go beyond AWS requirements to ensure consistency in product chemistry, mechanical properties and operation. Providing traceability to the date of manufacture, operator, line and shift. *Example: Standard commercial products. Products have an AWS certificate of conformance.*

Q2 Lot® – Comprised of Q1 Lot®, plus archived lot controlled records of in-process testing and manufacturing, as well as actual and deposit composition test results of the finished product. Providing traceability to the date of manufacture, operator, line and shift.
Examples: Stainless, Nickel, Pipeliner® and all Batch Managed Inventory. Products have Certified Material Test Reports (CMTR's, 3.1).

Q3 Lot® – Comprised of Q2 Lot®, plus special testing requirements and archived records for a specific shipment or customer. Products can be made to order per customer's purchase order.
Examples: Military and Nuclear certification. Products have Certified Material Test Reports (CMTR's, 3.1).

EN Certifications

EN 10204 Inspection Documents	Testing Levels per AWS A5.01 Filler Metal Procurement Guidelines	Examples of Lincoln Electric Options
Type 2.1 States "Products are in compliance with requirements of the order (WITHOUT any test results).	**Schedule F** The level of testing shall be the manufacturer's standard. A statement, "the product supplied will meet the requirements of the applicable AWS standard, when tested in accordance with that standard" and a summary of the typical properties of the material, when tested in that manner, shall be supplied upon written request.	Lincoln Electric "3 year" Certificate of Conformance applicable to a Q1 Lot®.
Type 2.2 States "Products are in compliance with requirements of the order (includes non-specific test results – NOT ACTUALS from the lot in question).	**Schedule G** Test results shall be supplied from any production run of the product made within the twelve months preceding the date of the purchase order. This shall include the results of all tests prescribed for that classification in the AWS standard.	Lincoln Electric "1 year" Certificate of Conformance applicable to a Q1 Lot®.
Type 3.1 States "Products are in compliance with requirments of the order and includes ACTUAL test results for some requirements, but not all.	**Schedule H** Chemical analysis of each lot shipped shall be supplied by the manufacturer. The analysis shall include those elements prescribed for that classification in the AWS standard.	Lincoln Electric "Q1 with Schedule H" Certificate of Actual Results on each S4 lot of SAW wire. Lincoln Electric "Q2" Certified Material Test Reports for stainless products.
	Schedule I Actual results of the tests called for in Table 2 of AWS A5.01 shall be supplied by the manufacturer for each lot shipped. These tests represent a consensus of those frequently requested for consumables certification; however, they do not necessarily include all tests required for Schedule J. The tests shall be performed as prescribed for that classification in the AWS standard.	Lincoln Electric "Q2" Certified Material Test Reports for products such as Pipeliner® products.
	Schedule J Actual results of all of the tests prescribed for that classification in the AWS standard shall be supplied by the manufacturer for each lot shipped.	Lincoln Electric "Q2" Certified Material Test Reports for stainless solid wires such as BlueMax® MIG, Lincolnweld® stainless subarc wires, and Lincoln® stainless cut length products.
	Schedule K In addition to, or in place of, any of the tests called for in the AWS standard, the purchaser may require other tests (such as testing after a specified heat treatment). In all such cases, the purchaser shall identify on the purchase order the specific tests that are to be conducted, the procedures to be followed, the requirements that shall be met and the results to be reported by the manufacturer.	Lincoln Electric "Q3" Certified Material Test Reports to specific customer requirements. Lincoln Electric "Q1 with Schedule K" Certificate of Actual Results for composition on each lot of SAW flux.

Disclaimers

TEST RESULTS

Test results for mechanical properties, deposit or electrode composition and diffusible hydrogen levels are 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 Lincoln Electric Company are manufacturers and sells 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 the information or advice, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose is specifically disclaimed.

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 these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com.au for any updated information.

Important Information On Our Website

Material Safety Data Sheets (MSDS):
http://www.msdsonline.com.au/lincoln

Consumable AWS Certificates:
http://www.lincolnelectric.com/LEExtranet/MyLincolnCerts/site/default.aspx

ANSI Z49.1, E205 Safety Booklet:
http://www.lincolnelectric.com/en-us/education-center/welding-safety/documents/e205.pdf

More Welding Safety Materials can be found at:
http://www.lincolnelectric.com/en-us/education-center/welding-safety/Pages/welding-safety.aspx

Stick Electrodes

Stick Electrodes

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Fleetweld® 5P

Stick Electrode - Cellulose

Key Features

- Deep arc penetration
- Light slag with minimal arc interference
- Excellent vertical and overhead capability

Typical Applications

- Steel with moderate surface contaminants
- Cross country and in-plant pipe welding
- Good for square edge butt welds
- Welding on galvanized and coated steels

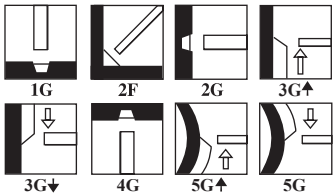
Conformances

AWS A5.1/A5.1M	E6010 / E4310
AS/NZS 4855-B	E4310A
Lloyd's Register	3M

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can Weight 22.7kg
2.4	300	ED010211
3.2	350	ED010203
4.0	350	ED010216
4.8	350	ED010207

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS	330 min	430 min	22 min	27 min
Requirements - AS/NZS	330 min	430 min	20 min	27 min
Typical Results - As Welded	420-475	515-570	25-31	41-68

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.09-0.17	0.40-0.63	0.09-0.43	0.005-0.017	0.005-0.014
	%Ni	**%Cr**	**%Mo**	**%V**	
Typical Results - As Welded	0.01-0.05	0.01-0.05	≤ 0.03	≤ 0.01	

Typical Operating Procedures

	Current (amps)			
Polarity	**2.4 mm**	**3.2 mm**	**4.0 mm**	**4.8 mm**
DC+	40-80	70-130	90-165	140-225
DC-	50-85	75-135	100-175	–

Fleetweld® 5P+

Stick Electrode - Cellulose

Key Features

- Standard in the pipe welding industry
- Reliable high ductility root welds
- High operator appeal and control

Typical Applications

- Steel with moderate surface contaminants
- Cross country and in-plant pipe welding
- Repair welding

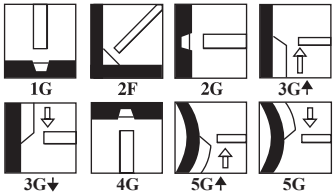
Conformances

AWS A5.1/A5.1M	E6010 / E4310
AS/NZS 4855-B	E4310A
Lloyd's Register	3M

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can Weight 22.7kg
2.4	300	ED032109
3.2	350	ED028845
4.0	350	ED028846
4.8	350	ED034369

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS	330 min	430 min	22 min	27 min
Requirements - AS/NZS	330 min	430 min	20 min	27 min
Typical Results - As Welded	415-500	500-610	22-29	51-93

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.09-0.20	0.46-0.79	0.10-0.32	0.005-0.017	0.004-0.014
	%Ni	**%Cr**	**%Mo**	**%V**	
Typical Results - As Welded	≤ 0.04	≤ 0.04	≤ 0.02	≤ 0.01	

Typical Operating Procedures

	Current (amps)			
Polarity	**2.4 mm**	**3.2 mm**	**4.0 mm**	**4.8 mm**
DC+	50-85	75-135	100-175	140-225
DC-	50-85	75-135	100-175	–

Easyarc™ 6012

Stick Electrode - Rutile

Key Features

- Easy to use general purpose rutile stick electrode
- All positional welding performance with similar current settings

Typical Applications

- Ideal for sheet metal lap & fillet welds
- Suited to a wide range of general fabrication applications
- Recommended for vertical down welding
- Great choice for welding galvanized & coated steels

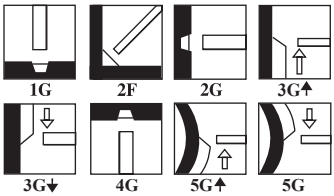
Conformances

AWS A5.1/A5.1M	E6012 / E4312
AS/NZS 4855-B	E4312A
Lloyd's Register	Grade 2

Diameter / Packaging

Diameter mm	Length mm	Outer Carton Weight 15kg
2.5	350	60122550
3.2	350	60123250
4.0	350	60124050

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ 0°C
Requirements - AWS	330 min	430 min	17 min	N/S
Requirements - AS/NZS	330 min	430 min	16 min	N/S
Typical Results - As Welded	410	485	26	85

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.07	0.39	0.22	0.028	0.016

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC	50-80	80-120	120-180

Key Features

- Easy to use general purpose rutile stick electrode
- Soft arc is ideal for welding thin plates and bridging wide gaps
- Good start and restart capability
- Reliable X-ray soundness

Typical Applications

- Ideal for many small to medium fabrication jobs
- Recommended for vertical up welding
- Excellent bead appearance
- Low spatter and low penetration applications

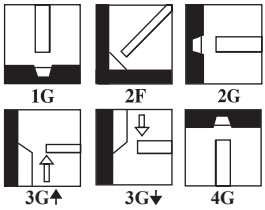
Conformances

AWS A5.1/A5.1M	E6013 / E4313
AS/NZS 4855-B	E4313A
LR / ABS / BV	Grade 2

Diameter / Packaging

Diameter mm	Length mm	Outer Carton Weight 15kg
2.5	350	60132550
3.2	350	60133250
4.0	350	60134050

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ 0°C
Requirements - AWS	330 min	430 min	17 min	N/S
Requirements - AS/NZS	330 min	430 min	16 min	N/S
Typical Results - As Welded	415	480	24	80

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	0.37	0.17	0.030	0.020

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC	50-80	70-125	110-175

Easyarc™ 7014

Stick Electrode - Rutile / Iron Powder

Key Features

- Rutile plus iron powder all position electrode, including vertical down
- Smooth stable arc, good bead shape and easy slag removal
- Faster deposition than 6013 electrodes

Typical Applications

- Suited to a wide range of general fabrication applications
- Great restart capability makes it an ideal choice for tack welding applications
- Good choice for welding galvanized steels

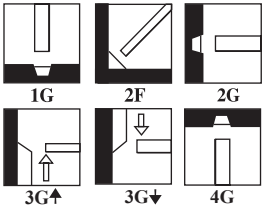
Conformances

AWS A5.1/A5.1M	E7014 / E4914
AS/NZS 4855-B	E4914A
Lloyd's Register	Pending

Diameter / Packaging

Diameter mm	Length mm	Outer Carton Weight 13.5kg
2.5	350	70142550
3.2	350	70143250
4.0	350	70144050

Welding Position



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ 0°C
Requirements - AWS	400 min	490 min	17 min	N/S
Requirements - AS/NZS	400 min	490 min	16 min	N/S
Typical Results - As Welded	440	520	22	74

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.08	0.59	0.38	0.025	0.019

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC	50-80	80-120	120-180

Easyarc™ 7024

Stick Electrode - Iron Powder

Key Features

- Iron powder rutile based with 165% recovery
- Good start and restart capability, high deposition
- Reliable X-ray soundness
- Excellent bead appearance

Typical Applications

- Ideal for many medium to large fabrication jobs
- Low spatter and low penetration applications

Conformances

AWS A5.1/A5.1M	E7024 / E4924
AS/NZS 4855-B	E4924A
ABS / DNV	Grade 3
LR	Grade 2

Diameter / Packaging

Diameter mm	Length mm	Outer Carton Weight 15kg
3.2	350	70243250
4.0	350	70244050
5.0	350	70245050

Welding Positions

Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS	400 min	490 min	17 min	N/S
Requirements - AS/NZS	400 min	490 min	16 min	N/S
Typical Results - As Welded	460	525	30.5	55

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.045	0.83	0.42	0.026	0.018

Typical Operating Procedures

	Current (amps)		
Polarity	3.2 mm	4.0 mm	5.0 mm
AC / DC	100-150	170-220	220-290

Easyarc™ 7016

Stick Electrode - Low Hydrogen

Key Features

- Easy to use low hydrogen stick electrode
- Suitable for AC/DC operation
- Soft and stable low spatter arc
- Easy to strike and restrike

Typical Applications

- Suitable for a wide range of mild and low allow steels
- Used for general construction welding applications such as bridges, buildings and pressure vessels
- Recommended for root pass applications

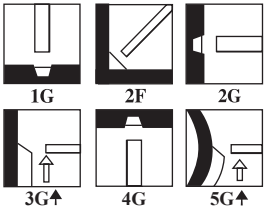
Conformances

AWS A5.1/A5.1M	E7016 / E4916
AS/NZS 4855-B	E4916A
Lloyd's Register	Pending

Diameter / Packaging

Diameter mm	Length mm	Outer Carton Weight 13.5kg
2.5	350	70162550
3.2	350	70163250
4.0	350	70164050

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS	400 min	490 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	27
Typical Results - As Welded	470	560	25	108

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.08	1.20	0.40	0.020	0.018

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC	50-85	80-140	130-180

Key Features

- Excellent root pass stick electrode
- Moisture resistant extremely basic coating
- Reliable impacts and CTOD data available
- Available in Sahara Ready Pack (SRP)

Typical Applications

- Suitable for a wide range of mild and low alloy steels
- Used for general construction welding applications such as bridges, buildings and pressure vessels
- Low hydrogen electrode for critical applications e.g. Offshore, Oil & Gas

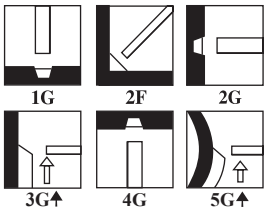
Conformances

AWS A5.1/A5.1M	E7016-1 H4R / E4918-1 H4R
AS/NZS 4855-B	E4916-1A H5
Lloyd's Register	3Y H5

Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	511567	14.0
3.2	350	511581	14.4
4.0	350	511611	11.2

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46°C
Requirements - AWS	400 min	483 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	-
Typical Results - As Welded	520	575	28	60

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	1.40	0.5	0.020	0.015
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	0.04	0.03	<0.20	0.01	3 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC	40-80	70-120	100-160

Conarc® 52

Stick Electrode - Low Hydrogen

Key Features

- Excellent low temperature impact properties to -30°C
- Directed arc even at very low current makes welding easier, especially in critical pipe welding applications
- Open gap root pass welding with 2.5 mm and 3.2 mm electrodes using DC +/- polarity

Typical Applications

- Designed for vertical up root pass welding of pipes up to and including X80 and similar steel
- Suitable for fill and cap pass welding for up to and including X65

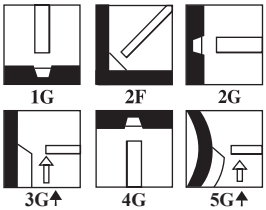
Conformances

AWS A5.1/A5.1M	E7016 H4R / E4916 H4R
AS/NZS 4855-B	E4916A H5
Lloyd's Register	Pending

Diameter / Packaging

Diameter mm	Length mm	Carton CB	Outer Carton Weight kg
2.5	350	510105	13.5
3.2	350	510112	14.4
4.0	350	510119	13.2

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30 °C
Requirements - AWS	400 min	490 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	-
Typical Results - As Welded	480	590	28	180

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	1.20	0.4	0.015	0.010
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	0.20	0.15	<0.20	<0.08	2 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
DC±	50-80	60-120	120-170

Key Features

- Premium low hydrogen stick electrode
- Moisture resistant extremely basic coating
- Realiable impacts and CTOD data available
- Available in Sahara Ready Pack (SRP)

Typical Applications

- Suitable for a wide range of mild and low alloy steels
- Used for general construction welding applications such as bridges, buildings and pressure vessels
- Low hydrogen electrode for critical applications e.g. off-shore when Ni-alloying is not allowed

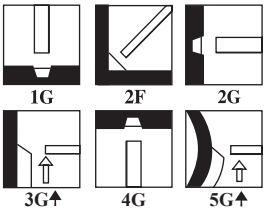
Conformances

AWS A5.1/A5.1M	E7018-1 H4R / E4918-1 H4R
AS/NZS 4855-B	E4918-1A H5
Lloyd's Register	3Y H5

Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	511420	14.0
3.2	350	511437	16.0
4.0	350	511505	12.8

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -50°C
Requirements - AWS	400 min	483 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	47
Typical Results - As Welded	480	580	28	100

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	1.40	0.30	0.015	0.010

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC	55-80	80-130	120-160

Excalibur® 7018-1MR

Stick Electrode - Low Hydrogen / Iron Powder

Key Features

- Premium arc performance
- Moisture resistant basic coating
- Q2 Lot certified showing chemistry and mechanical properties available online
- Easy strike and restrike, square coating burn-off

Typical Applications

- Suitable for a wide range of mild and low alloy steels
- Used for general construction welding applications such as bridges, buildings and pressure vessels
- Low hydrogen electrode for critical applications

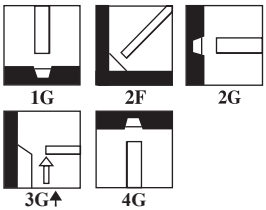
Conformances

AWS A5.1/A5.1M	E7018-1 H4R / E4918-1 H4R
AS/NZS 4855-B	E4918-1A H5
Lloyd's Register	3YM H5
ABS	3YH5

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 22.7kg
2.4	350	ED028700
3.2	350	ED028702
4.0	350	ED028704
4.8	350	ED028706

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46°C
Requirements - AWS	400 min	490 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	47
Typical Results - As Welded	460	565	28	138

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	1.30	0.36	0.012	0.005
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	0.02	0.03	0.25	<0.01	2~3 mls / 100 gm

Typical Operating Procedures

	Current (amps)			
Polarity	2.4 mm	3.2 mm	4.0 mm	4.8mm
DC+	70-110	90-160	130-210	180-300

Easyarc™ 7018

Stick Electrode - Low Hydrogen / Iron Powder

Key Features

- Smooth running low hydrogen stick electrode
- Suitable for AC/DC operation
- Soft and stable low spatter arc, easy slag removal
- Excellent crack resistance & X-ray performance

Typical Applications

- Suitable for a wide range of mild and low alloy steels
- Used for general construction welding applications such as bridges, buildings and pressure vessels.
- Workhorse low hydrogen electrode for repair of mining , farming equipment and other applications

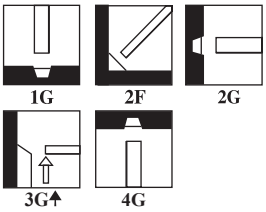
Conformances

AWS A5.1/A5.1M	E7018 / E4918
AS/NZS 4855-B	E4918A
Lloyd's Register	Pending

Diameter / Packaging

Diameter mm	Length mm	Outer Carton 13.5kg
2.5	350	70182550
3.2	350	70183250
4.0	350	70184050

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS	400 min	490 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	27
Typical Results - As Welded	455	555	33	150

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.07	1.10	0.40	0.023	0.020

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC	50-85	80-140	130-180

Easyarc™ 7018-1

Stick Electrode - Low Hydrogen / Iron Powder

Key Features

- Smooth running low hydrogen stick electrode
- Superb weld profiles in all positions
- Reliable impact properties to -46° C
- Vacuum Sealed Packaging

Typical Applications

- Suitable for a wide range of mild and low alloy steels
- Used for general construction welding applications such as bridges, buildings and pressure vessels
- Low hydrogen electrode for critical applications

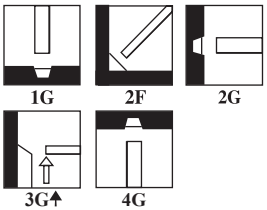
Conformances

AWS A5.1/A5.1M	E7018-1 / E4918-1
AS/NZS 4855-B	E4918-1A
Lloyd's Register	Pending

Diameter / Packaging

Diameter mm	Length mm	Outer Carton 9.6kg
2.5	350	7018-12550
3.2	350	7018-13250
4.0	350	7018-14050

Welding Positions



Mechanical Properties - As Required per AWS A5.1 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46°C
Requirements - AWS	400 min	490 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	27
Typical Results - As Welded	435	545	27	106

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.09	1.25	0.38	0.024	0.009
	%Ni	**%Cr**	**%Mo**	**%V**	
Typical Results - As Welded	0.20	0.15	0.20	0.04	

Typical Operating Procedures

	Current (amps)		
Polarity	**2.5 mm**	**3.2 mm**	**4.0 mm**
AC / DC	50-85	80-140	130-180

Excalibur® 8018-C3 MR

Stick Electrode - Low Hydrogen / Low Alloy / High Strength

Key Features

- Designed to produce a 1% Ni deposit
- Moisture resistant basic coating
- Premium arc performance
- Easy strike and restrike, square coating burn-off

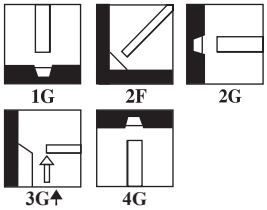
Typical Applications

- Pipe and gas storage tanks
- Suitable for colour matching weathering steels
- Cross country pipe repair
- General fabrication of high strength steels

Conformances

AWS A5.5/A5.5M	E8018-C3 H4R / E5518-C3 H4R
AS/NZS 4855-B	E5518-N2 A U H5
ABS	8018-C3 H4R

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 22.7kg
2.4	350	ED033213
3.2	350	ED033221
4.0	350	ED033072
4.8	350	ED034135

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS	470-550	550 min	24 min	27
Requirements - AS/NZS	470-550	550 min	20 min	47
Typical Results - As Welded	505-590	550-675	24-32	81-163

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	1.00	0.30	0.02	0.01
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	0.90	0.03	0.20	0.01	1-2 mls / 100 gm

Typical Operating Procedures

	Current (amps)			
Polarity	2.4 mm	3.2 mm	4.0mm	4.8 mm
DC±	70-120	90-160	130-210	180-300

Conarc® 70-G

Stick Electrode - Low Hydrogen / Low Alloy / High Strength

Key Features

- Basic all positional high strength stick electrode
- Moisture resistant extremely basic coating
- 115-120% recovery
- Available in Sahara Ready Pack (SRP)

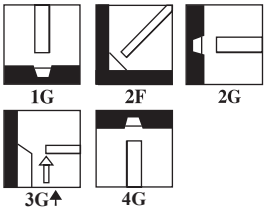
Typical Applications

- Suitable for a wide range of high strength low alloy steels - e.g. Bisplate 60 and 70C
- Can be used for fill and cap welding on up to X70 pipe and root pass in X80 pipe grades
- Low hydrogen electrode for critical applications e.g. Offshore

Conformances

AWS A5.5/A5.5M	E9018-G-H4R / E6218-1 H4R
AS/NZS 4857-B	E6218-G H5
DNV	4Y 50 H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	523706	15
3.2	350	523737	16
4.0	350	523713	12

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4857-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46 °C
Requirements - AWS	530 min	620 min	17 min	-
Requirements - AS/NZS	-	620 min	-	-
Typical Results - As Welded	600	655	24	50

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	1.20	0.40	0.014	0.009
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	1.0	<0.15	0.40	<0.08	2 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
DC+	60-100	80-130	120-180

Key Features

- Basic all positional high strength stick electrode
- Good impact values to -50°C
- 115-120% recovery
- Suitable for welding high strength steels (UTS up to 800 MPa)
- Available in Sahara Ready Pack (SRP)

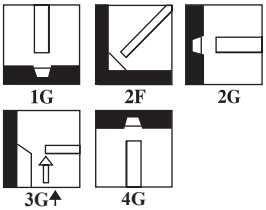
Typical Applications

- Suitable for a wide range of high strength low alloy steels - e.g. Bisplate 70 and 80, Welten 80, T1
- Ideal for applications where very low hydrogen is required

Conformances

AWS A5.5/A5.5M	E11018M H4 / E6218-G H4
AS/NZS 4857-B	E7618-G A U H5
LR	4Y 69 H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
3.2	350	523808	14.4
4.0	350	523829	12.0

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4857-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -51°C
Requirements - AWS	680-760 min	760 min	20 min	27
Requirements - AS/NZS	-	760 min	-	-
Typical Results - As Welded	750	785	22	80

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	1.5	0.4	0.015	0.01
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	2.2	<0.15	0.4	<0.08	2 mls / 100 gm

Typical Operating Procedures

	Current (amps)	
Polarity	3.2 mm	4.0 mm
DC+	80-130	120-180

Conarc® 85

Stick Electrode - Low Hydrogen / Low Alloy / High Strength

Key Features

- Basic all positional high strength electrode
- Impact properties down to -50°C
- 115-120% recovery
- Available in Sahara Ready Pack (SRP)

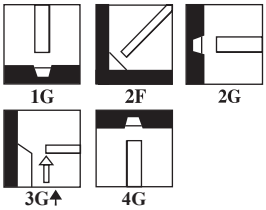
Typical Applications

- For high strength steels such as T1, HY 100, Naxtra 710, HRS 650, 690
- Ideal for applications where very low hydrogen is required
- For steels with UTS of 835 MPa max.

Conformances

AWS A5.5/A5.5M	E12018-G H4R / E8318-G H4R
AS/NZS 4857-B	E8318-G A U H5
DNV	4Y 69 H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
3.2	350	523881	15.2
4.0	350	523898	12.0

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4857-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -50°C
Requirements - AWS	740 min	830 min	14 min	-
Requirements - AS/NZS	-	830 min	-	-
Typical Results - As Welded	840	890	21	60

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	1.40	0.3	0.010	0.010
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	0.20	0.4	0.4	<0.08	2 mls / 100 gm

Typical Operating Procedures

	Current (amps)	
Polarity	3.2 mm	4.0 mm
DC+	80-130	120-180

SL 12G

Stick Electrode - Creep Resistant

Key Features

- Basic all positional creep resistant electrode
- DC- polarity is preferred
- Available in Sahara Ready Pack (SRP)

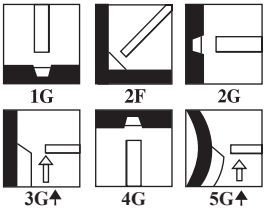
Typical Applications

- Suitable for a wide range of creep resistant and fine grained steels such as A335 Gr P1, EN 17Mo3
- Service temperature from -40°C up to 500°C
- For welding grades such as A387 Gr 11 & 12

Conformances

AWS A5.5/A5.5M	E7018-A1 H4R / E4918-A1 H4R
AS/NZS 4856-B	E4918-M3 H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	523973	14
3.2	350	524017	16
4.0	350	524000	12

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4856-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS	390 min	480 min	25 min	-
Requirements - AS/NZS	390 min	490 min	22 min	-
Typical Results[1] - Stress Relieved	560	620	25	50
Typical Results - As Welded	550	610	25	70

[1] 620C for 1hr

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.05	0.8	0.6	0.020	0.010
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	<0.01	<0.10	<0.55	<0.08	<5 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
DC±	60-90	80-130	120-180

SL 19G

Stick Electrode - Creep Resistant

Key Features

- Basic all positional creep resistant electrode
- DC- polarity is preferred
- Available in Sahara Ready Pack (SRP)

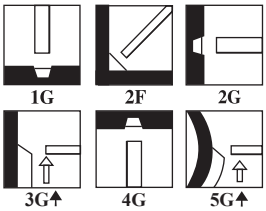
Typical Applications

- For welding creep resistant CrMo steels such as A387 Gr 11 & 12
- Maximum service temperature of 550°C

Conformances

AWS A5.5/A5.5M	E8018-B2 H4 / E5518-B2 H4
AS/NZS 4856-B	E5518-1CM H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	524062	14
3.2	350	524109	16
4.0	350	524093	12

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4856-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS	460 min	550 min	19 min	-
Requirements - AS/NZS	460 min	550 min	14 min	-
Typical Results[1] - Stress Relieved	570	640	24	100

[1] 700C for 1hr

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	0.75	0.6	0.015	0.010
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	<0.01	1.1	0.50	<0.08	<5 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
DC±	60-90	80-130	120-180

Key Features

- Basic all positional creep resistant electrode
- DC- polarity is preferred
- Available in Sahara Ready Pack (SRP)

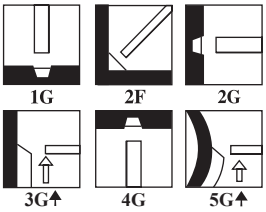
Typical Applications

- For welding creep resistant CrMo steels such as A387 Gr 21 & 22
- Maximum service temperature 600°C

Conformances

AWS A5.5/A5.5M	E9018-B3 H4 / E6218-B3 H4
AS/NZS 4856-B	E6218-2CM H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	524154	14
3.2	350	524192	16
4.0	350	524185	12

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4856-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -10°C
Requirements - AWS	530 min	620 min	17 min	-
Requirements - AS/NZS	530 min	620 min	15 min	-
Typical Results[1] - Stress Relieved	530	650	22	90

[1] 695C for 1hr

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	0.80	0.6	0.015	0.010
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	<0.01	2.3	1.0	<0.08	3 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	**2.5 mm**	**3.2 mm**	**4.0 mm**
DC±	60-90	80-130	120-180

SL 22G

Stick Electrode - Creep Resistant

Key Features

- Basic all positional creep resistant electrode
- DC- polarity is preferred
- Available in Sahara Ready Pack (SRP)

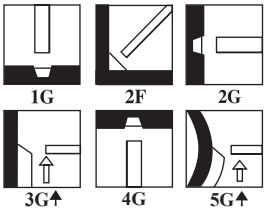
Typical Applications

- For welding creep resistant CrMo steels such as EN 14MoV6-3
- Maximum service temperature 500°C

Conformances

AWS A5.5/A5.5M	E8018-B1 H4 / E6218-B1 H4
AS/NZS 4856-B	E6218-G H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	524246	14
3.2	350	524284	16
4.0	350	524277	12

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4856-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -10°C
Requirements - AWS	460 min	550 min	19 min	-
Requirements - AS/NZS	460 min	550 min	15 min	-
Typical Results[1] - Stress Relieved	570	640	24	110

[1] 730C for 1hr

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.06	0.80	0.6	0.020	0.010
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	<0.01	0.5	0.5	0.3	<5 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	**2.5 mm**	**3.2 mm**	**4.0 mm**
DC±	60-90	80-130	120-180

SL 9Cr (P91)

Stick Electrode - Creep Resistant

Key Features

- Basic all positional creep resistant electrode
- Available in Sahara Ready Pack (SRP)

Typical Applications

- For welding creep resistant 9% Cr modified steel such as A335 P91
- Developed for power plants and the petrochemical industry
- Maximum service temperature 650°C

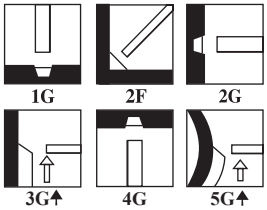
Conformances

AWS A5.5/A5.5M	E9016-B9 H4 / E6216-B9 H4
AS/NZS 4856-B	E6216-9C1MV H5

Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	525700	14
3.2	350	525724	16
4.0	350	525731	12

Welding Positions



Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4856-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C
Requirements - AWS	530 min	620 min	17 min	N/A
Requirements - AS/NZS	435 min	590 min	15 min	N/A
Typical Results[1] - Stress Relieved	570	710	21	80

[1] 750-760C for 2hr

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.09	0.60	0.2	0.010	0.010
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	0.6	9.0	1.0	0.2	3 mls / 100 gm

Nitrogen 0.04% / Nb 0.04%

Typical Operating Procedures

	Current (amps)		
Polarity	**2.5 mm**	**3.2 mm**	**4.0 mm**
DC±	60-90	85-140	130-175

Kryo® 1

Stick Electrode - Low Temperature

Key Features

- Designed to produce a 1% Ni deposit
- Excellent impact properties down to -60°C
- Extremely low hydrogen content
- 110-120% recovery, weldable on AC and DC
- Available in Sahara Ready Pack (SRP)

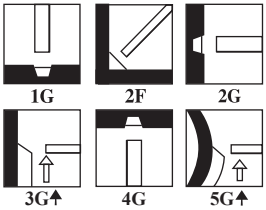
Typical Applications

- Basic all position offshore electrode complying with NACE 1% Ni limits
- Suitable colour match for weathering steels
- General fabrication of steels with low temperature properties

Conformances

AWS A5.5/A5.5M	E7018-G H4R / E4918-G H4R
AS/NZS 4856-B	E4918-G H5
ABS	3Y
LR	5Y40H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	524383	14.0
3.2	350	524390	15.2
4.0	350	524468	12.0

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -60°C
Requirements - AWS	390 min	480 min	25 min	-
Requirements - AS/NZS	400 min	490 min	20 min	-
Typical Results - As Welded	550	640	24	90

CTOD @ -10C > 0.25mm

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.05	1.5	0.4	<0.01	<0.01
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	0.90	<0.03	<0.03	<0.03	2 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC±	55-80	80-140	120-170

Key Features

- Designed to produce a 1% Ni deposit
- Excellent impact properties down to -60°C
- Extreme low hydrogen content
- 110-120% recovery, weldable on AC and DC
- Available in Sahara Ready Pack (SRP)

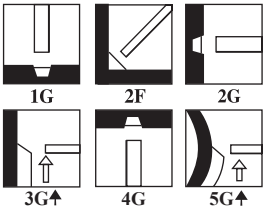
Typical Applications

- Basic all position offshore electrode complying with NACE 1% Ni limits
- Suitable colour match for weathering steels
- General fabrication of higher strength steels with low temperature properties

Conformances

AWS A5.5/A5.5M	E8018-G H4R / E5518-G H4R
AS/NZS 4855-B	E5518-G H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	519211	14.0
3.2	350	519181	15.2
4.0	350	519198	12.0

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -60°C
Requirements - AWS	460 min	550 min	19 min	-
Requirements - AS/NZS	460 min	560 min	17 min	-
Typical Results - As Welded	550	640	24	80
Stress Relieved @ 580°C 15hr	460	550	24	90

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.05	1.5	0.5	0.010	0.005
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	0.95	<0.03	<0.03	<0.03	<3 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC±	55-85	80-145	120-170

Kryo® 3

Stick Electrode - Low Temperature

Key Features

- Basic all positional offshore stick electrode with approx. 2.5% Ni
- Excellent impact properties down to -80°C
- Extremely low hydrogen content
- Available in Sahara Ready Pack (SRP)

