บริษัท เจมินี่ (ประเทศไทย) จำกัด
LUNA (Thailand) Co., Ltd.

Luna (Thailand) Co., Ltd., manufactures and selling in high-quality electrical welding rod under the trademark 'Luna' the owner for more than 20 years and accepted full recognition from customers both domestic and foreign companies around the world. Luna is committed to developing more products and services with international standards for respond to our customer's demand.

Luna (Thailand) Co., Ltd., was established since 1978 by thai investors, Manufacturing and distribution in electrical welding rod. In 1984 the company had took over manufacturing electrical welding rod, the Thai Hunsa Co., Ltd.-a joint venture between Thai's Company and Hunsa (Germany) Co., Ltd. Our company has vision to increase production capacity in electrical welding rod efficiencies and same as international quality. With modern machinery and reducing of dependence on Know-how from a foreign will lead us the production of high quality and production costs cheaper than imported products in the same category.

The company is located on over 4 acer (10 Rai) in Samutprakan province. Fully equipped with modern machinery, team of talented researchers enabling customers' confidence in Luna products electrical welding rod every line with stable consistent quality, certified by various institutions both domestic and overseas such as

1. Thai Industrial Standards Institution (TISI) from Thailand
2. LLOYD'S REGISTER OF SHIPPING from United Kingdom
3. AMERICAN BUREAU OF SHIPPING form USA
4. GERMANISCHER LLOYD form Germany
5. BUREAU VERITAS from Fance
6. DET NORSKE VERITAS from Norway
7. NIPPON KAIJI KYOKAI from Japan

During 20 years of manufacturing the electrical welding rod, Luna has been able to service all customers together with developing the country along with maintaining the spirit that has come to carry forward for Thailand.

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LUNA PRODUCT/STANDARD COMPARISON CHART

ELECTRODES FOR WELDING CAST IRON AND NON-FERROUS METALS

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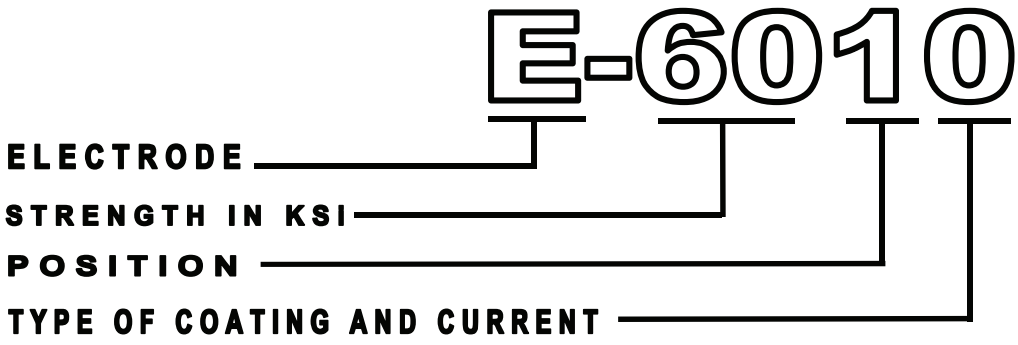
ELECTRODES FOR GOUGING AND CUTTING

HOW AWS CLASSIFIES ELECTRODES

MILD STEEL ELECTRODE, SMAW PROCESS



POSITION

1. FLAT, HORIZONTAL,VERTICAL, OVERHEAD
2. FLAT AND HORIZONTAL ONLY
3. FLAT, HORIZONTAL, VERTICAL DOWN, OVERHEAD

TYPE OF COATING AND CURRENT

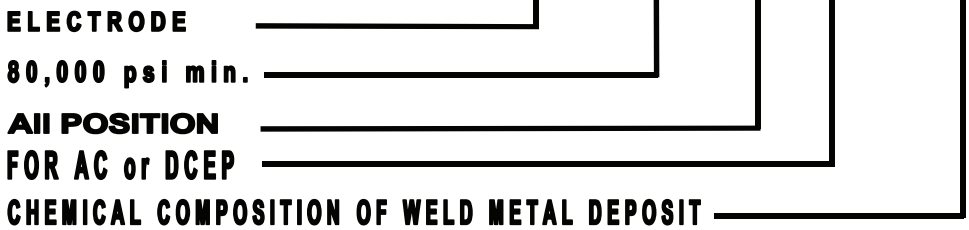
DIGIT	TYPE OF COATING	WELDING CURRENT
0	CELLULOSE SODIUM	DCEP
1	CELLULOSE POTASSIUM	AC or DCEP or DCEN
2	TITANIA SODIUM	AC or DCEN
3	TITANIA POTASSIUM	AC or DCEN
4	IRON POWDER TITANIA	AC or DCEN or DCEP
5	LOW HYDROGEN SODIUM	DCEP
6	LOW HYDROGEN POTASSIUM	AC or DCEP
7	IRON POWDER IRON OXIDE	AC or DCEP or DCEN
8	IRON POWDER LOW HYDROGEN	AC or DCEP
9	IRON OXIDE TITANIA POTASSIUM	AC or DCEP or DCEN
E6020	IRON OXIDE SODIUM	AC or DCEP

