

PROLINE

PROFFESIONAL WELDING SUPPLIES

WWW.PROLINEWELDING.COM

0800 699 353

WELDING CONSUMABLES

Product Catalogue | Australia and New Zealand



ABOUT US

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.

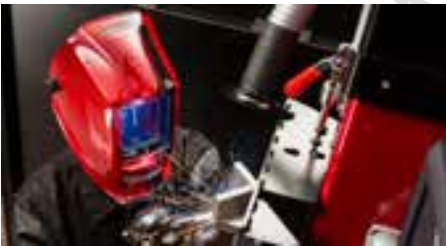
Innovation

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 its 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 and structural fabrication, mining, pipelines, automotive, transportation, LNG, wind power, repair and maintenance and others.

repeatability. Savings of 45% in consumable use. Best in class warranty.



Realweld. Weld. Score. Succeed

Practice Stick, MIG and Flux-Cored arc welding. Receive audio coaching. Weld performance tracking on 5 key parameters. It's like having a teacher right in the booth.



Torchmate Plasma Cutting Solutions

Spend less, get more. Delivers exceptional

Patented hole taper compensation.



PAPR Respiratory Helmet with 4C™ Technology

The VIKING™ PAPR is a complete system that purifies ambient air from the shop and delivers filtered, breathable air for as much as eight hours without interruption. The two-speed blower drives air through the hose to a 3350 helmet rated for a perfect 1/1/1 optical clarity. An adjustable baffling system inside the helmet directs air away from eyes to keep them from getting dry. The PAPR system complies to Australian standard AS/NZS 1338-1 and AS/NZS 1716:2012 class P2.



NEW DESIGN

Viking™ – 3350 Series with 4C™ Technology

Defining a new gold standard in welding helmets the VIKING 3350, our top-of-the-line helmet series, provides the best optical clarity available in a welding helmet today and the largest viewing area in its class. New Steampunk graphic available in 2018.



PythonX Beam Processing Solution

PythonX versatility breaks the bottleneck. Fast and efficient. No programming required.

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Conversion Tables

Common Abbreviations in Welding

Lincoln Electric Companies

Catalogue User Guide

1 STICK ELECTRODES

2 Conarc® 49C

3 Key Features

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

4 Typical Applications

- Suitable for many 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

Lloyds Register: 3Y H5

5 Welding Positions



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Diameter / Packaging

8	Diameter mm	Length mm	Part Number	Packaging
	2.5	350	511420	SRP Carton Weight 14.0kg
	3.2	350	511437	SRP Carton Weight 16.0kg
	4.0	350	511505	SRP Carton Weight 12.8kg

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

9		Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -45°C
	Requirements - AWS	400 min	490 min	22 min	27
	Requirements - AS/NZS	400 min	490 min	20 min	27
	Typical Results - As Welded	480	580	28	100

Deposit Composition

10		%C	%Mn	%Si	%P	%S	
	Typical Results - As Welded	0.06	1.40	0.30	0.015	0.010	Diffusible Hydrogen 2 ml/100g

Typical Operation Procedures

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

THE LINCOLN ELECTRIC COMPANY – WELDING CONSUMABLES
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Catalogue User Guide

1 **Product Category within Section**

Each consumable section of the catalogue has subcategories to further define each product.

2 **Brand Name**

The name of each product appears in the top left or right corner of each page.

3 **Key Features**

Top features of each product.

4 **Typical Applications**

List of where the product is typically used.

5 **Welding Positions**

Flat and Horizontal or All Position capability.

6 **Shielding Gas**

Required gas needed for welding

7 **Conformances**

Specifications and conformances to which the product is tested.

8 **Diameters and Packaging Chart**

Diameters and packaging available for each product.

9 **Mechanical Properties**

Details the AWS and/or AS/NZS mechanical property requirements and typical test results for each products' weld deposit.

10 **Chemical Composition**

Details the AWS chemical composition content requirements and typical wire composition or deposit composition results.

11 **Typical Operating Procedures**

Recommended operating ranges and resulting deposition rates for each product diameter.

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.

Lincoln Electric's Quality System is derived from controlled chemical composition of steel.

The 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).

QLot Certifications

	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			■

EN Certifications

EN 10204 Inspection Documents	Testing Levels per AWS A5.01 Filler Metal Procurement Guidelines	Examples of Lincoln Electric Options
<u>Type 2.1</u> States "Products are in compliance with requirements of the order (WITHOUT any test results).	<u>Schedule F</u> 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*.
<u>Type 2.2</u> States "Products are in compliance with requirements of the order (includes non-specific test results – NOT ACTUALS from the lot in question).	<u>Schedule G</u> 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*.
<u>Type 3.1</u> States "Products are in compliance with requirements of the order and includes ACTUAL test results for some requirements, but not all.	<u>Schedule H</u> 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.
	<u>Schedule I</u> 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.
	<u>Schedule J</u> 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.
	<u>Schedule K</u> 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	
Coating Type	
Cellulose	
Fleetweld® 5P	14
Fleetweld® 5P+	15
Rutile	
Easyarc™ 6012	16
Easyarc™ 6013	17
Iron Powder	
Easyarc™ 7014	18
Easyarc™ 7024	19
Low Hydrogen	
Easyarc™ 7016	20
Conarc® 51	21
Conarc® 52	22
Low Hydrogen / Iron Powder	
Conarc® 49C	23
Excalibur® 7018-1 MR	24
Easyarc™ 7018	25
Easyarc™ 7018-1	26
Low Hydrogen / Low Alloy	
Excalibur® 8018-C3 MR	27
Conarc® 70-G	28

Low Hydrogen / High Strength	
Conarc® 80	29
Conarc® 85	30
Creep Resistant	
SL 19G	31
SL 20G	32
Low Temperature	
Kryo® 1	33
Kryo® 1P	34
Kryo® 3	35
Excalibur® 8018-C1 MR	36
Stainless Steel	
Primalloy™ 308L	37
Primalloy™ 316L	38
Primalloy™ 309L Mo	39
Primalloy™ 312	40
Cast Irons	
RepTec Cast 1	41
RepTec Cast 31	42

Fleetweld® 5P

Key Features

- Deep arc penetration
- Light slag with minimal arc interference
- Excellent vertical and overhead capability
- No deliberate addition of Boron

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/NZS4855-B: E4310A

Lloyds Register: 3M

Welding Positions



Diameter / Packaging

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

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	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	≤ 0.05	≤ 0.05	≤ 0.03	≤ 0.01	

Typical Operation Procedures

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

Fleetweld® 5P+

Key Features

- Standard in the pipe welding industry
- Reliable high ductility root welds
- High operator appeal and control
- No deliberate addition of Boron

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

Lloyds Register: 3M

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.4	300	ED032564	Easy Open Can - Weight 22.7kg
2.4	300	ED010283	
3.2	350	ED010278	
4.0	350	ED010285	
4.8	350	ED010281	

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	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 Operation Procedures

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

Easyarc™ 6012

Key Features

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

Conformances

AWSA5.1/A5.1M: E6012 / E4312

AS/NZS 4855-B: E4312A

Lloyds Register: Grade 2

Typical Applications

- Ideal for sheet metal lap and fillet welds
- Suited to many general fabrication applications
- Recommended for vertical down welding
- Great choice for welding galvanized and coated steels

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	60122550	Outer Carton Weight 13.5kg
3.2	350	60123250	Outer Carton Weight 15kg
4.0	350	60124050	Outer Carton Weight 15kg

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	Not specified
Requirements - AS/NZS	330 min	430 min	16 min	Not specified
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 Operation Procedures

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

Easyarc™ 6013

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

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	60132550	Outer Carton Weight 13.5kg
3.2	350	60133250	Outer Carton Weight 15kg
4.0	350	60134050	Outer Carton Weight 15kg

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	Not specified
Requirements - AS/NZS	330 min	430 min	16 min	Not specified
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 Operation Procedures

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

Easyarc™ 7014

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

Conformances

AWS A5.1/A5.1M: E7014 / E4914

AS/NZS 4855-B: E4914A

Typical Applications

- Suited for many general fabrication applications
- Great restart capability makes it an ideal choice for tack welding applications
- Good choice for welding galvanized steels

Welding Positions



Diameter / Packaging

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

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	Not specified
Requirements - AS/NZS	400 min	490 min	16 min	Not specified
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 Operation Procedures

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

Easyarc™ 7024

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

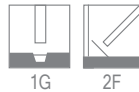
AWS A5.1/A5.1M: E7024 /E4924

AS/NZS 4855-B: E4924A

ABS/DNV: Grade 3

LR: Grade 2

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	70243250	Outer Carton Weight 13.5kg
4.0	350	70244050	Outer Carton Weight 15kg
5.0	350	70245050	Outer Carton Weight 15kg

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	Not specified
Requirements - AS/NZS	400 min	490 min	16 min	Not specified
Typical Results - As Welded	460	525	30	55

Deposit Composition

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

Typical Operation Procedures

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

Easyarc™ 7016

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

Conformances

AWS A5.1/A5.1M: E7016 / E4916

AS/NZS 4855-B: E4916A

Typical Applications

- Suitable for many mild and low alloy steels
- Used for general construction welding applications such as bridges, buildings and pressure vessels
- Recommended for root pass applications

Welding Positions



Diameter / Packaging

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

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	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 Operation Procedures

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

Conarc® 51

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 many 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 and gas

Conformances

AWS A5.1/A5.1M: E7016-1H4R / E4916-1H4R
AS/NZS 4855-B: E4916-1A H5
Lloyds Register: 3Y H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	511567	SRP Carton Weight 14.0kg
3.2	350	511581	SRP Carton Weight 14.4kg

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

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -45°C
Requirements - AWS	400 min	490 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	Diffusible Hydrogen
Typical Results - As Welded	0.06	1.40	0.5	0.020	0.015	3 mls / 100 g

Typical Operation Procedures

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

Conarc® 52

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

Conformances

AWS A5.1/A5.1M: E7016 H4R / E4916 H4R

AS/NZS 4855-B: E4916A H5

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

Welding Positions



Diameter / Packaging

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

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	27
Typical Results - As Welded	480	590	28	180

Deposit Composition

	%C	%Mn	%Si	%P	%S	Diffusible Hydrogen
Typical Results - As Welded	0.06	1.20	0.4	0.015	0.010	2 mls / 100 g

Typical Operation Procedures

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

Conarc® 49C

Key Features

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

Typical Applications

- Suitable for many 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: E7018-1H4R/E4918-1H4R

AS/NZS 4855-B: E4918-1A H5

Lloyds Register: 3Y H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	511420	SRP Carton Weight 14.0kg
3.2	350	511437	SRP Carton Weight 16.0kg
4.0	350	511505	SRP Carton Weight 12.8kg

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

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -45°C
Requirements - AWS	400 min	490 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	27
Typical Results - As Welded	480	580	28	100

Deposit Composition

	%C	%Mn	%Si	%P	%S	Diffusible Hydrogen
Typical Results - As Welded	0.06	1.40	0.30	0.015	0.010	2 mls / 100 g

Typical Operation Procedures

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

Excalibur® 7018-1MR

Key Features

- Premium arc performance
- Moisture resistant basiccoating
- Q2 Lot certified showing chemistry and mechanical properties availableonline
- Easy strike andrestrike, square coating burn-off

Conformances

AWSA5.1/A5.1M: E7018-1 H4R/ E4918-1 H4R

AS/NZS4855-B: E4918-1A H5

Lloyds Register: 3YM H5

ABS: 3YH5

Typical Applications

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

Welding Positions



Diameter / Packaging

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

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

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -45°C
Requirements - AWS	400 min	490 min	22 min	27
Requirements - AS/NZS	400 min	490 min	20 min	27
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 g

Typical Operation Procedures

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

Easyarc™ 7018

Key Features

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

Typical Applications

- Suitable for many 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

AWSA5.1/A5.1M: E7018/E4918

AS/NZS4855-B: E4918A

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	70182550	Outer Carton Weight 13.5kg
3.2	350	70183250	
4.0	350	70184050	

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	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 Operation Procedures

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

Easyarc™ 7018-1

Key Features

- Smooth running low hydrogen stick electrode
- Superb weld profiles in all positions
- Reliable impact properties to -45°C
- Vacuum Sealed Packaging

Conformances

AWSA5.1/A5.1M: E7018-1 / E4918-1

AS/NZS4855-B: E4918-1A

Lloyds Register: Pending

Typical Applications

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

Welding Positions



Diameter / Packaging

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

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

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -45°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

Typical Operation Procedures

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

Excaltur® 8018-C3 MR

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 UH5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.4	350	ED033213	Easy Open Can Weight 22.7kg
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 g

Typical Operation Procedures

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

Conarc® 70-G

Key Features

- Basic all positional high strength stick electrode
- Moisture resistant extremely basic coating
- 115-120% recovery
- Supplied 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

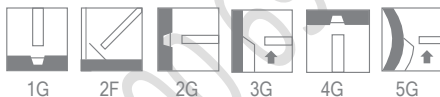
Conformances

AWSA5.5/A5.5M: E9018-G-H4R / E6218-G H4R

AS/NZS4857-B-B: E6218-G H5

DNV: 4Y 50 H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	523706	SRP Carton Weight 15kg
3.2	350	523737	SRP Carton Weight 16kg
4.0	350	523713	SRP Carton Weight 12kg

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

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -45°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 g

Typical Operation Procedures

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

Conarc® 80**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**AWSA5.5/A5.5M:** E11018MH4 / E7618MH4**AS/NZS4857-B:** E7618-G A UH5**LR:** 4Y 69 H5**Welding Positions****Diameter / Packaging**

Diameter mm	Length mm	Part Number	Packaging
3.2	350	523808	SRP Carton Weight 14.4kg
4.0	350	523815	SRP Carton Weight 12.0kg

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	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 g

Typical Operation Procedures

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

Conarc® 85

Key Features

- Basic all positional high strength electrode
- Impact properties down to -50°C
- 115-120% recovery
- Supplied 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

Conformances

AWS A5.5/A5.5M: E12018-G H4R / E8318-G H4R

AS/NZS 4857-B: E8318-G A UH5

DNV: 4Y 69 H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	523881	SRP Carton Weight 15.2kg
4.0	350	523898	SRP Carton Weight 12.0kg

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	2.0	0.4	0.4	<0.08	2 mls / 100 g

Typical Operation Procedures

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

SL19G

Key Features

- Basic all positional creep resistant electrode
- DC- polarity is preferred
- Supplied 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

AWSA5.5/A5.5M: E8018-B2 H4 / E5518-B2 H4
AS/NZS4856-B: E5518-1CM H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	524062	SRP Carton Weight 14kg
3.2	350	524109	SRP Carton Weight 16kg
4.0	350	524093	SRP Carton Weight 12kg

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 1 hour				

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 g

Typical Operation Procedures

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

SL 20G

Key Features

- Basic all positional creep resistant electrode
- DC- polarity is preferred
- Supplied 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

AWSA5.5/A5.5M: E9018-B3 H4 / E6218-B3 H4
AS/NZS4856-B: E6218-2CM H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	524154	SRP Carton Weight 14kg
3.2	350	524192	SRP Carton Weight 16kg
4.0	350	524185	SRP Carton Weight 12kg