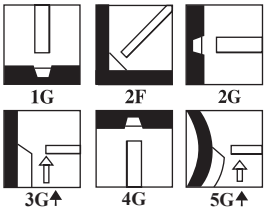
Typical Applications

- Low temperature steels such as A333 Gr6, A350 Gr LF2
- Suitable for colour matching of weathering steels

Conformances

AWS A5.5/A5.5M	E8018-C1 H4 / E5518-C1 H4
AS/NZS 4855-B	E5518-N5 H5
LR	5Y40H

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	524536	14.0
3.2	350	524604	15.2
4.0	350	524574	12.0

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -80°C
Requirements - AWS	460 min	550 min	19 min	27 @ -60°C
Requirements - AS/NZS	460 min	560 min	17 min	47
Typical Results - As Welded	520	600	26	60
Stress Relieved @ 600C 1hr	500	590	29	90 @ -60°C

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.05	0.7	0.3	0.015	0.01
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	2.5	<0.03	<0.03	<0.03	2 mls / 100 gm

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC±	55-80	80-140	120-170

Excalibur® 8018-C1 MR

Stick Electrode - Low Temperature

Key Features

- Designed to produce a 2.25% Ni deposit
- Moisture resistant basic coating
- Premium arc performance
- Easy strike and restrike, square coating burn-off

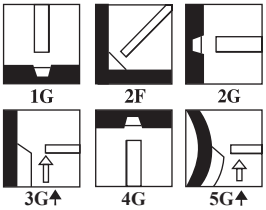
Typical Applications

- Low temperature steels such as A333 Gr6, A350 Gr LF2
- Suitable for colour matching of weathering steels
- Suitable for stress relieved applications
- Liquified gas storage piping and transportation

Conformances

AWS A5.5/A5.5M	E8018-C1 H4R / E5518-C1 H4R
AS/NZS 4856-B	E5518-N5 H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 22.7kg
2.4	350	ED030876
3.2	350	ED030877

Mechanical Properties - As Required per AWS A5.5 & AS/NZS 4855-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -60°C
Requirements - AWS	460 min	550 min	19 min	20
Requirements - AS/NZS	460 min	550 min	17 min	27
Typical Results - Stress Relieved	460-525	565-615	24-32	79-129

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.07	1.10	0.42	0.01	0.01
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen**
Typical Results - As Welded	2.45	<0.02	<0.02	<0.01	1~3 mls / 100 gm

Typical Operating Procedures

	Current (amps)	
Polarity	2.4 mm	3.2 mm
AC / DC±	70-120	90-160

Primalloy™ 308L

Stick Electrode - Stainless Steel

Key Features

- Rutile all positional stainless steel electrode
- Easy slag release, smooth arc
- Resealable moisture proof packaging

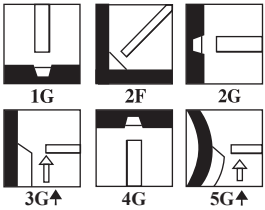
Typical Applications

- High resistance to intergranular corrosion
- Designed for joining 304 and 304L stainless steels
- Broad range of applications in exhaust pipe, transportation and petrochemical industries

Conformances

AWS A5.4	E308L-16
AS/NZS 4854-B	E308L-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube	Outer Carton Weight kg
2.5	350	3082525	10.4
3.2	350	3083225	12.8
4.0	350	3084025	12.8

Mechanical Properties - As Required per AWS A5.4 & AS/NZS 4854-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %
Requirements - AWS	-	520 min	35 min
Requirements - AS/NZS	-	510 min	30 min
Typical Results - Stress Relieved	-	620	42

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.02	0.84	0.85	0.014	0.014
	%Ni	**%Cr**	**%Mo**	**%Cu**	
Typical Results - As Welded	9.5	20.5	0.12	0.002	

Typical Operating Procedures

	Current (amps)		
Polarity	**2.5 mm**	**3.2 mm**	**4.0 mm**
AC / DC±	45-80	75-110	100-150

Primalloy™ 316L

Stick Electrode - Stainless Steel

Key Features

- Rutile all positional stainless steel electrode
- Easy slag release, smooth arc
- Resealable moisture proof packaging

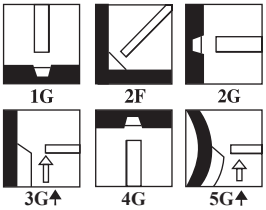
Typical Applications

- Suitable for application requiring high resistance to pitting corrosion
- Designed for joining 316 and 316L stainless steels
- Applications in marine, food & beverage, storage, transportation, and architectural stainless

Conformances

AWS A5.4	E316L-16
AS/NZS 4854-B	E316L-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube	Outer Carton Weight kg
2.5	300	3162525	10.4
3.2	350	3163225	12.8
4.0	350	3164025	12.8

Mechanical Properties - As Required per AWS A5.4 & AS/NZS 4854-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %
Requirements - AWS	-	490 min	30 min
Requirements - AS/NZS	-	490 min	25 min
Typical Results - As Welded	-	615	45

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.03	0.90	0.82	0.020	0.014
	%Ni	**%Cr**	**%Mo**	**%Cu**	
Typical Results - As Welded	11.5	19.7	2.2	0.025	

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0mm
AC / DC±	45-80	75-110	100-150

Primalloy™ 309LMo

Stick Electrode - Stainless Steel

Key Features

- Rutile all positional stainless steel electrode
- Easy slag release, smooth arc
- Resealable moisture proof packaging

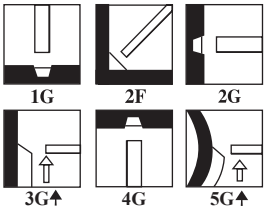
Typical Applications

- Excellent choice for welding stainless steel to carbon steel
- Suitable buffer layer for hardfacing deposits
- Applications in petrochemical, power generation and transport industries

Conformances

AWS A5.4	E309LMo-16
AS/NZS 4854-B	E309LMo-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube	Outer Carton Weight kg
2.5	350	3092525	10.4
3.2	350	3093225	12.8
4.0	350	3094025	12.8

Mechanical Properties - As Required per AWS A5.4 & AS/NZS 4854-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %
Requirements - AWS	-	520 min	30 min
Requirements - AS/NZS	-	510 min	25 min
Typical Results - As Welded	-	610	42

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.02	0.93	0.81	0.015	0.013
	%Ni	**%Cr**	**%Mo**	**%Cu**	
Typical Results - As Welded	12.6	22.9	2.14	0.017	

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC±	45-80	75-110	100-150

Primalloy™ 312

Stick Electrode - Stainless Steel

Key Features

- Rutile all positional stainless steel electrode
- Easy slag release, smooth arc
- Resealable moisture proof packaging
- Crack resistant weld metal

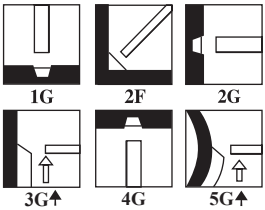
Typical Applications

- General repair, maintenance and disimilar welds between a range of stainless and carbon steels
- Suitable buffer layer for hardfacing deposits
- Good for difficult applications - e.g. Armour plate, Manganese steels, high carbon equivalent steels, tool steels, gear teeth

Conformances

AWS A5.4	E312-16
AS/NZS 4854-B	E312-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube	Outer Carton Weight kg
2.5	300	3122525	10.4
3.2	350	3123225	12.8
4.0	350	3124025	12.8

Mechanical Properties - As Required per AWS A5.4 & AS/NZS 4854-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %
Requirements - AWS	-	660 min	22 min
Requirements - AS/NZS	-	660 min	15 min
Typical Results - As Welded	-	775	23.5

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.12	0.92	0.96	0.024	0.015
	%Ni	**%Cr**	**%Mo**	**%Cu**	
Typical Results - As Welded	10.2	29.7	0.11	0.017	

Typical Operating Procedures

	Current (amps)		
Polarity	**2.5 mm**	**3.2 mm**	**4.0mm**
AC / DC±	45-80	75-110	100-150

Arosta® 316LP

Stick Electrode - Stainless Steel

Key Features

- Rutile all positional stainless steel electrode
- Easy slag release, smooth arc
- Full penetration welds

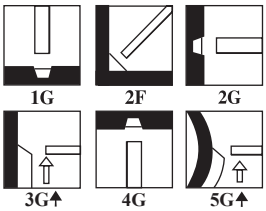
Typical Applications

- Excellent choice for welding stainless steel pipe >50 mm diameter
- Pulp and paper industry

Conformances

AWS A5.4	E316L-16
AS/NZS 4854-B	E316L-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Carton CB	Outer Carton Weight kg
2.5	250	529111	12

Mechanical Properties - As Required per AWS A5.4 & AS/NZS 4854-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS	-	490 min	30 min	-
Requirements - AS/NZS	-	490 min	25 min	-
Typical Results - As Welded	450	580	39	60

Deposit Composition

	%C	%Mn	%Si	%P
Typical Results - As Welded	0.02	0.70	0.85	0.024
	%S	**%Ni**	**%Cr**	**%Mo**
Typical Results - As Welded	0.015	11.5	18.1	2.85

Typical Operating Procedures

	Current (amps)
Polarity	2.5 mm
AC / DC±	30-70

Vertarosta® 316L

Stick Electrode - Stainless Steel

Key Features

- Basic stainless steel electrode
- Easy slag release, smooth arc
- Full penetration welds
- Specially developed for vertical down welding

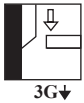
Typical Applications

- Excellent choice for welding stainless steel pipe >50 mm diameter
- Pulp and paper industry

Conformances

AWS A5.4	E316L-15
AS/NZS 4854-B	E316L-15

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Carton CB	Outer Carton Weight kg
2.5	300	558098	14.5

Mechanical Properties - As Required per AWS A5.4 & AS/NZS 4854-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS	-	490 min	30 min	-
Requirements - AS/NZS	-	490 min	25 min	-
Typical Results - As Welded	500	620	35	45

Deposit Composition

	%C	%Mn	%Si	%P
Typical Results - As Welded	0.02	0.70	0.85	0.024
	%S	**%Ni**	**%Cr**	**%Mo**
Typical Results - As Welded	0.015	11.5	18.0	2.8

Typical Operating Procedures

	Current (amps)
Polarity	2.5 mm
DC+	60-70

Arosta® 4462

Stick Electrode - 2205 Duplex Stainless Steel

Key Features

- Rutile all positional stainless steel electrode
- Improved pitting corrosion resistance combined with higher yield strength
- Available in Sahara Ready Pack (SRP)

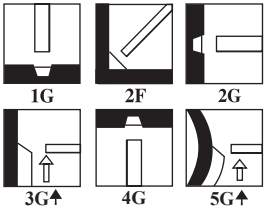
Typical Applications

- For welding duplex stainless steel, e.g. 2205 grades
- Suitable for root and fill applications
- Applications include offshore (oil & gas), marine, transportation and storage industries

Conformances

AWS A5.4	E2209-16
AS/NZS 4854-B	E2209-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	541625	15.0
3.2	350	541632	14.4
4.0	350	541649	16.0

Mechanical Properties - As Required per AWS A5.4 & AS/NZS 4854-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS	-	690 min	20 min	-
Requirements - AS/NZS	-	490 min	15 min	-
Typical Results - As Welded	650	800	27	40

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.02	0.80	1.0	0.020	0.014
	%Ni	**%Cr**	**%Mo**	**%N**	**PREN**
Typical Results - As Welded	9.5	22.5	3.2	0.16	~36

$PRE_N = Cr+3.3Mo+16N$

Typical Operating Procedures

	Current (amps)		
Polarity	2.5 mm	3.2 mm	4.0 mm
AC / DC±	40-75	80-110	80-150

Jungo® Zeron 100X

Stick Electrode - Super Duplex Stainless Steel

Key Features

- Fully basic super duplex stainless steel electrode
- High resistance to pitting and crevice corrosion
- Available in Sahara Ready Pack (SRP)

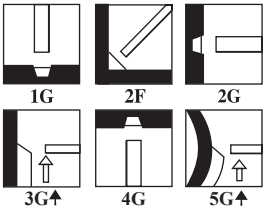
Typical Applications

- For welding super duplex stainless steels e.g. Zeron 100, SAF 2507
- High toughness and strength
- Applications in the petrochemical and offshore (oil & gas) industry

Conformances

AWS A5.4	E2595-15
AS/NZS 4854-B	E2595-15

Welding Positions



Diameter / Packaging

Diameter	Length	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	539035	14.0
3.2	350	539042	14.4
4.0	350	539073	12.8

Mechanical Properties - As Required per AWS A5.4 & AS/NZS 4854-B

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46°C
Requirements - AWS	-	760 min	15 min	-
Requirements - AS/NZS	-	760 min	17 min	-
Typical Results - As Welded	740	920	24	45

Deposit Composition

	%C	%Mn	%Si	%P	%S	
Typical Results - As Welded	0.03	0.80	0.3	0.020	0.014	
	%Ni	**%Cr**	**%Mo**	**%N**	**%Cu**	**%W**
Typical Results - As Welded	9.5	25.0	3.6	0.20	0.8	0.7

Typical Operating Procedures

	Current (amps)		
Polarity	**2.5 mm**	**3.2 mm**	**4.0 mm**
DC±	45-70	70-100	100-130

RepTec Cast1

Cast Iron

Key Features

- Nickel base electrode for repair welding
- Preferred welding polarity is DC-
- Good for multi layer welding
- Produces a soft malleable weld deposit which can be easily machined

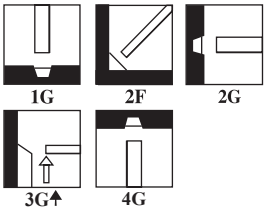
Typical Applications

- Suitable for welding and repair of grey and malleable grades of cast iron to give a low strength deposit.
- Can be used for joining these cast irons to carbon steels and Monel where higher strength is not required.
- Reduced hardenability due to dilution makes it useful for buttering runs before filling with more economical NiFe types.

Conformances

AWS A5.15 ENi-CI

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube 2.5kg
3.2	350	400892

Mechanical Properties

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness HB10
Requirements - AWS	262-414	276-448	3-6	135-218
Typical Results - As Welded	270	445	8	175

Deposit Composition

	%C	%Fe	%Ni
All Weld Deposit	0.7	2.0	97

Typical Operating Procedures

	Current (amps)
Polarity	3.2 mm
DC+	70-130

RepTec Cast 31

Cast Iron

Key Features

- Nickel / Iron electrode for repair welding
- Preferred welding polarity is DC-
- Weld deposit is readily machinable
- Produces a higher strength Ni/Fe weld deposit making it preferable for dissimilar joints

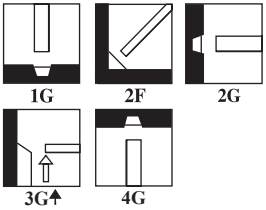
Typical Applications

- Suitable for welding SG, nodular and malleable cast irons
- Ideal for welding cast iron to cast steels, can also be considered for welding some grades of austenitic irons (e.g. Ni Resist)

Conformances

AWS A5.15 ENiFe-CI

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	2.5kg PE Tube
3.2	350	400922

Mechanical Properties

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness HB10
Requirements - AWS	296-434	400-579	6-18	165-218
Typical Results - As Welded	300	460	12	180

Deposit Composition

	%C	%Fe	%Ni
All Weld Deposit	0.7	45	Bal

Typical Operating Procedures

	Current (amps)
Polarity	3.2 mm
AC/DC±	90-150

Nyloid® 2

Stick Electrode - Nickel Base

Key Features

- Basic high recovery electrode for welding low temperature steels
- Weldable on AC and DC+
- Available in Sahara Ready Pack (SRP)

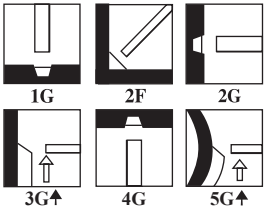
Typical Applications

- Specially developed for welding 9% Ni steels
- Excellent impact properties @ -196C
- LNG Industry

Conformances

AWS A5.11/A5.11M ENiCrMo-6

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Sahara Ready Pack	Outer Carton Weight kg
2.5	350	542741	13.6
3.2	350	542738	17.6
4.0	350	542745	14.4

Mechanical Properties - As Required per AWS A5.11

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46°C
Requirements - AWS	-	620 min	35 min	-
Typical Results - As Welded	740	920	27	45

Deposit Composition

	%C	%Mn	%Si	%Fe
Typical Results - As Welded	0.05	3.0	0.4	6
	%Ni	**%Cr**	**%Mo**	**%W**
	68	13	6	1.5

Typical Operating Procedures

	Current (amps)		
Polarity	**2.5 mm**	**3.2 mm**	**4.0 mm**
AC / DC+	75-100	85-145	140-190

Additional Products: The following nickel base electrodes are also available - contact your Lincoln Sales Representative for more details on these special consumables:

Product Name	AWS Classification
NiCro 31/27	383-16
NiCro 70/15	NiCrFe-2
NiCro 70/19	NiCrFe-2*
NiCro 70/15Mn	NiCrFe-3
NiCro 60/20	NiCrMo-3
NiCroMo 60/16	NiCrMo-4

*Some deviation


LINCOLN ELECTRIC
LINCOLN ELECTRIC
LINCOLN ELECTRIC

MIG & TIG

MIG Wire

TIG Rod

LINCOLN® ELECTRIC
THE WELDING EXPERTS®

Ultramag® S4

Mig Wire - Carbon Steel

Key Features

- Medium levels of manganese and silicon deoxidizers tolerate medium to heavy mill scale surfaces
- Suitable for argon based gases or 100% CO_2
- Precision layer wound wire
- Robust copper coating aids electrical conductivity for good arc-starting and helps extend contact tip life
- Available in a wide range of sizes and pack formats

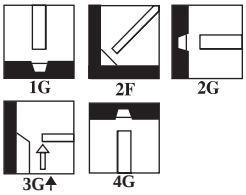
Typical Applications

- Medium to heavy mill scale base material
- Sheet and plate to 450 MPa yield strength
- General fabrication of Carbon Manganese steels

Conformances

AWS A5.18/A5.18M	ER70S-4|
AS/NZS 14341-B	G49A 3UM/C S4

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- M21 : 75-85% Argon / 15-25% CO_2
- M22 : 95-98% Argon / 2-5% O_2
- Flow Rate: 15-20 L/min

Diameter / Packaging

Diameter mm	Spool - Plastic 15kg	Accu-Trak® Drum 350kg
0.9	AUM0915S4	-
1.0	AUM1015S4	-
1.2	AUM1215S4	-
1.6	AUM1615S4	AUM16350S4

Mechanical Properties - As Required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS ER70S-4 As Welded with C1 gas	400 min	485 min	22 min	27 min
Typical Results As Welded with C1 gas	450	550	30	98

Wire Composition

	%C	%Mn	%Si	%S	%P
Requirements - AWS ER70S-4	0.06-0.15	1.00-1.50	0.65-0.85	0.035 max	0.025 max
Typical Results	0.09	1.44	0.75	0.013	0.010
	%Cr	**%Ni**	**%Mo**	**%V**	**%Cu (Total)**
Requirements - AWS ER70S-4	0.15 max	0.15 max	0.15 max	0.03 max	0.50 max
Typical Results	0.044	0.013	0.005	0.003	0.13

Typical Operating Procedures

Diameter, Polarity Shielding Gas	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps
0.9mm DC+				
Short Circuit Transfer 100% CO_2	10-12	100 150 250	18 19 22	80 120 175
Spray Transfer Argon based	12-19	375 500 600	23 29 30	195 230 275
1.2mm DC+				
Short Circuit Transfer 100% CO_2	12-19	125 150 200	19 20 21	145 165 200
Spray Transfer Argon based	12-19	350 475	27 30	285 335

Ultramag® S6

Mig Wire - Carbon Steel

Key Features

- High levels of manganese and silicon deoxidizers tolerate medium mill scale surfaces
- Precision layer wound wire
- Excellent toe-wetting provides optimal bead appearance
- Copper coated for long contact tip life
- Supports short-circuiting, globular, axial spray and pulsed spray transfer

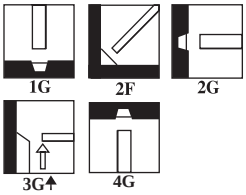
Typical Applications

- Medium mill scale base material
- Sheet and plate to 450 MPa yield strength
- Robotic or hard automation
- Structural steels

Conformances

AWS A5.18/A5.18M	ER70S-6
AS/NZS 14341-B	G49A 3UM/C S6

Welding Positions



Shielding Gas

- C1 : 100% CO2
- M21 : 75-85% Argon / 15-25 CO_2
- M22 : 95-98% Argon / 2-5% O_2
- Flow Rate: 15-20 L/min

Diameter / Packaging

Diameter mm	Spool - Plastic 5kg	Spool - Plastic 15kg	Accu-Trak® Drum 250 or 350kg
0.8	AUM0805S6	AUM0815S6	-
0.9	AUM0905S6	AUM0915S6	AUM09250S6
1.0		AUM1015S6	-
1.2		AUM1215S6	AUM12250S6
1.6		AUM1615S6	AUM16350S6

Mechanical Properties - As Required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS ER70S-6 As Welded with M21 gas	400 min	485 min	22 min	Not required
Typical Results As Welded with M21 gas	450	560	28	83

Wire Composition

	%C	%Mn	%Si	%S	%P
Requirements - AWS ER70S-6	0.06-0.15	1.40-1.85	0.80-1.15	0.035 max	0.025 max
Typical Results	0.095	1.50	0.85	0.013	0.009
	%Cr	**%Ni**	**%Mo**	**%V**	**%Cu (Total)**
Requirements - AWS ER70S-6	0.15 max	0.15 max	0.15 max	0.03 max	0.50 max
Typical Results	0.011	0.009	0.004	0.002	0.12

Typical Operating Procedures

Diameter, Polarity Shielding Gas	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps
0.9mm DC+				
Short Circuit Transfer 100% CO_2	9-12	100 150 250	18 19 22	80 120 175
Spray Transfer Argon based	12-19	375 500 600	23 29 30	195 230 275
1.2mm DC+				
Short Circuit Transfer 100% CO_2	12-19	125 150 200	19 20 21	145 165 200
Spray Transfer Argon based	12-19	350 475 500	27 30 30	285 335 340
1.6mm DC+				
Spray Transfer Argon based	12-25	210 235 290	27 28 29	325 350 430

LNM 28
Mig Wire - Low Alloy

Key Features

- Solid wire containing 1% Ni & Cu
- Stable arc and excellent feedability
- High impact values @ -40°C

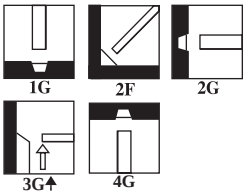
Typical Applications

- Suitable for transport industry & general fabrication
- Ideal for weather resistant steels - i.e. COR-TEN

Conformances

AWS A5.28/A5.28M	ER80S-Ni1
AS/NZS 14341-B	G55 SN2M1

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- C1 : Active Gas 100% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - B300[1] 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.0	E10K015PC01	125-400	19-28	145-350	15-20

[1]B300 wire basket (2158341 adaptor required)

Mechanical Properties - As Required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS ER80S-Ni1 As Welded with M21 gas	470 min	550 min	24	27 @ -45°C
Typical Results	570	620	26	70

Wire Composition

	%C	%Mn	%Si	%Ni	%Cu
Typical Results	0.10	1.40	0.75	0.8	0.30

LNM Ni-1

Mig Wire - Low Temperature

Key Features

- Solid nominal 1% Ni wire for welding Carbon Manganese and low alloy steels
- Stable arc and excellent feedability
- High impact values @ -60°C

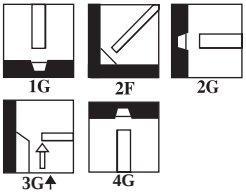
Typical Applications

- Suitable for Offshore and Oil & Gas industries
- Complies with NACE 1% Ni limits
- Up to API 5LX X65 grade pipe steels
- Weather resistant steels - i.e. COR-TEN

Conformances

AWS A5.28/A5.28M	ER80S-Ni1
AS/NZS 14341-B	G55 SN2M1

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - B300[1] 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.0	582468	125-400	19-28	145-350	15-20

[1]B300 wire basket (2158341 adaptor required)

Mechanical Properties - As Required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -60°C
Requirements - AWS ER80S-Ni1 As Welded with M21 gas	470 min	550 min	24	27 @ -45°C
Typical Results	480	580	30	60

Wire Composition

	%C	%Mn	%Si	%Ni	%Mo	%Ti
Typical Results	0.08	1.77	0.57	0.9	0.38	0.15

LNM MoNiVa

Mig Wire - High Strength

Key Features

- Capable of welding steels with yield strength up to 690 MPa
- Excellent for welding quenched and tempered (Q&T) steels
- Good impact values @ -40°C

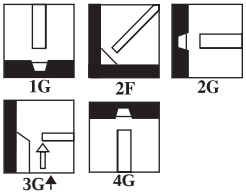
Typical Applications

- Bisplate 80, Weldten 80 and similar materials
- ASTM A514, A543, A724 and A782 quenched and tempered plate

Conformances

AWS A5.28/A5.28M	ER100S-G
AS/NZS 16834-B	G69A 4 AM3 M1

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - B300[1] 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	581195	125-400	19-28	145-350	15-20

[1]B300 wire basket (2158341 adaptor required)

Mechanical Properties - As Required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS ER100S-G As Welded with M21 gas	N/S	690 min	N/S	N/S
Typical Results As Welded with M21 gas	710	790	20	70

Wire Composition

	%C	%Mn	%Si	%Ni	%Mo
Typical Results	0.08	1.7	0.44	1.35	0.3
	%Cr	**%V**	**%Cu**	**%V**	
Typical Results	0.23	0.08	0.25	0.08	

Lincoln® MIG 308LSi

Mig Wire - Stainless Steel

Key Features

- High silicon level for increased puddle fluidity, better bead shape and edge wetting
- Low carbon wire to resist inter-granular corrosion (weld decay)
- Versatile electrode designed to weld Cr-Ni austenitic stainless steels
- Precision layer wound wire assists feeding and resists wire tangles

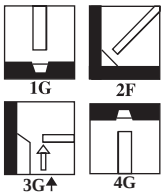
Typical Applications

- 304 and 304L stainless steels
- Common austenitic stainless steels referred to as "18-8" steels
- Suitable for welding UNS Grades S30403, S30400, S30409, S32100, S32109, S34700

Conformances

AWS A5.9/A5.9M	ER308LSi
AS/NZS ISO 14343-B	SS308LSi

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O_2
- M12 : 95-98% Argon / 2-5% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
0.8	331088	120-600	18-22	50-150	10-15
0.9	331089	120-475	19-23	60-210	10-15
1.2	331082	125-360	19-25	100-260	15-20

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -196°C	FN WRC
Requirements - AWS ER308LSi	Not specified				
Typical Results - As Welded with M12 gas	420	570	45	55	8-11

Wire Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo
Typical Results	0.02	1.7	0.8	20	10	0.2

Lincoln® MIG 316LSi

Mig Wire - Stainless Steel

Key Features

- High silicon level for increased puddle fluidity, better bead shape and edge wetting
- Low carbon wire to resist inter-granular corrosion (weld decay)
- Versatile electrode designed to weld Cr-Ni-Mo austenitic stainless steels
- Precision layer wound wire assists feeding and resists wire tangles

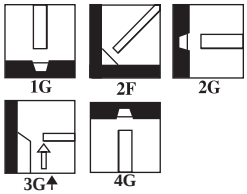
Typical Applications

- 316 and 316L stainless steels
- Marine, Chemical, Oil & Gas, Food & Dairy and many other industries
- Suitable for welding UNS Grades S31600, S31603, S31635, S31640

Conformances

AWS A5.9/A5.9M	ER316LSi
AS/NZS ISO 14343-B	SS316LSi

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O_2
- M12 : 95-98% Argon / 2-5% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
0.9	331069	120-475	18-22	60-160	10-15
1.2	331062	125-360	19-23	100-185	10-15
1.6	331066	175-300	25-28	250-390	15-20

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -196°C	FN WRC
Requirements - AWS ER316LSi	Not specified				
Typical Results - As Welded with M12 gas	430	600	42	>80	5-8

Wire Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo	%N
Typical Results	0.02	1.89	0.87	18.4	12.0	2.5	0.06

Lincoln® MIG 307

Mig Wire - Stainless Steel

Key Features

- High silicon level for increased puddle fluidity, better bead shape and edge wetting
- Versatile electrode for welding difficult to weld steels
- Precision layer wound wire assists feeding and resists wire tangles

Typical Applications

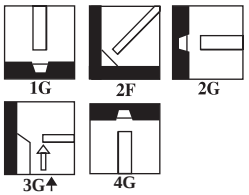
- Suitable for welding steels with difficult weldability e.g. armour plate, austenitic manganese steels, dissimilar steels
- Good as a buffer layer in hardfacing applications

Conformances

AWS A5.9/A5.9M	ER307*
AS/NZS ISO 14343-B	SS307Si

*nearest classification

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O_2
- M12 : 95-98% Argon / 2-5% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	331072	125-360	19-23	100-185	15-20

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -120°C
Requirements - AWS ER307	Not specified			
Typical Results - As Welded with M12 gas	400	630	40	50

Wire Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo
Typical Results	0.08	7.1	0.8	19.2	9.0	0.3

Lincoln® MIG 309LSi

Mig Wire - Stainless Steel

Key Features

- High silicon level for increased puddle fluidity, better bead shape and edge wetting
- Precision layer wound wire assists feeding and resists wire tangles

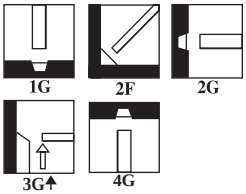
Typical Applications

- Ideal for welding carbon steels to stainless steels
- For welding UNS 309 and 309L austenitic grades S30900 and S30908
- Good as a buffer layer in many hardfacing applications

Conformances

AWS A5.9/A5.9M	ER309LSi
AS/NZS ISO 14343-B	SS309LSi

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O_2
- M12 : 95-98% Argon / 2-5% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
0.9	331099	120-475	18-22	60-160	10-15
1.2	331092	125-360	19-23	100-185	15-20

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	FN WRC
Requirements - AWS ER309LSi	Not specified			
Typical Results - As Welded with M12 gas	400	580	39	8-11

Wire Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo
Typical Results	0.03	1.8	0.89	23.3	13.7	0.2

Lincoln® MIG 4462

Mig Wire - 2205 Duplex Stainless Steels

Key Features

- Premium solid wire for welding duplex stainless steels
- High resistance to general corrosion, pitting and stress corrosion conditions
- Precision layer wound wire assists feeding and resists wire tangles

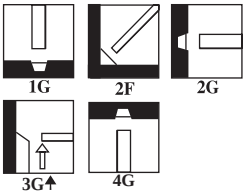
Typical Applications

- Suitable for welding 2205 type duplex stainless steels
- UNS S31803, S31500

Conformances

AWS A5.9/A5.9M	ER2209
AS/NZS ISO 14343-B	SS2209

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O_2
- M12 : 95-98% Argon / 2-5% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	331042	125-360	19-23	100-185	15-20

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46°C
Requirements - AWS ER2209	Not specified			
Typical Results - As Welded with M12 gas	625	810	28	40

Wire Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo	%N
Typical Results	0.02	1.5	0.5	22.7	8.5	3.0	0.15

LNM 4500

Mig Wire - Stainless Steel

Key Features

- Premium solid wire for welding fully austenitic steel types
- High resistance to sulphuric and phosphoric acids
- Precision layer wound wire assists feeding and resists wire tangles

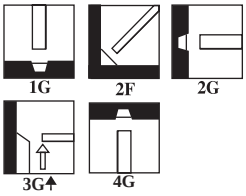
Typical Applications

- Suitable for welding fully austenitic steel types e.g. 20% Cr, 25% Ni, 4.5% Mo, 1.5% Cu

Conformances

AWS A5.9/A5.9M	ER385
AS/NZS ISO 14343-B	SS385

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O_2
- M12 : 95-98% Argon / 2-5% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - BS300 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	582031	125-360	19-23	100-185	15-20

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C
Requirements - AWS ER385	Not specified			
Typical Results - As Welded with M12 gas	350	610	35	100

Wire Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo	%Cu
Typical Results	0.01	1.7	0.3	20	25	4.4	1.5

LNM Zeron 100X

Mig Wire - Super Duplex Stainless Steel

Key Features

- High resistance to pitting and crevice corrosion in seawater
- High resistance to stress corrosion conditions
- Precision layer wound wire assists feeding and resists wire tangles

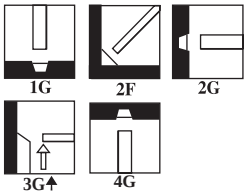
Typical Applications

- Suited for welding Super Duplex Steels e.g. UNS32550, S32760

Conformances

AWS A5.9/A5.9M	ER2594
AS/NZS ISO 14343-B	SS2594

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O_2
- M12 : 95-98% Argon / 2-5% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - B300[1] 12.5kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.0	21501160	140-500	18-22	90-180	10-15
1.2	595604	125-360	19-23	100-185	15-20

[1]B300 wire basket (2158341 adaptor required)

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46°C
Requirements - AWS ER2594	Not specified			
Typical Results - As Welded with M12 gas	655	845	23	55

Wire Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo	%Cu	%W	%N
Typical Results	0.02	0.7	0.4	25	9.8	3.7	0.6	0.7	0.22

Nickel & Copper Base Wires

A comprehensive range of Nickel and Copper base MIG wires are available on request.