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. 700C for 1 hour				

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 ml / 100 g

Typical Operation Procedures

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

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-GH4R
AS/NZS 4855-B: E4918-G H5
ABS: 3Y
LR: 5Y40H5

Welding Positions**Diameter / Packaging**

Diameter mm	Length mm	Part Number	Packaging
2.5	350	524383	SRP Carton Weight 14.0kg
3.2	350	524390	SRP Carton Weight 15.2kg
4.0	350	524468	SRP Carton Weight 12.0kg

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 g

Typical Operation Procedures

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

Kryo® 1P

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
- Supplied in Sahara Ready Pack (SRP)

Conformances

AWSA5.5/A5.5M: E8018-G H4R / E5518-G H4R

AS/NZS4855-B: E5518-G H5

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

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	519211	SRP Carton Weight 14.0kg
3.2	350	519181	SRP Carton Weight 15.2kg
4.0	350	519198	SRP Carton Weight 12.0kg

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 g

Typical Operation Procedures

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

Key Features

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

Typical Applications

- Low temperature steels such as A333 Gr6, A350 Gr LF2
- Suitable for welding weather steel grades

Conformances

AWSA5.5/A5.5M: E8018-C1H4/E5518-C1H4

AS/NZS4855-B: E5518-N5 H5

LR: 5Y40H

Welding Positions**Diameter / Packaging**

Diameter mm	Length mm	Part Number	Packaging
2.5	350	524536	SRP Carton Weight 14.0kg
3.2	350	524604	SRP Carton Weight 15.2kg
4.0	350	524574	SRP Carton Weight 12.0kg

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	27
Requirements - AS/NZS	460 min	560 min	17 min	27
Typical Results - As Welded	520	600	26	60
Stress Relieved @ 600C / 1hr	500	590	29	90

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 g

Typical Operation Procedures

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

Excalibur® 8018-C1 MR

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

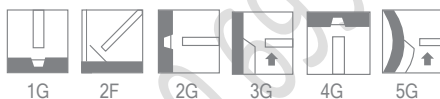
Typical Applications

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

Conformances

AWS A5.5/A5.5M: E8018-C1 H4R / E5518-C1 H4R
AS/NZS 4855-B: E5518-N5 H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.4	350	ED030876	Easy Open Can Weight 22.7kg
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	27
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 g

Typical Operation Procedures

Current (amps)		
Polarity	2.5mm	3.2mm
AC / DC±	70-120	90-160

Primalloy™ 308L

Key Features

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

Typical Applications

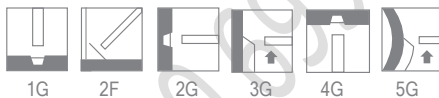
- High resistance to intergranular corrosion
- Designed for joining 304 and 304L stainless steels
- Broad range of applications including Processing, Transportation and Petrochemical Industries

Conformances

AWSA5.4: E308L-16

AS/NZS4854-B: E308L-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	3082525	PE Tube Weight 10.4kg
3.2	350	3083225	PE Tube Weight 12.8kg
4.0	350	3084025	PE Tube Weight 12.8kg

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 - As Welded	-	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	0.02	

Typical Operation Procedures

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

Primalloy™ 316L

Key Features

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

Typical Applications

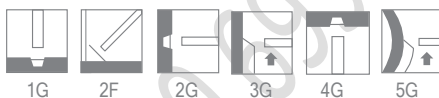
- Suitable for application requiring high resistance to pitting corrosion
- Designed for joining 316 and 316L stainless steels
- Applications in marine, food and beverage, storage, transportation, and architectural stainless

Conformances

AWS A5.4: E316L-16

AS/NZS 4854-B: E316L-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	3162525	PE Tube Weight 10.4kg
3.2	350	3163225	PE Tube Weight 12.8kg
4.0	350	3164025	PE Tube Weight 12.8kg

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 Operation Procedures

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

Primalloy™ 309LMo

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

Conformances

AWSA5.4: E309LMo-16

AS/NZS4854-B: E309LMo-16

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	3092525	PE Tube Weight 10.4kg
3.2	350	3093225	PE Tube Weight 12.8kg
4.0	350	3094025	PE Tube Weight 12.8kg

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	2.1	0.017	

Typical Operation Procedures

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

Primalloy™ 312

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 dissimilar 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	Part Number	Packaging
2.5	350	3122525	PE Tube Weight 10.4kg
3.2	350	3123225	PE Tube Weight 12.8kg
4.0	350	3124025	PE Tube Weight 12.8kg

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 Operation Procedures

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

RepTecCast1

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

AWSA5.15: ENi-CI

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	400892	PE Tube Weight 2.5kg

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 Operation Procedures

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

RepTec Cast 31

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

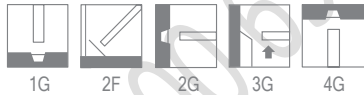
- Suitable for welding SG, nodular and malleable cast irons
- Ideal for welding cast iron to cast steels, can also be considered for welding some grades of austenitic irons (e.g. NiResist)

Conformances

AWSA5.15:

ENiFe-CI

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	400922	PE Tube Weight 2.5kg
4.0	350	400939	PE Tube Weight 2.5kg

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 Operation Procedures

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





MIG and TIG	
MIG Wire	
MIG Wire - Carbon Steel	
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Ultramag® S46

Key Features

- Medium levels of manganese and silicon deoxidizers tolerate medium to heavy mill scale surfaces
- Suitable for argon based gases or 100% CO₂
- 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

Conformances

AWS A5.18/A5.18M: ER70S-4

AS/NZS 14341-B: G49A 3UM/C S4

Typical Applications

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

Welding Positions



Shielding Gas

- C1 : 100% CO₂
- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging

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

Mechanical Properties - As required per AWS A5.18

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

Wire Composition

	%C	%Mn	%Si	%S	%P	%Cu (Total)
Requirements - AWS ER70S-4	0.06-0.15	1.00-1.50	0.65-0.85	0.035 max	0.025 max	0.50 max
Typical Results	0.09	1.44	0.75	0.013	0.010	0.13

Ultramag® S4**Typical Operating Procedures**

Diameter, Polarity Shielding Gas	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps
0.9mm DC+				
Short Circuit Transfer C1	10-12	100	18	80
		150	19	120
		250	22	175
Spray Transfer M21	12-19	375	23	195
		500	29	230
		600	30	275
1.2mm DC+				
Short Circuit Transfer C1	12-19	125	19	145
		150	20	165
		200	21	200
Spray Transfer M21	12-19	350	27	285
		475	30	335

Ultramag® S5

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/CS6

Welding Positions



Shielding Gas

- C1 : 100% CO₂
- M21 : 75-85% Argon / 15-25 CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging

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

Ultramag® S6

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 As Welded with M21 gas	400 min	485 min	22 min	27
Typical Results As Welded with M21 gas	450	560	28	83

Wire Composition

	%C	%Mn	%Si	%S	%P	%Cu (Total)
Requirements - AWS ER70S-6	0.06-0.15	1.40-1.85	0.80-1.15	0.035 max	0.025 max	0.50 max
Typical Results	0.095	1.50	0.85	0.013	0.009	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 C1	9-12	100	18	80
		150	19	120
		250	22	175
Spray Transfer M21	12-19	375	23	195
		500	29	230
		600	30	275
1.2mm DC+				
Short Circuit Transfer C1	12-19	125	19	145
		150	20	165
		200	21	200
Spray Transfer M21	12-19	350	27	285
		475	30	335
		500	30	340
1.6mmDC+				
Short Circuit Transfer C1	12-25	210	27	325
		235	28	350
		290	29	430

LNM28

Key Features

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

Typical Applications

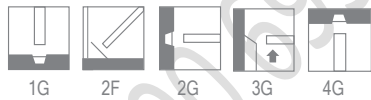
- Suitable for transport industry and general fabrication
- Ideal for weather resistant steels - i.e. COR-TEN

Conformances

AWS A5.28/A5.28M: ER80S-G

AS/NZS14341-B: G55A4M21SZ

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- C•1 : Active Gas 100% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
1.0	E10K016PCX01	Basket B300 ¹ 16kg	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-G As Welded with M21 gas	470 min	550 min	24	27
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

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

Conformances

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

AS/NZS 14341-B: G55A 5 M21 SN2

Typical Applications

- Suitable for offshore, oil and gas industries
- Complies with NACE 1% Ni limits
- Up to API 5LX X65 grade pipe steels
- Weather resistant steels - i.e. COR-TEN

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
1.0	582468	Basket B300 ¹ 15kg	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 @ -45°C
Requirements - AWS ER80S-Ni1 As Welded with M21 gas	470 min	550 min	24	27
Typical Results	480	580	30	60 @ -60°C

Wire Composition

	%C	%Mn	%Si	%Ni
Typical Results	0.08	1.2	0.6	0.9

LincolnWeld LA-100

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, ER110S-G

AS/NZS 16834-B: G69A5 M13 N3M2

Welding Positions



Shielding Gas

- M13 : 95-98% Argon / 2-5% O₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	ED031417	Basket B300 ¹ 15kg	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 @ -50°C
Requirements - AWS ER100S-G, ER110S-G, As Welded with M13 gas	N/S	690 / 760	Not specified	Not specified
Typical Results	730	780	20	70

Wire Composition

	%C	%Mn	%Si	%Ni	%Mo	%Cr	%V	%Cu
Typical Results	0.06	1.7	0.48	1.90	0.44	0.05	>0.01	0.12

Merit JM-110

Key Features

- Capable of welding steels with a minimum yield strength of 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: ER110S-G

AS/NZS 16834-B: G76A 4 N3M2

Welding Positions



Shielding Gas

- M13 : 95-98% Argon / 2-5% O₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	CTJIM110120S015W01	Spool S300 15kg	125-400	19-28	145-350	15-20

Mechanical Properties - As required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -40°C
Requirements - AWS, ER110S-G As Welded with M13 gas	Not specified	760	Not specified	Not specified
Typical Results	740	800	22	82

Wire Composition

	%C	%Mn	%Si	%Ni	%Mo	%Cr	%V	%Cu
Typical Results	0.09	1.62	0.53	1.57	0.34	0.29	>0.01	0.12

Lincoln® MIG308LSi

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 wire designed to weld Cr-Ni austenitic stainless steels
- Precision layer wound wire assists feeding and resists wire tangles

Conformances

AWS A5.9/A5.9M: ER308LSi

AS/NZS ISO 14343-B: SS308LSi

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

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O₂
- M12 : 95-98% Argon / 2-5% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
0.8	331088	Spool S300 15kg	120-600	18-22	50-150	10-15
0.9	331089	Spool S300 15kg	120-475	19-23	60-210	10-15
1.2	331082	Spool S300 15kg	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	Not specified	Not specified	Not specified	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	20.0	10.0	0.2

Lincoln® MIG 316LSi

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 wire designed to weld Cr-Ni-Mo austenitic stainless steels
- Precision layer wound wire assists feeding and resists wire tangles

Conformances

AWSA5.9/A5.9M: ER316LSi

AS/NZS ISO 14343-B: SS316LSi

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

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O₂
- M12 : 95-98% Argon / 2-5% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
0.9	331069	Spool S300 15kg	120-475	18-22	60-160	10-15
1.2	331062	Spool S300 15kg	125-360	19-23	100-185	10-15
1.6	331066	Spool S300 15kg	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	Not specified	Not specified	Not specified	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

Key Features

- High silicon level for increased puddle fluidity, better bead shape and edge wetting
- Versatile wire 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

AWSA5.9/A5.9M: ER307*

AS/NZS ISO 14343-B: SS307*

*nearest classification

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O₂
- M12 : 95-98% Argon / 2-5% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	331072	Spool S300 15kg	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	Not specified	Not specified	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® MIG309LSi

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 % O₂
- M12 : 95-98% Argon / 2-5% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

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

Mechanical Properties - As required per AWS A5.9

	Yield Strength MPa	Tensile Strength MPa	Elongation %	FN WRC
Requirements - AWS ER309LSi	Not specified	Not specified	Not specified	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

Key Features

- Premium 2209 solid wire for welding duplex stainless steels
- High resistance to general corrosion, pitting and stress corrosion cracking
- Precision layer wound wire assists feeding and resists wire tangles

Conformances

AWSA5.9/A5.9M: ER2209

AS/NZS ISO 14343-B: SS2209

Typical Applications

- Suitable for welding 2205 type duplex stainless steels
- Also suitable for welding 2205 stainless to carbon steels
- UNS S31803, S31500

Welding Positions



Shielding Gas

- M13 : 97-99% Argon / 1-3 % O₂
- M12 : 95-98% Argon / 2-5% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	331042	Spool S300 15kg	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-AWSER2209	Not specified	Not specified	Not specified	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

Silicon Bronze

Key Features

- Suitable for a wide range of dissimilar welding applications including overlaying carbon steels and cast irons

Typical Applications

- Welding of galvanized sheet steel
- Depositing corrosion resistant layers on carbon steel plate

Conformances

AWS A5.7: ERCuSi-A

Welding Positions



Shielding Gas

- Ar, He or Ar-He
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
0.9	94004703	Plastic Spool 13.6kg	125-360	19-25	90-200	15-20

Mechanical Properties - As required per AWS ERCuSi-A

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness Hv
Typical Results	330	105	34	85

Wire Composition

	%C	%Mn	%Si	%Sn	%Fe	%Pb
Typical Results	96	0.9	3.0	0.1	0.04	0.002

SuperGlaze® 4043

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 performance

Typical Applications

- Heat treatable base alloys
- Casting alloys
- Automotive components

Conformances

AWS A5.10/A5.10M: ER4043

AS/NZS ISO 18273-B: SAl4043

Welding Positions



Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow Rate 15-25 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Current amps	CTWD mm
1.2	ED028397	Spool S300 7.26kg	250-450	23-27	130-180	15-20
1.6	ED028398	Spool S300 7.26kg	120-300	24-28	150-240	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	Not specified	Not specified	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

Key Features

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

Conformances

AWS A5.10/A5.10M: ER5356

AS/NZS ISO 18273-B: SAI5356

Lloyds Register: WB/I-1 S

DNV: 5356

Typical Applications

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

Welding Positions



Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow Rate 15-25 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Approx. Current amps	CTWD mm
0.9	ED028385	Spool S300 7.26kg	500-700	17-23	80-160	10-15
	ED030312	Spool 0.45kg				
1.0	ED028386	Spool S300 7.26kg	400-600	18-24	90-170	10-15
	ED030313	Spool 0.45kg				
1.2	ED028387	Spool S300 7.26kg	300-500	23-27	130-180	15-20
	ED030314	Spool 0.45kg				
1.6	ED028388	Spool S300 7.26kg	120-300	24-28	150--240	15-20

Mechanical Properties - As required per AWS A5.10

	Yield Strength MPa	Tensile Strength MPa	Elongation %
Requirements - AWS ER5356	Not specified	Not specified	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

Key Features

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

Conformances

AWS A5.10/A5.10M: ER5183

AS/NZS ISO 18273-B: S Al 5183

Lloyds Register: WC/I-15

Typical Applications

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

Welding Positions



Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow rate 15-25 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS ipm	Voltage volts	Approx. Current amps	CTWD mm
0.9	EDS028435	Spool S300 7.26kg	500-700	23-27	100-160	10-15
1.2	ED034191	Spool S300 7.26kg	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 ER5183	Not specified	Not specified	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		

Lincoln® ER70S-2

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

Conformances

AWS A5.18/A5.18M: ER70S-2

AS/NZS 1167.2: R2

Typical Applications

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

Welding Positions



Shielding Gas

- I1 : 100% Argon
- Flow rate 10-15 L/min

Diameter / Packaging / Settings

Diameter mm	Length mm	Part Number	Packaging
2.4	915	ED033953	PE Tube 4.5kg
3.2	915	ED033954	PE Tube 4.5kg

Mechanical Properties - As required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C
Requirements - AWS ER70S-2	400	480	22 min	27 min
Typical Results - As Welded with I1 gas	530	610	27	80

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

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/NZS1167.2: R3

Welding Positions



Shielding Gas

- I1 : 100% Argon
- Flow rate 10-15 L/min

Diameter / Packaging / Settings

Diameter mm	Length mm	Part Number	Packaging
2.4	1000	T24T005R1S00	PE Tube 2kg (Master Carton 4kg)

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	27 min
Typical Results - As Welded with I1 gas	450	560	28	170

Wire Composition

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

Lincoln® TIG S-6

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



Shielding Gas

- I1 : 100% Argon
- Flow rate 10-15 L/min

Diameter / Packaging / Settings

Diameter mm	Length mm	Part Number	Packaging
1.6	1000	604116	Tube Cardboard 5kg
2.4	1000	604124	Tube Cardboard 5kg

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	27 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 Ni1

Key Features

- Solid TIGrod for welding low alloy steels
- High impact value at low temperatures -60°C
- Resealable PE Tube
- Ni content is controlled to meet “sour service” oilfield requirements such as NACE MR0175

Typical Applications

- Offshore Oil & Gas
- Small diameter pipe and tubing

Conformances

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

Welding Positions



Shielding Gas

- I1 : 100% Argon
- Flow rate 10-15 L/min

Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
1.6	1000	605099	PE Tube 2kg (Master Carton 4kg)
2.4	1000	605136	PE Tube 2kg (Master Carton 4kg)

Mechanical Properties - As required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @
Requirements - AWS ER80S-Ni1	470	550	24	27 @ -45°C
Typical Results -As Welded with I1 gas	480	580	30	60 @ -60°C

Wire Composition

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

Lincoln® TIG308LSi

Key Features

- Solid stainless TIG rod
- High silicon for improved wetting
- Very low carbon to minimise 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

AWSA5.9: ER308LSi

AS/NZS1167.2: R308LSi

Welding Positions



Shielding Gas

- I1 : 100% Argon
- Flow rate 10-15 L/min

Diameter / Packaging

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

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	390	590	35	90

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® TIG316LSi

Key Features

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

Conformances

AWSA5.9: ER316LSi
AS/NZS1167.2: R316LSi

Typical Applications

- Excellent for marine applications
- Good for root and fill applications in pipes
- Suitable for oil, gas, food and beverage industries
- Recommended where increased resistance to pitting corrosion is required

Welding Positions



Shielding Gas

- I1 : 100% Argon
- Flow rate 10-15 L/min

Diameter / Packaging

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

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® TIG309LSi

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

AWSA5.9: ER309LSi
AS/NZS1167.2: R309LSi

Welding Positions



Shielding Gas

- I1 : 100% Argon
- Flow rate 10-15 L/min

Diameter / Packaging

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

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® TIG4462

Key Features

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

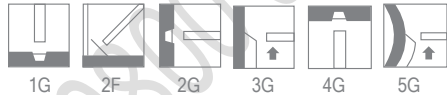
Typical Applications

- 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

AWSA5.9: ER2209
AS/NZS 1167.2: R2209

Welding Positions



Shielding Gas

- I1 : 100% Argon
- Flow rate 10-15 L/min

Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
1.6	1000	365241	PE Tube 2kg
2.4	1000	365242	PE Tube 2kg

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	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

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

Conformances

AWSA5.10: ER4043
AS/NZS 18273-B: SAL4043

Typical Applications

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

Welding Positions



Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow rate 10-15 L/min

Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.4	915	ED031112	Carton 4.5kg

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

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

AWSA5.10: ER5356
AS/NZS 18273-B: SAL5356

Welding Positions



Shielding Gas

- I1 : 100% Argon
- I3 : Argon / Helium mixtures
- Flow rate 10-15 L/min

Diameter / Packaging

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

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



FLUX CORED**Gas Shielded Wire****Mild Steel**

Outershiield® 71E-H	76
Outershiield® 71-CX	77
Outershiield® 71T1	78
Primacore® LW-71	79
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Outershield® 71E-H

Key Features

- Class leading welding performance
- Excellent mechanical properties with very low hydrogen levels H4/H5
- All positional rutile wire designed for welding with mixed gases and 100% CO₂ shielding gas
- Vacuum sealed aluminium foil bag packaging, precision layer wound wire

Conformances

AWS A5.20/A5.20M: E71T-1M / E71T-9MJ* H4
E71T-1C H4

*Applies to 1.2mm size only

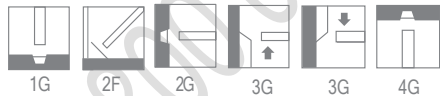
AS/NZS ISO 17632-B: T493 T1-1 MAK UH5
T430 T1-1 CAK UH5

	<u>M21</u>	<u>C1</u>
Lloyds Register	3YSH5	2YSH5
ABS	3YSAH5	2YSAH5
DNV	IIYMS(H5)	IIYMS(H5)

Typical Applications

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

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- C1 : 100% CO₂
- Flow Rate: 15 - 20L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	900149N / 900125	S300/S200 VFB 16kg/5kg	175-600	21-31	130-300	15-20
1.6	900262N	S300 VFB 16kg	130-400	21-31	170-400	15-20

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	Diffusible Hydrogen
Typical Results - with M21 gas	0.04	1.40	0.60	0.013	0.010	3 mls / 100 g

Outershield® 71-CX

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

Conformances

AWS A5.20/A5.20M: E71T-1C-H8,
E71T-9C-H8

AS/NZS ISO 17632-B: T493 T1-1CAK UH10

Lloyds Register 4YSH10

Typical Applications

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

Welding Positions



Shielding Gas

- C1 : 100% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

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

Mechanical Properties - As required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C
Requirements - AWS E71T-1, E71T-9 As Welded with C1 gas	400 min	480 min	22 min	27 min
Typical Results (1.2mm)	570	620	25	40

Deposit Composition

	%C	%Mn	%Si	%Ni	%S	%P	Diffusible Hydrogen
Typical Results	0.05	1.36	0.41	0.43	0.009	0.015	6 mls / 100 g

Outershield® 71T1

Key Features

- All positional wire with very smooth welding performance and excellent slag release
- Sound mechanical properties, CVN > 47J @ -20°C
- Rutile wire optimized and qualified for use with 100% CO₂ shielding gas – can also be used with mixed gases
- Vacuum sealed aluminium foil bag packaging, precision layer wound wire

Conformances

AWSA5.20: E71T-1C H8
AS/NZS ISO 17632-B: T492 T1-1 CA KU H10
Lloyds Register: 3YSH10
ABS: 3YSAH
DNV-GL: III YMS (H10)

Typical Applications

- Full out of position welding requiring smooth running and optimum weld appearance
- General structural fabrication, mining, shipbuilding, primed plate, etc.
- Ideal for root runs on ceramic backing

Welding Positions



Shielding Gas

- C1 Gas 100% Carbon Dioxide
- Flow Rate: 15-25 l/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	900928N	S300 VFB 16kg	175-620	21-32	130-290	15-20

Mechanical Properties - As required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -20°C
Requirements - AWS E71T-1, As welded with C1 Gas	400 min	490 min	22 min	27 min
Typical Results	550	580	25	60

Deposit Composition

	%C	%Mn	%Si	%P	%S	Diffusible Hydrogen
Typical Results	0.05	1.10	0.30	0.015	0.010	6 mls / 100 g

Primacore® LW-71

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

Conformances

AWS A5.20/A5.20M: E71T-1C-H8

E71T-9C-H8

AS/NZS ISO 17632-B: T493 T1-1 CAKU H10

Lloyds Register: 3YSH15

ABS: 3YSA H10

DNV: IIYMS (H10)

AWS D1.8: Meets lot requirements

Typical Applications

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

Welding Positions



Shielding Gas

- C1 : 100% CO₂
- Flow Rate: 15 - 20L/min

Diameter / Packaging / Settings

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

Mechanical Properties - As required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C
Requirements - AWS E71T-1, E71T-9. As Welded with C1 gas	400 min	490 min	22 min	27 min
Typical Results	559	610	26	85

Deposit Composition

	%C	%Mn	%Si	%S	%P	Diffusible Hydrogen
Typical Results	0.06	1.33	0.39	0.01	0.02	6 mls / 100 g

Outershield® MC710-H

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 MA UH5
Lloyds Register: 3YSH5
ABS: 3YSAH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	900356N	Spool S300 16kg	941922	Drum 200kg	100 - 550	15-33	180-340	15-20
1.6	900370N	Spool S300 16kg	941937	Drum 200kg	150 - 450	27-34	200-440	15-25

Mechanical Properties - As required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°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	Diffusible Hydrogen
Typical Results	0.05	1.35	0.6	0.023	0.015	3 mls / 100 g

Outershield® MC460VD-H

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: T494 T15-1 MAKUH5

Lloyds Register: 3YSH5

ABS: 3YSAH5

DNV: IIIYMSH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

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

Mechanical Properties - As required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°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	Diffusible Hydrogen
Typical Results	0.05	1.25	0.60	0.015	0.015	3 mls / 100 g

Outershield® MC715-H

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: T494 T15-1 MAKUH5

DNV: IV Y40H5

BV: SA3, 3YMHH

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- M20 : 90% Argon / 10% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	900429NE	Spool S300 16kg VFB	100 - 550	15-33	120-340	15-20
1.6	900470N	Spool S300 16kg VFB	150 - 450	27-34	200-450	20-25

Mechanical Properties - As required per AWS A5.18

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°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	Diffusible Hydrogen
Typical Results	0.04	1.5	0.4	0.020	0.012	3 mls / 100 g

Outershield® MC715Ni1-H

Key Features

- Gas shielded 1% Ni alloyed metal cored wire
- Ni content is controlled to meet “sour service” oil field requirements such as NACE MR0175
- 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

Typical Applications

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

Conformances

AWS A5.28/A5.28M: E80C-Ni1M H4

AS/NZS ISO 17632-B: T55 5 T15-1 MA N1 UH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	941938/N	Spool S300 VFB 14kg/16kg	100-550	15-33	120-340	15-20
1.2	941941	Accu-Trak Drum 200kg	100-550	15-33	120-340	15-20

Mechanical Properties - As required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -45°C	Charpy V-Notch J @ -60°C
Requirements - AWS E80C-Ni1M. As Welded with M21 gas	470 min	550	24 min	27 min	-
Typical Results	530	600	25	90	80

Deposit Composition

	%C	%Mn	%Si	%S	%P	Diffusible Hydrogen
Typical Results	0.05	1.35	0.6	0.023	0.015	3 mls / 100 g

Outershield® MC80D2-H

Key Features

- All positional (1.2mm only) gas shielded premium metal cored wire – spraytransfer with minimal spatter
- Good low temperature toughness with very low hydrogen levels H4/H5
- Greater deposition rate than fluxed cored wires
- Enhanced sidewall fusion compared to equivalent solid wires

Conformances

AWS A5.28/A5.28M: E90C-D2-H4

AS/NZS ISO 18276-B: T62 3 T15-0/1 MA 3M2 H5

Typical Applications

- For welding high strength steels
e.g. HY-80, Bisplate 70
- Fast downhand welding of HSLAsteels
- Mining machinery, earth moving equipment and shipbuilding

Welding Positions



Shielding Gas

- M21 type gases
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Approx. Current amps	CTWD mm
1.2	941948	Plastic Spool VFB 16kg	240-600	26-32	160-330	15-25
2.0	16-2033	Fibre Spool 15kg	170-350	27-36	350-550	25-30

Mechanical Properties - As required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C
Requirements - AWS E90C-D2, As Welded with M21 Gas	540 min	620 min	17	27 min
Typical Results	560	640	26	57

Deposit Composition

	%C	%Mn	%Si	%Mo	%P	%S	Diffusible Hydrogen
Typical Results	0.06	1.45	0.54	0.49	0.010	0.010	3 mls / 100 g

Metalshield® MC-110

Key Features

- Gas shielded low alloyed metal cored wire with H4 diffusible hydrogen levels
- Excellent arc characteristics provide outstanding operator appeal and mechanical properties @ -50°C
- Minimal spatter, fast travel speed, excellent wire feeding
- Enhanced silicon island management

Conformances

AWS A5.28/A5.28M: E110C-K4 H4

AS/NZS ISO 18276-B: T765 T15-0/1 MA N3M2 UH5

Typical Applications

- Welding higher strength Q&T steels such as Bisplate 80, Weldten 80, HY100
- Well suited to mining, heavy equipment and vessel fabrication
- Robotics and automation

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	ED033910	Spool S300 VFB 14kg	100-550	22-33	170-370	15-20

Mechanical Properties - As required per AWS A5.28

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -50°C
Requirements - AWS E110C-K4 H4. As Welded with M21 gas	680 min	760 min	15 min	27 min
Typical Results	780	810	22	60

Deposit Composition

	%C	%Mn	%Si	%Mo	%Ni	%Cr
Typical Results	0.06	1.6	0.55	0.50	2.10	0.30
	%P	%S	%Cu	%V	Diffusible Hydrogen	
Typical Results	0.015	0.015	0.04	0.015	3 mls / 100 g	

Outershield® 81Ni1-H

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, optimal alloy control, outstanding operator appeal
- Meets NACE MR-0175 requirements

Conformances

AWS A5.29/A5.29M: E81T1-Ni1M J H4

AS/NZS ISO 17632-B: T55 5 T1-1 MA N2 UH5

Lloyds Register: 4Y40SH5

DNV: IV YMSH5

Typical Applications

- Suitable for offshore and similar applications
- Boiler and pressure vessels
- Low alloy high strength steels

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	941378N	Spool S300 VFB 16kg	175-600	20-32	130-300	15-20
1.6	941380N	Spool S300 VFB 16kg	125-400	22-32	170-400	20-25
1.8	941382	Spool S300 VFB 14kg	125-350	23-32	200-425	20-25
2.0	941381N	Spool S300 VFB 16kg	125-325	23-32	220-450	20-25

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-J H4. As Welded with M21 gas	470 min	550 min	19 min	27 min
Typical Results	530	600	24	90

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni	Diffusible Hydrogen
Typical Results	0.05	1.3	0.20	0.010	0.013	0.92	3 mls / 100 g

Outershield® 81Ni1-HSR

Key Features

- All positional gas shielded 1.0% Ni, alloyed flux cored wire
- Specifically designed for stress relieved applications, excellent impact properties after PWHT
- Exceptional mechanical properties (Impact properties >47J at -50°C)
- Meets NACE MR-0175 requirements

Conformances

AWS A5.29/A5.29M: E81T1-Ni1M-J H4

AS/NZS ISO 17632-B: T555 T1-1 MAPN2 UHS

Lloyds Register: 4YSH5

DNV: IV YMSH5

Typical Applications

- Suitable for offshore and similar applications
- Boiler and pressure vessels
- Low alloy high strength steels