LNM NiCro 70/19 AWS ERNiCr-3

Diameter mm	Weight kg	Package Type	Part Number
1.0	15.0	Wire Spool	582833
1.2	15.0	Wire Spool	582840

LNM NiCro 60/20 AWS ERNiCrMo-3

Diameter mm	Weight kg	Package Type	Part Number
1.0	15.0	Wire Spool	581584
1.2	15.0	Wire Spool	581607

LNM NiCroMo 60/16 AWS ERNiCrMo-4

Diameter mm	Weight kg	Package Type	Part Number
1.0	15.0	Wire Spool	581331
1.2	15.0	Wire Spool	581344

LNM NiFe AWS ENiFe-CI

Diameter mm	Weight kg	Package Type	Part Number
1.2	15.0	Wire Spool	582116

LNM NiTi AWS ERNi1

Diameter mm	Weight kg	Package Type	Part Number
1.2	15.0	Wire Spool	583052

LNM NiCro 70/30 AWS ERNiCu-7

Diameter mm	Weight kg	Package Type	Part Number
1.0	15.0	Wire Spool	581508
1.2	15.0	Wire Spool	581344

Silicon Bronze AWS ERCuSi-A

Diameter mm	Weight kg	Package Type	Part Number
0.9	13.6	Plastic Spool	94004703

SuperGlaze® 4043

Mig Wire - Aluminium

Key Features

- General purpose aluminium filler metal for welding 6XXX series alloys
- Lower melting point and more fluidity than 5XXX series filler alloys
- Excellent feedability and consistent welding perfor-

Typical Applications

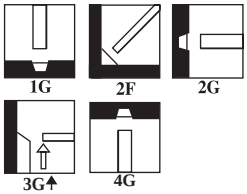
- Heat treateable base alloys
- Casting alloys
- Automotive components

Conformances

AWS A5.10/A5.10M ER4043

AS/NZS ISO 18273-B S Al 4043

Welding Positions



Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow Rate 14-24 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 7.26kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	ED028397	250-450	23-27	130-180	15-20

Mechanical Properties - As Required per AWS A5.10

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C
Requirements - AWS ER4043	Not specified			
Typical Results - As Welded with I1 gas	100	160	15	20

Wire Composition

	%Al	%Mn	%Si	%Mg	%Cr	%Zn
Typical Results	Bal	0.01	5.3	0.03	0.01	0.002
	%Fe	%Ti	%Cu	%Be		
Typical Results	0.30	0.01	0.01	<0.0002		

SuperGlaze® 5356

Mig Wire - Aluminium

Key Features

- General purpose aluminium filler metal for welding 5XXX series alloys
- Excellent feedability and consistent welding performance
- Tight and stable arc

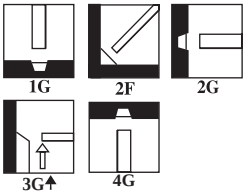
Typical Applications

- Welding a large range of 5XXX series alloys
- Truck panels, bullbars
- High strength applications e.g bicycle frames
- Marine fabrication and repair

Conformances

AWS A5.10/A5.10M	ER5356
AS/NZS ISO 18273-B	S Al 5356
Lloyds Register	WB/I-1 S
DNV	5356

Welding Positions



Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow Rate 14-24 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 7.26kg	Spool 0.45kg	WFS ipm	Voltage volts	Approx. Current amps	CTWD mm
0.9	ED028385	ED030312	500-700	17-23	80-160	10-15
1.0	ED028386	ED030313	400-600	18-24	90-170	10-15
1.2	ED028387	ED030314	300-500	23-27	130-180	15-20

Mechanical Properties - As Required per AWS A5.10

	Yield Strength MPa	Tensile Strength MPa	Elongation %
Requirements - AWS ER5356	Not specified		
Typical Results - As Welded with I1 gas	110	250	25

Wire Composition

	%Al	%Mn	%Si	%Mg	%Cr	%Zn
Typical Results	Bal	0.11	0.08	4.9	0.07	0.03
	%Fe	**%Ti**	**%Cu**	**%Be**		
Typical Results	0.20	0.06	0.01	0.006		

SuperGlaze® 5183

Mig Wire - Aluminium

Key Features

- Designed to meet the higher tensile strength requirements of high magnesium alloys
- Excellent feedability and consistent welding performance

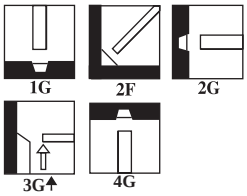
Typical Applications

- Cryogenic tanks
- Welding 5083 and 5654 alloy grades
- High strength applications e.g bicycle frames, marine fabrication and repair

Conformances

AWS A5.10/A5.10M	ER5183
AS/NZS ISO 18273-B	S Al 5183
Lloyds Register	WC/I-1 S

Welding Positions



Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow rate 14-24 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 7.26kg	WFS ipm	Voltage volts	Approx. Current amps	CTWD mm
0.9 1.2	ED028435 ED034191	500-700 300-500	23-27 23-27	100-160 130-180	10-15 15-20

Mechanical Properties - As Required per AWS A5.10

	Yield Strength MPa	Tensile Strength MPa	Elongation %
Requirements - AWS ER5183	Not specified		
Typical Results - As Welded with I1 gas	140	300	30

Wire Composition

	%Al	%Mn	%Si	%Mg	%Cr	%Zn
Typical Results	Bal	0.65	0.03	5.0	0.10	0.02
	%Fe	**%Ti**	**%Cu**	**%Be**		
Typical Results	0.13	0.07	0.001	0.0006		

Experience Lincoln Aluminium Solution

Lincoln® ER70S-2

Tig Rod - Carbon Steel

Key Features

- Triple deoxidised copper coated TIG rod. Contains zirconium, titanium, and aluminum in addition to silicon and manganese
- Produces X-ray quality welds over most surface conditions
- Ink jet printing identification on entire length of rod
- Q2 Lot - Certificates showing actual wire chemistry available online

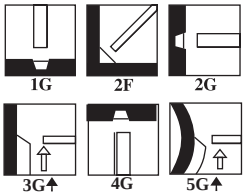
Typical Applications

- Repairs on a variety of mild and low alloy steel
- Small diameter pipe and tubing
- Sheet metal applications
- Root pass pipe welding

Conformances

AWS A5.18/A5.18M	ER70S-2
AS/NZS 1167.2	R2

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube 4.5kg Q2 Lot Tested Product
2.4	915	ED033953
3.2	915	ED033954

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS ER70S-2	400	482	22 min	20 min
Typical Results - As Welded with I1 gas	530	610	29	400

Wire Composition

	%C	%Mn	%S	%Si	%P	%Cu	%Cr
Typical Results	0.04	1.08	0.005	0.55	0.0003	0.20	0.08
	%Ni	%Mo	%V	%Al	%Ti	%Zr	
Typical Results	0.08	0.08	<0.002	0.08	0.10	0.07	

LNT 25

Tig Rod - Carbon Steel

Key Features

- Produces X-ray quality welds over most surface conditions
- Recommended for TIG welding on many grades of carbon steel
- High impact values

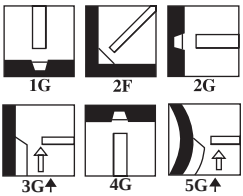
Typical Applications

- Repairs on a variety of mild and low alloy steel
- Small diameter pipe and tubing
- Root pass pipe welding

Conformances

AWS A5.18/A5.18M	ER70S-3
AS/NZS 1167.2	R3

Welding Positions



Diameter / Packaging

Diameter	Length mm	PE Tube 2kg Master Carton 4kg
2.4	1000	604146

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS ER70S-3	400	482	22 min	20 min
Typical Results - As Welded with I1 gas	450	560	28	170

Wire Composition

	%C	%Mn	%Si	%S	%P	%Cr	%Ni
Typical Results	0.07	1.25	0.65	0.003	0.008	0.04	0.04

Lincoln® TIG S-6

Tig Rod - Carbon Steel

Key Features

- High levels of silicon and manganese for use on slightly contaminated base materials
- Good puddle fluidity
- Excellent wetting action, smooth bead appearance
- Stamp identification on each rod

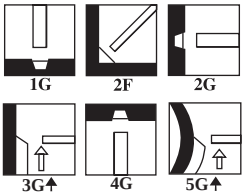
Typical Applications

- Repairs on a variety of mild and low alloy steel
- Small diameter pipe and tubing
- Sheet metal applications
- Root pass pipe welding

Conformances

AWS A5.18/A5.18M	ER70S-6
AS/NZS 1167.2	R6

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Tube - Cardboard 5kg
1.6	1000	604116
2.4	1000	604124

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C
Requirements - AWS ER70S-6	400	482	22 min	20 min
Typical Results - As Welded with I1 gas	455	560	30	120

Wire Composition

	%C	%Mn	%Si	%S	%P
Typical Results	0.09	1.50	0.90	<0.01	<0.01

LNT 19

Tig Rod - Low Alloy

Key Features

- Solid TIG rod for B2 type Cr-Mo Steels
- Service temperature up to 550°C
- Resealable PE Tube

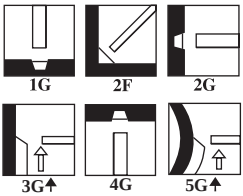
Typical Applications

- Welding creep and hydrogen resistant Cr-Mo Steels
- Small diameter pipe and tubing
- Root pass pipe welding

Conformances

AWS A5.28/A5.28M	ER80S-B2
AS/NZS 1167.2	RB2

Welding Positions



Diameter / Packaging

Diameter	Length mm	PE Tube 2kg Master Carton 4kg
2.4	1000	604351
3.0	1000	604375

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -10°C
Requirements - AWS ER80S-B2	-	-	19	NA
Typical Results - As Welded with I1 gas	442	545	28	177

Wire Composition

	%C	%Mn	%Si	%Cr	%Mo
Typical Results	0.10	1.0	0.60	1.2	0.50

LNT 20

Tig Rod - Low Alloy

Key Features

- Solid TIG rod for welding B3 type Cr-Mo steels
- Service temperature up to 600°C
- Resealable PE Tube

Typical Applications

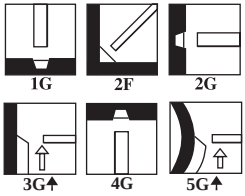
- Welding creep and hydrogen resistant Cr-Mo steels
- Small diameter pipe and tubing
- Root pass pipe welding

Conformances

AWS A5.28/A5.28M	ER90S-B3*
AS/NZS 1167.2	RB3

*Nearest classification

Welding Positions



Diameter / Packaging

Diameter	Length mm	PE Tube 2kg Master Carton 4kg
2.4	1000	605556

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -10°C
Requirements - AWS ER90S-B3	-	-	17	NA
Typical Results - As Welded with I1 gas	460	605	23	141

Wire Composition

	%C	%Mn	%Si	%Cr	%Mo
Typical Results	0.08	1.0	0.60	2.5	1.0

LNT Ni1

Tig Rod - Low Alloy

Key Features

- Solid TIG rod for welding low alloy steels
- High impact value at low temperatures -60°C
- Resealable PE Tube

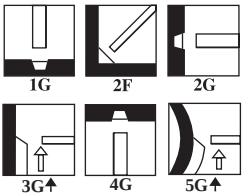
Typical Applications

- Offshore Oil & Gas
- Small diameter pipe and tubing

Conformances

AWS A5.28/A5.28M ER80S-Ni1

Welding Positions



Diameter / Packaging

Diameter	Length mm	PE Tube 2.0kg Master Carton 4.0kg
1.6	1000	605099
2.4	1000	605129

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -60°C
Requirements - AWS ER80S-Ni1	470	550	24	27J@-46°C
Typical Results - As Welded with I1 gas	480	580	30	60

Wire Composition

	%C	%Mn	%Si	%Ni
Typical Results	0.10	1.20	0.60	0.90

Lincoln® TIG 308LSi

Tig Rod - Stainless Steel

Key Features

- Solid stainless TIG rod
- High silicon for improved wetting
- Very low carbon to minimize weld decay
- Double stamped for optimum traceability

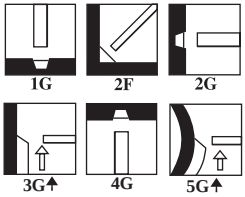
Typical Applications

- For welding general 18/8 stainless steels
- Economical stainless filler material
- Broad range of applications in transport, construction and petrochemical industries

Conformances

AWS A5.9	ER308LSi
AS/NZS 1167.2	R308LSi

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube 2kg
1.6	1000	365281
2.4	1000	365282

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C
Typical Results - As Welded	390	590	35	120

Deposit Composition

	%C	%Mn	%Si	%Ni	%Cr	%Mo
Typical Results - As Welded	0.010	1.6	0.5	10.0	20.0	0.2

Lincoln® TIG 316LSi

Tig Rod - Stainless Steel

Key Features

- Solid stainless TIG rod
- High silicon for improved wetting
- Popular stainless tig rod
- Double stamped for optimum traceability

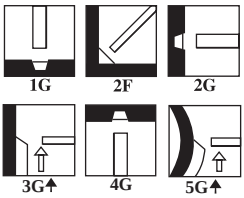
Typical Applications

- Excellent for marine applications
- Good for root and fill applications in pipes
- Suitable for Oil & Gas and Food & Beverage industries
- Recommended where increased resistance to pitting corrosion is required

Conformances

AWS A5.9	ER316LSi
AS/NZS 1167.2	R316LSi

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube 2.5kg
1.0	1000	365269
1.2	1000	365260
1.6	1000	365261
2.4	1000	365262

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -196°C
Typical Results - As Welded	400	620	35	45

Deposit Composition

	%C	%Mn	%Si	%Ni	%Cr	%Mo
Typical Results - As Welded	0.010	1.7	0.8	12.2	18.5	2.7

Lincoln® TIG 309LSi

Tig Rod - Stainless Steel

Key Features

- High silicon for improved wetting
- Double stamped for optimum traceability

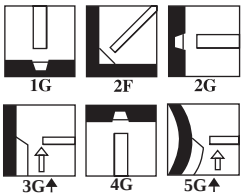
Typical Applications

- Excellent for welding dissimilar metals e.g. stainless steel to carbon steel
- Build up welding on mild and low alloy steels
- Buffer layers before hard facing

Conformances

AWS A5.9	ER309LSi
AS/NZS 1167.2	R309LSi

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	PE Tube 2kg
1.6	1000	365291
2.4	1000	365292

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -46°C
Typical Results - As Welded	400	600	35	65

Deposit Composition

	%C	%Mn	%Si	%Ni	%Cr	%Mo
Typical Results - As Welded	0.010	1.6	0.8	13.0	23.5	0.2

Lincoln® TIG 4462

Tig Rod - 2205 Duplex Stainless Steel

Key Features

- High yield strength
- Resistance to pitting and stress corrosion
- Double stamped for optimum traceability

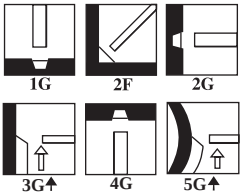
Typical Applications

- For welding duplex stainless steels e.g. 2205 grades
- Suitable for dissimilar welding - e.g. duplex to low alloy steel
- Suitable for root and fill applications in pipe
- Applications in exhaust pipe, marine, food beverage, transport and storage industries

Conformances

AWS A5.9	ER2209
AS/NZS 1167.2	R2209

Welding Positions



Diameter / Packaging

Diameter	Length	PE Tube 2.0kg
1.6	1000	365241
2.4	1000	365242

Shielding Gas

- I1 : 100% Argon
- Flow rate 14-24 L/min

Mechanical Properties - As Required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20C
Typical Results - As Welded	600	800	28	60

Deposit Composition

	%C	%Mn	%Si	%Ni	%Cr	%Mo	%N
Typical Results - As Welded	0.015	1.6	0.5	8.5	22.5	3.0	0.15

PREn - 36

Superglaze® 4043

Tig Rod - Aluminium

Key Features

- General purpose filler alloy for welding 5052 and any 6XXX series aluminium alloys or casting
- Excellent colour matching after anodising
- Embossed on each end for easy identification after use

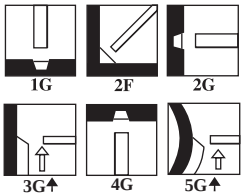
Typical Applications

- Suited for many weldable cast and wrought alloy structures and components
- Bicycle frames
- Pressure vessels, bus bars

Conformances

AWS A5.10	ER4043
AS/NZS 18273-B	Al4043

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Carton 4.5kg
2.4	915	ED031112

Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow rate 14-24 L/min

Deposit Composition

	%Al	%Si	%Fe	%Cu	%Mn
Typical Results - As Welded	Remainder	5.01	0.13	0.008	0.009
	%Mg	%Zn	%Ti	%Be	
Typical Results - As Welded	0.03	0.002	0.07	0.0002	

Superglaze® 5356

Tig Rod - Aluminium

Key Features

- General purpose filler alloy for welding 5XXX and 6XXX series aluminium alloys
- Excellent colour matching after anodising
- Embossed on each end for easy identification after use

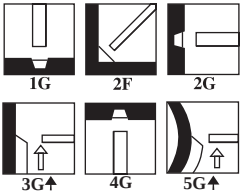
Typical Applications

- Architectural structures
- Suited for many weldable cast and wrought alloy structures and components
- Repairs to pleasure craft
- General fabrication

Conformances

AWS A5.10	ER5356
AS/NZS 18273 - B	Al5356

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Carton 4.5kg
1.6	915	ED031108
2.4	915	ED031109
3.2	915	ED031110

Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow rate 14-24 L/min

Deposit Composition

	%Al	%Si	%Fe	%Cu	%Mn
Typical Results - As Welded	Remainder	0.06	0.09	0.02	0.12
	%Mg	**%Cr**	**%Zn**	**%Ti**	**%Be**
Typical Results - As Welded	4.84	0.12	0.001	0.09	0.002

Nickel & Copper Base Rods

A comprehensive range of Nickel and Copper base TIG rods are available on request.

LNT NiCro 31/27 AWS ER383

Diameter mm	Weight kg	Package Type	Part Number
2.4	2	PE Tube	605631

LNT NiCro 70/19 AWS ERNiCr-3

Diameter mm	Weight kg	Package Type	Part Number
2.4	2	PE Tube	605655

LNT NiCro 60/20 AWS ERNiCrMo-3

Diameter mm	Weight kg	Package Type	Part Number
1.6	2	PE Tube	605723
2.4	2	PE Tube	605747

LNT NiCroMo 60/16 AWS ERNiCrMo-4

Diameter mm	Weight kg	Package Type	Part Number
2.4	2	PE Tube	606645

LNT NiCroMo 59/23 AWS ERNiCrMo-13

Diameter mm	Weight kg	Package Type	Part Number
2.4	2	PE Tube	605938

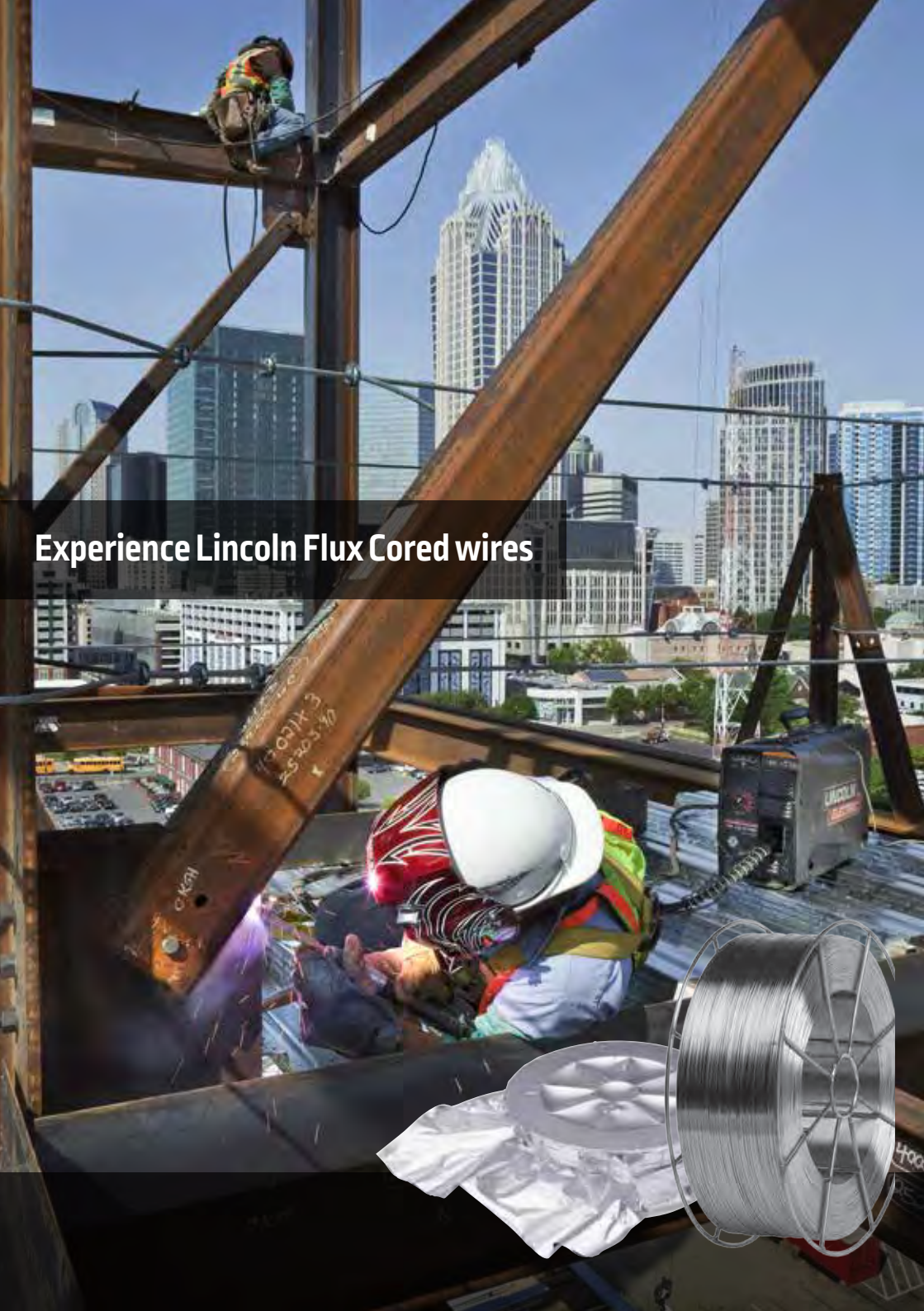
LNT NiTi AWS ERNi-1

Diameter mm	Weight kg	Package Type	Part Number
2.4	2	PE Tube	604764

LNT NiCu 70/30 AWS ERNiCu-7

Diameter mm	Weight kg	Package Type	Part Number
1.6	2	PE Tube	605198
2.4	2	PE Tube	604733

Experience Lincoln Flux Cored wires



Flux-Cored

Gas Shielded Wire (FCAW-G)

Mild Steel, All Position

Low Alloy

Creep Resistant

Stainless Steel

Duplex Stainless Steel

Nickel Based

Self-Shielded Wire (FCAW-S)

Mild Steel, Flat & Horizontal

Mild Steel, All Position

LINCOLN® ELECTRIC
THE WELDING EXPERTS®

Outershield® 71E-H

Flux Cored Wire - Mild Steel

Key Features

- Class leading welding performance
- Excellent mechanical properties with very low hydrogen levels H5/H4
- All positional rutile wire designed for welding with mixed gases and 100% CO_2 shielding gas
- Vacuum sealed aluminium foil bag packaging, precision layer wound wire

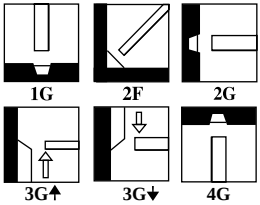
Typical Applications

- Full out of position welding requiring good penetration and high deposition rates
- General structural fabrication, mining, building, shipbuilding, etc
- C-Mn sheet and plate to 450 MPa yield strength
- Root runs on ceramic backing

Conformances

AWS A5.20/A5.20M	E71T-1M / E71T-9M J* H4 E71T-1C H4 *Applies to 1.2mm size only	
AS/NZS ISO 17632-B	T49 3 T1-1 MAK U H5 T43 0 T1-1 CAK U H5	
	M21	C1
Lloyds Register	3YSH5	2YSH5
ABS	3YSAH5	2YSAH5
DNV	IIIYMS(H5)	IIYMS(H5)

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- C1 : 100% CO_2
- Flow Rate: 15 - 20L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 / 200 VFB 15kg / 5kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	900149 / 900125	175-600	21-31	130-300	15-20mm
1.6	900262	130-400	21-31	170-400	15-20mm

Mechanical Properties - As Required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS E71T-1M, E71T-9M As Welded with M21 gas	400 min	480 min	22 min	27 min
Typical Results (1.2mm)	570	620	25	40

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - with M21 gas	0.04	1.40	0.60	0.013	0.010

OUTERSHIELD®

Recognised for consistency & performance

71E-H Flux Cored Wire

European Made | New to Australia

H4 Class

- Dual gas wire
- Outstanding welder appeal
- Proven track record in Europe

Outershield® 71-CX

Flux Cored Wire - Mild Steel

Key Features

- Excellent mechanical properties, low hydrogen
- Vacuum sealed aluminium foil bag packaging, precision layer wound wire
- All positional wire designed for welding with C1 shielding gas
- Premium arc performance and bead appearance

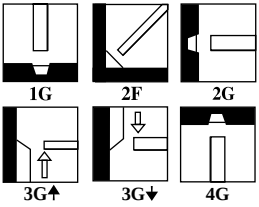
Typical Applications

- Medium to heavy mill scale base material
- Sheet and plate to 450 MPa yield strength
- General fabrication of carbon manganese steels

Conformances

AWS A5.20/A5.20M	E71T-1C-H8, E71T-9C-H8
AS/NZS ISO 17632-B	T49 3 T1-1 CAK U H10
Lloyds Register	4YS H10

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 13kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	033602	180-550	21-30	130-285	15-20mm
1.6	033606	125-400	21-31	190-380	15-20mm

Mechanical Properties - As Required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS E71T-1, E71T-9 As Welded with C1 gas	400 min	490-670 min	22	27 min
Typical Results	515	580	29	110

Deposit Composition

	%C	%Mn	%Si	%Ni	%S	%P
Typical Results	0.05	1.36	0.41	0.43	0.009	0.015

Primacore® LW-71

Flux Cored Wire - Mild Steel

Key Features

- Excellent mechanical properties, low fume levels
- Vacuum sealed aluminium foil bag packaging, precision layer wound wire
- Designed for welding with C1 shielding gas
- Certified for seismic applications - meets the requirements of AWS D1.8

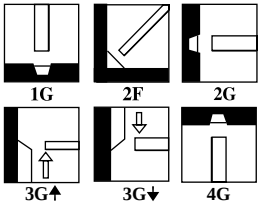
Typical Applications

- Structural fabrication
- Heavy equipment
- General fabrication
- Construction projects in seismic areas

Conformances

AWS A5.20/A5.20M	E71T-1C, E71T-9C
AS/NZS ISO 17632-B	T49 3 T1-1 CAK U H10
Lloyds Register	3YSH15
ABS	3YSA H10
DNV	IIIYMS (H10)
AWS D1.8	Meets lot requirements

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	COPLW71E21-B1	180-550	21-30	130-285	15-20mm
1.6	COPLW71E61-B1	125-400	21-31	190-380	15-20mm

Mechanical Properties - As Required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS E71T-1, E71T-9 As Welded with C1 gas	400 min	490-670 min	22 min	27 min
Typical Results	559	610	26	85

Deposit Composition

	%C	%Mn	%Si	%S	%P
Typical Results	0.06	1.30	0.33	0.01	0.02

Outershield® MC710-H

Metal Cored Wire - Mild Steel

Key Features

- All position (1.2mm only) high efficiency gas shielded metal cored wire
- Excellent arc characteristics provide outstanding operator appeal
- Few silicate islands, minimal spatter, fast travel speed, excellent wire feeding
- Superior product consistency with optimal alloy control

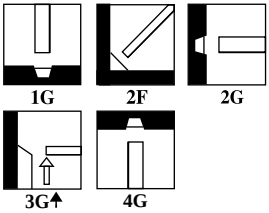
Typical Applications

- Structural fabrication
- Heavy equipment
- General fabrication
- Robotics / hard automation

Conformances

AWS A5.18/A5.18M	E70C-6M H4
AS/NZS ISO 17632-B	T49 3 T15-0/1 MAK U H5
Lloyds Register	3YSH5
ABS	3YSAH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - B300 15kg	Drum 200kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	900356	033111	100 - 550	15-33	180-350	15-20mm
1.6	900370	941937	150 - 450	27-34	200-440	15-20mm

Mechanical Properties - As Required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS E70C-6M As Welded with M21 gas	400 min	480 min	22 min	27 min
Typical Results	495	570	26	60

Deposit Composition

	%C	%Mn	%Si	%S	%P
Typical Results	0.05	1.35	0.6	0.023	0.015

Outershield® MC715-H

Metal Cored Wire - Mild Steel

Key Features

- All position (1.2mm only) high efficiency gas shielded metal cored wire
- Excellent arc characteristics provide outstanding operator appeal and mechanical properties
- Minimal spatter, fast travel speed, excellent wire feeding
- Superior product consistency with optimal alloy control
- Good alternative to basic (T-5) flux cored wires

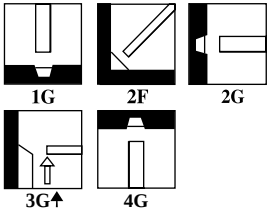
Typical Applications

- Structural fabrication
- Heavy equipment
- General fabrication
- Robotics / hard automation

Conformances

AWS A5.18/A5.18M	E70C-6M H4
AS/NZS ISO 17632-B	T49 4 T15-1 MAK UH5
DNV	IV Y40H5
BV	SA3, 3YMHH

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- M20 : 90% Argon / 10% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - B300 15kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	900401	100 - 550	15-33	120-275	15-20 mm
1.6	900415	150 - 450	27-34	200-450	20-25 mm

Mechanical Properties - As Required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS E70C-6M As Welded with M21 gas	400 min	480 min	22 min	27 min
Typical Results	480	540	27	110

Deposit Composition

	%C	%Mn	%Si	%S	%P
Typical Results	0.04	1.5	0.4	0.020	0.012

Outershield® MC460VD-H

Metal Cored Wire - Mild Steel

Key Features

- Metal cored wire for fillet welding with high efficiency
- Especially designed for vertical down welding in thin plate
- Minimal slag, minimal silicate islands, very good wire feeding
- Vacuum Sealed Packaging

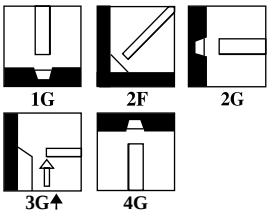
Typical Applications

- Structural fabrication - thin plate
- Ideal for fast vertical down welding
- Robotics / hard automation
- Ship building

Conformances

AWS A5.18/A5.18M	E70C-6M H4
AS/NZS ISO 17632-B	T49 4 T15-1 MAK UH5
Lloyds Register	3YSH5
ABS	3YSAH5
DNV	IIIYMSH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 14kg	WFS in/Min	Voltage volts	Current amps	CTWD mm
1.2	942852	250-550	28-33	180-340	15-20 mm

Mechanical Properties - As Required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS E70C-6M As Welded with M21 gas	400 min	480 min	22 min	27 min
Typical Results	510	600	25	60

Deposit Composition

	%C	%Mn	%Si	%S	%P
Typical Results	0.05	1.25	0.60	0.015	0.015

Outershield® MC715Ni1-H

Metal Cored Wire - Low Alloy

Key Features

- Gas shielded 1% Ni alloyed metal cored wire for offshore and similar applications
- Excellent arc characteristics provide outstanding operator appeal and mechanical properties @ -50°C
- Minimal spatter, fast travel speed, excellent wire feeding
- Superior product consistency with optimal alloy control
- Ni content is controlled to meet "sour service" oilfield requirements such as NACE MR0175

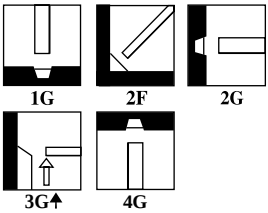
Typical Applications

- Offshore fabrication
- Oil & Gas industries
- High strength low alloy and quench & tempered (Q&T) steels

Conformances

AWS A5.28/A5.18M	E80C-Ni1M H4
AS/NZS ISO 17632-B	T55 5 T15-1 MAN1 UH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 14kg	Accu-Trak® Drum 200kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	941938	941941	100-550	15-33	120-275	15-20 mm
1.6	941945	-	150-450	27-34	200-450	15-20mm

Mechanical Properties - As Required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C	Charpy V-Notch J @ -50°C
Requirements - AWS E80C-Ni1M As Welded with M21 gas	470 min	550	24 min	27 min	-
Typical Results	530	600	25	100	80

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni
Typical Results	0.05	1.35	0.45	0.020	0.012	0.95

Outershield® 81Ni1-H

Flux Cored Wire - Low Alloy

Key Features

- All positional (except 2.0mm) gas shielded 1.0% Ni, alloyed flux cored wire
- Exceptional mechanical properties (Impact properties >47J @ -50°C)
- Superior product consistency with optimal alloy control
- Outstanding operator appeal

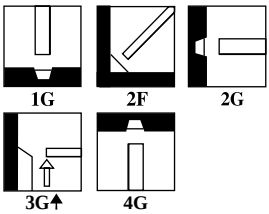
Typical Applications

- Suitable for offshore and similar applications
- Boiler and pressure vessels
- Low alloy high strength steels
- Meets NACE MR-0175 requirements

Conformances

AWS A5.29/5.29M	E81T1-Ni1M-J
AS/NZS ISO 17632-B	T55 6 T1-1 MAPN3 UH5
Lloyds Register	4Y40SH5
DNV	IV YMSH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 14kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	941378	175-600	20-32	130-300	15-20 mm
1.6	941380	125-400	22-32	170-400	20-25 mm
2.0	941381	125-325	23-32	220-450	20-25 mm

Mechanical Properties - As Required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS E81T1-Ni1M As Welded with M21 gas	470 min	550-690	19 min	27 min
Typical Results	530	600	24	90

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni
Typical Results	0.05	1.4	0.20	0.010	0.013	0.95

Outershield® 81Ni1-HSR

Flux Cored Wire - Low Alloy

Key Features

- All positional gas shielded 1.0% Ni, alloyed flux cored wire
- Exceptional mechanical properties (Impact properties >47J at -50°C)
- Outstanding operator appeal, excellent feeding
- Specifically designed for stress relieved applications, excellent impact properties after PWHT