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20 L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	942719N	Spool S300 VFB 16kg	175-600	20-32	130-300	15-20

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-J H4. As Welded with M21 gas	470 min	550 min	19	27 min
Typical Results - As Welded	530	600	24	90
Typical Results - Stress Relieved*	525	590	25	70 @ - 50°C

*1Hr/600°C

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni	Diffusible Hydrogen
Typical Results - As Welded	0.05	1.4	0.20	0.010	0.013	0.95	3 mls / 100 g

Outershield® 91Ni1-HSR

Key Features

- All positional gas shielded 1.0% Ni / 0.4% Mo alloyed flux cored wire
- Exceptional mechanical properties
- Outstanding operator appeal, excellent feeding and meets NACE MR-0175 requirements
- Specifically designed for stress relieved applications, excellent impact properties after PWHT

Conformances

AWS A5.29/A5.29M: E91T1-GM

AS/NZS ISO 18276-B : T62 4 T1-1MAP N2M2 H5

Typical Applications

- Suitable for offshore and similar applications
- Boiler and pressure vessels
- Low alloy high strength steels

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	942673N	Spool S300 VFB 16kg	175-600	20-32	130-300	15-20

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 min	17 min	NA
Typical Results - As Welded	640	700	19	60

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni	%Mo	Diffusible Hydrogen
Typical Results - As Welded	0.05	1.4	0.20	0.010	0.013	0.95	0.40	4.5 mls / 100 g

Outershield® 690-H

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: T764 T1-1MAN3M2 UH5

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- Flow Rate: 15-20L/min

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	942453NE	Spool S300 VFB 16kg	175-600	21-29	130-260	15-20
1.6	942447N	Spool S300 VFB 16kg	200-400	22-30	170-350	20-25

Mechanical Properties - As required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C
Requirements - AWS E111T1-K3M-J. As Welded with M21 gas	680 min	760 min	15	27 min
Typical Results - As Welded	780	810	18	85

Deposit Composition

	%C	%Mn	%Si	%S	%P	%Ni	%Mo	Diffusible Hydrogen
Typical Results - As Welded	0.06	1.5	0.20	0.010	0.015	2.0	0.30	3 mls / 100 g

Innershield® NS-3M

Key Features

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

Typical Applications

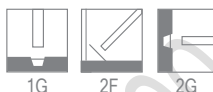
- Open groove welds
- Machinery bases and heavy equipment repair
- Installing wear plates
- 6.5-13 mm single pass fillet / lap welds

Conformances

AWS A5.20/A5.20M: E70T-4

AS/NZS ISO 17632-B: T49T40NGA

Welding Positions



Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
2.0	ED012740	Coil 22.7kg	200-300	29-33	280-350	50-55
2.0	ED030651	Coil 11.3kg	200-300	29-33	280-350	50-55
2.4	ED012736	Coil 22.7kg	110-275	29-34	300-450	70-75
3.0	ED012731	Speed-Feed® Drum 272kg	140-225	28-33	380-550	70-75
3.0	ED012732	Coil 22.7kg	140-225	28-33	380-550	70-75

*Polarity DC+

Mechanical Properties - As required per AWS A5.20

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

Deposit Composition

	%C	%Mn	%Si	%S	%P	%AL
AWS 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

Innershield® NR-311

Key Features

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

Typical Applications

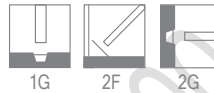
- Recommended for fillet, lap and butt welds on 3.2 mm and thicker steel, including some low alloy steels
- General fabrication
- Assembly welding
- Welds on lightly rusted or primed plate

Conformances

AWS A5.20/A5.20M: E70T-7

AS/NZS ISO 17632-B : T49T7 ONA G

Welding Positions



Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
2.0	ED014464	Coil 6.4kg - Carton 25.4kg	100-240	21-29	170-300	30-35
2.4	ED012629	Coil 22.7kg	75-200	20-29	200-390	35-40

*Polarity DC-

Mechanical Properties - As required per AWS A5.20

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

Deposit Composition

	%C	%Mn	%Si	%S	%P	%AL
AWS 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

Innershield® NR-152

Key Features

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

Typical Applications

- Single pass welding on plate thickness up to 5mm (not recommended for welding multiple passes)
- Continuous welding on galvanized or zinc coated carbon steel
- Spot or short intermittent welds
- Automotive and Transportation

Conformances

AWS A5.20/A5.20M: E71T-14

AS/NZS ISO 17632-B : T49 T14-1 NSG

Welding Positions



Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
1.7	ED012186	Coil 22.7kg	30-110	13-21	70-240	15-20

*Polarity DC-

Mechanical Properties - As required per AWS A5.20

	Transverse Tensile Strength MPa	Hardness Rockwell B
Requirements - AWS E71T-14	490 min	-
Typical Results	480-550	93

Deposit Composition

	%C	%Mn	%Si	%S	%P	%AL
AWS 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

Innershield® NR-211-MP

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

AS/NZS ISO 17632-B: T49ZT11-1 NA

Welding Positions



Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
0.9	ED016354	Spool Plastic 4.5kg	50-270	14-21	30-155	13-16
1.2	ED016363	Spool Plastic 4.5kg	70-130	15-19	120-170	16-19
1.2	ED030638	Spool Steel 11.3kg				
1.7	ED012506	Spool Plastic 6.4kg	40-175	15-24	125-300	19-32
1.7	ED030641	Spool Steel 11.3kg				
2.0	ED012508	Spool Plastic 6.4kg	50-160	16-23	180-325	19-32
2.0	ED030645	Spool Steel 11.3kg				

*Polarity DC-

Maximum Plate Thickness: 0.9/1.2mm ≤ 8mm, 1.7/2.0mm ≤ 13mm

Mechanical Properties - As required per AWS A5.20

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

Deposit Composition

	%C	%Mn	%Si	%S	%P	%AL
AWS 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

Innershield® NR-212

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 a maximum plate thickness of 20mm
- 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 T11-1 NAG

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
1.2	ED030639	Spool Steel 11.3kg	55-160	14-20	75-170	15-20
1.7	ED030642	Spool Steel 11.3kg	60-175	16-23	145-275	20-25
2.0	ED030646	Spool Steel 11.3kg	60-150	16-24	200-325	20-25

*Polarity DC-

Mechanical Properties - As required per AWS A5.20

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

Wire Composition

	%C	%Mn	%Si	%S	%P	%Ni	%Al
AWS Requirements	NS	0.50 min	1.00 max	0.030 max	0.030 max	0.50 min	1.8 max
Typical Results	0.06-0.11	0.84-1.55	0.20-0.33	≤0.003	0.007	1.02 -1.15	1.3-1.6

Steelcore® 71T-GS

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 ISO 17632-B: T49TG1NAG

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
0.8	14-1392	Spool Plastic 4.5kg	50-300	14-18	60-150	10-12
0.9	14-1393	Spool Plastic 4.5kg	50-275	14-20	60-180	12-15
	14-1383	Blister Pack 0.9kg				

*Polarity DC-

Deposit Composition

	%C	%Mn	%Si	%S	%P	%AL
AWS Requirements	Not Specified					
Typical Results	0.22	0.34	0.79	NA	NA	2.41

Innershield® NR-232

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

Conformances

AWS A5.20/A5.20M: E71T-8-H16

AS/NZS ISO 17632-B: T49 3 T8 1 NA

Lloyds Register: 3YS H15

ABS: 3YSA

DNV: III YMSH15

AWSD1.8: Meets lot 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

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
1.7	ED012518	Coil 6.1kg Carton 24.5kg	110-320	18-27	200-400	19-32
	ED033980	Spool Steel 11.3kg				
	ED012519	Coil 22.7kg				
2.0	ED012525	Coil 6.1kg Carton 24.5kg	60-180	16-23	150-365	19-32
	ED034370	Spool Steel 11.3kg				
	ED012526	Coil 22.7kg				

*Polarity DC-

Mechanical Properties - As required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness Rockwell B	Charpy V-Notch J @ -30°C
Requirements - AWS E71T-8	400 min	480 min	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
AWS 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

Innershield® NR-233

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-H8

AS/NZS ISO 17632-B: T49 3 T8-1 NA UH10

AWSD1.8: Meets lot requirements

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
1.6	ED030934	Spool Plastic 11.3kg	150-350	17-27	220-315	19-25
	EDO32659	Plastic Spool VFB 11.3kg				
1.8	ED031030	Spool Plastic 11.3kg	100-300	17-24	180-355	19-25

*Polarity DC-

Mechanical Properties - As required per AWS A5.20

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Hardness Rockwell B	Charpy V-Notch J @ -30°C
Requirements - AWS E71T-8	400 min	480 min	22 min	-	27 min
Typical Results - As Welded	435-455	575-595	26-29	87-89	54

Deposit Composition

	%C	%Mn	%Si	%S	%P	%AL
AWS 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

Innershield® NR-555

Key Features

- Higher strength self shielded wire for welding in structural applications requiring excellent toughness
- Welder-friendly, flat bead face in out of position fillets and butt welds
- Meets AWS D1.8 seismic lot waiver requirements
- Foil bag shields against moisture, prevents rust and prolongs storage life, AWS H8 rated wire

Conformances

AWS A5.29: E81T8-G

AS/NZS ISO 17632-B: T55 3 T8 1 NA UH10

AWS D1.8: Meets requirements

Typical Applications

- Structural fabrication, including those subject to seismic requirements
- General plate fabrication
- Bridges, weathering steels
- Vertical up and overhead fillets and groove welds

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts*	Current amps	CTWD mm
1.6	ED035565	Spool Plastic VFB 11.3kg	75-120	16-22	145-220	20-25

*Polarity DC-

Mechanical Properties - As required per AWS A5.29

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -45°C
E81T8-G	470	550 min	19 min	-
Typical Results - As Welded	530	610	27	100

Deposit Composition

	%C	%Mn	%Si	%S	%P	%AL	%Ni
Requirements	0.15 max	1.0-2.0	0.40 max	0.03 max	0.03 max	1.8 max	0.5-1.5
Typical Results - As Welded	0.05	1.84	0.17	≤0.00	≤0.01	0.84	1.12

Cor-A-Rosta® 304L

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

Conformances

AWS A5.22/A5.22M: E308LT0-1, E308LT0-4

AS/NZS ISO 17633-B: TS308L-FB0

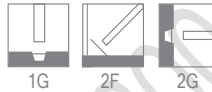
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304L

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

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- C1 : 100% CO₂

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	585155	Spool S300 VFB 15kg	250-450	22-28	140-250	15-20

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 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® P316L

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

Conformances

AWS A5.22/A5.22M: E316LT1-1, E316LT1-4

AS/NZS ISO 17633-B: TS316L-FB1

Typical Applications

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

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- C1 : 100% CO₂

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	585322	Spool S300 VFB 15kg	250-450	22-31	100-250	15-20

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 E316LT1-1, E316LT1-4	Not Specified	485 min	30 min	Not Specified	
Typical Results - As Welded with M21 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® P309L

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

Conformances

AWS A5.22/A5.22M: E309LT1-1, E309LT1-4

AS/NZS ISO 17633-B: TS309L-FB1

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

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- C1 : 100% CO₂

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	585223	Spool S300 VFB 15kg	250-450	22-31	100-250	15-20

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 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® P4462

Key Features

- Gas shielded flux cored wire designed for all 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 250°C
- High resistance to general corrosion, pitting and stress corrosion

Conformances

AWS A5.22/A5.22M: E2209T1-1, E2209T1-4

AS/NZS ISO 17633-B: TS2209-FB1

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂

Diameter / Packaging / Settings

Diameter mm	Part Number	Packaging	WFS in/min	Voltage volts	Current amps	CTWD mm
1.2	585506	Spool S300 VFB 15kg	250-450	22-29	100-250	15-20

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



SUBMERGED ARC**Submerged ArcFlux****Active**

Lincolnweld® 761	106
Lincolnweld® 780	107
Lincolnweld® 781	108

Neutral

Lincolnweld® 860	109
Lincolnweld® 865	110
Lincolnweld® 880	111
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Hardfacing

Lincolnweld® 802	114
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Alloy

Lincolnweld® A-XXX10	120
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Stainless Steel & Nickel

Lincolnweld® P2007	121
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Submerged Arc Wire**Mild Steel**

Lincolnweld® L-50	122
Lincolnweld® L-56	122
Lincolnweld® L-60	123
Lincolnweld® L-61	123
Lincolnweld® L-S3	124
Lincolnweld® LA-71	124
Lincolnweld® LC-72	125

Low Alloy

Lincolnweld® L-70	125
Lincolnweld® LA-85	126
Lincolnweld® LA-90	126
Lincolnweld® LAC-Ni2	127
Lincolnweld® LAC-690	127

Lincolnweld® 1061

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 singlepass 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: SACS/MS 188 ACH5

Product Information

Basicity Index: 0.8

Density: 1.2 g/cm³

Recommended Wires

Mild Steel:

Lincolnweld® L-50, L-60, L-61

Low Alloy:

Lincolnweld® L-70

Packaging

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

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O 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

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 – subject to voltage control
- Excellent bead shape and slag removal
- Good resistance to moisture contamination for reduced porosity

Conformances

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

Typical Applications

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

Product Information

Basicity Index: 0.7

Density: 1.4 g/cm³

Recommended Wires

Mild Steel:

Lincolnweld® L-50, L-60, L-61

Packaging

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

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O 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® 1081

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
- Hot water tanks

Conformances

AS/NZS ISO 14174: SA ZS 1 87 AC H5

Product Information

Basicity Index: 0.8

Density: 1.5g/cm³

Recommended Wires

Mild Steel:

Lincolnweld® L-50, L-60, L-61

Low Alloy Steel:

Lincolnweld® L-70

Packaging

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

Typical Flux Composition

	% SiO ₂	% MnO	% MgO	% CaF ₂	% Na ₂ O	% Al ₂ O ₃	% TiO ₂	% CaO	% ZrO ₂	% Metal Alloys
Lincolnweld® 781	21	17	14	5	2	4	12	1	21	3 max

Typical Test Results

Flux / Wire Combination	Weld Condition	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ °C		AWS Classification AS.17/AS.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® 1090

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

Conformances

AS/NZS ISO 14174: SA AB 1 56 AC H5

Recommended Wires

Mild Steel:

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

Low Alloy:

Lincolnweld® L-70, LA-85

Typical Applications

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

Product Information

Basicity Index: 1.1

Density: 1.4 g/cm³

Packaging

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

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O 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

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
- Minimal loss of strength when used in the stress relieved condition

Conformances

AS/NZS ISO 14174: SAAR/AB 1

Recommended Wires

Mild Steel:

Lincolnweld® L-50, L-61, LA-71

Typical Applications

- Butt joints, flat and horizontal fillets
- Pair with Lincolnweld® L-61 for grade 350 steels
- Applications requiring stress relieving

Product Information

Basicity Index: 1.0

Density: 1.3 g/cm³

Packaging

Package Type	Weight Kg	Part Number
Bag	22.7	EDS27857

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O 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	480	570	22	85	-29	F7A2-EM12K-H8
L-61	Stress Relieved	450	550	30	117	-29	F7P2-EM12K-H8
LA-71	As Welded	540	630	26	73	-29	F7A2-EM14K-H8