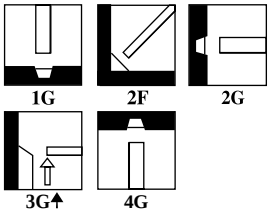
Typical Applications

- Suitable for offshore and similar applications
- Boiler and pressure vessels
- Low alloy high strength steels
- Meets NACE MR-0175 requirements

Conformances

AWS A5.29/A5.29M	E81T1-Ni1M J
AS/NZS ISO 17632-B	T55 6 T1-1 MAPN3 UH5
Lloyds Register	4YSH5
DNV	IV YMSH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 14kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	942719	175-600	20-32	130-300	15-20 mm
1.6	942767	125-400	22-32	170-400	20-25mm

Mechanical Properties - As Required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS E81T1-Ni1M As Welded with M21 gas	470 min	550-690	19	27 min
Typical Results - As Welded	530	600	24	90
Typical Results - Stress Relieved	525	590	25	70 @ - 50°C

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni
Typical Results - As Welded	0.05	1.4	0.20	0.010	0.013	0.95

Outershield® 91Ni1-HSR

Flux Cored Wire - Low Alloy

Key Features

- All positional gas shielded 1.0% Ni / 0.4% Mo alloyed flux cored wire
- Exceptional mechanical properties
- Outstanding operator appeal, excellent feeding
- Specifically designed for stress relieved applications, excellent impact properties after PWHT

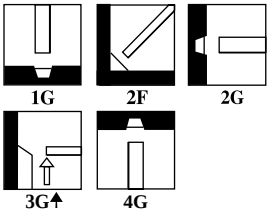
Typical Applications

- Suitable for offshore and similar applications
- Boiler and pressure vessels
- Low alloy high strength steels
- Meets NACE MR-0175 requirements

Conformances

AWS A5.29/A5.29M	E91T1-GM
AS/NZS ISO 18276-B	T62 4 AP 1 NiMo H5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 14kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	942673	175-600	20-32	130-300	15-20 mm

Mechanical Properties - As Required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS E91T1-G As Welded with M21 gas	540 min	620-760	17 min	47 min
Typical Results - As Welded	640	700	19	60

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni	%Mo
Typical Results - As Welded	0.05	1.4	0.20	0.010	0.013	0.95	0.40

Outershield® 690-H

Flux Cored Wire - Low Alloy

Key Features

- All positional gas shielded flux cored wire for high strength steels
- Exceptional mechanical properties (Impact properties >50J @ -40°C)
- Superior product consistency with optimal alloy control
- Outstanding operator appeal, excellent feeding

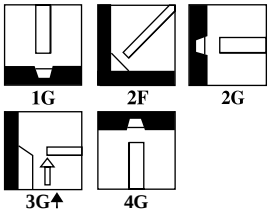
Typical Applications

- Ideal for Bisplate 80, Weldten 80, etc.
- Where high strength weld metal is required
- Mining and heavy fabrications

Conformances

AWS A5.29/A5.29M	E111T1-K3M J
AS/NZS ISO 18276-B	T76 T2-1 MAN3M2 H5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 14kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	942453E	175-600	20-32	130-300	15-20 mm
1.6	942447	200-400	21-31	130-385	20-25 mm

Mechanical Properties - As Required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS E111T1-K3 As Welded with M21 gas	680 min	760-900	15	27 min
Typical Results - As Welded	780	810	18	85

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni	%Mo
Typical Results - As Welded	0.06	1.5	0.20	0.010	0.015	2.0	0.30

Outershield® 12-H

Flux Cored Wire - Creep Resistant

Key Features

- All position gas shielded 0.5% Mo-alloyed rutile cored wire
- Outstanding operator appeal, excellent feeding
- Superior product consistency with optimal alloy control
- Outstanding operator appeal, excellent feeding

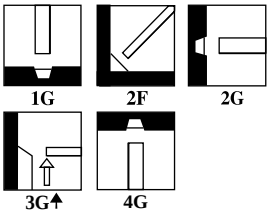
Typical Applications

- Ideal for welding creep resistant steels
- Pressure vessels and pressure piping

Conformances

AWS A5.29/A5.29M	E81T1-A1M H4
AS/NZS ISO 17634-B	T55 2 T1-1 MP 2M3 H5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - B300 15kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	943009	175-600	20-32	130-300	15-20 mm

Mechanical Properties - As Required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS E81T1-A1 As Welded with M21 gas	470 min	550-690	19 min	-
Typical Results - Stress Relieved 1 hr @ 620°C	540	600	27	79

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Mo
Typical Results - As Welded	0.07	0.8	0.20	0.010	0.014	0.46

Outershield® 19-H

Flux Cored Wire - Creep Resistant

Key Features

- All position 1.25% Cr / 0.5% Mo-alloyed gas shielded rutile cored wire
- Outstanding operator appeal, excellent feeding
- Superior product consistency with optimal alloy control
- Outstanding operator appeal, excellent feeding

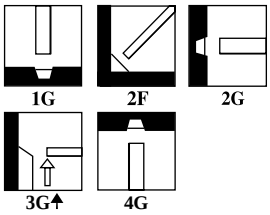
Typical Applications

- Ideal for welding B2 class creep resistant steels
- Pressure vessels and pressure piping

Conformances

AWS A5.29/A5.29M	E81T1-B2M H4
AS/NZS ISO 17634-B	T55 2 T1-1 MP 1CM H5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 14kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	943018	175-600	20-32	130-300	15-20 mm

Mechanical Properties - As Required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS E81T1-B2 As Welded with M21 gas	470 min	550-690	19 min	-
Typical Results - Stress Relieved 1 hr @ 690°C	545	635	21	80

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Cr	%Mo
Typical Results - As Welded	0.07	0.74	0.24	0.010	0.013	1.24	0.52

Outershield® 20-H

Flux Cored Wire - Creep Resistant

Key Features

- All position 2.25% Cr / 1.0% Mo-alloyed gas shielded rutile cored wire
- Outstanding operator appeal, excellent feeding
- Superior product consistency with optimal alloy control

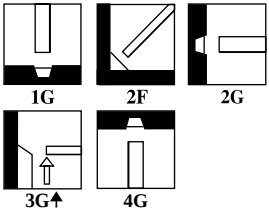
Typical Applications

- Ideal for welding B3 class creep resistant steels
- Pressure vessels and pressure piping

Conformances

AWS A5.29/A5.29M	E91T1-B3M H4
AS/NZS ISO 17634-B	T62 2 T1-1 MP 2C1MH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Basket - B300 15kg	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	943023	175-600	20-32	130-300	15-20 mm

Mechanical Properties - As Required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS E91T1-B3 As Welded with M21 gas	540 min	620-760	17 min	-
Typical Results - Stress Relieved 1 hr @ 690°C	570	680	19	60

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Mo	%Cr
Typical Results - As Welded	0.07	0.75	0.21	0.008	0.013	2.23	1.09

Innershield®

With no shielding gas required, flux-cored self-shielded wire brings the productivity of wire welding to outdoor applications.

Innershield® NS-3M

Flux Cored Wire - Self Shielded / Flat & Horizontal

Key Features

- Very high deposition rates
- Increased resistance to hydrogen cracking and porosity
- Soft low penetrating arc for minimal base material dilution

Typical Applications

- Open groove welds
- Machinery bases and heavy equipment repair
- Installing wear plates
- 6.5-13 mm single pass fillet / lap welds

Conformances

AWS A5.20/A5.20M	E70T-4
ASME SFA-A5.20	E70T-4
AS/NZS ISO 17632-B	T49 Z T4 0 NA

Welding Positions

Diameter / Packaging

Diameter mm	Coil - 6.4kg Master Carton - 25.4kg	Coil 22.7kg	Speed-Feed® Drum 272kg
2.0	-	ED012740	-
2.4	ED012739	ED012736	ED012731
3.0	-	ED012732	-

Mechanical Properties - As Required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness HRB
Requirements - AWS E70T-4	400 min	480-655	22 min	-
Typical Results - As Welded	415-450	580-620	25-28	87-91

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Al
Requirements	0.30 max	1.75 max	0.60 max	0.03 max	0.03 max	1.8 max
Typical Results	0.21-0.25	0.37-0.53	0.25-0.29	≤0.01	≤0.01	1.3-1.6

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
2.0mm DC+	54	200 240 260 300	29-31 30-32 30-32 31-33	280 315 330 350	4.6 5.5 6.0 6.9
2.4mm DC+	76	110 150 185 230 275	28-30 29-31 30-32 31-33 32-34	250 300 350 400 450	3.7 5.3 6.6 8.3 10.0
3.0mm DC+ (ESO - 70mm)	76	140 175 200 225	28-30 29-31 30-32 31-33	380 450 500 550	7.0 9.1 10.5 11.9
3.0mm DC+ (ESO - 95mm)	100	210 250 300 355	35-37 36-38 37-39 38-40	450 500 550 600	11.3 13.2 15.4 18.0

Innershield® NR-311

Flux Cored Wire - Self Shielded / Flat & Horizontal

Key Features

- High deposition rates and fast travel speeds
- Easy slag removal
- Optimal toe wash-in
- Deep penetration
- High resistance to cracking

Typical Applications

- Recommended for fillet, lap and butt welds on 3.2 mm and thicker steel, including some low alloy steels
- General fabrication
- Assembly welding
- Welds on lightly rusted or primed plate

Conformances

AWS A5.20/A5.20M	E70T-7
ASME SFA-A5.20	E70T-7
AS/NZS ISO 17632-B	T 49 Z T7 0 NA

Welding Positions

FCAW

Diameter / Packaging

Diameter mm	Coil - 6.4kg Master Carton - 25.4kg	Coil 22.7kg
2.0	ED014464	-
2.4	-	ED012629

Mechanical Properties - As Required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness HRB
Requirements - AWS E70T-7	400 min	480-655	22 min	-
Typical Results - As Welded	420-475	600-645	23-26	88-92

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Al
Requirements	0.30 max	1.75 max	0.60 max	0.03 max	0.03 max	1.8 max
Typical Results	0.25-0.29	0.44-0.51	0.09-0.12	≤0.01	≤0.01	1.4-1.7

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
2.0mm DC-	38	100	20-23	190	2.3
		160	24-28	275	3.6
		240	25-29	355	5.6
		300	27-31	410	7.2
2.4mm DC-	45	75	20-23	200	2.5
		135	23-26	300	4.6
		150	24-27	325	5.2
		210	26-28	400	7.5
		270	28-30	450	10.0

Innershield® NR-211-MP

Flux Cored Wire - Self Shielded / All Position

Key Features

- 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

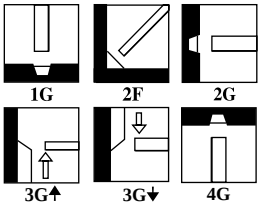
Typical Applications

- Sheet or thin gauge metal
- Galvanized sheet metal
- General fabrication
- Small diameters ideally suited to DIY welders

Conformances

AWS A5.20/A5.20M	E71T-11
ASME SFA-A5.20	E71T-11
AS/NZS ISO 17632-B	T49 Z T-11 1 NA

Welding Positions



Diameter / Packaging

Diameter mm	Spool - Plastic 4.5kg	Spool - Plastic 6.4kg	Spool - Steel 11.3kg
0.9	ED016354	-	-
1.2	ED016363	ED012506	ED030638
1.7	-	ED012508	ED030641
2.0	-	-	ED030645

Mechanical Properties - As Required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness HRB
Requirements - AWS E71T-11	400 min	480-655	20 min	-
Typical Results - As Welded	435-475	605-645	22-25	89-92

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Al
Requirements	0.30 max	1.75 max	0.60 max	0.03 max	0.03 max	1.8 max
Typical Results	0.23-0.26	0.57-0.66	0.17-0.26	≤0.01	≤0.01	1.3-1.6

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
0.9mm DC-	13-16	50	14-15	30	0.3
		70	15-16	60	0.5
		110	16-17	115	0.6
		150	17-18	130	0.8
		200	18-19	155	1.1
		275	20-21	155	1.5
1.2mm DC-	16-19	70	15-16	120	0.5
		90	16-17	140	0.8
		110	17-18	160	1.0
		130	18-19	170	1.2
1.7mm DC-	19-32	40	15-16	125	0.8
		75	18-19	190	1.5
		130	20-21	270	2.8
		175	23-24	300	3.8
2.0mm DC-	19-32	50	16-17	180	1.3
		75	18-19	235	2.0
		120	20-21	290	3.4
		160	22-23	325	4.5

Maximum Plate Thickness

Diameter mm	Maximum Plate Thickness mm
0.9	8
1.2	8
1.7	13
2.0	13

Innershield® NR-232

Flux Cored Wire - Self Shielded / All Position

Key Features

- High deposition rates for out-of-position welding
- Penetrating arc
- Fast freezing, easy to remove slag system
- Meets AWS D1.8 seismic lot waiver requirements

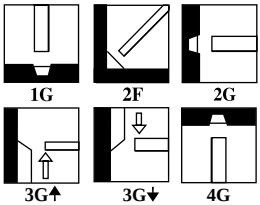
Typical Applications

- 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

Conformances

AWS A5.20/A5.20M	E71T-8-H16
ASME SFA-A5.20	E71T-8-H16
AS/NZS ISO 17632:B	T49 3 T8 1 NA
ABS	3YSA
Lloyd's Register	3YS H15
DNV Grade	III YMS H15
AWS D1.8	Meets requirements

Welding Positions



Diameter / Packaging

Diameter mm	Coil - 6.1kg Master Carton - 24.5kg	Spool - Steel 11.3 kg	Coil 22.7kg
1.7	ED012518	ED033980	ED012519
2.0	ED012525	ED034370	ED012526

Mechanical Properties - As Required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness Rockwell B	Charpy V-Notch J @ -29°C
Requirements - AWS E71T-8	400 min	480-655	22 min	-	27 min
Typical Results - As Welded	460-520	575-615	25-31	87-90	47-75

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Al
Requirements	0.30 max	1.75 max	0.60 max	0.03 max	0.03 max	1.8 max
Typical Results	0.16-0.18	0.61-0.72	0.26-0.33	≤0.01	≤0.01	0.5-0.8

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.7mm DC-	19-32	110	18-19	195	1.8
		130	19-21	225	2.0
		150	19-21	250	2.4
		170	20-22	270	2.8
		195	23-24	300	3.2
		250	23-24	350	4.0
		320	25-27	400	5.2
2.0mm DC-	19-32	60	16-17	145	1.2
		115	19-20	260	2.5
		120	19-20	270	2.6
		130	20-21	285	2.8
		180	22-23	365	3.9

Innershield® NR-233

Flux Cored Wire - Self Shielded / All Position

Key Features

- High deposition rates for out-of-position welding
- Welder-friendly, easy to use and great bead appearance
- Minimal gas marking
- Meets AWS D1.8 seismic lot waiver requirements

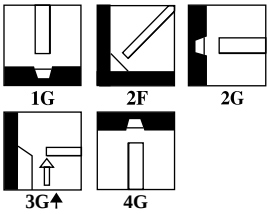
Typical Applications

- Structural fabrication, including those subject to seismic requirements
- General plate fabrication
- Ship and barge fabrication
- Vertical up and overhead fillets and groove welds

Conformances

AWS A5.20/A5.20M	E71T-8-H16
ASME SFA-A5.20	E71T-8-H16
ABS	E71T-8-H16
AS/NZS ISO 17632-B	T493T8-1NA-H15
AWS D1.8	Meets requirements

Welding Positions



Diameter / Packaging

Diameter mm	Spool - Plastic 11.3kg
1.6	ED030934
1.8	ED031030

Mechanical Properties - As Required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness Rockwell B	Charpy V-Notch J @ -29°C
Requirements - AWS E71T-8	400 min	480-655	22 min	-	27 min
Typical Results - As Welded	435-455	575-595	26-29	87-89	34-54

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Al
Requirements	0.30 max	1.75 max	0.60 max	0.03 max	0.03 max	1.8 max
Typical Results	0.15-0.20	0.61-0.65	0.17-0.21	≤0.03	≤0.01	0.5-0.6

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.6mm DC-	15-25	150	17-19	220	1.9
		200	19-21	245	2.5
		250	21-23	270	3.0
		300	23-25	295	3.5
		350	25-27	315	4.3
1.8mm DC-	19-25	100	17-18	184	1.6
		150	18-19	250	2.5
		200	20-21	295	3.2
		250	22-23	330	4.0
		300	23-24	355	4.8

Innershield® NR-212

Flux Cored Wire - Self Shielded / All Position

Key Features

- Suitable for a wide range of mild steels
- Fast freeze characteristics accommodate poor fit-up
- Smooth arc performance and ease of use

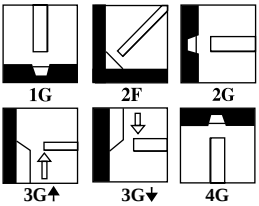
Typical Applications

- Single or multiple pass welding with thickness limitations
- General fabrication
- Truck bodies, tanks, hoppers, racks and scaffolding
- Welding on galvanized steel or zinc coated carbon steel

Conformances

AWS A5.29/A5.29M	E71TG-G
ASME SFA-A5.29	E71TG-G
AS/NZS ISO 17632-B	T49 Z TG 1

Welding Positions



Diameter / Packaging

Diameter mm	Spool - Steel 11.3kg
1.2	ED030639
1.7	ED030642
2.0	ED030646

Mechanical Properties - As Required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness Rockwell B
Requirements - AWS E71TG-G	400 min	480-655	20 min	-
Typical Results	440-505	575-605	24-28	89-92

Deposit Composition

	%C	%Mn	%Si	%S	%P
Requirements	Not Specified	0.50 min	1.00 max	0.030 max	0.030 max
Typical Results	0.06-0.11	0.84-1.55	0.20-0.33	≤0.003	0.006-0.009
	%Ni	**%Cr**	**%Mo**	**%V**	**%Al**
Requirements	0.50 min	0.30 min	0.20 min	0.10 min	1.8 max
Typical Results	1.02 -1.15	0.02-0.04	≤0.02	-	1.3-1.6

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.2mm DC-	15-20	55	14-15	75	0.5
		70	15-16	90	0.6
		90	16-17	115	0.8
		110	17-18	135	1.0
		130	18-19	155	1.2
		160	19-20	170	1.4
1.7mm DC-	20-25	60	16-17	145	1.1
		75	17-18	180	1.4
		90	18-19	200	1.7
		120	19-20	230	2.3
		150	20-21	255	2.9
		175	22-23	275	3.4
2.0mm DC-	20-25	60	16-17	200	1.5
		75	18-19	225	1.8
		90	19-20	245	2.3
		110	20-21	275	2.8
		130	21-23	300	3.3
		150	22-23	325	3.8

Maximum Plate Thickness

Diameter mm	Maximum Plate Thickness mm
1.2	19
1.7	19
2.0	19

Innershield® NR-152

Flux Cored Wire - Self Shielded / All Position

Key Features

- Designed for high speed welding of specially coated steels
- Soft, consistent arc
- Resistant to porosity
- Excellent overlapping capabilities
- Ideal for robotic applications

Typical Applications

- Single pass welding on plate thickness up to 5mm
- Continuous welding on galvanized or zinc coated carbon steel
- Spot or short intermittent welds
- Automotive & Transportation

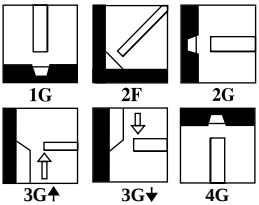
Conformances

AWS A5.20/A5.20M	E71T-14
AS/NZS ISO 17632-B	T49 Z T14 1 NS

Warning

- NR-152 is NOT recommended for welding multiple passes

Welding Positions



Diameter / Packaging

Diameter mm	Coil 22.7kg
1.7	ED012186

Mechanical Properties - As Required per AWS A5.20

	Transverse Tensile Strength MPa	Longitudinal Bend Test	Hardness Rockwell B
Requirements - AWS E71T-14	480 min	180° over 3/4 inch Radius / No openings exceeding 1/8 inch	-
Typical Results	480-550	Passed	93

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Al
Requirements	Not Specified					
Typical Results	0.25-0.30	0.83-1.04	0.20-0.23	0.006-0.01	0.005-0.02	1.08-1.38

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.7mm DC-	15-20	30	13-14	68	0.6
		40	13-14	95	0.9
		50	14-15	120	1.1
		60	15-16	145	1.3
		80	16-17	190	1.8
		110	20-21	240	2.4

Maximum Plate Thickness

Diameter mm	Max. Plate Thickness mm
1.7	5

Steelcore® 71T-GS

Self Shielded / All Position

Key Features

- Versatile welding capability on mild and galvanized steels
- High operator appeal and good bead appearance
- Easy slag removal
- Suited to small portable MIG machines

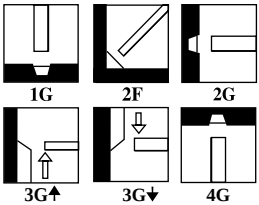
Typical Applications

- Ideal for sheet or thin gauge metal
- Excellent performance on galvanized sheet
- General DIY fabrication
- 5mm maximum plate thickness

Conformances

AWS A5.20/A5.20M:	E71T-GS
AS/NZS ISO17632:B	T49 Z T-G 1NA

Welding Positions



FCAW

Diameter / Packaging

Diameter mm	4.5kg Spool	0.9kg Blister Pack
0.8	14-1392	-
0.9	14-1393	14-1383

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps
0.8mm DC-	10-12	50-300	14-18	60-150
0.9mm DC-	12-15	50-275	14-20	60-180

Cor-A-Rosta® 304L

Flux Cored Wire - Stainless Steel

Key Features

- Gas shielded flux cored wire designed for flat and horizontal welding positions
- Class leading weld performance and operator appeal
- Excellent wire feeding
- Low spatter and good slag removal
- Vacuum sealed packaging

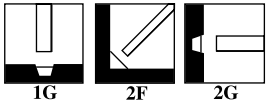
Typical Applications

- 304L and other common 18/8 stainless steels
- Nitrogen bearing 304LN and titanium stabilized 321 steels
- General fabrication including piping, tanks and pressure vessels

Conformances

AWS A5.22/A5.22M	E308LT0-1, E308LT0-4
AS/NZS ISO 17633-B	TS308L-FB0
LR	304L

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- M21 : 75-85% Argon / 15-25% CO_2

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS in/min	Voltage Volts	Current Amps	CTWD mm
1.2	585155	250-450	22-28	140-250	15-20 mm

Mechanical Properties - As Required per AWS A5.22

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C	Charpy V-Notch J @ -110°C
Requirements AWS E308LT0-1, E308LT0-4	Not Specified	520 min	35 min	Not Specified	
Typical Results As Welded with M21/C1 gas	400	560	42	80	40

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni	FN
Typical Results	0.03	1.3	0.70	19.5	10.0	8

Cor-A-Rosta® 316L

Flux Cored Wire - Stainless Steel

Key Features

- Gas shielded flux cored wire designed for flat and horizontal welding positions
- Class leading welding performance and operator appeal
- Excellent wire feeding
- Low spatter and good slag removal
- Vacuum sealed packaging

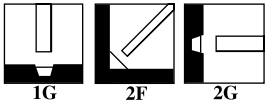
Typical Applications

- 316 / 316L and other stainless steels
- Ti and Nb stabilized grades 316Ti, 316Nb, 347
- Applications requiring good resistance to pitting and general corrosion; e.g. marine, food and beverage

Conformances

AWS A5.22/A5.22M	E316LT0-1, E316LT0-4
AS/NZS ISO 17633-B	TS316L-FB0
LR	316L

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- M21 : 75-85% Argon / 15-25% CO_2

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	585308	250-450	22-31	100-250	15-20 mm

Mechanical Properties - As Required per AWS A5.22

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C	Charpy V-Notch J @ -110°C
Requirements AWS E316LT0-1, E316LT0-4	Not Specified	485 min	30 min	Not Specified	
Typical Results As Welded with M21/C1 gas	440	580	38	70	40

Deposit Composition

	%C	%Mn	%Si	%Mo	%Cr	%Ni	FN
Typical Results	0.03	1.3	0.50	2.7	19.0	12.0	8

Cor-A-Rosta® P316L

Flux Cored Wire - Stainless Steel

Key Features

- Gas shielded flux cored wire designed for welding in all positions
- Class leading welding performance and operator appeal
- Excellent wire feeding
- Low spatter and good slag removal
- Vacuum sealed packaging

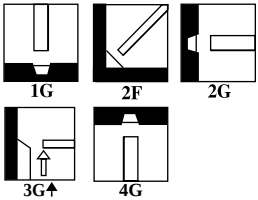
Typical Applications

- 316 / 316L and other stainless steels
- Ti and Nb stabilized grades 316Ti, 316Nb, 347
- Applications requiring good resistance to pitting and general corrosion; e.g. marine, food and beverage

Conformances

AWS A5.22/A5.22M	E316LT1-1, E316LT1-4
AS/NZS ISO 17633-B	TS316L-FB1
LR	Pending

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- M21 : 75-85% Argon / 15-25% CO_2

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	585322	250-450	22-31	100-250	15-20 mm

Mechanical Properties - As Required per AWS A5.22

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C	Charpy V-Notch J @ -110°C
Requirements AWS E316LT0-1, E316LT0-4	Not Specified	485 min	30 min	Not Specified	
Typical Results As Welded with M21/C1 gas	440	580	38	70	40

Deposit Composition

	%C	%Mn	%Si	%Mo	%Cr	%Ni	FN
Typical Results	0.03	1.3	0.50	2.7	19.0	12.0	6

Cor-A-Rosta® 309L

Flux Cored Wire - Stainless Steel

Key Features

- Gas shielded flux cored wire designed for flat and horizontal welding positions
- Class leading welding performance and operator appeal
- Excellent wire feeding
- Low spatter and good slag removal
- Vacuum sealed packaging

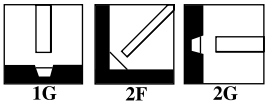
Typical Applications

- Ideal for welding stainless steel to mild steel
- Buffer layers in clad steel, overlays on carbon manganese and low alloy steels
- Welds that require high resistance to embrittlement
- Welding dissimilar materials

Conformances

AWS A5.22/A5.22M	E309LT0-1, E309LT0-4
AS/NZS ISO 17633-B	TS309L-FB0
LR	SS/CMn

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- M21 : 75-85% Argon / 15-25% CO_2

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	585209	250-450	22-31	100-250	15-20 mm

Mechanical Properties - As Required per AWS A5.22

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C	Charpy V-Notch J @ -20°C
Requirements AWS E309LT0-1, E309LT0-4	Not Specified	520 min	35 min	Not Specified	
Typical Results As Welded with M21/C1 gas	445	560	36	45	40

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni	FN
Typical Results	0.03	1.4	0.6	24.0	12.5	15

Cor-A-Rosta® flux-cored wires offer significant advantages to cut down production time.

Cor-A-Rosta® P309L

Flux Cored Wire - Stainless Steel

Key Features

- Gas shielded flux cored wire designed for welding in all positions
- Class leading weld performance and operator appeal
- Excellent wire feeding
- Low spatter and good slag removal
- Vacuum sealed packaging

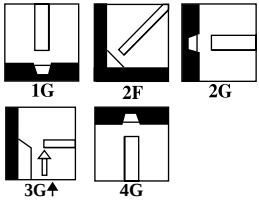
Typical Applications

- Ideal for welding stainless steel to mild steel
- Buffer layers in clad steel, overlays on carbon manganese, and low alloy steels
- Welds that require high resistance to embrittlement
- Welding dissimilar materials

Conformances

AWS A5.22/A5.22M	E309LT1-1, E309LT1-4
AS/NZS ISO 17633-B	TS309L-FB1
LR	Pending

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- M21 : 75-85% Argon / 15-25% CO_2

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	585223	250-450	22-31	100-250	15-20 mm

Mechanical Properties - As Required per AWS A5.22

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C	Charpy V-Notch J @ -20°C
Requirements AWS E309LT1-1, E309LT1-4	Not Specified	520 min	35 min	Not Specified	
Typical Results As Welded with M21/C1 gas	445	560	36	65	55

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni	FN
Typical Results	0.04	1.3	0.6	24.0	12.5	15

Cor-A-Rosta® 309MoL

Flux Cored Wire - Stainless Steel

Key Features

- Gas shielded flux cored wire designed for flat and horizontal welding positions
- Class leading weld performance and operator appeal
- Excellent wire feeding
- Low spatter and good slag removal
- Vacuum sealed packaging

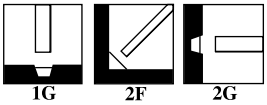
Typical Applications

- Welding stainless steel to mild steel
- Buffer layers in clad steel, overlays on carbon manganese, and low alloy steels
- Welds that require high resistance to corrosion
- Difficult to weld steels
- Maximum ~12mm thickness in butt welds

Conformances

AWS A5.22/A5.22M	E309LMoT0-1, E309LMoT0-4
AS/NZS ISO 17633-B	TS309LMo-FB0
LR	SS/CMn

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- M21 : 75-85% Argon / 15-25% CO_2

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	585254	250-450	22-31	100-250	15-20 mm

Mechanical Properties - As Required per AWS A5.22

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ +20°C
Requirements - AWS E309LMoT0-1, E309LMoT0-4	Not Specified	520 min	25 min	Not Specified
Typical Results - As Welded with M21/C1 gas	550	700	30	50

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo	FN
Typical Results	0.03	1.3	0.7	23.0	12.8	2.3	20

Cor-A-Rosta® 4462

Flux Cored Wire - 2205 Duplex Stainless Steel

Key Features

- Gas shielded flux cored wire designed for flat and horizontal welding positions
- Class leading weld performance and operator appeal
- Excellent wire feeding
- Low spatter and good slag removal
- Vacuum sealed packaging

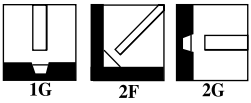
Typical Applications

- Ideal for welding duplex stainless steels; e.g. S31803, S31500, S32304, S32104
- Service temperatures up to 250C
- High resistance to general corrosion, pitting and stress corrosion

Conformances

AWS A5.22/A5.22M	E2209T0-1, E2209T0-4
AS/NZS ISO 17633-B	TS2209-FB0
LR	Pending

Welding Positions



Shielding Gas

- C1 : 100% CO_2
- M21 : 75-85% Argon / 15-25% CO_2

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	585223	250-450	22-31	100-250	15-20 mm

Mechanical Properties - As Required per AWS A5.22

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C	Charpy V-Notch J @ -50°C
Requirements AWS E2209T0-1, E2209T0-4	Not Specified	520 min	25 min	Not Specified	
Typical Results - As Welded with M21 gas	630	800	29	50	40

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo	%N	FN
Typical Results	0.03	1.2	0.7	23.0	9.2	3.1	0.12	40

PRen: -34 -38

NiCro-Cor P60/20

Flux Cored Wire - Nickel Based

Key Features

- Gas shielded flux cored wire designed for welding in all positions
- Class leading weld performance and operator appeal
- Excellent wire feeding
- Low spatter and good slag removal
- Vacuum sealed packaging

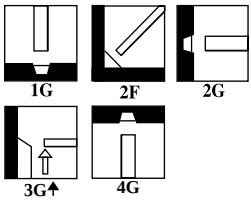
Typical Applications

- Welding 9% nickel steels ASTM A353
- LNG Industries
- Low temperature steels, welding dissimilar materials

Conformances

AWS A5.34/A5.34M ENiCrMo3T1-4

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2

Diameter / Packaging / Settings

Diameter mm	Spool - S300 VFB 15kg	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	585575	200-400	24-30	125-220	20 mm

Mechanical Properties - As Required per AWS A5.34

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C	Charpy V-Notch J @ -196°C
Requirements AWS ENiCrMo3T1-4	Not Specified	690 min	25 min	Not Specified	
Typical Results As Welded with M21 gas	500	770	42	95	80

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni	%Mo	%Nb	%Fe
Typical Results	0.02	0.3	0.2	21.0	66.0	8.5	3.4	1.0

Lincoln Submerged Arc Welding

A variety of welding fluxes and wires designed to be paired together to meet any industry specific welding requirement.