Lincolnweld® 880

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 with Lincore 355 and 405

Conformances

AS/NZS ISO 14174: SA AS/FB 155 AC

Product Information

Basicity Index: 2.0

Density: 1.4 g/cm³

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 ₂ O	%Al ₂ O 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-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

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 FB 1 55 AC

Recommended Wires

Mild Steel:

Lincolnweld® 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-S3, or LA-71

Product Information

Basicity Index: 3.3

Density: 1.2 g/cm³

Packaging

Package Type	Weight Kg	Part Number
Plastic bag	22.7	ED031853

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O ₃	%CaO	%K ₂ O	% 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 AS.17/AS.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

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

Conformances

AS/NZS ISO 14174: SA FB 1 66 AC H5

Recommended Wires

Mild Steel:

Lincolnweld® L-S3, L-61, LA-71

Low Alloy Steel:

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

Typical Applications

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

Product Information

Basicity Index: 2.2

Density: 1.3 g/cm³

Packaging

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

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O ₃	%CaO	%FeO	%K ₂ O	% 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

Key Features

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

Typical Applications

- General hardfacing flux for use with Lincore 30-S, 35-S, 40-S, 42-S
- Ideal for hardfacing applications on castor rolls using Lincore-965

Conformances

AS/NZS ISO 14174: SAC S 1/2 55 DCH5

Packaging

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

Lincolnweld® 8500

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

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

Conformances

AS/NZS ISO 14174: SA FB 1 54 AC H5

Product Information

Basicity Index: 2.9

Density: 1.3 g/cm³

Recommended Wires

Mild Steel:

Lincolnweld® 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	FX8500-25SRB

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O ₃	%CaO	%K ₂ O	%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

Key Features

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

Conformances

AS/NZS ISO 14174: SA AB 1 66 AC H5

Recommended Wires

Mild Steel:

Lincolnweld® L-50, L-61, LA-71

Low Alloy Steel:

Lincolnweld® LA-85

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
- Wind towers

Product Information

Basicity Index: 1.1

Density: 1.4 g/cm³

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 ₂ O	%Al ₂ O 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

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

Conformances

AS/NZ ISO 14174: SA AB 1 66 AC H5

Recommended Wires

Mild Steel:

Lincolnweld® L-50, L-61, LC-72

Low Alloy Steel:

Lincolnweld® LAC-Ni2

Typical Applications

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

Product Information

Basicity Index: 0.6

Density: 1.4 g/cm³

Packaging

Package Type	Weight Kg	Part Number
Bag	22.7	ED027861

Typical Flux Composition

	%SiO ₂	%MnO	%MAO	%CaF ₂	%Na ₂ O	%Al ₂ O ₃	%TiO ₂	% 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

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: SAAB 167 ACH5

Product Information

Basicity Index: 1.5

Density: 1.2 g/cm³

Recommended Wires

Mild Steel:

Lincolnweld® 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 ₂ O	%Al ₂ O ₃	%CaO	%TiO ₂	%K ₂ O	%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-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

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: SAAS 155 ACH10

Product Information

Basicity Index: 1.0

Density: 1.4 g/cm³

Recommended Wires

Mild Steel:

Lincolnweld® L-61

Packaging

Package Type	Weight Kg	Part Number
Bag	22.7	ED027862

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O ₃	%ZrO ₂	%TiO ₂	%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

Key Features

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

Conformances

AS/NZS ISO 14174: SAZ 33

Recommended Wires

Mild Steel:

Lincolnweld® L-60

Typical Applications

- Use with Lincolnweld® L-60 mild steel wire for hardfacing applications
- Low carbon martensitic deposit

Product Information

Basicity Index: NA

Density: NA

Packaging

Package Type	Weight Kg	Part Number
Paper Bag	22.7	ED027865

Lincolnweld® P2007

Key Features

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

Conformances

AS/NZSISO14174: SAAF 2 63 ACH5

Recommended Wires

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

Typical Applications

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

Product Information

Basicity Index: 1.5

Density: 1.2 g/cm³

Packaging

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

Typical Flux Composition

	%SiO ₂	%MnO	%MgO	%CaF ₂	%Na ₂ O	%Al ₂ O 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	780	40	100	-196

Lincolnweld® L-50

Key Features

- A low carbon, medium manganese, medium silicon wire
- Pair it with Lincolnweld® 980 flux for the best flux / wire combination with semi-automatic 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

Diameter / Packaging

Diameter	Part Number	Packaging
2.0	ED011335	Coil 27.2kg
2.4	ED011328	Coil 27.2kg

Typical Wire Composition

As Required per AWS A5.17 / A5.17M

		%C	%Mn
Lincolnweld® L-50		0.06-0.16	0.90-1.40
%Si	%S	%P	%Cu
0.35-0.75	0.03	0.03	0.35

Lincolnweld® L-56

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

Diameter / Packaging

Diameter	Part Number	Packaging
2.0	KC5620600	Steel Reel 600kg

Typical Wire Composition

As Required per AWS A5.17 / A5.17M

		%C	%Mn
Lincolnweld® L-56		0.06-0.15	1.40-1.85
%Si	%S	%P	%Cu
0.80-1.15	0.03	0.03	0.35

Lincolnweld® L-60

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

Diameter / Packaging Coil

Diameter	Part Number	Packaging
2.4	KC602425	Coil 25kg
2.4	KC6024600	Bulk Steel Reel 600kg
3.2	KC603225	Coil 25kg
3.2	KC6032600	Bulk Steel Reel 600kg
4.0	KC604025	Coil 25kg
4.0	KC6040600	Bulk Steel Reel 600kg

Typical Wire Composition

As Required per AWS A5.17 / A5.17M

		%C	%Mn
Lincolnweld® L-60		0.04-0.14	0.25-0.60
%Si	%S	%P	%Cu
0.10	0.03	0.03	0.35

Lincolnweld® L-61

Key Features

- Industry standard for single and multi pass submerged arc welding applications
- A low carbon, medium manganese, low silicon general purpose submerged arc electrode

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

Diameter / Packaging

Diameter	Part Number	Packaging
2.4	KC612425	Coil 25kg
	KC6124600	Bulk Steel Reel 600kg
3.2	KC613225	Coil 25kg
	KC6132600	Bulk Steel Reel 600kg
4.0	KC614025	Coil 25kg
	KC6140100	Stein Basket 100kg
	KC6140200	Coil 200kg
	KC6140600	Bulk Steel Reel 600kg

Typical Wire Composition

As Required per AWS A5.17 / A5.17M

		%C	%Mn
Lincolnweld® L-61		0.05-0.15	0.80-1.25
%Si	%S	%P	%Cu
0.10-0.35	0.03	0.03	0.35

Lincolnweld® L-S3

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

Diameter	Part Number	Packaging
2.0	030400	Coil 25kg
2.4	030401	Coil 25kg
3.2	030402	Coil 25kg
4.0	030403	Coil 25kg

Typical Wire Composition

As Required per AWS A5.17 / A5.17M

		%C	%Mn
Lincolnweld® L-S3		0.06-0.15	1.50-2.0
%Si	%S	%P	%Cu
0.25-0.65	0.025	0.025	0.35

Lincolnweld® LA-71

Key Features

- A low carbon, medium manganese, medium silicon electrode containing approximately 0.1% titanium for stress relieving applications
- 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

Diameter	Part Number	Packaging
2.4	ED011052	Coil 27.2kg
3.2	ED011051	Coil 27.2kg
4.0	ED011053	Coil 27.2kg

Typical Wire Composition

As Required per AWS A5.17 / A5.17M

			%C	%Mn
Lincolnweld® LA-71			0.06-0.19	0.90-1.40
%Si	%Ti	%S	%P	%Cu
0.35-0.75	0.03-0.17	0.025	0.025	0.35

Lincolnweld® LC-72

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 semi-automatic submerged arc welding

Conformances

AWS A5.17/A5.17M: EC1

AS/NZS ISO 14171-B: TU3M

Recommended Fluxes

Lincolnweld® 980

Diameter	Part Number	Packaging
2.4	ED011098	Coil 22.7kg

Typical Wire Composition

As Required per AWS A5.17 / A5.17M

		%C	%Mn
Lincolnweld® LC-72		0.15	1.8
%Si	%S	%P	%Cu
0.9	0.035	0.035	0.35

Lincolnweld® L-70

Key Features

- A low carbon, medium manganese, low silicon, 0.5% 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

Diameter	Part Number	Packaging
2.0	ED012054	Coil 25kg
2.4	FL70-24-25	Coil 25kg
3.2	ED012051	Coil 25kg
4.0	ED012053	Coil 25kg

Typical Wire Composition

As Required per AWS A5.23 / A5.23M

			%C	%Mn
Lincolnweld® L-70			0.05-0.15	0.65-1.00
%Si	%Mo	%S	%P	%Cu
0.20	0.45-0.65	0.025	0.025	0.35

Lincolnweld® LA-85

Key Features

- A 1% 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

Diameter	Part Number	Packaging
2.4	ED029254	Coil 27.2kg
3.2	ED023166	Coil 27.2kg

Typical Wire Composition

As Required per AWS A5.23 / A5.23M

		%C	%Mn	%Si
Lincolnweld® LA-85		0.12	1.20-1.60	0.05-0.30
%Ni	%Mo	%S	%P	% Cu
0.75-1.25	0.10-0.30	0.025	0.020	0.35

Lincolnweld® LA-90

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

Diameter	Part Number	Packaging
3.2	EDS11083	Coil 27.2kg

Typical Wire Composition

As Required per AWS A5.23 / A5.23M

			%C	%Mn
Lincolnweld® LA-90			0.05-0.15	1.60-2.10
%Si	%Mo	%S	%P	%Cu
0.50-0.80	0.40-0.60	0.025	0.025	0.35

Lincolnweld® LAC-Ni2

Key Features

- When used with Lincolnweld® 888 flux, it can produce impact properties exceeding 27J @ -73°C required when welding ASTM A350 LF1 and LF2 forgings
- A 2% nickel cored wire used in weathering steel applications

Conformances

AWS A5.23/A5.23M: ECNi2
AS/NZS ISO 26304-B: TUN4C1M3

Recommended Fluxes

Lincolnweld® 880, 880M, 888, 980

Diameter / Packaging

Diameter	Part Number	Packaging
2.4	ED010986	Coil 22.7kg

Lincolnweld® LAC-690

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

Diameter / Packaging

Diameter	Part Number	Packaging
2.4	ED032958	Coil 22.2kg
3.2	ED032959	Coil 22.2kg
4.0	ED033302	Coil 22.2kg

Deposit Composition

		%C	%Mn	%Si
Lincolnweld® LAC-690		0.08	1.51	0.36
%S	%P	%Cr	%Ni	%Mo
0.007	0.011	0.36	2.59	0.44
%Cu	Diffusible Hydrogen (mL/100g weld deposit)			
0.04	3.6			



HARDFACING**Hardfacing Electrodes****Build-Up**

Wearshield® BU-30	131
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Metal-to-Metal

Wearshield® MM	132
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Severe Abrasion

Wearshield® 60(E)	133
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Severe Impact

Wearshield® FROG MANG®	134
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Hardfacing Wire**Build-Up**

Lincore® 30-S	135
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Lincore® 33	136
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Metal-to-Metal / Build-Up

Lincore® 35-S	137
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Metal-to-Metal

Lincore® 40-S	138
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Lincore® 42-S	139
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Lincore® 55-G	140
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Abrasion & Impact

Lincore® 50	144
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Abrasion

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Severe Abrasion

Weartech® SHS9800U	148
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Weartech® SHS9192U	149
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Severe Impact

Lincore® M	151
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Lincore® FROG MANG®	152
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Lincore® 15CrMn	153
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LINCORE
HARDFACING WIRE

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.

Wearshield® BU-30

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

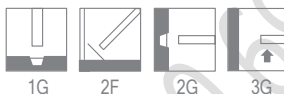
Typical Applications

- Bucket and shovel lips
- Agricultural equipment
- Crane and mine car wheels
- Tractor rolls, idlers, links, sprockets

Conformances

AS/NZS2576: 1430A4

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	400021	PE Tube 2.5kg
4.0	350	400038	

Mechanical Properties

Rockwell – HRc			
	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	0.2	0.8	1.0	1.5	0.5

As welded microstructure consists mainly of martensite with some bainite

Typical Operation Procedures

Current (amps)		
Polarity	3.2mm	4.0mm
AC/DC+	90-130	140-180

Wearshield® MM

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, scraper blades
- Cable sheaves
- Transfer tables

Conformances

AS/NZS2576: 1855 A4

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	400151	PE Tube 2.5kg

Mechanical Properties

Rockwell – HRC		
	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 Operation Procedures

Current (amps)	
Polarity	3.2mm
DC+	90-130

Wearshield® 60(E)

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

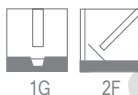
Typical Applications

- 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/NZS2576: 2360A4

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	450	400502	PE Tube 2.5kg
4.0	450	400519	

Mechanical Properties

Rockwell – HRC		
	1 Layer	2 Layers
Typical Results	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 Operation Procedures

Current (amps)		
Polarity	3.2mm	4.0mm
AC/DC+	110-150	140-180

Wearshield® Frog Mang®

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 temperature 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/NZS2576: 1220-A4

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
4.8	350	ED033135	Easy Open Can 3 x 4.5kg

Mechanical Properties

Rockwell – HRc		
	As Welded	Work Hardened
Typical Results - As Welded	20-30	40-45

Deposit Composition

	%C	%Mn	%Si	%Cr
2 or more layers	1.2	21.0	0.4	5.3

As welded microstructure consists mainly of austenitic Manganese

Typical Operation Procedures

Current (amps)	
Polarity	4.8mm
AC/DC+	175-215

Lincore® 30-S

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 | For Hardfacing |
| • Tractor rollers | • Shafts |
| • Idlers | • Track rails |
| • Trunnions | • Idlers |
| • Crane wheels | |

Conformances

AS/NZS 2576: 1125 B1

Recommended Flux

- Primary Flux – Lincolnweld® 802
- Secondary Flux – Lincolnweld® 860

Diameter / Packaging

Diameter mm	Part Number	Packaging
2.4	ED011200	Coil 22.7kg
3.2	ED015889	Coil 22.7kg
	ED015891	Speed-Feed Drum 272kg

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

Key Features

- Delivers tough machinable deposits for build-up or final overlay intended for metal-to-metal wear
- 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

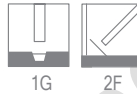
Typical Applications

- Tractor rolls and idlers
- Shovel parts
- Mine car wheels
- Mill and crusher hammers
- Dredge pumps

Conformances

AS/NZS2576: 1130 B1/B7

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.6	ED031117	Spool Steel 11.3kg
2.0	ED011237	Coil 6.4kg – Master Carton 25.4kg
	ED011238	Coil 22.7kg
2.8	ED011240	Coil 22.7kg

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

	%C	%Mn	%Si	%Al	%Cr
3 Layers (1.6 mm)	0.11-0.18	1.8-2.1	0.50-0.75	1.6-1.9	1.2-1.4

Typical Operating Procedures

Diameter, Polarity, ES0	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
1.6 mm, DC+, 45 mm	250	29	180	3.5
	350	32	225	5.0
2.0 mm, DC+, 50 mm	200	27	290	4.9
	250	29	325	6.1
2.8 mm, DC+, 64 mm	175	28	420	7.3
	235	30	470	9.6