Submerged Arc

Submerged Arc Flux

Active

Neutral

Hardfacing

Alloy

Stainless Steel

Submerged Arc Wire

Mild Steel

Low Alloy

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Lincolnweld® 761

Submerged Arc Flux - Active

Key Features

- Manganese alloying and carbon reducing flux designed to provide superior crack resistance
- Slow freezing slag for a wide, flat weld
- Excellent resistance to cracking in single pass applications
- Available in moisture proof Sahara Ready Bag (SRB) and Steel Drums

Typical Applications

- Single pass welding of mild steel
- Large fillets with constant current power sources
- Suitable for spiral pipe mills

Conformances

AS/NZS ISO 14174 SA CS/MS 1 88 AC H5

Product Information

Basicity Index	0.8
Density	1.2 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-60, L-61

Low Alloy Steel

Lincolnweld® L-70

Packaging

Package Type	Weight Kg	Part Number
SRB	25	FX761-25-C-SRB
Steel Drum	250	111842

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%TiO_2	%FeO	% Metal Alloys
Lincolnweld® 761	45	19	22	5	2	2	2	1	6 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-50	As Welded	480	590	29	45	-29	F7A2-EM13K-H8
L-60	As Welded	440	530	29	64	-29	F7A2-EL12
L-61	As Welded	480	590	28	54	-29	F7A2-EM12K-H8
L-70	As Welded	550	640	24	58	-18	F9A0-EA1-G

Lincolnweld® 780

Submerged Arc Flux - Active

Key Features

- Industry standard for submerged arc welding applications
- Fast freezing slag for easy removal and minimised spilling on circumferential welds
- When paired with Lincolnweld® L-61 it is recommended for up to three pass welding applications
- Excellent bead shape and slag removal
- Good resistance to moisture contamination for reduced porosity

Typical Applications

- Single pass welding of mild steel
- Roundabouts with minimal spillage
- Horizontal position welding

Conformances

AS/NZS ISO 14174 SA AR/AB 1 78 AC H5

Product Information

Basicity Index	0.7
Density	1.4 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-60, L-61

Packaging

Package Type	Weight Kg	Part Number
Plastic Bag Steel Drum	25 250	FX780-25 111781

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%TiO_2	%CaO	% Metal Alloys
Lincolnweld® 780	9	16	2	11	2	45	9	1	6 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-50	As Welded	520	600	27	65	-18	F7A0-EM13K
L-60	As Welded	440	520	30	88	-18	F7A0-EL12-H8
L-61	As Welded	530	600	27	46	-29	F7A2-EM12K-H8

Lincolnweld® 781

Submerged Arc Flux - Active

Key Features

- Features fast follow characteristics that allow for uniform welds at high speeds without undercut or voids
- Recommended for high speed, limited pass welding on clean plate and sheet steel
- Good wetting action

Typical Applications

- Single pass welding of mild steel
- Roundabouts with minimal spillage
- Horizontal position welding

Conformances

AS/NZS ISO 14174 SA ZS 1 87 AC H5

Product Information

Basicity Index	0.8
Density	1.5 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-60, L-61

Low Alloy Steel

Lincolnweld® L-70, LA-85

Packaging

Package Type	Weight Kg	Part Number
Plastic Bag	25	FX781-25

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%TiO_2	%CaO	% Metal Alloys
Lincolnweld® 781	21	17	14	5	2	4	12	1	3 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation (%)	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-50	As Welded	530	610	29	38	-18	F7A0-EM13K
L-60	As Welded	460	550	29	42	-18	F7A0-EL12
L-61	As Welded	530	610	28	31	-18	F7A0-EM12K
L-70	As Welded	590	660	25	35	-18	F9A0-EA1-G

Lincolnweld® 860

Submerged Arc Flux - Neutral

Key Features

- Industry standard for submerged arc welding applications
- Excellent operating characteristics in a variety of general welding applications
- Capable of producing weld deposits with impact toughness exceeding 27J @ -40°C with Lincolnweld® L-61

Typical Applications

- Pipe and double ending applications
- General purpose structural and multiple pass welds
- Storage tanks

Conformances

AS/NZS ISO 14174 SA AB 156 AC H5

Product Information

Basicity Index	1.1
Density	1.4 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-56, L-60, L-61, LA-71, L-S3

Low Alloy Steel

Lincolnweld® L-70, LA-85

Packaging

Package Type	Weight Kg	Part Number
Steel Drum	25 250	FX860-25 111828

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%TiO_2	%CaO	% Metal Alloys
Lincolnweld® 860	19	11	17	12	2	32	2	2	3 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation (%)	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-50	As Welded	430	520	30	84	-29	F2A2-EM13K-H8
L-56	As Welded	470	590	28	61	-29	F7A2-EH11K
L-60	As Welded	370	450	34	138	-29	F6A2-EL12-H8
L-61	As Welded	410	500	31	58	-40	F7A4-EM12K-H8
L-61	Stress Relieved	340	440	37	222	-46	F6P5-EM12K-H8
L-S3	As Welded	500	590	28	52	-29	F7A2-EH12K
LA-71	As Welded	450	540	30	110	-29	F7A2-EM14K-H8
LA-71	Stress Relieved	400	520	32	119	-29	F7P2-EM14K-H8
LA-85	As Welded	520	600	26	38	-40	E8A4-ENi5-Ni5-H8

Lincolnweld® 865

Submerged Arc Flux - Neutral

Key Features

- General purpose flux designed to weld butt joints and flat and horizontal fillets
- When used with Lincolnweld® L-50 or L-61, it is capable of producing 480 MPa tensile strength after stress relief
- Small loss of strength when used in the stress relieved condition

Typical Applications

- Butt joints and flat and horizontal fillets
- Pair with Lincolnweld® L-61 on A516 steels
- Applications requiring stress relieving

Conformances

AS/NZS ISO 14174 SA AR 1 56 AC H5

Product Information

Basicity Index	1.0
Density	1.3 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-61, LA-71

Packaging

Package Type	Weight Kg	Part Number
Paper Bag	22.7	EDS27857

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%TiO_2	% Metal Alloys
Lincolnweld® 865	11	1	14	19	2	37	12	3 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17 / A5.23
L-61	As Welded	410	500	31	58	-40	F7A4-EM12K-H8
L-61	Stress Relieved	340	440	37	222	-46	F6P5-EM12K-H8
L-S3	As Welded	500	590	28	52	-29	F7A2-EH12K
LA-71	As Welded	450	540	30	110	-29	F7A2-EM14K-H8
LA-71	Stress Relieved	400	520	32	119	-29	F7P2-EM14K-H8
L-70	As Welded	450	550	28	54	-29	F7A2-EA1-A2-H8
L-70	Stress Relieved	430	520	31	47	-29	F7P2-EA1-A2-H8
LA-85	As Welded	520	600	26	38	-40	E8A4-ENi5-Ni5-H8

Lincolnweld® 880

Submerged Arc Flux - Neutral

Key Features

- Can be used for both joining and hardfacing
- Optimal bead appearance when used with solid low alloy steel electrodes with a minimum of 0.20% silicon
- Use with both solid and flux cored wires

Typical Applications

- Applications requiring smooth bead appearance
- Hardfacing applications

Conformances

AS/NZS ISO 14174 SA AS 1 55 AC

Product Information

Basicity Index	2.0
Density	1.4 g/cm^3

Recommended Wires

Low Alloy Steel

Lincolnweld® LA-90, LAC-Ni2

Packaging

Package Type	Weight Kg	Part Number
Plastic Bag	22.7	ED027866
Steel Drum	250	ED028322

Typical Flux Composition

	%SiO_2	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%ZrO_2	% Metal Alloys
Lincolnweld® 880	17	27	27	2	16	2	7	5 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
LA-90	As Welded	540	640	28	61	-40	F8A4-EA2K-A4-H8
LAC-B2	Stress Relieved	480	590	26	135	-29	F8P2-ECB2-B2-H8
LAC-Ni2	As Welded	460	540	29	140	-51	F7A6-ECNi2-Ni2-H8
LAC-Ni2	Stress Relieved	430	540	30	95	-73	F7P10-ECNi2-Ni2-H8

Lincolnweld® 880M

Submerged Arc Flux - Neutral

Key Features

- A basic flux which features industry proven results in multiple pass applications
- Recommended for welding with solid mild steel and low alloy electrodes, as well as Lincoln Electric's LAC series of low alloy flux-cored electrodes
- Good deep groove slag removal
- Excellent choice for single arc AC submerged arc welding

Conformances

AS/NZS ISO 14174 SA AS 1 55 AC

Recommended Wires

Mild Steel

Lincolnweld® L-56, LA-71, L-S3

Low Alloy Steel

Lincolnweld® LA-85, LA-90, LAC-Ni2

Typical Applications

- Tandem arc applications for offshore fabrication
- Joints requiring 480 MPa tensile strength after stress relief when used with L-56, L-S3, or LA-71

Product Information

Basicity Index	3.3
Density	1.2 g/cm^3

Packaging

Package Type	Weight Kg	Part Number
Plastic bag	22.7	ED031853

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%K_2O	% Metal Alloys
Lincolnweld® 880M	12	1	29	29	1	18	8	1	1 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-S3	As Welded	400	510	32	264	-51	F7A6-EH12K-H8
LA-71	As Welded	480	570	29	143	-62	F7A8-EM14K-H8
LA-71	Stress Relieved	430	550	31	164	-62	F7P8-EM14K-H8
LA-85	As Welded	520	610	24	57	-51	F7A6-ENi5-Ni5-H8
LA-85	Stress Relieved	490	590	27	145	-62	F7P8-ENi5-Ni5-H8
LA-90	As Welded	580	680	26	68	-51	F9A6-EA3K-A3-H8
LA-90	Stress Relieved	520	630	28	145	-62	F8P8-EA3K-A3-H8
LAC-Ni2	As Welded	510	600	22	77	-73	F7A10-ECNi2-Ni2-H8
LAC-Ni2	Stress Relieved	480	570	28	103	-73	F7P10-ECNi2-Ni2-H8

Lincolnweld® 888

Submerged Arc Flux - Neutral

Key Features

- Designed for deep groove slag removal in critical applications
- Low H4/H5 diffusible hydrogen levels
- Moisture resistant packaging
- Charpy V-Notch and CTOD test results available for most alloy systems

Typical Applications

- Excellent operation with multiple arcs
- Structural fabrication
- Shipbuilding
- Offshore

Conformances

AS/NZS ISO 14174 SA FB 1 66 AC H5

Product Information

Basicity Index	2.2
Density	1.3 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-56, L-S3, L-61, LA-71

Low Alloy Steel

Lincolnweld® L-70, LA-85, LA-90, LAC-Ni2, LAC-690

Packaging

Package Type	Weight Kg	Part Number
Sahara Ready Bag	25	FX888-25SRB

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%FeO	%K_2O	% Metal Alloys
Lincolnweld® 888	18	1	27	25	2	19	5	1	2	3 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-61	As Welded	420	520	31	121	-51	F7A6-EM12K-H4
L-S3	As Welded	480	570	33	70	-62	F7A8-EH12K-H4
L-S3	Stress Relieved	370	510	33	165	-62	F6P8-EH12K-H4
LA-71	As Welded	520	610	28	68	-51	F7A6-EM14K-H4
LA-71	Stress Relieved	410	540	32	134	-62	F7P8-EM14K-H4
LA-85	As Welded	540	640	26	79	-51	F8A6-ENi5-Ni5-H4
LAC-Ni2	As Welded	540	630	20	56	-62	F8A8-ECNi2-Ni2-H8
LAC-690	As Welded	800	860	22	91	-73	F11A10-ECG-G-H4
LAC-690	Stress Relieved	707	776	21	51	-51	F11P6-ECG-G-H4

Lincolnweld 802

Submerged Arc Flux - Hardfacing

Key Features

- Neutral flux, good bead appearance
- Excellent hot slag removal with wire containing niobium, vanadium, or very high chrome levels

Typical Applications

- Hardfacing
- Use with Lincore 96-S, 42-S, 40-S. 35-S, 30-S
- Suitable for hardfacing applications on plate and caster rolls

Conformances

AS/NZS ISO 14174 SA CS 1 55 DC H5

Packaging

Package Type	Weight Kg	Part Number
Plastic Bag	25	KC802025 FX802-25

Lincolnweld® 8500

Submerged Arc Flux - Neutral

Key Features

- Capable of providing impact properties necessary for thick weld joints from root to cap pass
- Operates well on AC and multiple arcs with good resistance to nitrogen porosity
- Capable of producing weld deposits with impact properties exceeding 27J at -62°C
- CTOD data is available for this flux with many alloy systems

Typical Applications

- Fabrication of offshore drilling platforms
- Multiple pass welding
- Single and multiple arc welding

Conformances

AS/NZS ISO 14174 SA FB 1 54 AC H5

Product Information

Basicity Index	2.9
Density	1.3 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-56, L-61, L-S3, LA-71

Low Alloy Steel

Lincolnweld® LA-85, LA-90

Packaging

Package Type	Weight Kg	Part Number
Plastic Bag	25	FX8500-25
Steel Drum	225	FX8500-225

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%K_2O	%TiO_2	% Metal Alloys
Lincolnweld® 8500	13	1	30	24	2	19	8	1	1	1 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-56	As Welded	470	570	31	132	-62	F7A8-EH11K
L-56	Stress Relieved	430	540	33	151	-62	F7P8-EH11K
L-61	As Welded	400	480	31	168	-51	F7A6-EM12K-H8
L-S3	As Welded	460	570	29	91	-62	F7A8-EH12K-H8
LA-71	As Welded	450	550	30	155	-62	F7A8-EM14K-H8
LA-71	Stress Relieved	420	520	32	220	-62	F7P8-EM14K-H8
LA-85	As Welded	510	590	29	155	-62	F8A8-ENi5-Ni5-H8
LA-85	Stress Relieved	500	590	28	134	-51	F7P6-ENi5-Ni5-H8
LA-90	As Welded	670	590	24	84	-29	F9A2-EA3K-A3-H8

Lincolnweld® 960

Submerged Arc Flux - Neutral

Key Features

- Low cost, general purpose flux designed to weld butt joints and both single and multiple pass fillets
- Recommended for automatic and semiautomatic submerged arc welding
- A versatile, cost-effective flux that can be used with many alloy systems

Typical Applications

- Single and multiple pass welding
- Fillet and butt welds with unlimited plate thickness
- Can weld steel with heavy scale or rust when used with Lincolnweld® L-50 wire

Conformances

AS/NZS ISO 14174 SA AB 1 66 AC H5

Product Information

Basicity Index	1.1
Density	1.4 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-61, LA-71

Low Alloy Steel

Lincolnweld® LA-85

Packaging

Package Type	Weight Kg	Part Number
Plastic Bag	25	FX960-25
Steel Drum	250	111835

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%TiO_2	% Metal Alloys
Lincolnweld® 960	21	10	21	10	2	31	1	1	3 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-50	As Welded	460	570	27	58	-29	F7A2-EM13K-H8
L-61	As Welded	420	520	32	125	-29	F7A2-EM12K-H8
LA-71	As Welded	460	570	29	44	-29	F7A2-EM14K-H8
LA-71	Stress Relieved	420	540	31	89	-29	F7P2-EM14K-H8
LA-85	As Welded	520	640	24	57	-29	F8A2-ENi5-G-H8
LA-85	Stress Relieved	500	610	25	39	-46	F7P5-ENi5-G-H8

Lincolnweld® 980

Submerged Arc Flux - Neutral

Key Features

- Combines many of the features of the 700 and 800 series fluxes and is ideal for semiautomatic submerged arc welding
- Exceptional resistance to flash-through and porosity caused by arc blow in a variety of applications
- Especially high productivity when used with Lincolnweld® LC-72 wire

Typical Applications

- Semi-automatic, single and multiple pass submerged arc welding
- General purpose fabrication
- Fillet welds

Conformances

AS/NZS ISO 14174 SA AR/AB 1 57 AC H5

Product Information

Basicity Index	0.6
Density	1.4 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-50, L-61, LC-72

Low Alloy Steel

Lincolnweld® LAC-Ni2

Packaging

Package Type	Weight Kg	Part Number
Paper Bag	22.7	ED027861

Typical Flux Composition

	%SiO_2	%MnO	%MaO	%CaF_2	%Na_2O	%Al_2O_3	%TiO	% Metal Alloys
Lincolnweld® 980	11	14	2	12	2	47	7	4 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-50	As Welded	430	540	31	43	-29	F7A2-EM13K-H8
L-61	As Welded	430	530	31	37	-29	F7A2-EM12K-H8
LC-72	As Welded	450	540	28	43	-29	F7A2-EC1-H8
LAC-Ni2	As Welded	540	630	25	110	-29	F8A2-ECNi2-Ni2-H8

Lincolnweld® P223

Submerged Arc Flux - Neutral

Key Features

- Industry standard for pipe welding
- Fast freezing and easily removable slag for excellent bead profile
- Can be used for welding with up to three arcs

Typical Applications

- Pipe welding up to X80 grade pipe
- Two run welding applications for pipe fabrication
- Multiple pass welding for general construction

Conformances

AS/NZS ISO 14174 SA AB 1 67 AC H5

Product Information

Basicity Index	1.5
Density	1.2 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-56, L-61, LA-71, L-S3

Low Alloy Steel

Lincolnweld® L-70

Packaging

Package Type	Weight Kg	Part Number
Plastic Bag	25	110364

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%CaO	%TiO_2	%K_2O	%FeO	% Metal Alloys
Lincolnweld® P223	21	4	21	21	2	20	4	2	1	1	3 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-56	As Welded	500	620	30	68	-51	F7A6-EH11K-H8
L-56	Stress Relieved	540	580	30	66	-51	F7P6-EH11K-H8
L-61	As Welded	430	530	31	126	-40	F7A4-EM12K
LA-71	As Welded	480	570	29	94	-40	F7A4-EM14K-H8
LA-71	Stress Relieved	410	540	32	76	-51	F7P6-EM14K-H8
L-S3	As Welded	460	570	30	88	-62	F7A8-EH12K-H8
L-70	As Welded	550	650	25	53	-29	F8A2-EA1-A2

Lincolnweld® A-XXX10

Submerged Arc Flux - Alloy

Key Features

- An alloy flux designed to produce a 1% nickel-bearing weld deposit

NOTE:
Since the alloy level in the weld deposit depends upon the arc voltage, and thus the arc length, always maintain a consistent arc voltage.

Typical Applications

- Recommended for use on ASTM A533 Class 1 and A588 weathering steels such as Corten A when combined with Lincolnweld® L-61
- Suitable for welding higher strength steels

Conformances

AS/NZS ISO 14174	SA AS 1 55 AC H5

Product Information

Basicity Index	1.0
Density	1.4 g/cm^3

Recommended Wires

Mild Steel

Lincolnweld® L-61

Packaging

Package Type	Weight Kg	Part Number
Paper Bag	22.7	ED027862

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%ZrO_2	%TiO	% Metal Alloys
Lincolnweld® A-XXX10	18	5	22	11	2	19	22	1	5 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification A5.17/A5.23
L-61	As Welded	460	570	30	85	-40	F7A4-EM12K-Ni1-H8

Lincolnweld® H535

Submerged Arc Flux - Alloy

Key Features

- Produces a weld deposit with good abrasion resistance
- Hardness range 24-45 Rc dependant upon actual welding procedure

Typical Applications

- Use with Lincolnweld® L-60 Mild Steel Wire for Hardfacing application

Conformances

AS/NZS ISO 14174	SA Z3 3

Product Information

Basicity Index	NA
Density	NA

Recommended Wires

Mild Steel

Lincolnweld® L-60

Packaging

Package Type	Weight Kg	Part Number
Paper Bag	22.7	ED027865

Lincolnweld® P2007

Submerged Arc Flux - Stainless Steel

Key Features

- Stainless steel welding flux
- Excellent slag release
- Straight edges on butt weld applications
- Suitable for AC welding current
- Good impact toughness at low temperatures

Typical Applications

- Welding of austentic stainless steels
- Ideal for stainless steel pressure vessel and pipe fabrication
- Excellent performance on 9% Nickel steels

Conformances

AS/NZS ISO 14174 SA AF 2 63 AC H5

Product Information

Basicity Index	1.5
Density	1.2 g/cm^3

Recommended Wires

For most 300 series and duplex stainless steel wires. Also suitable for nickel based wires.

Packaging

Package Type	Weight Kg	Part Number
Sahara Ready Bag	25	FXP2007-25SRB

Typical Flux Composition

	%SiO_2	%MnO	%MgO	%CaF_2	%Na_2O	%Al_2O_3	%ZrO_2	%TiO_2	% Metal Alloys
Lincolnweld® P2007	<30	<2	<20	<50	2	<40	<2	1	5 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C	
Lincoln 309L	As Welded	442	577	33	68	-60
LNS NiCro 60/20	As Welded	520	78	40	100	-196

LincolnWeld®

Over 150 combinations are available for single and multiple pass welding in both automatic and semi-automatic applications.

Lincolnweld® L-50

Submerged Arc Wire - Mild Steel

Key Features

- A low carbon, medium manganese, medium silicon wire
- Pair it with Lincolnweld® 980 flux for the best flux / wire combination when handheld submerged arc welding

Conformances

AWS A5.17/A5.17M	EM13K
AS/NZS ISO 14171-B	SU25

Recommended Fluxes

Lincolnweld® 761, 780, 781, 860, 865, 880M, 888, 8500, 960, 980, P223

Diameters / Packaging

Diameter mm	Coil 27.2 kg
2.0	ED011335
2.4	ED011328

Typical Wire Composition As Required per AWS A5.17 / A5.17M

	%C	%Mn	%Si	%S	%P	%Cu
Lincolnweld® L-50	0.06-0.16	0.90-1.40	0.35-0.75	0.03	0.03	0.35

Lincolnweld® L-56

Submerged Arc Wire - Mild Steel

Key Features

- A low carbon, high manganese, very high silicon wire
- Can be used with Lincolnweld® 800 series fluxes for welds requiring 480 MPa tensile strength in stress relieved conditions

Conformances

AWS A5.17/A5.17M	EM11K
AS/NZS ISO 14171-B	SU31

Recommended Fluxes

Lincolnweld® 860, 880M, 8500, 888, P223

Diameters / Packaging

Diameter mm	Steel Reel 600 kg
2.0	KC5620600

Typical Wire Composition As Required per AWS A5.17 / A5.17M

	%C	%Mn	%Si	%S	%P	%Cu
Lincolnweld® L-56	0.06-0.15	1.40-1.85	0.80-1.15	0.03	0.03	0.35

Lincolnweld® L-60

Submerged Arc Wire - Mild Steel

Key Features

- A low carbon, low manganese, low silicon general purpose electrode
- Provides the lowest hardness and is best suited for use with the Lincolnweld® 700 series of active fluxes

Conformances

AWS A5.17/A5.17M	EL12
AS/NZS ISO 14171-B	SU11

Recommended Fluxes

Lincolnweld® 761, 780, 781, 860

Diameters / Packaging

Diameter mm	Coil 25 kg	Bulk Steel Reel 600 kg
2.0	KC602025	-
2.4	KC602425	KC6024600
3.2	KC603225	KC6032600
4.0	KC604025	KC6040600
4.8	-	KC6048600

Typical Wire Composition - As Required per AWS A5.17 / A5.17M

	%C	%Mn	%Si	%S	%P	%Cu
Lincolnweld® L-60	0.04-0.14	0.25-0.60	0.10	0.03	0.03	0.35

Lincolnweld® L-61

Submerged Arc Wire - Mild Steel

Key Features

- Industry standard for submerged arc welding applications
- A low carbon, medium manganese, low silicon general purpose submerged arc electrode
- A good choice for a wide range of applications with single or multiple pass subarc welding

Conformances

AWS A5.17/A5.17M	EM12K
AS/NZS ISO 14171-B	SU21

Recommended Fluxes

Lincolnweld® 761, 780, 781, 860, 865, 888, P223, 960, 980, AXXX-10

Diameters / Packaging

Diameter mm	Coil 25 kg	Coil 400 kg	Bulk Steel Reel 600 kg
2.0	KC612025	-	-
2.4	KC612425	-	-
3.2	KC613225	KC6124400	KC6124600
4.0	KC614025	KC6132400	KC6132600
4.8	KC614825	KC6140400	KC6140600

Typical Wire Composition - As Required per AWS A5.17 / A5.17M

	%C	%Mn	%Si	%S	%P	%Cu
Lincolnweld® L-61	0.05-0.15	0.80-1.25	0.10-0.35	0.03	0.03	0.35

Lincolnweld® L-S3

Submerged Arc Wire - Mild Steel

Key Features

- A low carbon, high manganese, medium silicon electrode for use with the Lincolnweld® 800 series of fluxes
- Capable of producing weld deposits with impact properties exceeding 27J @ -62°C when used with Lincolnweld® 888 and 8500 neutral fluxes

Conformances

AWS A5.17/A5.17M	EH12K
AS/NZS ISO 14171-B	SU42

Recommended Fluxes

Lincolnweld® 860, 880M, 882, 888, 8500, P223

Diameters / Packaging

Diameter mm	Coil 25 kg
2.0	030400
2.4	030401
3.2	030402
4.0	030403

Typical Wire Composition - As Required per AWS A5.17 / A5.17M

	%C	%Mn	%Si	%S	%P	%Cu
Lincolnweld® L-S3	0.06-0.15	1.50-2.0	0.25-0.65	0.025	0.025	0.35

Lincolnweld® LA-71

Submerged Arc Wire - Mild Steel

Key Features

- A low carbon, medium manganese, medium silicon electrode containing approximately 0.1% titanium
- Small addition of titanium allows deposits to be stress-relieved with little loss of strength, even with extended stress relief times
- Widely used with neutral basic fluxes in both as-welded and post-weld heat treated conditions

Conformances

AWS A5.17/A5.17M	EH14K
AS/NZS ISO 14171-B	SU24

Recommended Fluxes

Lincolnweld® 860, 865, 880M, 888, 8500, 960, P223

Diameters / Packaging

Diameter mm	Coil 27.2 kg
2.4	ED011052
3.2	ED011051
4.0	ED011053

Typical Wire Composition - As Required per AWS A5.17 / A5.17M

	%C	%Mn	%Si	%Ti	%S	%P	%Cu
Lincolnweld® LA-71	0.06-0.19	0.90-1.40	0.35-0.75	0.03-0.17	0.025	0.025	0.35

Lincolnweld® LC-72

Submerged Arc Cored Wire - Mild Steel

Key Features

- A cored wire designed to increase deposition rates 10-30% when used with 980 flux
- Designed to provide optimal bead shape, penetration, and slag removal in semiautomatic submerged arc welding

Conformances

AWS A5.17/A5.17M	EC1
AS/NZS ISO 14171-B	TU3M

Recommended Fluxes

Lincolnweld® 980

Diameters / Packaging

Diameter mm	Coil 22.7 kg
2.4	ED011098

Deposit Composition - As Required per AWS A5.23 / A5.23M

	%C	%Mn	%Si	%S	%P	%Cu
Lincolnweld® LC-72	0.15	1.8	0.9	0.035	0.035	0.35

Lincolnweld® L-70

Submerged Arc Wire - Low Alloy

Key Features

- A low carbon, medium manganese, low silicon, ½% molybdenum wire used for single or multiple pass welds
- A standard choice for pipe fabrication and other limited pass applications

Conformances

AWS A5.23/A5.23M	EA1
AS/NZS ISO 24598-B	1M3

Recommended Fluxes

Lincolnweld® 761, 781, 860, 888, P223

Diameters / Packaging

Diameter mm	Coil 25 kg
2.0	ED012054
2.4	TBA
3.2	ED012051
4.0	ED012053

Typical Wire Composition - As Required per AWS A5.23 / A5.23M

	%C	%Mn	%Si	%Mo	%S	%P	%Cu
Lincolnweld® L-70	0.05-0.15	0.65-1.00	0.20	0.45-0.65	0.025	0.025	0.35

Lincolnweld® LA-85

Submerged Arc Wire - Low Alloy

Key Features

- A nickel-bearing wire with 0.2% molybdenum designed for use on weathering steels
- Capable of producing weld deposits with 480-550 MPa tensile strength in the as-welded and stress-relieved conditions

Conformances

AWS A5.23/A5.23M	ENi5
AS/NZS ISO 26304-B	SUN2M1

Recommended Fluxes

Lincolnweld® 860, 880, 888, 8500

Diameters / Packaging

Diameter mm	Coil 25 kg
2.4	ED029254
3.2	ED023166

Typical Wire Composition - As Required per AWS A5.23 / A5.23M

	%C	%Mn	%Si	%Ni	%Mo	%S	%P	%Cu
Lincolnweld® LA-85	0.12	1.20-1.60	0.05-0.30	0.75-1.25	0.10-0.30	0.025	0.020	0.35

Lincolnweld® LA-90

Submerged Arc Wire - Low Alloy

Key Features

- A low carbon, high manganese, high silicon, 0.5% molybdenum special purpose wire
- Recommended for seam welding of pipe and for the general welding of high strength plate

Conformances

AWS A5.23/A5.23M	EA3K
AS/NZS ISO 14171-B	SU4M31

Recommended Fluxes

Lincolnweld® 880, 880M, 888, 8500, P223

Diameters / Packaging

Diameter mm	Coil 27.2 kg
3.2	EDS11083

Typical Wire Composition - As Required per AWS A5.23 / A5.23M

	%C	%Mn	%Si	%Mo	%S	%P	%Cu
Lincolnweld® LA-90	0.05-0.15	1.60-2.10	0.50-0.80	0.40-0.60	0.025	0.025	0.35

Lincolnweld® LAC-Ni2

Submerged Arc Cored Wire - Low Alloy

Key Features

- A 2% nickel electrode used primarily in weathering steel applications
- When used with Lincolnweld® 888 flux, it can produce impact properties exceeding 27J @ -73°C

Conformances

AWS A5.23/A5.23M ECNi2

AS/NZS ISO 26304-B TUN4C1M3

Recommended Fluxes

Lincolnweld® 880, 880M, 888, 980

Diameters / Packaging

Diameter mm	Coil 22.7 kg
2.4	ED010986

Lincolnweld® LAC-690

Submerged Arc Cored Wire - Low Alloy

Key Features

- Combine with Lincolnweld® 888 flux for H4 diffusible hydrogen weld deposits.
- Charpy V-notch test results capable of exceeding 27J @ -73°C with Lincolnweld® 888 flux.
- Excellent tandem, AC and DC operation
- Clean and easy slag removal minimizes risk of inclusions, even in narrow gap applications

Conformances

AWS A5.23/A5.23M F11A10-ECG-G-H4
F11P6-ECG-G-H4

AS/NZS ISO 26304-B TUN5M3

Recommended Fluxes

Lincolnweld® 888

Diameters / Packaging

Diameter mm	Coil 22.7 kg
2.4	ED032958
3.2	ED032959
4.0	ED033302

Deposit Composition

	%C	%Mn	%Si	%S	%P	
Lincolnweld® LAC-690	0.08	1.51	0.36	0.007	0.011	

	%Cr	%Ni	%Mo	%Cu	Diffusible Hydrogen (mL/100g weld deposit)
Lincolnweld® LAC-690	0.36	2.59	0.44	0.04	3.6

Experience Lincoln Hard Facing Consumables

Hardfacing

Hardfacing Electrodes

Hardfacing Wire

Cobalt Base Alloys

**Weartech™ WT-12 & WT-21 (SMAW, TIG & MIG) available upon request*

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Wearshield® BU-30

Hardfacing Electrode

Key Features

- Stick electrode with moderate hardness and good resistance to impact loading
- Used for build-up or final hardfacing layers on parts to be machined
- Unlimited layers, good arc re-strike, low spatter

Typical Applications

- Bucket and shovel lips
- Agricultural equipment
- Crane and mine car wheels
- Tractor rolls, idlers, links, sprockets

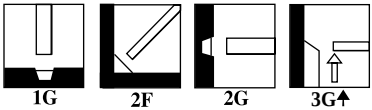
Conformances

AS/NZS 2576 1430 A4

Diameter / Packaging

Diameter mm	Length mm	PE Tube 2.5kg
3.2	350	400021
4.0	350	400038
5.0	450	401080

Welding Positions



Mechanical Properties

	Rockwell Hardness (Rc)		
	1 Layer	2 Layers	3 Layers
Typical Results - As Welded	29-30	33-35	35-38

Deposit Composition

	%C	%Mn	%Si	%Cr	%Mo
2 or more layers	0.02	0.8	1.0	1.5	0.5

As welded microstructure consists mainly of martensite with some bainite

Typical Operating Procedures

	Current (amps)		
Polarity	**3.2 mm**	**4.0 mm**	**5.0 mm**
AC/DC+	90-130	140-180	180-220

Wearshield® MM

Hardfacing Electrode

Key Features

- Stick electrode with moderate hardness and good resistance to impact loading
- Designed for rolling, sliding and metal to metal wear resistance applications
- Preheat between 200 - 350°C necessary to prevent cracking - slow controlled cooling recommended

Typical Applications

- Sprockets and gear teeth
- Dredger buckets, scrapper blades
- Cable sheaves
- Transfer tables

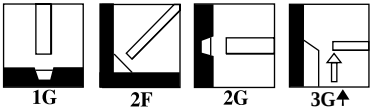
Conformances

AS/NZS 2576 1855 A4

Diameter / Packaging

Diameter mm	Length mm	PE Tube 2.5kg
3.2	350	400151
4.0	350	400168

Welding Positions



Mechanical Properties

	Rockwell Hardness (Rc)	
	1 Layer	2 Layers
Typical Results - As Welded	45-55	52-57

Deposit Composition

	%C	%Mn	%Si	%Cr	%Mo	%W
2 or more layers	0.55	0.5	1.5	4.5	0.5	0.5

As welded microstructure consists mainly of martensite

Typical Operating Procedures

	Current (amps)	
Polarity	3.2 mm	4.0 mm
DC+	90-130	140-180

Wearshield® 60(E)

Hardfacing Electrode

Key Features

- Coated high recovery electrode that produces a chromium carbide weld deposit
- Ideal for severe abrasion, limited to 2 layers
- Non machinable deposit, grinding only
- Deposits will show relief checking

Typical Applications

- Crusher rolls and cones
- Bucket /Shovel teeth and lips
- Brick and cement mill parts
- Earth moving equipment, ripper teeth, power shovels, crushing equipment, etc

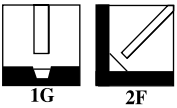
Conformances

AS/NZS 2576 2360 A4

Diameter / Packaging

Diameter mm	Length mm	PE Tube 2.5kg
3.2	450	400502
4.0	450	400519

Welding Positions



Mechanical Properties

	Rockwell Hardness (Rc)	
Typical Results	1 Layer	2 Layers
	57-60	60-62

Deposit Composition

	%C	%Si	%Cr
2 or more layers	5.0	3.5	35

As welded microstructure consists mainly of primary chromium carbides in an austenite-carbide eutectic matrix

Typical Operating Procedures

Polarity	Current (amps)	
	3.2 mm	4.0 mm
AC/DC+	110-150	140-180

Wearshield® Frog Mang®

Hardfacing Electrode

Key Features

- Coated electrode specifically for build up of manganese steels
- Ideal for severe impact, resists deformation
- Multi-layer procedures are possible with correct control
- No pre-heat is required. interpass tempreature limited to 250° C maximum - some preheat may be necessary on carbon and low alloy steels to prevent pull out

Typical Applications

- Manganese crossing diamonds
- Manganese railroad frogs
- Swing hammers
- Austenitic manganese deposit to handle severe loads of railroad cars

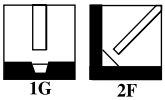
Conformances

AS/NZS 2576 1220 - A4

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 4.5kg
4.8	350	ED033135

Welding Positions



Mechanical Properties

	Rockwell Hardness (Rc)	
Typical Results - As Welded	As Welded	Work Hardened
	20-30	40-50

Deposit Composition

	%C	%Mn	%Si	%Cr
3 or more layers on carbon steel	1.2	21.0	0.4	5.3

As welded microstructure consists mainly of austenitic Manganese

Typical Operating Procedures

Polarity	Current (amps) 4.8 mm
AC/DC+	90-130

Hardfacing products are available for restoring parts to their original size that have been worn down due to metal-to-metal friction, severe impact, severe abrasion or abrasion plus impact. Hardfacing products can also be used for overlay to add a protective layer to carbon steel surfaces.

Lincore® 30-S

Hardfacing Wire (SAW) - Build-Up

Key Features

- Intended for build-up before final overlay, and as a final surface for metal-to-metal wear with moderate impact
- For automatic and semi-automatic operation on mild and low alloy steels
- Good resistance to cross checking
- Unlimited deposit thickness with proper preheat and interpass temperatures and procedures

Typical Applications

For Build-up

- Tractor rollers
- Idlers
- Trunnions
- Crane wheels

For Hardfacing

- Shafts
- Track rails
- Idlers

Conformances

AS/NZS 2576 1125 B1

Recommended Flux

Primary Flux - Lincolnweld® 802
Secondary Flux - Lincolnweld® 860

Diameter / Packaging

Diameter mm	Coil 22.7 kg	Speed-Feed® Drum 272 kg
2.4	ED011200	
3.2	ED015889	ED015891

Mechanical Properties

Rockwell - HRc	
6 Layers - Under 802 Flux	6 Layers - Under 860 Flux
27	27

Deposit Composition

On Carbon Steel	%C	%Mn	%Si	%Cr
6 Layers - Under 802	0.11	2.5	0.40	0.50
6 Layers - Under 860	0.11	2.7	0.60	0.50

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
2.4 mm, DC+, 38 mm	60	26	220	2.7
	120	27	360	5.2
	180	28	500	7.7
3.2 mm, DC+, 40 mm	50	27	310	3.4
	80	28	450	6.4
	110	28	600	9.1

Lincore® 33

Hardfacing Wire - Build-Up

Key Features

- Delivers tough machinable deposits for build-up or final overlay intended for metal-to-metal wear
- Use for build-up of steel mill parts such as rougher couplings
- Build-up deposit on carbon and low alloy steel base metals
- It is ideal for rebuilding worn parts to near final dimensions before applying final hardfacing layers which are more wear resistant
- Unlimited layers with proper preheat and interpass temperatures and procedures

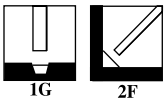
Typical Applications

- Tractor rolls and idlers
- Shovel parts
- Mine car wheels
- Mill and crusher hammers
- Dredge pumps

Conformances

AS/NZS 2576 1130 B1/B7

Welding Positions



Diameter / Packaging

Diameter mm	Coil - 6.4 kg Master Carton - 25.4 kg	Spool - Steel 11.3 kg	Coil 22.7 kg
1.6	-	ED031117	-
2.0	ED011237	-	ED011238
2.8	-	-	ED011240

Mechanical Properties

	Rockwell - HRc		
Number of Layers	As Welded	Work Hardened	Flame Hardened / Water Quenched
1	14-30	28-34	-
2	26-32	32-36	38-42
3	25-34	35-38	-

Deposit Composition[1]

	%C	%Mn	%Si	%Al	%Cr	%S	%P
3 Layers (1.2 mm & 1.6 mm)	0.11-0.18	1.8-2.1	0.50-0.75	1.6-1.9	1.2-1.4	0.002-0.005	0.004-0.012
3 Layers (2.0 mm & 2.8 mm)	0.13-0.15	2.1-2.3	0.45-0.60	1.45-1.70	1.1-1.4	0.002-0.005	0.004-0.008

[1]Composition and properties depend upon dilution. Single layer deposit properties depend upon base metal and/or build-up material.

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.6 mm, DC+, 45 mm	150	26	125	2.1
	250	29	180	3.5
	350	32	225	5.0
2.0 mm, DC+, 50 mm	125	23	200	3.1
	200	27	290	4.9
	250	29	325	6.1
2.8 mm, DC+, 64 mm	135	26	360	5.7
	175	28	420	7.3
	235	30	470	9.6

Lincore® 35-S

Hardfacing Wire (SAW) - Metal-to-Metal / Build-Up

Key Features

- Intended for rolling and sliding metal-to-metal wear with moderate impact and abrasion
- For automatic and semiautomatic operation on mild and low alloy steels
- Recommended as final overlay where medium hardness and good machinability are required
- Unlimited deposit thickness with proper preheat and interpass temperatures and procedures

Typical Applications

For Build-up

- Tractor rollers
- Idlers
- Trunnions
- Crane wheels
- Caster rolls

For Hardfacing

- Mine car wheels
- Track rails
- Shafts
- Bearing journals

Conformances

AS/NZS 2576 1135 B1

Recommended Flux

Primary Flux - Lincolnweld® 802
Secondary Flux - Lincolnweld® 880

Diameter / Packaging

Diameter mm	Coil 22.7 kg
3.2	ED019881

Mechanical Properties

Rockwell - HRc	
3 layers	35 - 39

Deposit Composition

	%C	%Mn	%Si	%Cr	%Mo
With Recommended Neutral Flux	0.19	1.7	0.60	2.0	0.50

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
3.2 mm, DC+, 40 mm	50	28	340	3.6
	100	28	500	7.5
	150	28	660	11.3

Lincore® 40-S

Hardfacing Wire (SAW) - Metal-to-Metal

Key Features

- Designed for rebuilding heavy equipment undercarriages
- Deposit is machinable and hot forgeable and resists rolling and sliding metal-to-metal wear
- Use on carbon and low alloy steels for good puddle control on roundabout welding
- Limited to 4 layers

Typical Applications

- Idlers
- Drive sprockets
- Mine car wheels

Conformances

AS/NZS 2576 1140 B1

Recommended Flux

Primary Flux - Lincolnweld® 802
Secondary Flux - Lincolnweld® 880

Diameter / Packaging

Diameter mm	Coil 22.7 kg
3.2	ED015892

Mechanical Properties

Rockwell - HRc	
3 or more layers	39 - 42

Deposit Composition

	%C	%Mn	%Si	%Cr	%Mo
With Recommended Neutral Flux	0.12	2.75	0.50	0.50	0.85

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
3.2 mm, DC+, 32 mm	65	27	330	4.4
	90	28	425	5.9
	120	29	525	7.8
3.2 mm, DC+, 65 mm	80	29	345	5.2
	110	30	425	7.3
	145	31	500	9.4
3.2 mm, DC+, 90 mm	100	31	375	6.5
	130	32	435	8.6
	180	33	520	11.9

Lincore® 42-S

Hardfacing Wire (SAW) - Metal-to-Metal

Key Features

- Designed for rebuilding heavy equipment undercarriages
- The deposit exhibits enhanced crack resistance and toughness compared to Lincore® 40-S
- Designed to resist rolling and sliding metal-to-metal wear
- For automatic and semi-automatic operation

Typical Applications

- Tractor rollers
- Tractor idlers
- Track pads

Conformances

AS/NZS 2576 1440 B1

Recommended Flux

Primary Flux - Lincolnweld® 802
Secondary Flux - Lincolnweld® 880

Mechanical Properties

Rockwell - HRc	
1 Layer	38 - 40

Diameter / Packaging

Diameter mm	Speed-Feed® Drum 136 kg
3.2	ED029264

Deposit Composition

With Recommended Neutral Flux	%C	%Mn	%Si	%Cr	%Mo
3.2 mm Diameter (20 mm ESO)					
1 Layer	0.14	2.13	0.34	1.45	0.43
2 Layers	0.12	2.70	0.39	2.22	0.66
4 Layers	0.11	3.33	0.44	2.95	0.84
3.2 mm Diameter (40 mm ESO)					
1 Layer	0.14	2.49	0.33	2.02	0.60
2 Layers	0.13	3.05	0.42	2.96	0.84
4 Layers	0.13	3.41	0.47	3.15	0.99

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
3.2 mm, DC+, 20 mm	50	27	350	3.8
	100	28	565	7.5
	125	29	675	9.3
3.2 mm, DC+, 40 mm	50	27	325	3.8
	100	28	510	7.5
	125	29	605	9.4

Lincore® 96-S

Hardfacing Wire (SAW) - Metal-to-Metal

Key Features

- Metal-cored wire which produces a high carbon, 420 stainless steel deposit
- Use where a higher hardness is required
- Responds to flame and induction hardening
- Can be used on work rolls and backup rolls when water spray causes pitting on tool steel deposits

Typical Applications

- Caster rolls
- Cable sheaves
- Rope drums

Conformances

AS/NZS 2576 1650 B1

Recommended Flux

Lincolnweld® 802

Mechanical Properties

Rockwell - HRc
48-54

Diameter / Packaging

Diameter mm	Speed-Feed® Drum 272 / 230 kg
3.2	ED018575 / 032522

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni
With Recommended Neutral Flux	0.23	1.20	0.40	13.00	0.20

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
3.2 mm, DC+, 40 mm	60	26	360	4.3
	100	28	525	7.1
	140	30	635	10.0

Lincore® 55-G

Hardfacing Wire - Metal-to-Metal

Key Features

- Gas shielded metal cored wire
- Produces a deposit which resists metal-to-metal wear and moderate abrasion
- To be used on carbon and low alloy steels
- Unlimited layers with appropriate preheat and interpass temperatures to avoid relief checking

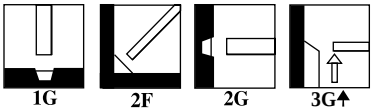
Typical Applications

- Crane wheels
- Blower blades
- Bucket lips
- Dredge parts
- Tillage tools

Conformances

AS/NZS 2576 1855 B5

Welding Positions



Shielding Gas

M21 : 75-85% Argon / 15-25% CO_2

M13 : 98% Argon / 2% O_2

Diameter / Packaging

Diameter mm	Spool - Plastic 11.3 kg
1.2	ED028176
1.6	ED028177

Mechanical Propeties

	Rockwell - HRc		
Shielding Gas	1 Layer	2 Layers	4 Layers
M21	50-51	53-54	54-55
M13	54-55	55-56	56-57

Deposit Composition

On Carbon Steel (2 Layers)	%C	%Mn	%Si	%Cr	%Mo
1.2 mm - M21	0.39	1.24	0.93	5.6	0.55
1.2 mm - M13	0.47	1.30	1.18	6.4	0.65
1.6 mm - M21	0.41	1.24	0.95	5.7	0.57
1.6 mm - M13	0.45	1.25	1.10	5.8	0.58

NOTE: Area to be overlayed should be clean and free of rust, oil, etc. Any previous hardfacing deposit that has been embrittled by severe work hardening should be removed. Cracks and other irregularities should be properly repaired. Cold parts should be warmed to at least 25°C. Higher preheat of 150-260°C may be necessary on thick parts or heavy sections. Interpass temperatures between 150°C and 200°C do not affect the hardness of Lincore® 55-G significantly.

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.2 mm, DC+, 16 mm 75% Ar / 25% CO_2	200	27	165	2.0
	300	29	225	3.0
	400	31	290	4.2
1.2 mm, DC+, 20 mm 98% Ar / 2% O_2	200	25	145	2.3
	300	27	200	3.4
	350	28	225	3.9
	400	29	250	4.4
1.6 mm, DC+, 16 mm 75% Ar / 25% CO_2	150	28	260	2.6
	250	30	340	4.7
	350	32	420	6.8
1.6 mm, DC+, 20 mm 98% Ar / 2% O_2	150	24	220	2.9
	250	26	315	5.0
	350	28	410	7.2

Lincore® 55

Hardfacing Wire - Metal-to-Metal

Key Features

- Self-shielded open arc cored wire
- Produces a deposit which resists metal-to-metal wear and moderate abrasion
- To be used on carbon and low alloy steels
- Unlimited layers with appropriate preheat and interpass temperatures to avoid relief checking

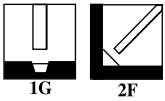
Typical Applications

- Crane wheels
- Blower blades
- Rail ends
- Skip guides
- Cams and transfer tables

Conformances

AS/NZS 2576 1855 B7

Welding Positions



Diameter / Packaging

Diameter mm	Coil - 6.4 kg Master Carton - 25.4 kg	Spool - Steel 11.3 kg	Coil 22.7 kg
2.0	ED011277	ED031122	ED011278
2.8	-	-	ED011280

Mechanical Propeties

	Rockwell - HRc	
	1 Layer	2 Layers
As welded	50-59	50-60
Work hardened	54-62	56-62

Deposit Composition

	%C	%Mn	%Si	%Al	%Cr	%Mo	%S	%P
2.0 mm	0.45	1.3	0.53	1.4	5.3	0.80	0.004	0.010
2.8 mm	0.45	1.4	0.60	1.4	5.3	0.80	0.004	0.010

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
2.0 mm, DC+, 45 mm	125	24	190	3.2
	200	27	295	5.0
	250	30	330	6.2
2.8 mm, DC+, 64 mm	90	25	280	3.8
	125	27	350	5.2
	175	30	420	7.3

NOTE: Area to be overlayed should be clean and free of rust, oil, etc. Any previous hardfacing deposit that has been embrittled by severe work hardening should be removed. Cracks and other irregularities should be properly repaired. Cold parts should be warmed to at least 25°C. Higher preheat of 150-260° C may be necessary on thick parts or heavy sections. Interpass temperatures between 150° C and 200° C do not affect the hardness of Lincore® 55 significantly.

Lincore® T&D

Hardfacing Wire - Metal-to-Metal

Key Features

- Self-shielded open arc cored wire
- Delivers a deposit similar to H12 tool steel
- For build-up of tool steel dies and edges, or applying wear resistance surfaces on carbon or low alloy steels

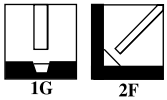
Typical Applications

- Punch dies
- Shear blades
- Cutting tools and trimmers

Conformances

AS/NZS 2576 1550 B7

Welding Positions



Diameter / Packaging

Diameter mm	Spool - Steel 11.3 kg
1.6	ED031134

Mechanical Properties

Rockwell - HRc	
As Welded	Heat treated at 540°C
48-55	55-65

Deposit Composition

	%C	%Mn	%Si	%Al	%Cr	%Mo	%W
6 Layers Open Arc	0.65	1.5	0.8	1.8	7.0	1.4	1.6

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.6 mm, DC+, 32 mm	150	22	170	2.4
	200	23	210	3.6
	250	24	250	4.1
	300	25	270	4.9
	350	26	300	5.4

NOTE: Minimum preheat and interpass temperatures of 315°C are essential for crack-free welding on mild steel or low alloy steel. For crack-free welding on tool steel parts, preheat of 538°C or higher may be necessary. After welding, very slow cooling to 120°C is usually required. This can be followed by post-weld heat treating at 538°-593°C to develop maximum hardness.

Lincore® 50

Hardfacing Wire - Abrasion & Impact

Key Features

- Self-shielded open arc cored wire
- Delivers an abrasion resistant deposit, even under conditions of moderate impact
- Larger wire diameter sizes may be used for the submerged arc process
- Can be used on low carbon, medium carbon, low alloy, manganese and stainless steels
- Limited to 4 layers

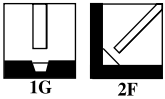
Typical Applications

- Crusher rolls
- Dredge cutter teeth
- Ore chute baffles
- Muller plows and tires
- Coal mining cutting teeth

Conformances

AS/NZS 2576 2150 B7

Welding Positions



Mechanical Properties

	Rockwell - HRc		
	1 Layer	2 Layers	3 Layers
Mild Steel	34-37	44-48	48-52
0.50% Carbon Steel	41-43	47-50	50-53
Austenitic Mn Steel	-	43-45	48-50

Diameter / Packaging

Diameter mm	Spool - Steel 11.3 kg	Coil 22.7 kg
1.2	ED031123	-
1.6	ED031124	-
2.8	-	ED011275

Deposit Composition

	%C	%Mn	%Si	%Al	%Cr	%Mo
Open Arc 1.2 mm	2.4	1.3	1.0	0.6	11.4	-
Open Arc 1.6 mm	2.4	1.3	1.0	0.6	11.4	-
Open Arc 2.8 mm	2.0	0.9	1.0	0.6	9.2	0.5
Submerged Arc with 802 Flux	2.5	1.1	1.3	0.4	10.1	0.5
Submerged Arc with 860 Flux	2.5	2.0	1.7	0.2	11.0	0.5

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.2 mm, DC+, 25 mm	200	19-21	120	1.9
	400	23-25	190	3.9
	600	27-29	250	5.8
1.6 mm, DC+, 25 mm	150	22-24	175	2.7
	350	29-31	325	6.2
	450	32-34	365	7.9
2.8 mm, DC+, 32 mm	80	26	315	3.9
	100	27	375	4.9
	130	29	450	6.4
2.8 mm, DC+, 64 mm	100	27	315	4.9
	130	29	370	6.4
	175	31	450	8.6

Lincore® 60-G

Hardfacing Wire - Abrasion

Key Features

- Gas shielded metal cored wire
- Deposit features higher alloy levels to resist both abrasion and moderate impact
- Used on carbon, low alloy, manganese and stainless steels, and cast iron
- Deposit is limited to two layers and will show some relief checking

Typical Applications

- Augers
- Bucket lips and sides
- Loaders
- Brushing and grinding equipment
- Shaper sides and blades

Shielding Gas

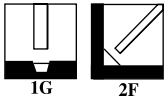
M21 : 75-85% Argon / 15-25% CO_2

M13 : 98% Argon / 2% O_2

Conformances

AS/NZS 2576 2355 B5

Welding Positions



Mechanical Properties

Rockwell - HRc	
1 Layer	2 Layers
58	60

Diameter / Packaging

Diameter mm	Spool - Plastic 11.3kg
1.2	ED029936

Deposit Composition

On Carbon Steel	%C	%Mn	%Si	%Cr
1 Layer	4.6	1.2	0.5	13.8
2 Layers	5.5	1.3	0.6	17.3

Typical Operating Procedures

Diameter, Polarity, ESO Shielding Gas	Wire Feed Speed in/min	Voltage volts	Approx. Current amps	Deposition Rate kg/hr
1.2 mm, DC+, 20 mm M21/M13	200	23-24		
	300	25-26		
	400	27-28		

Lincore® 60-O

Hardfacing Wire - Abrasion

Key Features

- Open arc self-shielded cored wire
- Primary carbide weld deposit to resist both abrasion and moderate impact
- To be used on carbon, low alloy, manganese, stainless steels and cast iron
- Deposit is limited to two layers

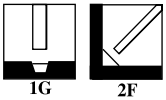
Typical Applications

- Bucket and shovel lips
- Crusher rolls and hammers
- Ore chutes
- Dozer blades
- Ripper teeth

Conformances

AS/NZS 2576 2355 B7

Welding Positions



Mechanical Properties

Rockwell - HRC
55-60

Diameter / Packaging

Diameter mm	Spool - Steel 11.3 kg	Coil 22.7 kg
1.2	ED031131	-
1.6	ED031132	-
2.0	-	ED019887

Deposit Composition

	%C	%Mn	%Si	%Al	%Cr
2 Layers - Open Arc	3.7-4.3	0.8-0.9	0.8-1.0	0.3-0.4	20.0-21.3

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Approx. Current amps	Deposition Rate kg/hr
1.2 mm, DC+, 25 mm	200	21	125	1.9
	400	25	185	3.7
	500	27	210	4.7
1.6 mm, DC+ , 22 mm	200	28	240	3.4
	300	31	300	5.1
	450	33	350	7.5
2.0 mm, DC+, 32 mm	125	26	250	3.4
	200	30	350	5.4
	250	32	400	6.9

NOTE: Deposit thickness limit is two layers unless high travel speed is used to obtain very closely spaced check cracks. Many layers can be used with high travel speed and small bead sizes to ensure close-spaced check cracks. Lincore® 60-O deposit cross cracks (commonly called relief-checking) on cooling. This is desirable, since cross-cracking of the deposit relieves cooling stresses and prevents spalling.

Lincore® 65-O

Hardfacing Wire - Severe Abrasion

Key Features

- Open arc self-shielded cored wire
- Primary carbide weld deposit to resist both abrasion and limited impact
- To be used on carbon, low alloy, manganese, stainless steels and cast iron
- Limited to four layers and will show significant relief checking

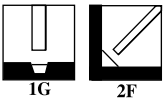
Typical Applications

- Ore chutes & wear plates
- Screw augers
- Crusher rolls
- Ripper teeth
- Earth engaging tools
- Slurry pipe and elbows

Conformances

AS/NZS 2576 2365 B7

Welding Positions



Mechanical Properties

Rockwell - HRc		
1 Layer	2 Layers	4 Layers
57	60	64

Diameter / Packaging

Diameter mm	Coil 22.7kg	Speed-Feed® Drum 227kg
2.8	ED026077	ED026083

Deposit Composition

	%C	%Mn	%Si	%Cr
1 Layer	3.7	1.3	0.7	19.9
2 Layers	4.9	1.6	1.0	26.2
4 Layers	5.7	1.8	1.1	30.8

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Approx. Current amps	Deposition Rate kg/hr
2.8 mm, DC+, 30 mm	75	27	225	3.2
	100	28	280	4.4
	150	30	360	7.5
	200	31	420	8.9
	250	32	480	11.1
	300	33	500	13.5

4 Layers of Lincore 65-O	
Condition	Rockwell - HRc
As Welded	63
Aged at 650°C for 2 hours	56
Aged at 760°C for 2 hours	54

NOTE: Postweld heat treatment up to 760°C will not affect abrasion resistance very significantly, but will affect hardness to some extent. Typical results are shown in the table on the left.

Lincore® M

Hardfacing Wire - Severe Impact

Key Features

- Self-shielded open arc cored wire
- Deposit resists severe impact as well as moderate abrasion
- Produces an austenitic manganese deposit that work-hardens
- Recommended for build-up and repair of Hadfield-type austenitic manganese materials as well as carbon and low alloy steels
- Unlimited layers with proper preheat and interpass temperatures and procedures

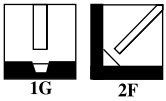
Typical Applications

- Rail crossover
- Crusher hammers
- Dredge parts
- Crusher rolls
- Breaker bars
- Buckets

Conformances

AS/NZS 2576 1220 B7

Welding Positions



Mechanical Properties

Rockwell - HRc	
As Welded	Work Hardened
18-28	30-48

Diameter / Packaging

Diameter mm	Spool - Steel 11.3 kg	Coil 22.7 kg
2.0	ED031130	-
2.8	-	ED011164

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni
Open Arc	0.60	13.0	0.4	4.9	0.5

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
2.0 mm, DC+, 32 mm	125	24	240	2.9
	175	27	300	4.2
	250	29	360	6.2
2.8 mm, DC+, 45 mm	75	25	240	3.5
	125	27	360	6.2
	150	28	395	7.5
2.8 mm, DC+, 64 mm	75	25	240	3.6
	175	30	400	8.8
	225	32	455	11.6

NOTE: As with all austenitic manganese welding products, interpass temperatures should be limited to 260ºC maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

Lincore® FROG MANG®

Hardfacing Wire - Severe Impact

Key Features

- Self-shielded open arc cored wire
- Designed for repair of manganese frogs and crossing diamonds in the railroad industry
- High alloy austenitic manganese deposit
- Unlimited layers with proper preheat and inter-pass temperatures and procedures

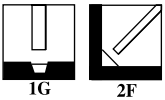
Typical Applications

- Manganese crossing diamonds
- Manganese railroad frogs

Conformances

AS/NZS 2576 1220 B7

Welding Positions



Mechanical Properties

Rockwell - HRc	
As Welded	Work Hardened
20-30	40-50

Diameter / Packaging

Diameter mm	Spool - Steel 11.3 kg
1.6	ED026106

Deposit Composition

	%C	%Mn	%Si	%Cr
Open Arc 6 Layers	1.1	25.5	0.17	4.6

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.6 mm, DC+, 25 mm	200	27	220	3.0
	250	29	250	4.0
	325	32	300	5.3

NOTE: Remove all damaged and foreign material by the air-carbon arc gouging process and grinding. Make sure all defective metal is removed. In the event hairline cracks remain at flangeway depth, use a 3.2 mm diameter stainless product, such as Primalloy® 309LMo to tie up these cracks and avoid hot cracking during the build-up process. As with all austenitic manganese welding products, interpass temperatures should be limited to 260°C maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

Lincore® 15CrMn

Hardfacing Wire - Severe Impact

Key Features

- Self-shielded open arc cored wire
- Provides an austenitic manganese deposit which exhibits very good crack resistance
- Work-hardens for overlay or joining austenitic manganese steel to itself or to carbon steel
- Can be used as a build-up layer before capping with abrasion resistant alloys
- Unlimited layers with proper preheat and interpass temperatures and procedures

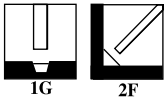
Typical Applications

- Spreader cones
- Crusher hammers
- Austenitic manganese parts
- For joining austenitic manganese steel to carbon steel, low alloy steel, austenitic manganese steel, or stainless steel

Conformances

AS/NZS 2576 1720 - B7

Welding Positions



Mechanical Properties

Rockwell - HRc	
As Welded	Work Hardened
18-22	40-50

Diameter / Packaging

Diameter mm	Spool - Steel 11.3 kg	Coil 22.7 kg
2.0	ED031126	-
2.8	-	ED022061

Deposit Composition

	%C	%Mn	%Si	%Cr
6 Layers Open Arc	0.4	15.0	0.25	16.0

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
2.0 mm, DC+, 32 mm	125	26	210	3.3
	200	29	280	5.3
	250	30	320	6.8
	350	32	380	9.7
2.8 mm, DC+, 45 mm	75	26	250	2.5
	125	28	320	5.1
	150	29	350	6.6
	175	30	380	7.5

NOTE: As with all austenitic manganese welding products, interpass temperatures should be limited to 260°C maximum. A stringer bead, or at most, a slight weave is recommended to limit heat build-up. Excessive heat build-up causes manganese carbide precipitation which damages the toughness of austenitic manganese.

Weartech™ WT-1SMAW

Cobalt Base Electrode

Typical Applications

- Wear Pads
- Mixer Rotors
- Pump Sleeves

Diameter / Packaging

Diameter mm	Carton 4.5 kg
3.2	ED034876
4.0	ED034877

Welding Positions

DEPOSIT COMPOSITION

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.13 ECoCr-C	1.7-3.0	2.0 max	2.0 max	25-33	3.0 max
Typical Results	2.1	0.6	0.6	28.1	2.4
	%Fe	**%Mo**	**%W**	**%Co**	**Hardness, Rc**
Requirements AWS A5.13 ECoCr-C	5.0 max	1.0 max	11-14	Balance	Not Required
Typical Results	4.1	0.1	12.3	50	52

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3.2 mm	4.0 mm
DC+	115-135	145-165

Weartech™ WT-6 SMAW

Cobalt Base Electrode

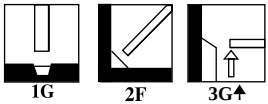
Typical Applications

- Shear Blades
- Fluid Flow Valves
- Extrusion Screws
- Roll Bushings
- High Temperature
- Valve Bearing Surface

Diameter / Packaging

Diameter mm	Carton 4.5 kg
3.2	ED034878
4.0	ED034879
4.8	ED034880

Welding Positions



DEPOSIT COMPOSITION

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.13 ECoCr-A	0.7-1.4	2.0 max	2.0 max	25-32	3.0 max
Typical Results	1.2	0.9	1.1	27.3	2.5
	%Fe	**%Mo**	**%W**	**%Co**	**Hardness, Rc**
Requirements AWS A5.13 ECoCr-A	5.0 max	1.0 max	3.0 -6.0	Balance	Not Required
Typical Results	3.3	0.1	4.60	58	41

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3.2 mm	4.0 mm	4.8 mm
DC+	115-135	145-165	175-195

Weartech™ WT-1 TIG

Cobalt Base GTAW

Typical Applications

- Wear Pads
- Mixer Rotors
- Pump Sleeves

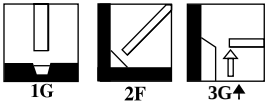
Welding Processes

- Gas Tungsten Arc Welding
- Oxyfuel Welding

Diameter / Packaging

Diameter mm	Carton 4.5 kg
3.2	ED034870

Welding Positions



DEPOSIT COMPOSITION

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.13 ECoCr-C	1.7-3.0	2.0 max	2.0 max	25-33	3.0 max
Typical Results	2.1	0.6	0.6	28.1	2.4
	%Fe	**%Mo**	**%W**	**%Co**	**Hardness, Rc**
Requirements AWS A5.13 ECoCr-C	5.0 max	1.0 max	11-14	Balance	Not Required
Typical Results	4.1	0.1	12.3	50	52

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3.2 mm
DC-	115-135

Weartech™ WT-6 TIG

Cobalt Base GTAW

Typical Applications

- Shear Blades
- Fluid Flow Valves
- Extrusion Screws
- Roll Bushings
- High Temperature
- Valve Bearing Surface

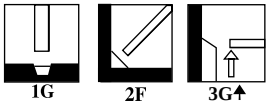
Welding Processes

- Gas Tungsten Arc Welding
- Oxyfuel Welding

Diameter / Packaging

Diameter mm	Carton 4.5 kg
3.2	ED034871
4.0	ED034872
4.8	ED034873

Welding Positions



DEPOSIT COMPOSITION

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.21 ERCoCr-A	0.9-1.4	1.0 max	2.0 max	26-32	3.0 max
Typical Results	1.1	0.1	1.3	28.2	2.5
	%Fe	**%Mo**	**%W**	**%Co**	**Hardness, Rc**
Requirements AWS A5.21 ERCoCr-A	3.0 max	1.0 max	3.0 -6.0	Balance	Not Required
Typical Results	2.5	0.1	4.7	59	42

TYPICAL OPERATING PROCEDURES

Polarity	Current (Amps) 3.2 mm	4.0 mm	4.8 mm
DC-	115-135	145-165	175-195

Weartech™ WT-1MIG

Cobalt Base GMAW

Typical Applications

- Wear Pads
- Mixer Rotors
- Pump Sleeves

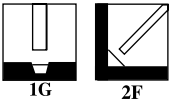
Shielding Gas

- 100% Argon

Diameter / Packaging

Diameter mm	Spool 15 kg
1.1	ED034885

Welding Positions



DEPOSIT COMPOSITION

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.21 ERCCoCr-C	2.0-3.0	2.0 max	2.0 max	25-33	3.0 max
Typical Results	2.5	0.8	0.3	28.9	0.2
	%Fe	**%Mo**	**%W**	**%Co**	**Hardness, Rc**
Requirements AWS A5.21 ERCCoCr-C	5.0 max	1.0 max	11-14	Balance	Not Required
Typical Results	3.7	0.1	11.3	50	49

TYPICAL OPERATING PROCEDURES

Diameter mm	Approx. Current amps	Voltage volts	CTWD mm
1.1	175 225 240 260	20 24 26 28	25

Weartech™ WT-6 MIG

Cobalt Base GMAW

Typical Applications

- Shear Blades
- Fluid Flow Valves
- Extrusion Screws
- Roll Bushings
- High Temperature
- Valve Bearing Surface

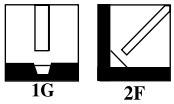
Shielding Gas

- 100% Argon

Diameter / Packaging

Diameter mm	Spool 15 kg
1.1	ED034886
1.6	ED034887

Welding Positions

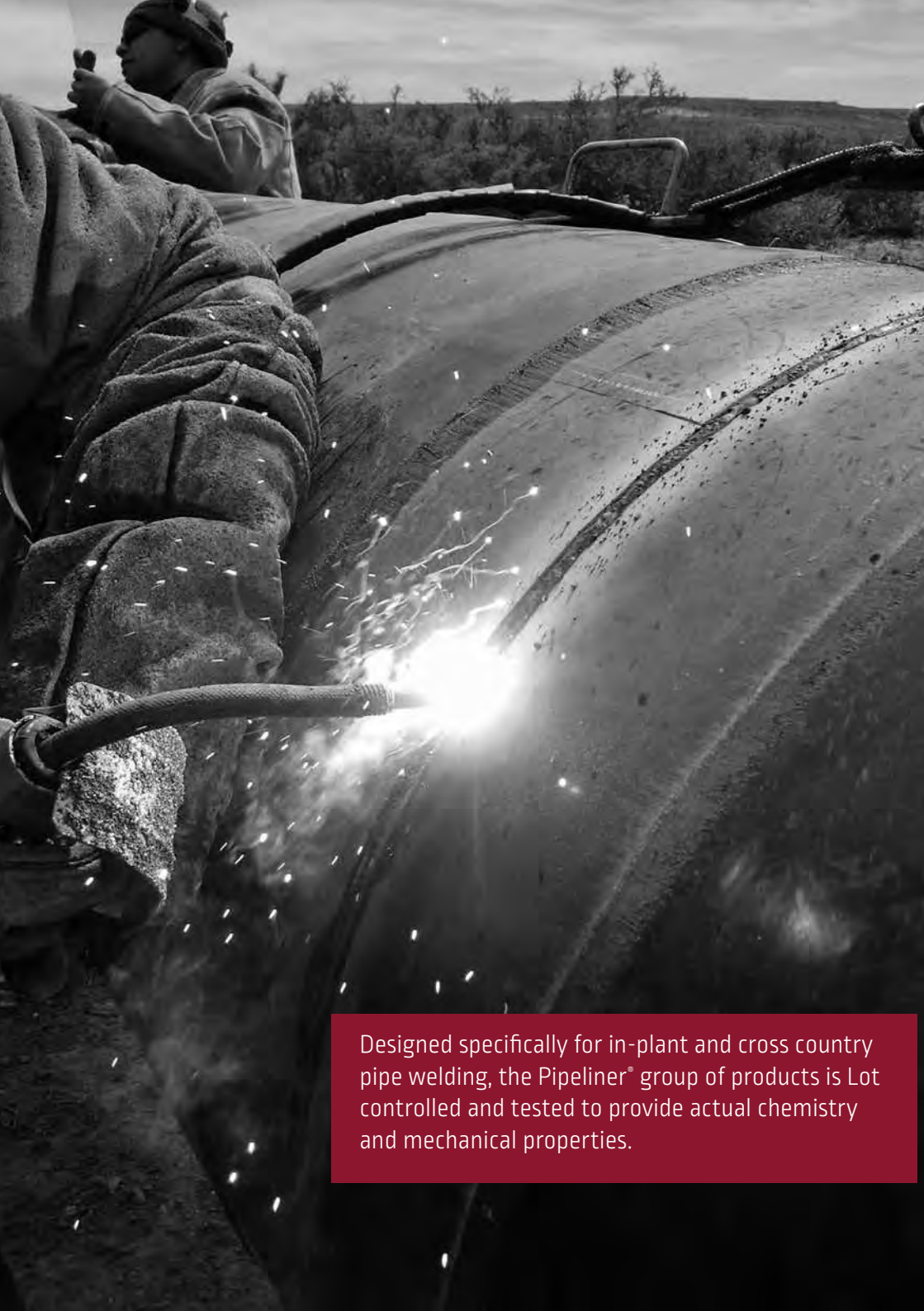


DEPOSIT COMPOSITION

	%C	%Mn	%Si	%Cr	%Ni
Requirements AWS A5.21 ERCCoCr-A	0.7-1.4	2.0 max	2.0 max	25-32	3.0 max
Typical Results	1.2	0.8	0.5	28.2	0.3
	%Fe	**%Mo**	**%W**	**%Co**	**Hardness, Rc**
Requirements AWS A5.21 ERCCoCr-A	5.0 max	1.0 max	3.0 -6.0	Balance	Not Required
Typical Results	3.9	0.1	4.1	58	40

TYPICAL OPERATING PROCEDURES

Diameter mm	Approx. Current amps	Voltage volts	CTWD mm
1.1	175 225 240 260	20 24 26 28	25
1.6	280 300	26 28	25



Designed specifically for in-plant and cross country pipe welding, the Pipeliner® group of products is Lot controlled and tested to provide actual chemistry and mechanical properties.