Lincore® 35-S

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

- Shafts
- Track rails
- Idlers
- Mine car wheels

Conformances

AS/NZS 2576: 1135 B1

Recommended Flux

- Primary Flux – Lincolnweld® 802
- Secondary Flux – Lincolnweld® 880

Diameter / Packaging

Diameter mm	Part Number	Packaging
3.2	ED019881	Coil 22.7kg

Mechanical Properties

Rockwell – HRC	
3 Layers	35 - 39

Deposit Composition

On Carbon Steel	%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

Key Features

- Designed for rebuilding heavy equipment undercarriages
- Deposit is machinable, hot forgeable, resists rolling and sliding metal-to-metal wear
- Use on carbon and low alloy steels for good puddle control on round about 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	Part Number	Packaging
3.2	ED015892	Coil 22.7kg

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	3.3	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

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

Diameter / Packaging

Diameter mm	Part Number	Packaging
3.2	ED029264	Speed-Feed® Drum 136kg

Mechanical Properties

Rockwell – HRC	
1 Layer	38 - 40

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® 55-G

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

- Cranewheels
- Blower blades
- Bucket lips
- Dredge parts
- Tillage tools

Conformances

AS/NZS2576: 1855 B5

Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- M13 : 98% Argon / 2% O₂

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.2	ED028176	Spool Plastic 11.3kg
1.6	ED028177	Spool Plastic 11.3kg

Mechanical Properties

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 overlaid 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% CO2	200	27	165	2.0
	300	29	225	3.0
	400	31	290	4.2
1.2 mm, DC+, 20 mm 98% Ar / 2% O2	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% CO2	150	28	260	2.6
	250	30	340	4.7
	350	32	420	6.8
1.6 mm, DC+, 20 mm 98% Ar / 2% O2	150	24	220	2.9
	250	26	315	5.0
	350	28	410	7.2

Lincore® 55

Key Features

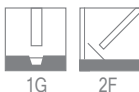
- Self-shielded open arc cored wire
- Produces a deposit which resists metal-to-metal wear and moderate abrasion
- To be used on carbon and low alloy steels
- Unlimited layers with appropriate preheat and interpass temperatures to avoid relief checking

Typical Applications

- Crane wheels
- Blower blades
- Rail ends
- Skip guides
- Cams and transfer tables

Conformances

AS/NZS2576: 1855 B7



Diameter / Packaging

Diameter mm	Part Number	Packaging
2.0	ED011277	Coil 6.4kg – Master Carton 25.4kg
	ED031122	Spool Steel 11.3kg
	ED011278	Coil 22.7kg
2.8	ED011280	Coil 22.7kg

Mechanical Properties

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
2.0 mm	0.45	1.3	0.53	1.4	5.3	0.80
2.8 mm	0.45	1.4	0.60	1.4	5.3	0.80

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 overlaid 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

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

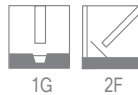
Typical Applications

- Punch dies
- Shear blades
- Cutting tools and trimmers

Conformances

AS/NZS2576: 1550 B7

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.6	ED031134	Spool - Steel 11.3kg

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

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/NZS2576: 2150 B7

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.2	ED031123	Spool - Steel 11.3kg
1.6	ED031124	Spool - Steel 11.3kg
2.8	ED011275	Coil 22.7kg

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

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

Lincore® 50**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

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 thickness limited to two or three layers and will show some relief checking
- Deposit is limited to two layers

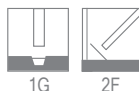
Conformances

AS/NZS2576: 2355 B5

Typical Applications

- Augers
- Bucket lips and sides
- Loaders
- Brushing and grinding equipment
- Shaper sides and blades

Welding Positions



Shielding Gas

- M21 : 75-85% Argon / 15-25% CO₂
- M13 : 98% Argon / 2% O₂

Diameter / Packaging

Diameter mm	Part Number	Packaging
1.2	ED029936	Spool Plastic 11.3kg

Mechanical Properties

Rockwell - HRC	
1 Layer	2 Layers
58	60

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	Current amps	Deposition Rate kg/hr
1.2 mm, DC+, 20 mm M21/M13	200	23-24	165	2.0
	300	25-26	225	3.0
	400	27-28	290	4.2

Lincore® 60-O

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

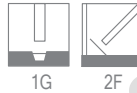
Typical Applications

- Bucket and shovellips
- Crusher rolls and hammers
- Ore chutes
- Dozer blades
- Ripper teeth

Conformances

AS/NZS2576: 2355 B7

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.2	ED031131	Spool Plastic 11.3kg
1.6	ED031132	Spool Plastic 11.3kg
2.0	ED019887	Coil 22.7kg

Mechanical Properties

Rockwell - HRC
55-60

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	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+, 25 mm	200	28	240	3.4
	300	31	300	5.1
	450	33	350	7.5
2.8 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.

Weartech® SHS9800U

Key Features

- Open arc self-shielded cored wire
- Exceptional resistance to severe sliding abrasion
- Longer lasting wear life than most chrome carbide and complex carbide alloys
- Improved impact resistance results
- Deposit is limited to two layers

Typical Applications

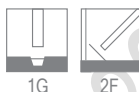
- Wear plate manufacture
- Ore chutes
- Crusher rolls
- Screw augers
- Slurry transport
- ID clade pipe

Conformances

AS/NZS2576: 2465*-B7

* Nearest equivalent

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.2	W9800-120X15	Spool PLW 15kg
1.6	W9800-160X15	Spool PLW 15kg

Mechanical Properties

Rockwell - HRC

68-71

Deposit Composition

	%C	%Mn	%Si	%Al	%Cr
2 Layers – Open Arc	< 2	< 2	< 2	< 5	< 21
	%W	%B	%Mo	%Nb	%Fe
2 Layers – Open Arc	< 10	< 7	< 6	< 6	Balance

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps
1.2 mm, DC+, 20 mm	7	24	135
1.6 mm, DC+, 20 mm	7	22	24

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. Weartech® SHS 9800U deposit cross cracks (commonly called relief-checking) on cooling. This is desirable, since cross-cracking of the deposit relieves cooling stresses and prevents spalling.

Weartech® SHS 9192U

Key Features

- Open arc self-shielded cored wire
- Extreme resistance to abrasion
- Maintains high hardness after exposure to elevated temperatures
- Provides exceptional uniformity of hardness and wear across a wide range of service environments
- Deposit is limited to two layers

Typical Applications

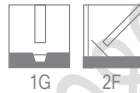
- Wear plate manufacture
- Ore chutes
- Crusher rolls
- Screw augers

Conformances

AS/NZS2576: 2465*-B7

* Nearest equivalent

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.2	ED035663	Spool PLW 11.3kg
1.6	ED035662	Spool PLW 13.6kg

Mechanical Properties

Rockwell - HRC
69-72

Deposit Composition

	%C	%Mn	%Si	%Al	%Cr
2 Layers – Open Arc	< 5	< 5	< 2	< 5	< 20
	%W	%B	%Mo	%Nb	%Fe
2 Layers – Open Arc	< 10	< 5	< 10	< 10	Balance

Typical Operating Procedures

Diameter, Polarity, ESO	Wire Feed Speed in/min	Voltage volts	Current amps
1.2 mm, DC+, 20 mm	7	24	135
1.6 mm, DC+, 20 mm	7	22	24

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. Weartech® SHS 9192U 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® M

Key Features

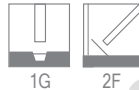
- Self-shielded open arc cored wire
- Deposit resists severe impact as well as moderate abrasion
- Produces an austenitic manganese deposit that work-hardens
- Unlimited layers with proper preheat and interpass temperatures and procedures

Typical Applications

- Rail crossover
- Crusher hammers
- Dredge parts
- Crusher rolls
- Breaker bars
- Buckets

Conformances

AS/NZS2576: 1220 B7



Diameter / Packaging

Diameter mm	Part Number	Packaging
2.0	ED031130	Spool Steel 11.3kg
2.8	ED011164	Coil 22.7kg

Mechanical Properties

Rockwell - HRC	
As Welded	Work Hardened
18-28	30-48

Deposit Composition

	%C	%Mn	%Si	%Cr	%Ni
Open Arc (2 layers)	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 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® FROGMANG

Key Features

- Self-shielded open arc cored wire
- High alloy austenitic manganese deposit
- Unlimited layers with proper preheat and interpass temperatures and procedures

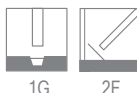
Typical Applications

- Repair of manganese frogs and crossing diamonds in the railroad industry

Conformances

AS/NZS2576: 1220 B7

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.6	ED026106	Spool Steel 11.3kg

Mechanical Properties

Rockwell - HRC	
As Welded	Work Hardened
20-30	40-50

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

Key Features

- Self-shielded open arc cored wire
- Provides an austenitic manganese deposit which exhibits very good crack resistance
- Unlimited layers with proper preheat and interpass temperatures and procedures

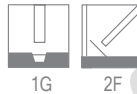
Typical Applications

- Spreader cones
- Crusher hammers
- Austenitic manganese parts
- 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

Conformances

AS/NZS2576: 1720 B7

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
2.0	ED031126	Spool Steel 11.3kg
2.8	ED022061	Coil 22.7kg

Mechanical Properties

Rockwell - HRC	
As Welded	Work Hardened
18-22	40-50

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.



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Pipeliner® 6P+

Key Features

- High operator appeal and control in vertical down welding
- Easy slag removal
- Q2 (3.1) Lot Certificates showing chemistry and mechanical properties available online
- The standard in the pipe welding industry
- Boron-free design

Conformances

AWS A5.1/A5.1M: E6010 / E4310

AS/NZS 4855-B: E4310 A

ABS: E6010

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

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	ED030848	Easy Open Can 22.7kg
3.2	350	ED032610	Easy Open Can 4.5kg
4.0	350	ED030849	Easy Open Can 22.7kg

Mechanical Properties - As Required per AWS A5.1 / A5.1M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°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 Operation Procedures

Current (amps)		
Polarity	3.2mm	4.0mm
DC ±	75-135	100-175

Pipelin[®] 7P+

Key Features

- High productivity in vertical down and out of position pipe welding
- Q2 (3.1) Lot certificates showing chemistry and mechanical properties available online
- Clean, visible weld puddle, deep penetration
- Superior puddle control

Typical Applications

- Cross country and in-plant pipe welding
- Root pass welding up to X80 grade pipe
- Hot, fill and cap passes up to X65 grade pipe

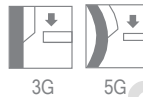
Conformances

AWS A5.5/A5.5M: E7010-P1/E4910-P1

AS/NZS 4855-B: E4910-P1

ABS: E7010-P1

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	ED031611	Easy Open Can 22.7kg
4.0	350	ED031612	
5.0	350	ED031613	

Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C	Charpy V-Notch J @ -40°C
Requirements - AWS E7010-P1	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 Operation Procedures

Current (amps)			
Polarity	3.2mm	4.0mm	5.0mm
DC+	65-130	100-165	130-210

Pipeliner® 8P+

Key Features

- High productivity in vertical down and out-of-position pipe welding
- Deep penetration, superior puddle control
- Q2 (3.1) Lot Certificates showing chemistry and mechanical properties available online
- Clean, visible weld puddle

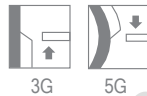
Conformances

AWSA5.5/A5.5M:	E8010-P1 E5510-P1
AS/NZS4855-B:	E5510-P1 A
ABS:	E8010-P1

Typical Applications

- Root pass welding up to X80 grade pipe
- Hot, fill and cap passes up to X70 grade pipe

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	ED030826	Easy Open Can 22.7kg
4.0	350	ED030827	
5.0	350	ED030828	

Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C	Charpy V-Notch J @ -40°C
Requirements - AWS E8010-P1	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 Operation Procedures

Current (amps)			
Polarity	3.2mm	4.0mm	5.0mm
DC+	65-120	100-165	130-210

Pipeliner® Arc 80

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 (3.1) Lot Certificates showing chemistry and mechanical properties available online

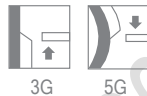
Typical Applications

- Root pass welding up to X80 grade pipe
- Hot, fill and cap pass welding up to X70 grade pipe

Conformances

AWSA5.5/A5.5M:	E8010-P1
	E8010-G
AS/NZS4855-B:	E5510-P1 A

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
4.0	350	ED034456	Easy Open Can 22.7kg
5.0	350	ED034457	

Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C	Charpy V-Notch J @ -40°C
Requirements - AWS E8010-P1	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 Operation Procedures

Current (amps)		
Polarity	4.0mm	5.0mm
DC+	100-165	130-210

Pipeliner® LH-D80

Key Features

- Low hydrogen, vertical down capability up to X70 pipe
- High productivity
- Q2 (3.1) 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

AWSA5.5/A5.5M: E8045-P2 H4R

AS/NZS 4855-B: E4948-H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	ED032626	Easy Open Can 4.5kg
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 @ -30°C	Charpy V-Notch J @ -46°C
Requirements - AWS E8045-P2	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	%Ni
Typical Results - As Welded	0.04-0.06	1.10-1.25	0.35-0.50	≤0.01	≤0.01	≤0.04
	%Cr	%Mo	%V	Diffusible Hydrogen (mL/100g weld deposit)		
Typical Results - As Welded	≤0.05	≤0.02	0.01 max	2-4		

Typical Operation Procedures

Current (amps)		
Polarity	3.2mm	4.0mm
DC+	120-170	170-250

Pipelin[®]er LH-D90

Key Features

- Low hydrogen, vertical down capability up to X80 pipe
- High productivity, deep penetration
- Q2 (3.1) 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 4855-B: E5548-H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	ED032629	Easy Open Can 4.5kg
4.0	350	ED032630	

Mechanical Properties - As Required per AWS A5.5 / A5.5M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C	Charpy V-Notch J @ -46°C
Requirements - AWS 9045-P2	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	%Ni
Typical Results - As Welded	0.04-0.06	1.15-1.35	0.35-0.55	≤0.01	≤0.01	0.25-0.30 ¹ / 0.80-1.00 ²
	%Cr	%Mo	%V	Diffusible Hydrogen (mL/100g weld deposit)		
Typical Results - As Welded	≤0.05	0.15-0.25	≤0.01	2-4		

13.2mm diameter only | 24.0mm diameter only

Typical Operation Procedures

Current (amps)		
Polarity	4.0mm	5.0mm
DC+	120-170	170-250

Pipelin[®] 16P

Key Features

- Premium low hydrogen electrode
- Q2 (3.1) Lot certified – deposit chemistry and mechanical properties available online
- Supplied in Easy Open Can

Typical Applications

- Hot, fill and cap pass welding up to X60
- Open gap root pass welding up to X100 grade pipe

Conformances

AWS A5.1/A5.1M: E7016 H4 / E4916 H4

AS/NZS 4855-B: E4916A H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
2.5	350	ED033835	Easy Open Can 4.5kg
3.2	350	ED033836	
4.0	450	ED033837	

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
Typical Results - As Welded	435-545	550-640	23-34	84-160