Pipeliner

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Pipeliner® 6P+

Stick Electrode - Cellulose

Key Features

- High operator appeal and control
- Easy slag removal
- Q2 Lot Certificates showing chemistry and mechanical properties available online
- The standard in the pipe welding industry

Typical Applications

- Cross country and in-plant pipe welding
- Root pass welding up to X80 grade pipe
- Hot, fill and cap passes up to X60 grade pipe

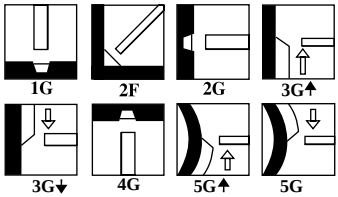
Conformances

AWS A5.1/A5.1M	E6010 / E4310
AS/NZS 4855-B	E4310A
ABS	E6010

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 22.7kg
3.2	350	ED030848
4.0	350	ED030849

Welding Positions



Mechanical Properties - As Required per AWS A5.1 / A5.1M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS E6010	330 min	430 min	22 min	27 min
Typical Results - As Welded	405 - 515	495 - 620	22 - 36	27 - 85

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.11-0.20	0.51-0.77	0.15-0.32	0.006-0.016	0.005-0.011
	%Ni	**%Cr**	**%Mo**	**%V**	
Typical Results - As Welded	0.01-0.04	0.01-0.04	0.01-0.02	≤0.01	

Typical Operating Procedures

	Current (amps)	
Polarity	**3.2 mm**	**4.0 mm**
DC ±	75-135	100-175

Pipeliner® 7P+

Stick Electrode - Cellulose / Low Alloy

Key Features

- High productivity in vertical down and out of position pipe welding
- Q2 Lot certificates showing chemistry and mechanical properties available online
- Clean, visible weld puddle, deep penetration
- Superior puddle control

Typical Applications

- Root pass welding up to X80 grade pipe
- Hot, fill and cap passes up to X65 grade pipe
- Vertical down welding

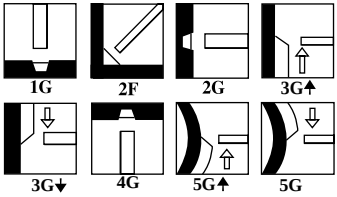
Conformances

AWS A5.5/A5.5M	E7010-P1 / E4910-P1
AS/NZS 4855-B	E4910-P1
ABS	E7010-P1

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 22.7kg
3.2	350	ED031611
4.0	350	ED031612
5.0	350	ED031613

Welding Positions



Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C	Charpy V-Notch J @ -40°C
Requirements - AWS	415 min	490 min	22 min	27 min	-
Typical Results - As Welded	455 - 515	525 - 635	23 - 29	49 - 92	31-85

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.09-0.20	0.44-0.83	0.06-0.31	0.01-0.02	0.01-0.02
	%Ni	**%Cr**	**%Mo**	**%V**	
Typical Results - As Welded	0.58-0.90	0.02-0.05	0.04-0.21	≤ 0.01	

Typical Operating Procedures

	Current (amps)		
Polarity	3.2 mm	4.0 mm	5.0 mm
DC+	65-130	100-165	130-210

Pipeliner® 8P+

Stick Electrode - Cellulose / Low Alloy

Key Features

- High productivity in vertical down and out-of-position pipe welding
- Deep penetration, superior puddle control
- Q2 Lot Certificates showing chemistry and mechanical properties available online
- Clean, visible weld puddle, deep penetration

Typical Applications

- Root pass welding up to X80 grade pipe
- Hot, fill and cap passes up to X70 grade pipe

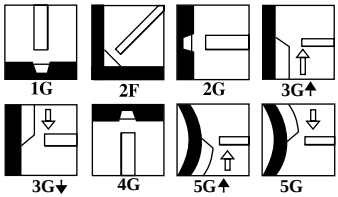
Conformances

AWS A5.5/A5.5M	E8010-P1 / E5510-P1
AS/NZS 4855-B	E5510-P1A
ABS	E8010-P1

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 22.7kg
3.2	350	ED030826
4.0	350	ED030827
5.0	350	ED030828

Welding Positions



Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C	Charpy V-Notch J @ -40°C
Requirements - AWS	460 min	550 min	19 min	27 min	-
Typical Results - As Welded	475 - 545	560 - 670	20 - 32	49 - 149	41 - 119

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.09-0.20	0.55-0.98	0.07-0.27	0.01-0.02	0.01-0.02
	%Ni	**%Cr**	**%Mo**	**%V**	
Typical Results - As Welded	0.73-1.00	0.02-0.05	0.13-0.22	0.01 max	

Typical Operating Procedures

	Current (amps)		
Polarity	**3.2 mm**	**4.0 mm**	**5.0 mm**
DC+	65-120	100-165	130-210

Pipeliner® Arc 80

Stick Electrode - Cellulose / Low Alloy

Key Features

- Excellent impact properties without the micro alloying addition of Boron
- High productivity in vertical down and out of position pipe welding
- Deep penetration
- Q2 Lot Certificates showing chemistry and mechanical properties available online

Typical Applications

- Root pass welding up to X80 grade pipe
- Hot, fill and cap pass welding up to X70 grade pipe

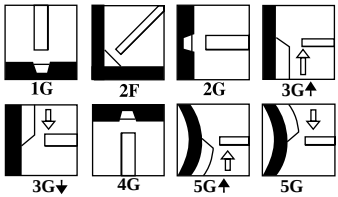
Conformances

AWS A5.5/A5.5M	E8010-P1, E8010 G
AS/NZS ISO 4855-B	E5510-P1 A

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 22.7kg
4.0	350	ED034456
5.0	350	ED034457

Welding Positions



Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C	Charpy V-Notch J @ -40°C
Requirements - AWS	460 min	550 min	19 min	27 min	-
Typical Results - As Welded	475 - 545	560 - 670	19 - 32	49 - 149	41 - 119

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.09-0.20	0.55-0.98	0.07-0.27	0.01-0.02	0.01-0.02
	%Ni	**%Cr**	**%Mo**	**%V**	
Typical Results - As Welded	0.73-1.00	0.02-0.05	0.13-0.22	0.01 max	

Typical Operating Procedures

	Current (amps)	
Polarity	4.0 mm	5.0 mm
DC+	100-165	130-210

Pipeliner® LH-D80

Stick Electrode - Low Hydrogen / Low Alloy / Pipe

Key Features

- Low hydrogen, vertical down capability up to X70 pipe
- High productivity
- Q2 Lot certificates showing chemistry and mechanical properties available online
- Touch start tapered tip
- Meets H4R diffusible hydrogen level and moisture resistance

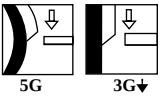
Typical Applications

- Fill and cap pass welding up to X70 grade pipe
- Pipe repair
- Hot tapping

Conformances

AWS A5.5/A5.5M	E8045-P2 H4R
AS/NZS 4855-B	E4948-H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 4.5kg
3.2	350	ED032626
4.0	350	ED032627

Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C	Charpy V-Notch J @ -46°C
Requirements - AWS	460 min	550 min	19 min	27 min	-
Typical Results - As Welded	485 - 515	570 - 600	26 - 31	75 - 125	50 - 95

Deposit Composition

	%C	%Mn	%Si	%P	%S	
Typical Results - As Welded	0.04-0.06	1.10-1.25	0.35-0.50	≤0.01	≤0.01	
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen (mL/100g weld deposit)**	
Typical Results - As Welded	≤0.04	≤0.05	≤0.02	0.01 max	2~4	

Typical Operating Procedures

	Current (amps)	
Polarity	3.2 mm	4.0 mm
DC+	120-170	170-250

Pipeliner® LH-D90

Stick Electrode - Low Hydrogen / Low Alloy / Pipe

Key Features

- Low hydrogen, vertical down capability up to X80 pipe
- High productivity, deep penetration
- Q2 Lot Certificates showing chemistry and mechanical properties available online
- Touch start tapered tip
- Meets H4R diffusible hydrogen level and moisture resistance

Typical Applications

- Root pass welding up to X80 grade pipe
- Pipe repair
- Hot tapping

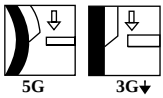
Conformances

AWS A5.5/A5.5M	E9045-P2 H4R
AS/NZS ISO 4855-B	E5548 H5

Diameter / Packaging

Diameter mm	Length mm	Easy Open Can 4.5kg
3.2	350	ED032629
4.0	350	ED032630

Welding Positions



Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C	Charpy V-Notch J @ -46°C
Requirements - AWS	530 min	620 min	17 min	27 min.	-
Typical Results - As Welded	550 - 600	625 - 670	26 - 31	75 - 125	50 - 95

Deposit Composition

	%C	%Mn	%Si	%P	%S	
Typical Results - As Welded	0.04-0.06	1.15-1.35	0.35-0.55	≤0.01	≤0.01	
	%Ni	**%Cr**	**%Mo**	**%V**	**Diffusible Hydrogen (mL/100g weld deposit)**	
Typical Results - As Welded	0.25-0.30[1] / 0.80-1.00[2]	≤0.05	0.15-0.25	≤0.01	2~4	

[1]3.2mm diameter only | [2]4.0mm diameter only

Typical Operating Procedures

	Current (amps)	
Polarity	**3.2 mm**	**4.0 mm**
DC+	120-170	170-250

Pipeliner® NR -207+

Flux Cored Wire - Self Shielded / Low Alloy

Key Features

- Vertical down capability up to X70 pipe
- Capable of producing weld deposits with impact toughness exceeding 27J @ -29°C
- Q2 Lot Certificates showing chemistry and mechanical properties available online
- High deposition rates
- ProTech® hermetically sealed packaging

Typical Applications

- Hot, fill and cap pass welding up to X70 grade pipe

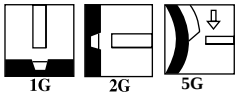
Conformances

AWS A5.29/A5.29M E71T8-K6

Diameter / Packaging

Diameter mm	Hermetically Sealed Pail 25.4kg (4 coils)
2.0	ED030924

Welding Positions



Mechanical Properties - As Required per AWS A5.29 / A5.29M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -29°C
Requirements - AWS	400 min	485 - 620	20 min	27 min
Typical Results - As Welded	425 - 470	540 - 565	29 - 31	119 - 205

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.04-0.06	1.18-1.33	0.24-0.28	≤0.01	≤0.01
	%Ni	**%Cr**	**%Mo**	**%V**	**%Al**
Typical Results - As Welded	0.78-0.93	0.02-0.03	0.01-0.02	<0.01	0.9-1.2

Typical Operating Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
2.0mm DC-	19	70-130	18-21	210-300	2.0-3.7

Pipeliner® G70M-E

Flux Cored Wire - Gas Shielded / Pipe

Key Features

- All positional gas shielded low alloy cored wire
- Specifically designed for pipeline applications
- Superior weldability, low spatter, low hydrogen
- Outstanding operator appeal
- Capable of producing weld deposits with impact toughness >47J at -50°C
- Excellent wire feeding

Conformances

AWS A5.29/A5.29M	E81T1-GM H4
AS/NZS ISO 17632-B	T55 4T1-1 MA-N1-UH5

Diameter / Packaging

Diameter mm	Spool - S200 4.5kg	Spool - S300 VFB 14kg
1.2	944252	944238

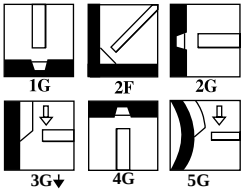
Typical Applications

- Hot, fill and cap pass welding up to X70 grade pipe
- Suitable for automated and semi-automatic pipe welding

Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-25 L/min

Welding Positions



Mechanical Properties - As Required per AWS A5.29 / A5.29M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C	Charpy V-Notch J @ -50°C
Requirements - AWS	470 min	550-690	19 min	-	-
Typical Results - As Welded	580	630	23	90	70

Deposit Composition

	%C	%Mn	%Si	%P	
Typical Results - As Welded	0.05	1.45	0.2	0.013	
	%S	**%Ni**	**Diffusible Hydrogen** (mL/100g weld deposit)		
Typical Results - As Welded	0.01	0.95	4~5		

Typical Operating Procedures

Diameter, Polarity, Shielding Gas	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.2 mm, DC+ M21	15-20	175-500	21-30	130-275	1.6-4.5

Pipeliner® G80M-E

Flux Cored Wire - Gas Shielded / Low Alloy

Key Features

- All positional gas shielded low alloy cored wire
- Superior weldability, low spatter and low hydrogen
- Outstanding operator appeal
- Exceptional mechanical properties
- Specifically designed to withstand high heat input procedures
- Excellent wire feeding

Typical Applications

- Hot, fill and cap pass welding on up to X80 grade pipe
- Suitable for automated and semi-automatic pipe welding
- Designed for offshore and pipeline industries

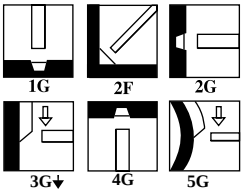
Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-25 L/min

Conformances

AWS A5.29/A5.29M	E91T1-GM H4
AS/NZS ISO 18276-B	T62 5T1-1 MAN2 M2 UH5

Welding Positions



Diameter / Packaging

Diameter mm	Wire Basket - B300 15kg
1.2	944260

Mechanical Properties - As Required per AWS A5.29 / A5.29M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS	540 min	620 - 760	17 min	-
Typical Results - As Welded	695	740	21	65

Deposit Composition

	%C	%Mn	%Si	%P	
Typical Results - As Welded	0.06	1.4	0.3	0.013	
	%S	**%Ni**	**%Mo**	**Diffusible Hydrogen (mL/100g weld deposit)**	
Typical Results - As Welded	0.01	0.95	0.4	< 5	

Typical Operating Procedures

Diameter, Polarity, Shielding Gas	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.2 mm, DC+ M21	15-20	175-500	21-30	130-275	1.6-4.5

Pipeliner® G90M-E

Flux Cored Wire - Gas Shielded / Low Alloy

Key Features

- All positional gas shielded low alloy cored wire
- Designed for high strength pipeline steels
- Outstanding operator appeal
- Excellent mechanical properties >50J @ -40C
- Optimal alloy control
- Excellent wire feeding

Typical Applications

- Hot, fill and cap pass welding on X80 to X100 grade pipe
- Suitable for automated and semi-automatic pipe welding

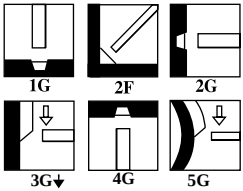
Shielding Gas

- M21 : 75-85% Argon / 15-25% CO_2
- Flow Rate: 15-25 L/min

Conformances

AWS A5.29/A5.29M	E111T1-GM
AS/NZS ISO 18276-B	T69 5T1-1 MAN3 M2 UH5

Welding Positions



Diameter / Packaging

Diameter mm	Spool - S200 13.5kg (3 x 4.5kg)
1.2	944254

Mechanical Properties - As Required per AWS A5.29 / A5.29M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS	680 min	760-900	15 min	-
Typical Results - As Welded	740	790	19	65

Deposit Composition

	%C	%Mn	%Si	%P	
Typical Results - As Welded	0.06	1.5	0.2	0.015	
	%S	**%Ni**	**%Mo**	**Diffusible Hydrogen (mL/100g weld deposit)**	
Typical Results - As Welded	0.010	2.0	0.5	< 5	

Typical Operating Procedures

Diameter, Polarity, Shielding Gas	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.2 mm, DC+ M21	15-20	175-500	21-30	130-275	1.6-4.5

Pipeliner® Selection Guide

PRODUCTS	AWS CLASSIFICATION	LOW STRENGTH				HIGH STRENGTH		
		<X60	X60	X65	X70	X80	X90	X100
STICK ELECTRODES								
Stick Electrodes - Cellulose								
Pipeliner® 6P+	E6010	R+F	R+F	R	R	R		
Pipeliner® 7P+	E7010-P1		R+F	R+F	R	R		
Pipeliner® 8P+	E8010-P1		R+F	R+F	R+F	R		
Stick Electrodes - Basic, Low Hydrogen, Vertical Down								
Pipeliner® LH-D80	E8045-P2 H4R		F	F	F			
Pipeliner® LH-D90	E9045-P2 H4R			F	F			
FLUX CORED WIRES								
Flux Cored Wires - Self Shielded								
Pipeliner® NR®-207+	E71T8-K6	F	F	F				
Flux Cored Wires - Gas Shielded								
Pipeliner® G70M-E	E81T1-GM	F	F	F	F			
Pipeliner® G80M-E	E91T1-GM		F	F	F	F		
Pipeliner® G90M-E	E111T1-GM					F	F	F

R = Root Pass Only R+F = Root & Fill Passes F = Fill Pass Only

NOTE 1: This table indicates common welding electrodes by API 5L pipe grade. Final product selection should be project specific. The specific electrode recommendation depends on project specifications, including strength overmatch and minimum toughness requirements. For assistance in selecting the appropriate consumables and other technical questions, please contact your local Lincoln Electric representative.

NOTE 2: Please note that the welding consumable recommendations in this table are based on weld metal strength matching of the nominal pipe strength based upon API 5L minimum requirements. Recommended consumables in this chart are based upon these standards and not the actual strength of pipe.

Pipeliner® LH-D Welding - Helpful Hints

Pipeliner® LH-D80 and LH-D90 are low hydrogen, high deposition electrodes specifically designed for the vertical down welding of pipe. They are recommended for fill and cap pass welding of up to X70 and X80 pipe, as well as pipe repair and hot tapping applications. For low diffusible hydrogen, high productivity and operator appeal - choose Pipeliner® LH-D electrodes.

Use Recommended Starting and Stopping Techniques

Porosity can be the result of incorrect starting or stopping techniques. Refer to Diagram #2 and #5 below.

Do Not Re-Strike Electrode

If arc does not initiate on first attempt, discard electrode and start with a new one.

Make Sure Operating Procedures are Correct

Recommended operating ranges for Pipeliner® LH-D electrodes are in the table below.

Typical Operating Procedures

	Current (Amps)	
Polarity	3.2 mm	4.0 mm
DC+	120-170	170-250

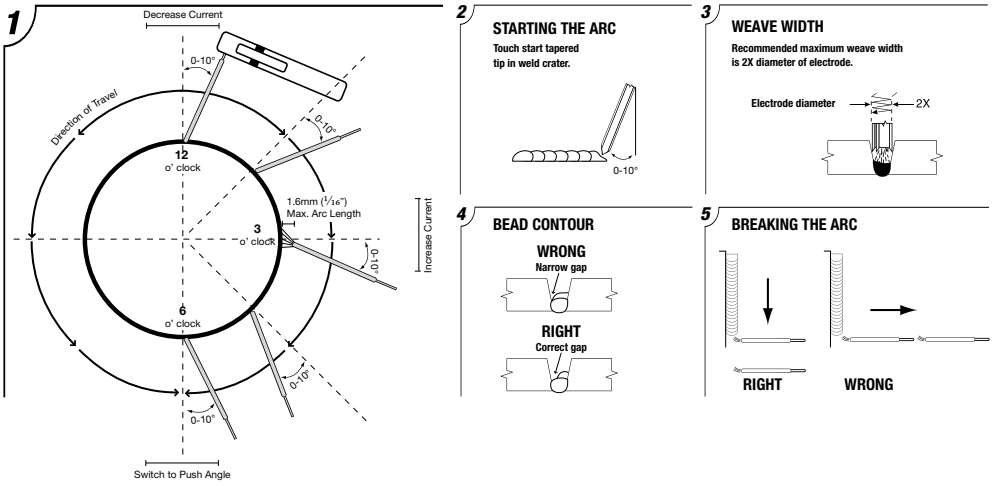
Technique Tips for Weld Positions

12 o'clock	Decreased current and rod angle will reduce spatter.
3 o'clock	Increased current will help hold weld puddle up.
6 o'clock	A push angle and weave will help latten bead.

Use the Recommended Weaving Technique

Weaving too wide can cause undercutting and slag entrapment. Use a maximum weave width of approximately 2 times the electrode diameter. Refer to Diagram #3 below for directions.

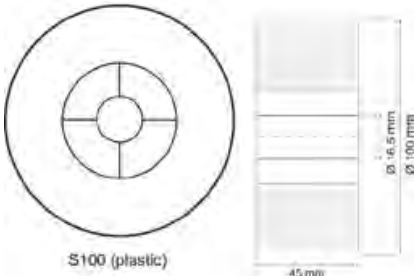
Welding Guidelines Diagram

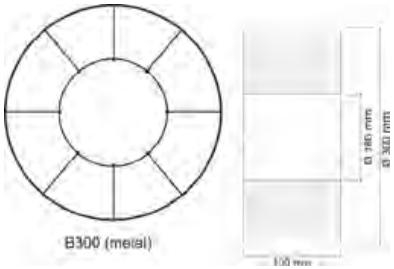


Packaging

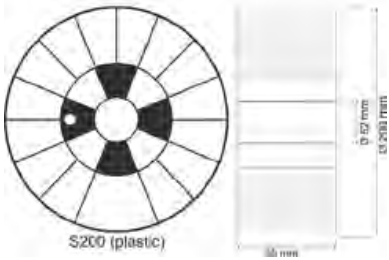
Packaging

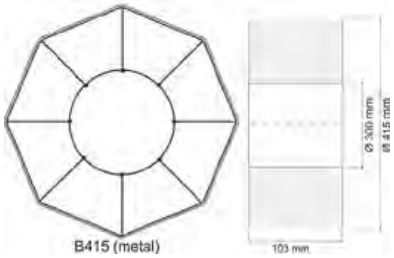
Packaging and Sizes
(Solid wires and Flux-cored wires)



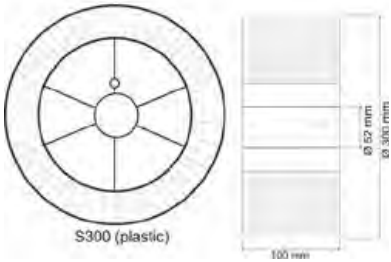


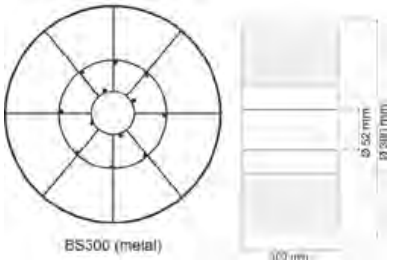
Adaptor : 2158341



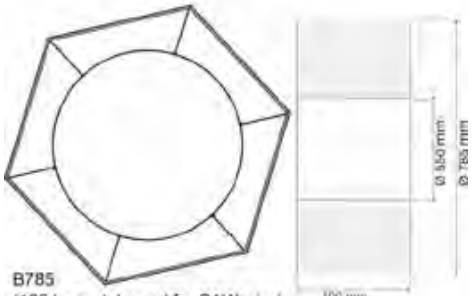


Adaptor : K299 (axis 25mm)





Adaptor : K10158
K10158-1 (plastic)



Adaptor : K10410

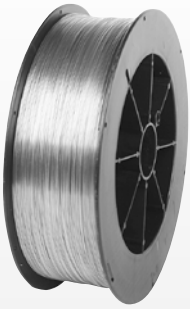
Tubes, Cans & Cartons

Easy Open Cans 22.7kg

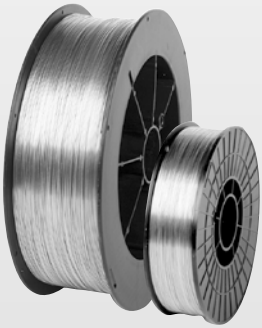
Plastic Tubes 2.4kg

Cardboard Carton 4.5, 22.7kg

Steel Spool
Solid & Flux-Cored - 15kg



Plastic Spool
Flux-Cored - 11.3kg



Plastic Spool
Solid, Mild Steel - 11.3kg, 5kg

Plastic Spool
Solid, Aluminum - 7.3kg, 0.5kg

Coils & Bags

WIRES

Flux-Cored
6.1 kg Coil (24.5 kg HS Pail)

Flux-Cored
27.2 kg

FLUX

Paper Bag 22.7kg

Plastic Bag 25kg

Drums & Pails

Accu-Trak®/Speed-Feed® Drums

Steel Drum

Hermetically Sealed Pail

Pail as Master

Storing Low Hydrogen Electrodes

Low hydrogen electrodes must be dry to perform properly. Unopened hermetically sealed containers provide excellent protection in good storage conditions. Opened cans or electrodes should be stored in a cabinet at 120-150°C.

Moisture resistant electrodes with an "R" suffix have a high resistance to coating moisture pick-up.

However, all low hydrogen electrodes should be stored properly, even those with an "R" suffix. Standard EXX18 electrodes should be supplied to welders twice per shift. Moisture resistant types may be exposed for up to 9 hours. Specific code requirements may indicate exposure limits differently from these guidelines.

Depending on the amount of moisture absorbed and other factors, moisture pick-up can degrade weld quality in various ways:

1. Moisture in low hydrogen electrodes may cause porosity. This porosity could be completely subsurface and require x-ray inspection or destructive testing. The porosity could also be visible external porosity.
2. High moisture can also lead to excessive slag fluidity, a rough weld surface, and difficult slag removal.
3. Excessive moisture in low hydrogen electrodes will lead to elevated levels of diffusible hydrogen which, in turn, can lead to hydrogen-induced weld cracking and/or underbead cracking.

Re-drying Low Hydrogen Electrodes

Re-drying, when done correctly, restores the electrode's ability to deposit quality welds. Proper re-drying temperature depends upon the electrode type and its condition. One hour at the listed final temperature is satisfactory. DO NOT dry electrodes at higher temperatures. Several hours at lower temperatures is not equivalent to using the specified requirements.

Electrodes of the E8018 and higher strength classifications should be given no more than three 1-hour re-dries in the 370°-430°C range. This minimizes the possibility of oxidation of alloys in the coating which would result in lower than normal tensile or impact properties.

Any low hydrogen electrode should be discarded if excessive re-drying causes the coating to become fragile and flake or break off while welding, or if there is a noticeable difference in handling or arc characteristics, such as insufficient arc force.

Electrodes to be re-dried should be removed from the can and evenly spread out in the oven because each electrode must reach the drying temperature.

Storing Cellulosic Electrodes

Electrodes in unopened Lincoln Electric cans or cartons retain the proper moisture content indefinitely when stored in good condition.

If exposed to humid air for long periods of time, electrodes from opened containers may pick up enough moisture to affect operating characteristics or weld quality. If moisture appears to be a problem, store electrodes from the opened containers in heated cabinets at 40° to 50°C.

Storing and Re-drying Non-Low Hydrogen Electrodes

Electrodes in unopened Lincoln Electric cans or cartons retain the proper moisture content indefinitely when stored in good condition.

If exposed to humid air for long periods of time, electrodes from opened containers may pick up enough moisture to affect operating characteristics or weld quality. If moisture appears to be a problem, store electrodes from the opened containers in heated cabinets at 40° to 50°C. DO NOT use higher temperatures.

Some electrodes from wet containers or long exposure to high humidity can be re-dried. Follow the procedures on the following page for each type.

Using longer drying times or higher temperatures can easily damage the electrodes. For drying, remove the electrodes from the container and spread them out in the furnace because each electrode must reach the drying temperature.

RE-DRYING CONDITIONS - LOW HYDROGEN

Condition	Pre-drying Temperature[1]	Final Re-drying Temperature
Electrodes exposed to air for less than one week; no direct contact with water.	—	370 - 430°C
Electrodes which have come in direct contact with water or which have been exposed to high humidity.	80 - 105°C	370 - 430°C

RE-DRYING CONDITIONS - NON-LOW HYDROGEN

Electrode	Electrode Group	Final Re-drying Temperature	Time
E6010: E6011: E7010-A1[1]: E7010-G[1]: E8010-G[1]: E9010-G[1]:	Excessive moisture is indicated by a noisy arc and high spatter, rusty core wire at the holder end or objectionable coating blisters while welding. Rebaking of this group of electrodes is not recommended.	Not Recommended	—
E7024: E6027:	Excessive moisture is indicated by a noisy or "digging" arc, high spatter, tight slag, or undercut. Pre-dry unusually damp electrodes for 30 - 45 minutes at 90°C to 110°C (200°F to 230°F) before final drying to minimize cracking of the coating.	200 - 260°C	30 - 45 minutes
E6013: E7014: E6022:	Excessive moisture is indicated by a noisy or "digging" arc, high spatter, tight slag, or undercut. Pre-dry unusually damp electrodes for 30 - 45 minutes at 90°C to 110°C (200°F to 230°F) before final drying to minimize cracking of the coating.	150 - 180°C	20 - 30 minutes

[1]Pre-dry for 1-2 hours.

Stainless Steel

Storing Stainless Steel Electrodes

Stainless steel covered electrodes should be handled and stored as if they were low hydrogen electrodes for welding low alloy steels. They should be protected from moisture pickup. The consequences of moisture pickup with stainless electrodes does not include cold cracking, as would be the case with low alloy steels, unless they are used for dissimilar metal joining.

But if stainless electrodes are exposed for extended periods in a humid environment, the coating can pick up enough moisture to cause starting porosity and/or centerline porosity.

The electrodes should be stored in sealed cans, or stored in an oven at about 120°C (250°F). If they are exposed to the point that porosity occurs, they can be restored to like-new condition by baking one hour at 345 to 425°C (650 to 800°F).

Shelf Life

As a general rule, The Lincoln Electric Company estimates maximum storage time for mild and low alloy steel consumables to be 3 years. This estimate is for material in the original, undamaged packages that is stored indoors at up to ~70% relative humidity and that are protected from the weather or other adverse conditions. Packages should be stored under conditions that minimize the likelihood of temperature variations that cause moisture condensation on the consumables.

These estimates are based on what we know about the packaging materials and the frequency of product improvements. Since actual storage conditions vary widely across geographical regions and from one customer to another, it is not possible to be more specific. For packages that are not hermetically sealed, a shorter storage time is advisable under sustained severe humidity conditions but is not possible to estimate. Note that product stored for longer than 3 years, may still be suitable for use. It depends on the product and the condition it is in.

Dispose of any wire or rod that has visible signs of rust.

Customers are not encouraged to store consumables for extended periods of time. It is advisable to maintain turnover in inventory to ensure the products are as close to their as manufactured conditions as can be reasonably expected. The general guidelines above are provided for those unplanned instances where product is stored longer than originally anticipated.

Storage of Unopened Packages

FCAW products should be stored in the original, unopened packaging until ready to use. To maintain the integrity of these products, electrodes must be protected from the atmosphere. All flux cored electrodes, regardless of package, should be protected from condensation, including rain or snow. To ensure that condensation does not form on the product, it is recommended that the electrode be stored in an environment that is kept above the dew point temperature for a given relative humidity. Minimising temperature variation will also help to protect the electrode from moisture condensation. It is advisable to maintain turnover in inventory to ensure the product is as close to the manufactured condition as possible.

> *For applications in which the weld metal hydrogen must be controlled (usually 8 mL/100g or lower), or where shipping and storage conditions are not controlled or known; only hermetically sealed packaging is recommended.*

Handling of Wires out of the Package

The following minimum precautions should be taken to safeguard the wire after opening the original package:

1. It is recommended to use wires within one week of opening the original package.
2. Open wires should not be exposed to damp moisture conditions or extremes in temperature and/or humidity where surface condensation can occur.
3. When not in use, wires should be placed in original packaging and sealed as best as possible.
4. If exposed to moisture conditions, discard any rusty wire.
5. After exposure, hydrogen levels can be reduced by conditioning the wire. Wires may be conditioned at a temperature of 100°C ± 4°C for a period of 6 to 12 hours, cooled and then stored in sealed poly bags (4 mil minimum thickness) or equivalent. Wire on plastic spools should not be heated at temperatures in excess of 65°C.