Deposit Composition

	%C	%Mn	%Si	%P	%S	Diffusible Hydrogen (mL/100g weld deposit)
Typical Results - As Welded	0.06	1.4	0.50	0.010	0.010	1-4 mls / 100 g

Typical Operation Procedures

Current (amps)			
Polarity	2.5mm	3.2mm	4.0mm
AC / DC	55-115	75-150	120-185

Pipelin[®] 19P

Key Features

- Premium low hydrogen electrode
- Q2 (3.1) Lot certified – deposit chemistry and mechanical properties available online
- Supplied in Easy Open Can

Typical Applications

- Fill and cap pass welding up to X80 grade pipe

Conformances

AWS A5.1/A5.1M: E10018-G H4R

AS/NZS 4857-B: E6918-G H5

Welding Positions



Diameter / Packaging

Diameter mm	Length mm	Part Number	Packaging
3.2	350	ED032622	Easy Open Can 4.5kg
4.0	350	ED032623	

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	600min	690min	15 min	NS
Typical Results - As Welded	660-740	740-825	20-26	69-95

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.04	1.66	0.45	0.015	< 0.001
	%Ni	%M	Diffusible Hydrogen (mL/100g weld deposit)		
Typical Results - As Welded	2.1	0.42	2-3		

Typical Operation Procedures

Current (amps)		
Polarity	3.2mm	4.0mm
AC / DC	80-160	130-215

Pipeliner® 208-XP

Key Features

- Vertical down capability up to X80 pipe
- Capable of producing weld deposits with impact toughness exceeding 150J @ -30°C
- Q2 (3.1) 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: E81T8-G

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
2.0	ED031968	Hermetically Sealed Pail 4 x 6.4kg

Mechanical Properties - As Required per AWS A5.29 / A5.29M

	Yield Strength MPa	Tensile Strength MPa	Elongation %	Charpy V-Notch J @ -30°C
Requirements - AAWS E81T8-G	470 min	550 - 690	19 min	NS
Typical Results - As Welded	485 - 515	550 - 585	27 - 29	153 - 302

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	≤0.02	2.10-2.2	0.12	0.005	<0.003
	%Ni	%Cr	%Mo	%V	%Al
Typical Results - As Welded	0.74-0.80	0.04-0.05	0.01-0.03	<0.01	0.9-1.1

Typical Operation Procedures

Diameter Polarity	CTWD mm	Wire Feed Speed in/min	Voltage volts	Current amps	Deposition Rate kg/hr
2.0mm DC-	19	70-130	17-20	195-295	1.8-3.5

Pipelinor® G70M-E

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

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% CO₂
- Flow Rate: 15-25 L/min

Welding Positions



Diameter / Packaging

Diameter mm	Part Number	Packaging
1.2	944252	Spool S200 4.5kg
	944238	Spool S200 VFB 14kg

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 E81T1-GM	470 min	550-690	19 min	-	-
Typical Results - As Welded	580	630	23	90	70

Deposit Composition

	%C	%Mn	%Si	%P	%S
Typical Results - As Welded	0.05	1.45	0.2	0.013	0.01
	%Ni	Diffusible Hydrogen (mL/100g weld deposit)			
Typical Results - As Welded	0.95	< 5			

Typical Operation 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

Pipeliners Selection Guide

Products	AWS Classification	Lower Strength				Higher Strength		
		<X60	X60	X65	X70	X80	X90	X100

Stick Electrodes

Stick Electrodes - Cellulose

Pipeliners® 6P+	E6010	R+F	R+F	R	R	R		
Pipeliners® 7P+	E7010-P1		R+F	R+F	R	R		
Pipeliners® 8P+	E8010-P1		R+F	R+F	R+F	R		

Stick Electrodes - Basic, Low Hydrogen, Vertical Down

Pipeliners® LH-D80	E8045-P2 H4R		F	F	F			
Pipeliners® LH-D90	E9045-P2 H4R				F	F		
Pipeliners® 16P	E7016H4/E4916H4	R	R	R	R			
Pipeliners® 19P	E10018-G H4R				F	F		

Flux Cored Wires

Flux Cored Wires - Self Shielded / Low Alloy

Pipeliners® NR® 208-XP	E81T8-G		F	F	F			
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Flux Cored Wires - Gas Shielded

Pipeliners® G70M-E	E81T1-GM	F	F	F	F			
Pipeliners® G80M-E	E91T1-GM		F	F	F	F		
Pipeliners® G90M-E	E111T1-GM					F	F	F

R = Root Pass Only

R+F = Root & Fill Passes

F=FillPassOnly

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.

LH-D80/90 Welding Guidelines

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

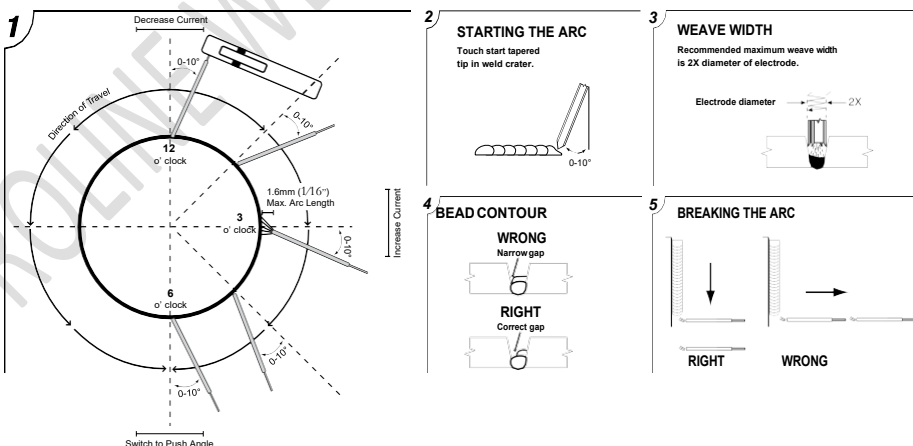
Technique Tips for Weld Positions

- | | |
|------------|--|
| 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



Find out more at: <http://bit.ly/LH-DStick>



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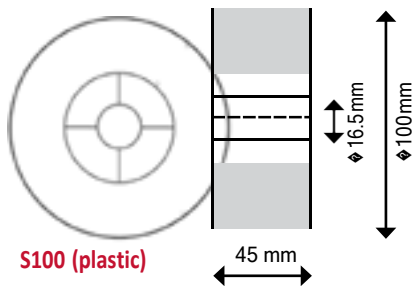
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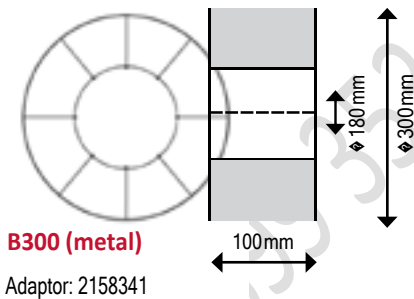
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Packaging Sizes for Solid and Flux-Cored Wires

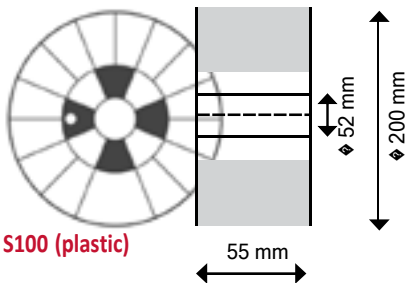


S100 (plastic)

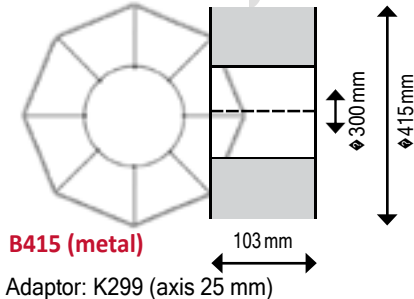


B300 (metal)

Adaptor: 2158341

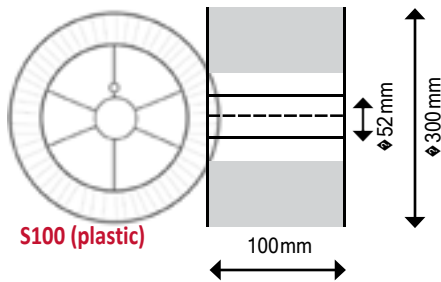


S100 (plastic)

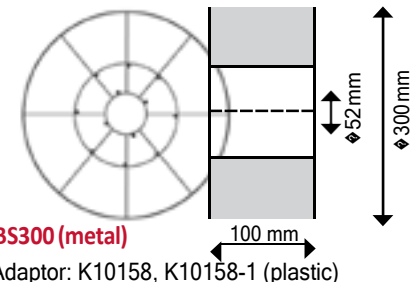


B415 (metal)

Adaptor: K299 (axis 25 mm)

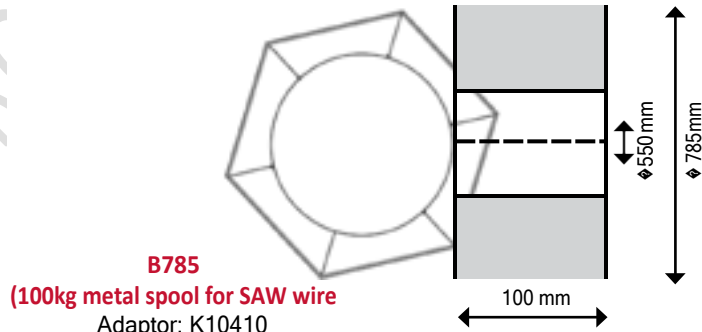


S100 (plastic)



BS300 (metal)

Adaptor: K10158, K10158-1 (plastic)



B785

(100kg metal spool for SAW wire)

Adaptor: K10410

Stick Electrodes—Tubes, Cans and Cartons

Easy Open Cans 22.7kg



Plastic Tubes 2.4kg



Cardboard Carton 4.5kg and 22.7kg



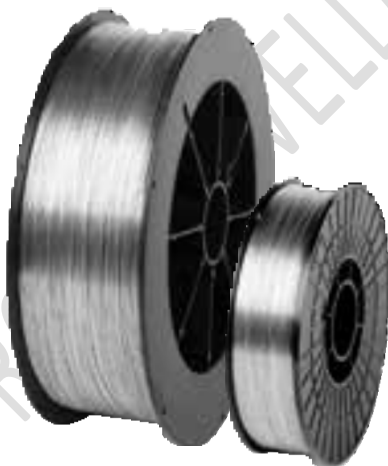
Wires – Spools



Steel Spool Solid and Flux-Cored 15kg



Plastic Spool Flux-Cored 11.3kg



Plastic Spool Solid, Mild Steel 11.3kg and 5kg



Plastic Spool Solid, Aluminium 7.3kg and 0.5kg

Wires – Coils



Flux-Cored 6.1kg Coil (24.5kg HS Pail)



Flux-Cored 27.2kg

Flux – Bags



Paper Bag 22.7kg



Plastic Bag 25kg

Wires and Flux – Drums



Accu-Trak®/Speed-Feed® Drums



Steel Drums

Wires – Pails



Hermetically Sealed Pail



Pail as Master



Storage and Handling – Stick Electrodes

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.

Storage and Handling—Stick Electrodes

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	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	-
E6011			
E7010-A1 ⁽¹⁾			
E7010-G ⁽¹⁾			
E8010-G ⁽¹⁾			
E9010-G ⁽¹⁾			
E7024	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
E6027			
E6013	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
E7014			
E6022			

1. Pre-dry for 1-2 hours.

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).

Storage and Handling – Metal & Flux Cored Wire

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.

Storage and Handling—Submerged and Wire

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 $100^{\circ}\text{C} \pm 4^{\circ}\text{C}$ 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.

Storage for Submerged Arc Flux

Condition	Pre-drying Temperature ⁽¹⁾	Final Re-drying Temperature
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 and Handling—Submerged and Wire

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-dried 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.

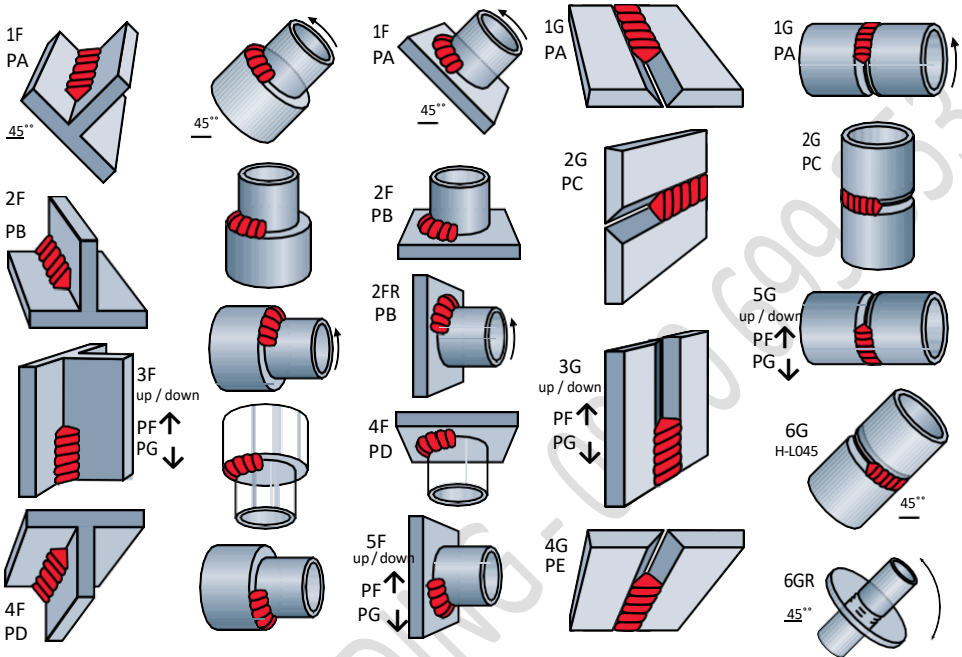
Recycling Flux

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.



Welding Positions According to ASME & ISO 6947



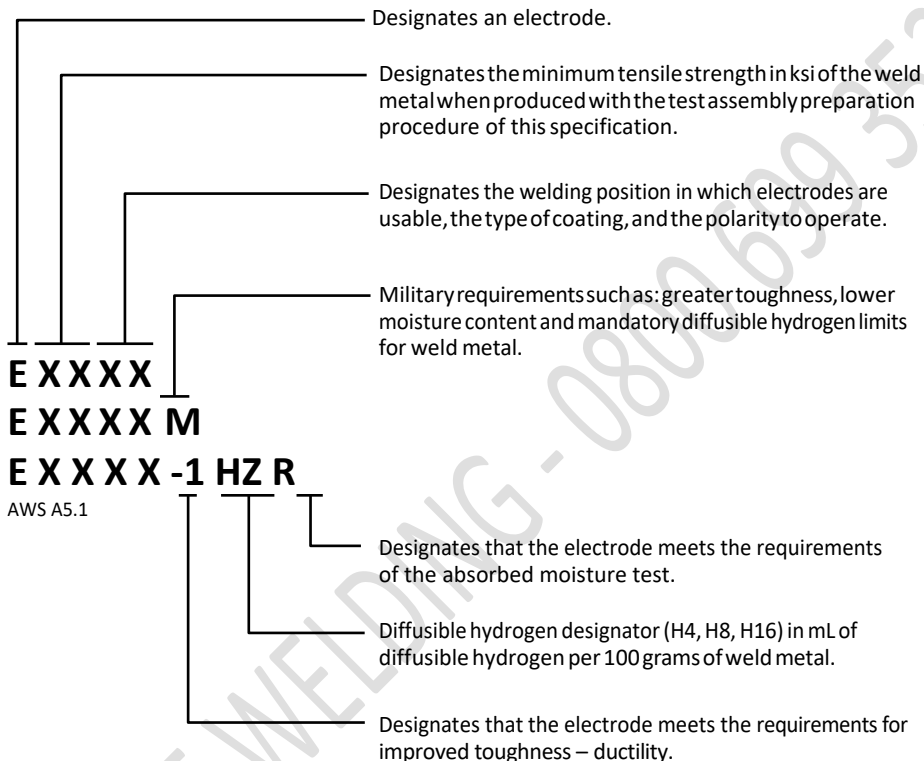
	Position	Plate	Pipe
Plate-fillet	1F	1F	1F
	2F	1F, 2F	1F, 2F, 2FR
	3F	1F, 2F, 3F	1F, 2F, 2FR
	4F	1F, 2F, 4F	1F, 2F, 2FR, 4F
	3F + 4F	All qualifications	All qualifications
Plate-fillet	1F	1F	1F
	2F	1F, 2F	1F, 2F, 2FR
	2FR		1F, 2FR
	4F	1F, 2F, 4F	1F, 2F, 2FR, 4F
	5F	All qualifications	All qualifications

	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

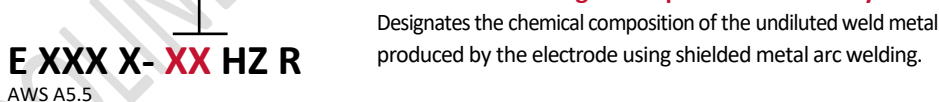
Stick (SMAW)

Mild and Low Alloy Steel per AWS A5.1/A5.1M and AWS A5.5/A5.5M

Classification Designators per AWS A5.1 & A5.5



Classification Designators per AWS A5.5 Only



Additional Classifications

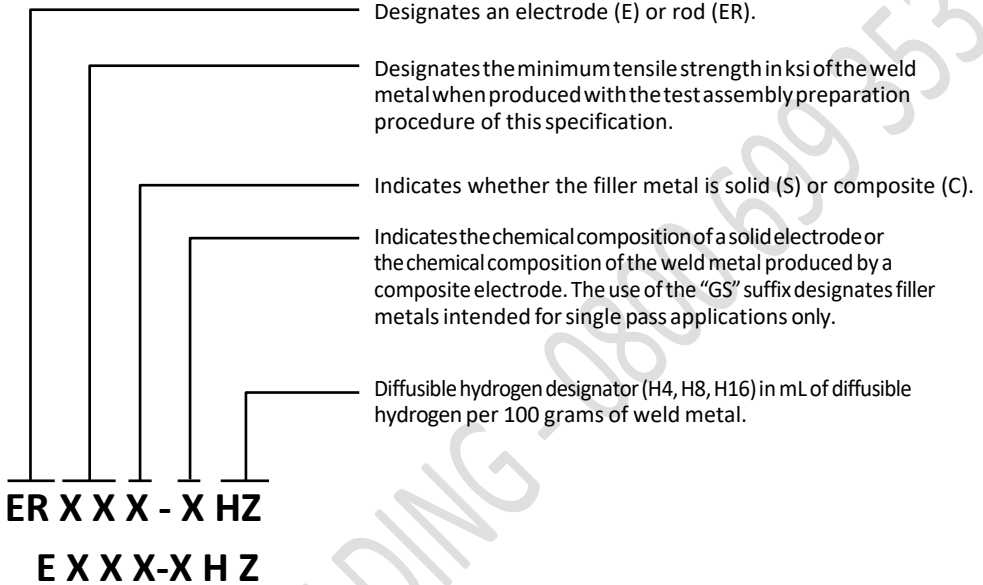
Stainless Steel - Per AWS A5.4

- 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.

MIG, TIG & Metal-Cored

Mild and Low Alloy Steel per AWS A5.18/A5.18M and AWS A5.28/A5.28M

Classification Designators per AWS A5.18 & A5.28



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.

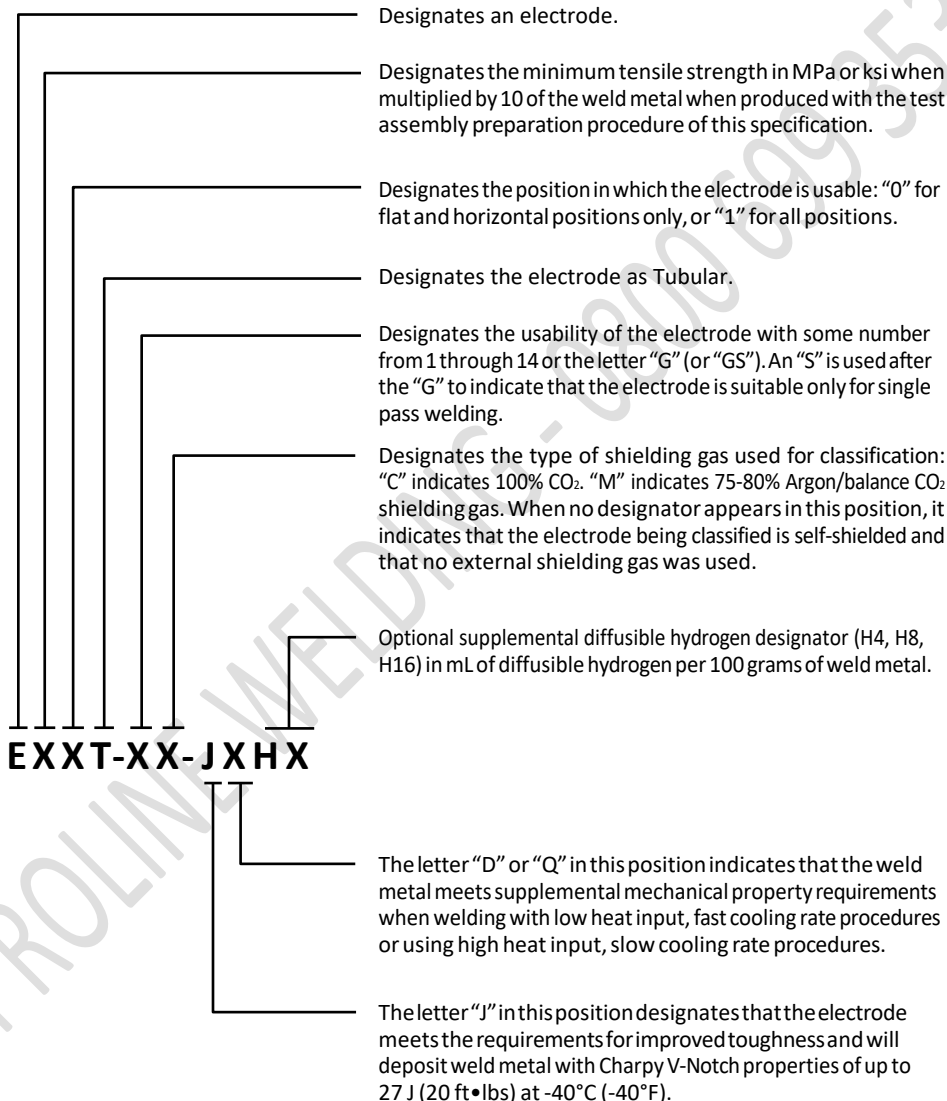
Nickel Alloy – Per AWS A5.14/A5.14M

ERXXXX-X The chemical symbol "Ni" appears in the designations immediately after "E" or "ER" to identify the filler metal as a nickel-base 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.

Flux-Cored (FCAW)

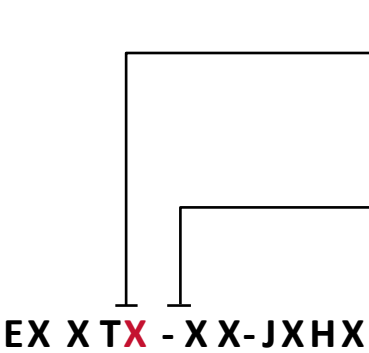
Mild Steel per AWS A5.20/A5.20M

Classification Designators per AWS A5.20



Flux-Cored (FCAW)

Mild and Low Alloy Steel per AWS A5.20/A5.20M and AWS A5.29/A5.29M



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

EXXTX-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.

Submerged Arc (SAW) Flux and Electrode

Mild and Low Alloy Steel - Per AWS A5.17/A5.17M and AWS A5.23/A5.23M

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.

F X P X - E C M X X K - H Z

F X P X - E C X X X - H Z

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).

Submerged Arc (SAW) Flux and Electrode

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.

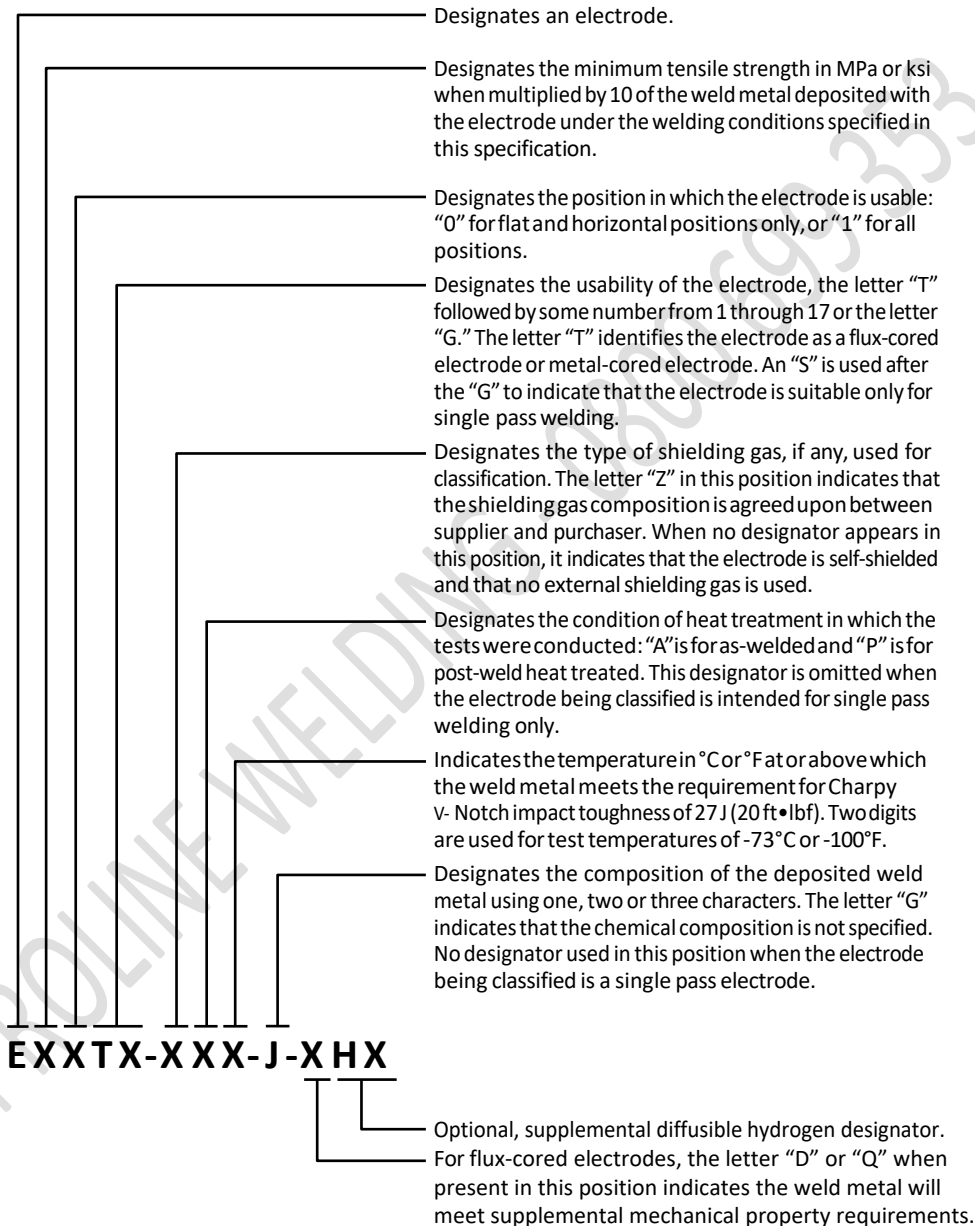
EM2, EM3, and EM4 (High-Strength, Low Alloy Steel) – May contain a combination of Cr, Ni, Mo, Ti, Zr and Al.

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.

Flux-Cored (FCAW)

Classification Designators per AWS A5.36



Submerged Arc Fluxes

Flux Types and General Characteristics

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.

Innershield® Wire Selection Guide

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
		1.6
NR®-233	E71T-8	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
Pipeliners*		
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

Innershield® Wire Selection Guide

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.



<http://bit.ly/seismiczones>

Safety Guidelines

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:
 - 2d1. Route the electrode and work cables together - Secure them with tape when possible.
 - 2d2. Never coil the electrode lead around your body.
 - 2d3. 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.
 - 2d4. Connect the work cable to the workpiece as close as possible to the area being welded.
 - 2d5. Do not work next to welding power source.



Safety Guidelines



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.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semi-automatic welding gun are also electrically “hot”.
- 3.d. 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.e. Ground the work or metal to be welded to a good electrical (earth) ground. 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 Z87.1 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.

Safety Guidelines



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

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



Lincoln Electric Companies



Oerlikon and SAF-FRO designs, produces and markets welding and cutting products, solutions and services for professional users. This leading International brand made the commitment to create value for customers throughout the world, by bringing them innovative technologies, products and services in welding and cutting.



A Lincoln Electric Company

Metrode offers one of the largest ranges of alloy welding consumables available from any source.



A LINCOLN ELECTRIC COMPANY

The Harris Products Group is a world leader in metal working products used in the brazing, soldering, welding, cutting and gas distribution industries.



Techalloy® manufactures a full product line of nickel alloy and stainless steel welding consumables for the automotive, pharmaceutical and energy industries.



Weartech™ International Inc. is a producer of cobalt-based hardfacing and wear resistant welding consumables. For over 20 years, Weartech™ has provided technical solutions to customers facing significant wear problems.



SWP (Specialised Welding Products) offers one of the largest and most diverse range of specialised welding consumables in Australia.

Note: Products in the above Lincoln Electric companies may not be available in Australia and New Zealand and are listed for illustrative purposes

PROLINE

professional welding supplies

Call Free Nationwide - 0800 699 353 (0800 NZ WELD)

North Island Sales Office - 09 274 1090

South Island Sales Office - 03 547 9021

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International Contact Details:

email: sales@prolinewelding.com

phone: +64 3 547 9021



CUSTOMER ASSISTANCE POLICY

Lincoln Electric® business is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric® for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric® is not in a position to warrant or guarantee such advice and to the extent permitted by law assumes no liability, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given. The provision of information or advice does not create, expand or alter this warranty. Lincoln Electric® is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric® is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric® affect the results obtained in applying this type of fabrication methods and service requirements. Subject to Change – This information is accurate to the best of our knowledge at the time of printing.

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