When to Dispose of Product

It is advisable to dispose of any wire that has visible signs of rust on the wire where the package integrity has been compromised. When proper storage procedures are not followed, consumables may show signs of high moisture. High moisture can result in rough bead surface or slag that is unusually difficult to remove. In addition, it can also result in visible and/or internal porosity in the weld deposit, increased spatter, and decreased puddle control which can increase chances of slag entrapment. Oxidation (rust) of either the surface of the wire or internal fluxing agents increases the oxygen content of the wire that can lead to changes in alloy recovery. This, in turn, can deteriorate the mechanical properties of the weld metal.

Submerged Arc Flux / Wire and MIG Wire

STORAGE FOR SUBMERGED ARC FLUX

Flux Package Type[1]	Flux Storage Conditions for General Welding Applications	Flux Storage for Applications Requiring Diffusible Hydrogen Control
Plastic or Multi-Wall Plastic/Paper Bag	Store indoors at < 90% RH Protect from condensation	Store indoors at < 70% RH and 5 - 50°C. Protect from condensation
Bulk Bag with Liner	Store indoors at < 90% RH Protect from condensation	Store indoors at < 70% RH and 5 - 50°C. Protect from condensation
Steel Drum	Protect from rain or snow	Protect from rain or snow
Plastic Pail	Protect from rain or snow	Protect from rain or snow

[1]For other package types, consult your Lincoln Electric Technical Representative.

STORAGE FOR MILD AND LOW ALLOY STEEL MIG AND SUBARC WIRES

Wire Package Type[1]	Wire Storage Conditions for All Welding Applications
Any Type	Protect from rain or snow. Protect from condensation. Do not use wire with visible signs of rust.

[1]For other package types, consult your Lincoln Electric Technical Representative.

Re-Drying & Recycling Flux

Lincoln Electric submerged arc welding flux can be used directly from its original, undamaged package, if it has been stored according to the conditions listed in the chart on the previous page.

When proper procedures are not followed, flux may show signs of moisture. These can include porosity, a rough bead surface or slag that is unusually difficult to remove. In many instances these fluxes can be re-dryed for general welding applications.

Re-Drying Flux

To re-dry standard Lincolnweld® fluxes

- Remove flux from its original packaging and place in a clean oven set between 260°-480°C.
- Leave in oven long enough to raise the temperature of the entire bulk of flux to your set temperature for a minimum of one hour.
- For ovens in which heating rods are inserted into the flux, do not let the temperature of flux adjacent to the rods exceed 480°C.

Recycling Flux

Non-consumed flux may be collected from the finished weld and recycled.
To do so, please follow these procedures:

- Remove slag, metal, mill scale, and any other contaminants from the flux.
- Prevent damage to the flux from heavy impingement in flux transport systems.
- Avoid the separation of different sized particles in cyclones or “dead” corners.
- Remove excess fines from recycled fluxes.
- For optimal welding characteristics, it is recommended to add at least 20% new flux by weight to recycled flux.

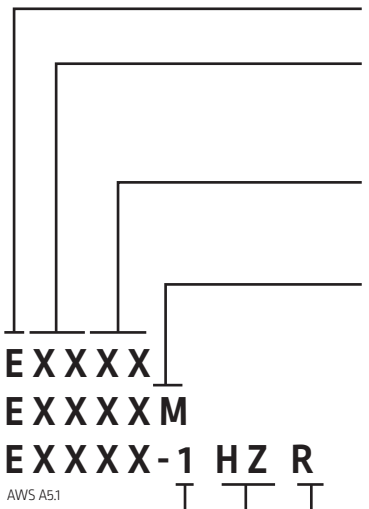
Appendix

AWS Classification System

Stick (SMAW)

Mild & Low Alloy Steel per AWS A5.1/A5.1M: 2004 and AWS A5.5/A5.5M: 2006

Classification Designators per AWS A5.1 & A5.5



- Designates an electrode.
- Designates the minimum tensile strength in ksi of the weld metal when produced with the test assembly preparation procedure of this specification.
- Designates the welding position in which electrodes are usable, the type of coating, and the polarity to operate.
- Military requirements such as: greater toughness, lower moisture content and mandatory diffusible hydrogen limits for weld metal.
- Designates that the electrode meets the requirements of the absorbed moisture test.
- Diffusible hydrogen designator (H4, H8, H16) in mL of diffusible hydrogen per 100 grams of weld metal.
- Designates that the electrode meets the requirements for improved toughness – ductility.

Classification Designators per AWS A5.5 Only

- Designates the chemical composition of the undiluted weld metal produced by the electrode using shielded metal arc welding.

Additional Classifications

Stainless Steel - Per AWS A5.4

EXXX-15 The three digits that follow the "E" indicate the American Iron and Steel Institute type of stainless steel. The last two digits indicate the current and the welding position in which it is used:

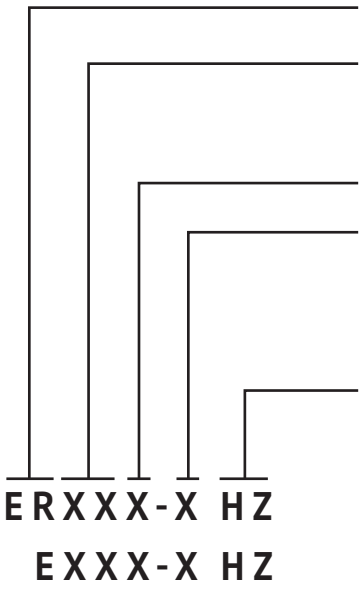
-15 fast freezing slag for out-of-position welding
-16 stable arc and out-of-position welding capability
-17 smooth arc transfer in the flat and horizontal welding positions.

AWS Classification System

MIG (GMAW), TIG (GTAW) & Metal-Cored (GMAW-C)

Mild & Low Alloy Steel per AWS A5.18/A5.18M: 2005 and AWS A5.28/A5.28M: 2005

Classification Designators per AWS A5.18 & A5.28



Designates an electrode (E) or rod (ER).

Designates the minimum tensile strength in ksi of the weld metal when produced with the test assembly preparation procedure of this specification.

Indicates whether the filler metal is solid (S) or composite (C).

Indicates the chemical composition of a solid electrode or the chemical composition of the weld metal produced by a composite electrode. The use of the "GS" suffix designates filler metals intended for single pass applications only.

Diffusible hydrogen designator (H4, H8, H16) in mL of diffusible hydrogen per 100 grams of weld metal.

Additional Classifications

Aluminum – Per AWS A5.10/A5.10M

ERXXXX The first digit following "E" or "ER" indicates the principle alloying element or elements (4 – Silicon, 5 – Magnesium). If the second digit following "E" or "ER" is different from zero, it denotes a modification to the original alloy. The last two digits are used to identify the specific alloy.

Stainless – Per AWS A5.9/A5.9M

ERXXXLSi The three digits following "E" or "ER" specify the chemical composition of the filler metal with a series of numbers. In some cases, chemical symbols for the letter L (low carbon), Si (high silicon), or H (high carbon) will follow to designate modifications of basic alloy types.

Nickel Alloy – Per AWS A5.14/A5.14M

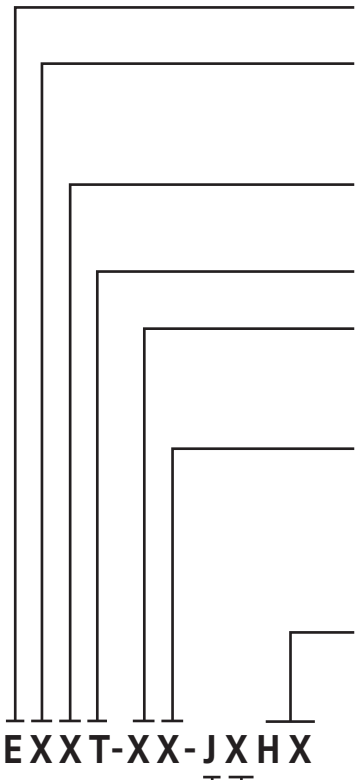
ERXXXX-X The chemical symbol "Ni" appears in the designations immediately after "E" or "ER" to identify the filler metal as a nickel-based alloy. Other symbols such as Cr and Mo in the designation are intended to group the filler metals according to their principal alloying elements. The number at the end of the designation separates one composition from another within a group.

AWS Classification System

Flux-Cored (FCAW)

Mild & Low Alloy Steel per AWS A5.20/A5.20M: 2005 and AWS A5.29/A5.29M: 2005

Classification Designators per AWS A5.20 & A5.29



Designates an electrode.

Designates the minimum tensile strength in MPa or ksi when multiplied by 10 of the weld metal when produced with the test assembly preparation procedure of this specification.

Designates the position in which the electrode is usable: "0" for flat and horizontal positions only, or "1" for all positions.

Designates the electrode as Tubular.

Designates the usability of the electrode with some number from 1 through 14 or the letter "G" (or "GS"). An "S" is used after the "G" to indicate that the electrode is suitable only for single pass welding.

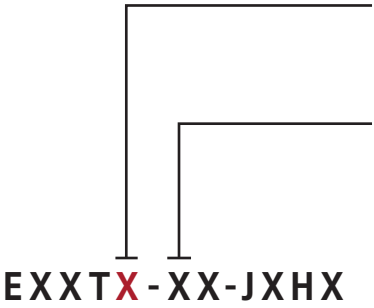
Designates the type of shielding gas used for classification: "C" indicates 100% CO_2. "M" indicates 75-80% Argon/balance CO_2 shielding gas. When no designator appears in this position, it indicates that the electrode being classified is self-shielded and that no external shielding gas was used.

Optional supplemental diffusible hydrogen designator (H4, H8, H16) in mL of diffusible hydrogen per 100 grams of weld metal.

The letter "D" or "Q" in this position indicates that the weld metal meets supplemental mechanical property requirements when welding with low heat input, fast cooling rate procedures or using high heat input, slow cooling rate procedures.

The letter "J" in this position designates that the electrode meets the requirements for improved toughness and will deposit weld metal with Charpy V-Notch properties of up to 27 J (20 ft·lbs) at -40°C (-40°F).

Mild & Low Alloy Steel per AWS A5.20/A5.20M: 2005 and AWS A5.29/A5.29M: 2005



Classification Designators per AWS A5.29 Only

Designates the usability of the electrode with the number 1, 4, 5, 6, 7, 8, or 11. The letter "G" in this position indicates that the polarity and general operating characteristics are not specified.

Two, three or four digits are used to designate the chemical composition of the deposited weld metal. The letter "G" indicates that the chemical composition is not specified.

Additional Classifications

Stainless Steel - Per AWS A5.22/A5.22M

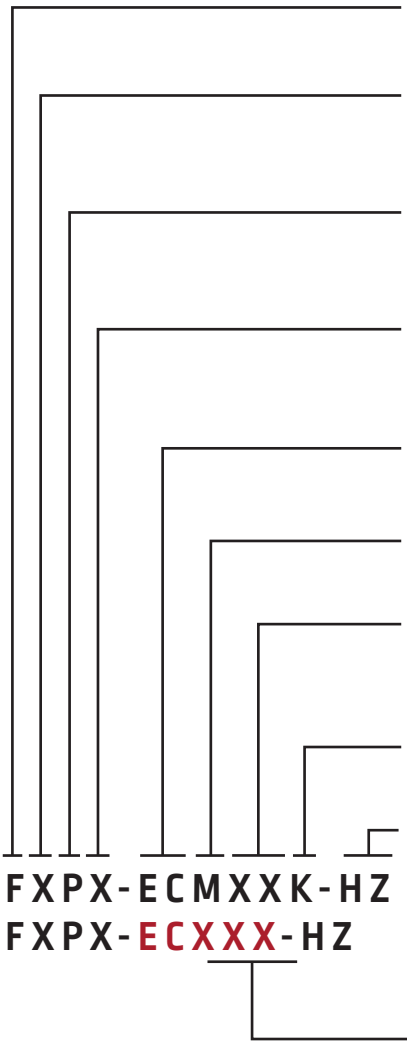
EXXXTX-X The three digits that follow "E" designate the chemical composition of the weld metal. The digit following "T" designates the position in which the electrode is usable: "0" for flat and horizontal positions only, or "1" for all positions.

AWS Classification System

Submerged Arc (SAW) Flux & Electrode

Mild & Low Alloy Steel - Per AWS A5.17/A5.17M: 1997 and AWS A5.23/A5.23M: 2007

Classification Designators per AWS A5.17 & A5.23



Designates a flux. If followed by the letter "S", the flux is a crushed slag or a blend of crushed slag with unused (virgin) flux.

Designates the minimum tensile strength in MPa or ksi when multiplied by 10 of the weld metal deposited with the flux and some classification of electrode.

Designates the condition of heat treatment in which the tests were conducted: "A" is for as-welded and "P" is for post-weld heat treated.

Indicates the temperature in °C or °F at or above which the weld metal meets the requirement for Charpy V-Notch impact toughness of 27J. Two digits are used for test temperatures of -73°C or lower.

The letter "E" at the beginning of each classification stands for electrode. The letter "C" will follow the "E" if it is a composite electrode.

Indicates whether the electrode is L – low manganese, M – medium manganese or H – high manganese.

The classification is based upon low dilution weld metal obtained with a particular flux. The numerical suffix refers to the approximate carbon content in hundredths of one percent.

Indicates that the electrode is made from a heat of silicon-killed steel.

Optional supplemental diffusible hydrogen designator (H4, H8, H16) in mL of diffusible hydrogen per 100 grams of weld metal.

Classification Designators per AWS A5.23 Only

Indicates the chemical composition of a solid electrode or the undiluted weld metal obtained with a composite electrode and particular flux. Usually a combination of letters, numbers and elements (see next page).

Classification Descriptions for AWS A5.17 & A5.23

The electrode classification identifies the chemical composition of the electrode. The following paragraphs highlight the differences between these electrodes and electrode groups and indicate typical applications.

Mild Steel Electrodes

EL8, EL8K, EL12, EM11K, EM12, EM12K, EM13K, EM14K, EM15K, EH10K, EH11K, EH12K and EH14 – Carbon steel electrodes which vary from one another in their carbon, manganese, and silicon contents. EM14K electrodes also contain small additions of titanium, although they are considered carbon steel electrodes.

Low Alloy Electrodes

EA1, EA2, EA3, EA3K, and EA4 (C-Mo Steel) – Similar to the medium manganese and high manganese carbon steel electrodes shown above except that 0.5% molybdenum is added.

EB1, EB2, EB2H, EB3, EB5, EB6, EB6H, EB8, and EB9 (Cr-Mo Steel) – Produce weld metal containing between 0.5% and 10% chromium and between 0.5% and 1% molybdenum.

The letter "R" when added as a suffix to the EB2 or EB3 electrode classification or to the B2 or B3 weld metal designation is an optional supplemental designator indicating that the electrode will meet the reduced residual limits necessary to meet "X" factor requirements for step cooling applications.

Since all Cr-Mo weld deposits will air harden in still air, both preheat and postweld heat treatment (PWHT) are required for most applications.

EB9 is a 9% Cr-1% Mo electrode modified with niobium (columbium) and vanadium designed to provide improved creep strength, and oxidation and corrosion resistance at elevated temperatures.

ENi1, ENi1K, ENi2, and ENi3 (Ni Steel) – Designed to produce weld metal with increased strength without being hardenable or with increased notch toughness at temperatures as low as -73°C or lower. They have been specified with nickel contents which fall into three nominal levels of 1% Ni, 2.5% Ni, and 3.5% Ni.

ENi4, ENi5, EF1, EF2, and EF3 (Ni-Mo Steel) – Contain between 0.5% and 2% nickel and between 0.25% and 0.5% molybdenum.

EF4, EF5, and EF6 (Cr-Ni-Mo Steel) - A combination of Cr, Ni, and Mo develop the strength levels and notch toughness required for a number of high-strength, low-alloy or micro-alloyed structural steels.

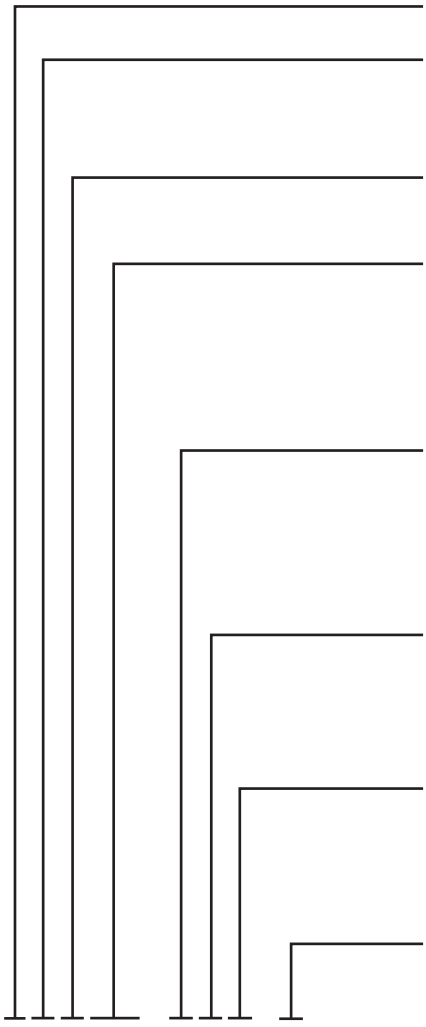
EM2, EM3, and EM4 (High-Strength, Low Alloy Steel) – May contain a combination of Cr, Ni, Mo, Ti, Zr and Al.

EW (Weathering Steel) – Designed to produce weld metal that matches the corrosion resistance and the coloring of the ASTM weathering-type structural steels. These special properties are achieved by the addition of approximately 0.5% copper to the weld metal.

EG (General Low-Alloy Steel) – Indicates that the electrode is of a general classification. It is general because not all of the particular requirements specified for each of the other classifications are specified for this classification.

AWS Classification System

Flux-Cored (FCAW)



Classification Designators per AWS A5.36

Designates an electrode.

Designates the minimum tensile strength in MPa or ksi when multiplied by 10 of the weld metal deposited with the electrode under the welding conditions specified in this specification.

Designates the position in which the electrode is usable: "0" for flat and horizontal positions only, or "1" for all positions.

Designates the usability of the electrode, the letter "T" followed by some number from 1 through 17 or the letter "G." The letter "T" identifies the electrode as a flux-cored electrode or metal-cored electrode. An "S" is used after the "G" to indicate that the electrode is suitable only for single pass welding.

Designates the type of shielding gas, if any, used for classification. The letter "Z" in this position indicates that the shielding gas composition is agreed upon between supplier and purchaser. When no designator appears in this position, it indicates that the electrode is self-shielded and that no external shielding gas is used.

Designates the condition of heat treatment in which the tests were conducted: "A" is for as-welded and "P" is for post-weld heat treated. This designator is omitted when the electrode being classified is intended for single pass welding only.

Indicates the temperature in °C or °F at or above which the weld metal meets the requirement for Charpy V-Notch impact toughness of 27 J (20 ft·lbf). Two digits are used for test temperatures of -73°C or -100°F.

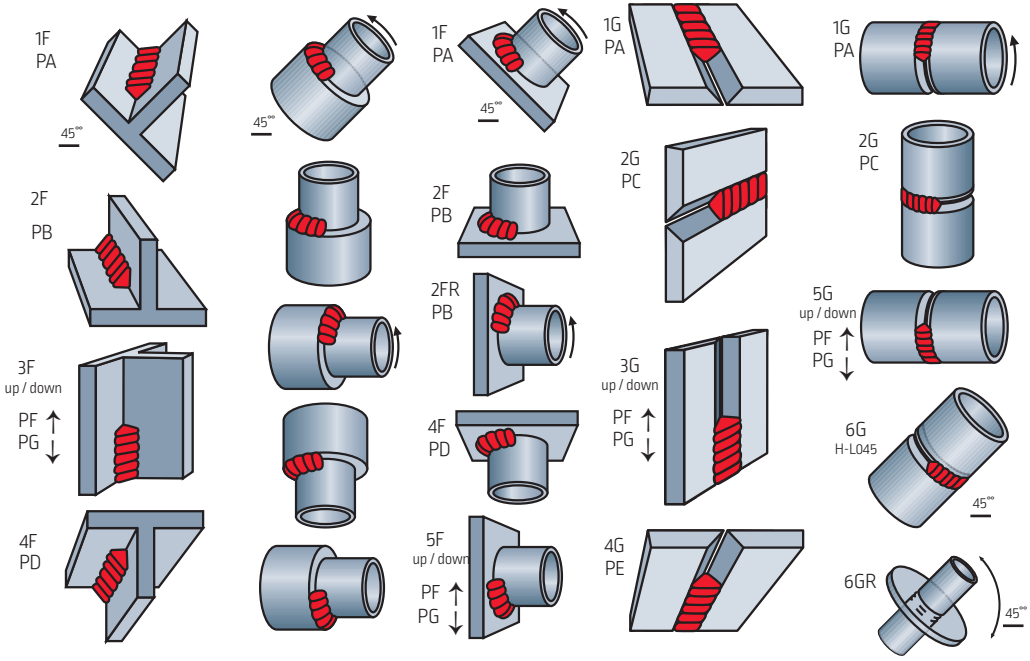
Designates the composition of the deposited weld metal using one, two or three characters. The letter "G" indicates that the chemical composition is not specified. No designator used in this position when the electrode being classified is a single pass electrode.

Optional, supplemental diffusible hydrogen designator.

For flux-cored electrodes, the letter "D" or "Q" when present in this position indicates the weld metal will meet supplemental mechanical property requirements.

Welding Positions

According to ASME & ISO 6947



	Position	Plate	Pipe
Plate-fillet	1F	1F	1F
	2F	1F, 2F	1F, 2F, 2FR
	3F	1F, 2F, 3F	1F, 2F, 2FR
	4F	1F, 2F, 4F	1F, 2F, 2FR, 4F
	3F + 4F	All qualifications	All qualifications
Plate-fillet	1F	1F	1F
	2F	1F, 2F	1F, 2F, 2FR
	2FR		1F, 2FR
	4F	1F, 2F, 4F	1F, 2F, 2FR, 4F
	5F	All qualifications	All qualifications

	Position	Plate	Pipe	Plate	Pipe
Plate-groove	1G	1G	1G	1F	1F
	2G	1G, 2G	1G, 2G	1F, 2F	1F, 2F, 2FR
	3G	1G, 3G		1F, 2F, 3F	1F, 2F, 2FR
	4G	1G, 4G		1F, 2F, 4F	1F, 2F, 2FR, 4F
Pipe-groove	1G	1G	1G	1F	1F
	2G	1G, 2G	1G, 2G	1F, 2F	1F, 2F, 2FR
	5G	1G, 2G, 4G	1G, 2G	1F, 2F, 4F	All qualifications
	6G +6GR	All qualifications	All qualifications	All qualifications	All qualifications
	2G + 5G	All qualifications	All qualifications	All qualifications	All qualifications

Stick Electrode

Mild Steel per AWS A5.1

TYPES OF COATING & CURRENT

Digit	Types of Coating	Current
0	High cellulose sodium	DC+
1	High cellulose potassium	AC, DC±
2	High titania sodium	AC, DC-
3	High titania potassium	AC, DC+
4	Iron powder, titania	AC, DC±
5	Low-hydrogen sodium	DC+
6	Low-hydrogen potassium	AC, DC+
7	High iron oxide, iron powder	AC, DC±
8	Low-hydrogen potassium, iron powder	AC, DC±

Low Alloy Steel per AWS A5.5

TYPES OF COATING

Suffix	%C	%Mn	%Si	%P	%S	%Ni	%Cr	%Mo	%V
A1	0.12	0.60	0.40	0.03	0.03	-	-	0.40 - 0.65	-
B2	0.05 - 0.12	0.90	0.80	0.03	0.03	-	1.00 - 1.50	0.40 - 0.65	-
B3	0.05 - 0.12	0.90	0.80	0.03	0.03	-	2.00 - 2.50	0.90 - 1.20	-
C1	0.12	1.25	0.80	0.03	0.03	2.00 - 2.75	-	-	-
C3	0.12	0.40 - 1.25	0.80	0.03	0.03	0.80 - 1.10	0.15	0.35	0.05
D2	0.15	1.65 - 2.00	0.80	0.03	0.03	0.90	-	0.25 - 0.45	-
G[1]	-	1.00 min	0.80 min	0.03	0.03	0.50 min	0.30 min	0.20 min	0.10 min
P1	0.20	1.20	0.60	0.03	0.03	1.00	0.30	0.50	0.10
P2	0.12	0.90 - 1.70	0.80	0.03	0.03	1.00	0.30	0.50	0.05

[1] Only one of the listed elements is required.

NOTE 1: Joining Electrodes, Non-Charpy V-Notch Rated
These electrodes (see below) and others of the same AWS classification, are not required to deposit weld metal capable of delivering any minimum specified Charpy V-Notch (CVN) properties. They should not be used in applications where minimum specified CVN properties are required. Typical applications where minimum specified CVN properties are required include, but are not restricted to, bridges, pressure vessels, and buildings in seismic zones. The user of this product is responsible for determining whether minimum CVN properties are required for the specific application.

EasyArc™ 6013 EasyArc™ 7014

NOTE 2: Joining Electrodes, Non-Low Hydrogen
These electrodes (see below) and others of the same AWS classification, are not required to deposit weld metal that is low in diffusible hydrogen. Therefore, these electrodes should not be used in applications where the hydrogen content of the weld metal is required to be controlled, such as applications that involve steels with higher carbon and alloy content, and higher strength.

Fleetweld® 5P
Fleetweld® 5P+
Fleetweld® 180
EasyArc™ 6013
Shield-Arc® 85
Shield-Arc® 90
Shield-Arc® HYP+
EasyArc™ 7024
Shield-Arc® 70+
Pipeliner® 6P+
Pipeliner® 7P+
Pipeliner® 8P+

The Lincoln Electric Company manufactures three general types of submerged arc fluxes:
· Active fluxes

· Neutral fluxes

· Alloy fluxes

With all submerged arc fluxes, variations in arc voltage change flux consumption. Higher arc voltages and the resulting longer arc length increase the amount of flux melted or consumed. Consequently, when a flux contains an alloy as an ingredient, increasing the arc voltage increases the amount of alloy recovered in the weld deposit.

Types and General Characteristics

Active Fluxes

American Welding Society (AWS) defines active fluxes as those which contain small amounts of manganese, silicon, or both. These deoxidizers are added to the flux to provide improved resistance to porosity and weld cracking caused by contaminants on or in the base metal.

The primary use for active fluxes is to make single pass welds, especially on oxidized base metal.

Alloy in the weld deposit will vary with changes in the arc voltage. An increase in deposit alloy increases the strength level of the weld metal, but might lower the impact properties. For this reason, voltage must be more tightly controlled for multiple pass welding with active fluxes than when using neutral fluxes. Because of this, Lincoln Electric does not recommend using active fluxes (700 series) for multiple pass welding of plates over 25 mm (1 in) thick.

Neutral Fluxes

AWS defines neutral fluxes as those which will not produce any significant change in the all-weld metal composition as a result of a large change in the arc voltage, and thus, the arc length.

Neutral fluxes are used in multiple pass welding, especially when the base plate exceeds 25 mm (1 in) in thickness. They are also used for general welding on clean steel. Note the following considerations concerning neutral fluxes:

1. Since neutral fluxes contain little or no alloy, they have little resistance to cracking and/or porosity caused by contaminants, especially on single pass welds. For this reason, active fluxes are usually the best choice for single pass welding.
2. Even when a neutral flux is used to maintain the weld metal composition through a range of welding voltage, weld properties, such as strength level and impact properties, can change because of changes in cooling rate, penetration, heat input and number of passes.

Alloy Fluxes

AWS defines alloy fluxes as those which can be used with a plain carbon steel electrode to make an alloy weld deposit. The alloys for the weld deposit are added as ingredients in flux.

The primary use of alloy fluxes is hardfacing applications.

Since the alloy level in the weld deposit is dependent upon the correct arc voltage, and thus arc length, it is very important that the voltage is carefully controlled to ensure that the intended alloy is reached in the deposit.

LOW TEMPERATURE IMPACT PROPERTIES

Name	AWS Classification	Diameter mm
All Position NR®-232	E71T-8	1.7 1.8 2.0
NR®-233	E71T-8	1.6 1.8 2.0

FEMA 353 AND AWS D1.8 COMPLIANT

Name	AWS Classification	Diameter mm
All Position NR®-232	E71T-8	1.7 1.8
NR®-233	E71T-8	1.6 1.8

HIGH DEPOSITION WITH NO LOW TEMPERATURE IMPACT PROPERTIES

Name	AWS Classification	Diameter mm
Flat & Horizontal NR®-311	E70T-7	2.0
NS-3M	E70T-4	2.1

SINGLE PASS ONLY WITH NO LOW TEMPERATURE IMPACT PROPERTIES

Name	AWS Classification	Diameter mm
Flat & Horizontal NR®-152	E71T-14	1.7

PIPE FABRICATION

Name	AWS Classification	Diameter mm
All Position NR®-207	E71T8-K6	2.0 2.4
Pipeliner®		
All Position NR®-207+	E71T-8-K6	2.0

GENERAL FABRICATION WITH NO LOW TEMPERATURE IMPACT PROPERTIES

Name	AWS Classification	Diameter mm
All Position NR®-211-MP	E71T-11	0.8 0.9 1.1 1.7 2.0
NR®-212	E71TG-G	1.1 1.7 2.0

POSITION OF WELDING, POLARITY AND APPLICATION REQUIREMENTS

AWS Classification	Welding Position[1]	Current	Application[2]
E70T-3	H and F	DC+	S
E70T-4	H and F	DC+	M
E70T-6	H and F	DC+	M
E70T-7	H and F	DC-	M
E71T-8	H, F, VU, OH	DC-	M
E70T-10	H and F	DC-	S
E71T-11	H, F, VD, OH	DC-	M
E71T-14	H, F, VD, OH	DC-	S
E71T-G	VU, OH	Not Specified	M

[1] H = Horizontal position
F = Flat position
OH = Overhead position
VU = Vertical-Up position
VD = Vertical-Down position

[2] S = Single pass only
M = Single or Multiple pass

For everything you need to know about welding in seismic zones

To assist structural fabricators, erectors, inspectors and specifying engineers, Lincoln Electric created this D1.8 Resource Center with tools to understand seismic welding guidelines and links to Lincoln Electric consumables tested to meet the AWS D1.8 and FEMA 353. requirements. The development of Lincoln Electric's D1.8 Resource Center is just one more way Lincoln sets the standard for the welding industry, worldwide.

FEMA 353 — AWS D1.8 Structural Welding Code Seismic Supplement

www.lincolnelectric.com/d1.8

Safety Guidelines

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

For Diesel Engines

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

For Gasoline Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

⚠ FOR ENGINE powered equipment. ⚠

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

ELECTRIC SHOCK can kill.

3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground. In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage (Wire) Welder.
- DC Manual (Stick) Welder.
- AC Welder with Reduced Voltage Control.

3.b. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semi-automatic welding gun are also electrically "hot".

3.c. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.d. Ground the work or metal to be welded to a good electrical (earth) ground.

3.e. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.f. Never dip the electrode in water for cooling.

3.g. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.h. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

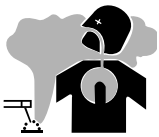
3.i. Also see Items 6.c. and 8.

ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.

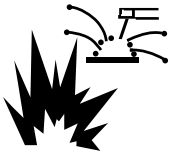
5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to ensure breathing air is safe.

5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.



WELDING and CUTTING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to ensure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned".

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

Conversion Tables

Inches to Millimetre Conversion

INCHES		mm
1/64	0.0156	0.40
3/64	0.0469	1.19
5/64	0.0781	1.98
3/32	0.0938	2.38
7/64	0.1094	2.78
1/8	0.1250	3.18
5/32	0.1563	3.97
3/16	0.1875	4.76
7/32	0.2188	5.56
1/4	0.2500	6.35
9/32	0.2813	7.14
27/64	0.4219	10.72
7/16	0.4375	11.11
1/2	0.5000	12.7
5/8	0.6250	15.88
3/4	0.75	19.05
1	1.00	25.4

Travel and Wire Feed Speed Conversion Table

Inch/min IPM	Metres/ min
110	2.8
120	3.1
130	3.4
140	3.6
150	3.8
160	4.1
170	4.3
180	4.6
190	4.9
200	5.1
225	5.7
250	6.3
275	7.0
300	7.6
325	8.3
350	9.0
375	9.5
400	10.2
425	10.8
450	11.5
475	12.2
500	12.7
525	13.3
550	14.0
575	14.7
600	15.3
625	15.9

Common Abbreviations in Welding

A	Amperage
AC	Alternating current
AS/NZS	Australian & New Zealand Standards
ASME	American Society for Mechanical Engineers
AWS	American Welding Society
BOP	Bead on plate
CE	Carbon Equivalent
CMTR	Certified Material Test Report
CTOD	Crack Tip Opening Displacement
CVN	Charpy Vee Notch
DC	Direct current
DR	Deposition Rate
ESO	Electrical Stick Out
FCAW (G)	Flux Cored Arc Welding, Gas Shielded
FCAW (S)	Flux Cored Arc Welding, Self Shielded
FN	Ferrite Number
GMAW	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
HAZ	Heat affected Zone
HDm	Diffusible hydrogen in deposited metal
HRc	Hardness Rockwell C scale
HV	Hardness Vickers scale
IPM	Inches Per Minute
ISO	International Organisation for Standardisation ITP Interpass Temperature
kJ/mm	kilo joules per millimetre (Heat input)
ksi	kilo pounds per square inch
MCAW	Metal Cored Arc Welding
NACE	National Association of Corrosion Engineers (USA)
NDE	Non Destructive Examination
OCV	Open Circuit Voltage
PF	Process Efficiency
PREn	Pitting Corrosion Resistance Number
PWHT	Post Weld Heat Treatment
SAW	Submerged Arc Welding
SMAW	Manual Metal Arc Welding
SMYS	Specified Minimum Yield Strength
STT®	Surface Tension Transfer
TS or V	Travel Speed
UTS	Ultimate Tensile Strength
V	Voltage
WFS	Wire Feed Speed
WPQR	Welding Procedure Qualification Record
WPS	Welding Procedure Specification