DCEP - DIRECT CURRENT ELECTRODE POSITIVE

DCEN - DIRECT CURRENT ELECTRODE NEGATIVE

LOW ALLOY ELECTRODE

E-8018-B1



CHEMICAL COMPOSITION OF WELD METAL DEPOSIT

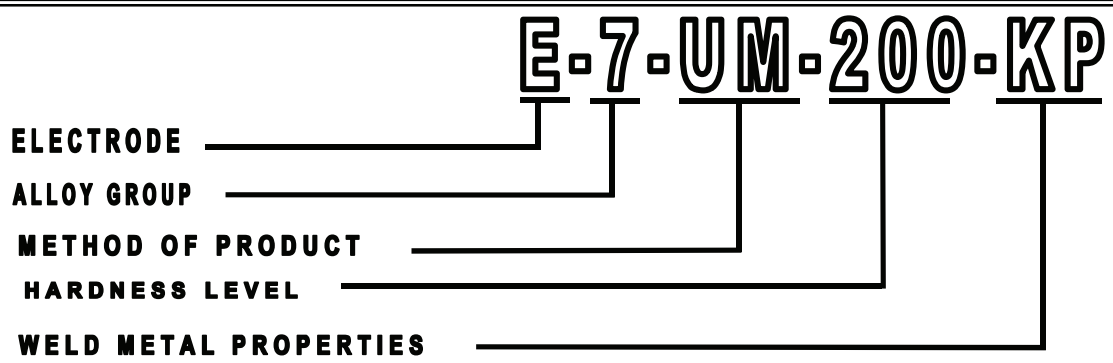
SUFFIX	C	Mn	Si	Ni	Cr	Mo	Va
A1	0.12	0.6-10*	0.40-0.80*	-	-	0.40-0.65	-
B1	0.12	0.90	0.60-0.80*	-	0.40-0.65	0.40-0.65	-
B2L	0.05	0.90	0.80-1.00*	-	1.00-1.50	0.40-0.65	-
B2	0.12	0.90	0.60-0.90*	-	1.00-1.50	0.40-0.65	-
B3L	0.05	0.90	0.80-1.00*	-	2.00-2.50	0.90-1.20	-
B3	0.12	0.90	0.60-0.80*	-	2.00-2.50	0.90-1.20	-
B4L	0.05	0.90	1.00	-	1.75-2.25	0.40-0.65	-
B5	0.07-0.15	0.40-0.70	0.30-0.60	-	0.50-0.60	1.00-1.25	0.05
C1	0.12	1.20	0.60-0.80*	1.0-2.75	-	-	-
C2	0.12	1.20	0.60-0.80*	3.0-3.75	-	-	-
C3	0.12	0.40-1.25	0.80	0.80-1.10	0.15	0.35	0.05
D1	0.12	1.25-1.75	0.60-0.80*	-	-	0.25-0.45	-
D2	0.15	1.65-2.00	0.60-0.80*	-	-	0.25-0.45	-
G	-	1.0 Min	0.80 Min	0.50 Min	0.30 Min	0.20 Min	0.10Min
M**	0.10	0.60-2.25*	0.60-0.80*	1.4-2.5	0.15-1.50*	0.25-0.55*	0.50

***Amount depends on electrode classification. Single values indicate maximum, check AWS A5.5 for the different electrode classes.**

****There are several different M classes. M classifications are intended to conform to military specifications.**

HOW DIN 8555 CLASSIFIES ELECTRODES

HARDFACING ELECTRODE



ALLOY GROUP

Alloy group	Type of filler metal or weld metal
1	Unalloyed up to 0.4 %C or low alloy up to 0.4%C and up to a maximum of 5% of the alloying elements Cr,Mn, Mo, Ni in total.
2	Unalloyed with up to more than 0.4%C or low alloy with more than 0.4% C and up to a maximum of 5% of the alloying elements Cr,Mn, Mo,Ni in total.
3	Alloyed, with the properties of hot working steels.
4	Alloyed, with the properties of high speed steels.
5	Alloyed with more than 5% Cr, with a low C content
6	Alloyed with more than 5% Cr, with a higher C content (about 0.2 to 2.0%)
7	Mn austenites with 11 to 18% Mn, more than 0.5% C and up to 3% Ni.
8	Cr-Ni-Mn austenites.
9	Cr-Ni steels (resistant to rusting, acid and heat)
10	With a high C content and high Cr alloying content and without additional carbide forming agents.
20	Co based, Cr-W alloyed, with or without Ni and Mo.
21	Carbide based (sintered,cast or cored)
22	Ni based, Cr alloyed, Cr-B alloyed.
23	Ni based, Mo alloyed,with or without Cr.
30	Cu based, Sn alloyed.
31	Cu based, Al alloyed.
32	Cu based, Ni alloyed.

METHOD OF PRODUCT

The method of production of filler metal shall be specified by using the following symbols :
GW : rolled GO : cast GZ : drawn GS : sintered GF : cored UM : covered

HARDNESS LEVEL

Hardness level	Hardness rage
150	125 up to 175 HB
200	over 175 up to 225 HB
250	over 225 up to 275 HB
300	over 275 up to 325 HB
350	over 325 up to 375 HB
400	over 375 up to 450 HB
40	37 up to 42 HRC
45	over 42 up to 47 HRC
50	over 47 up to 52 HRC
55	over 52 up to 57 HRC
60	over 57 up to 62 HRC
65	over 62 up to 67 HRC
70	over 67 HRC

*Mean values form 10 measurements.

WELD METAL PROPERTIES

Only those properties of the weld metal apart form the hardness are to be specified, which are particularly typical. The following code letter shall be used (if more than one letter is used, arrange them alphabetically) :

C : corrosion resistant;
G : resistant to abrasive wear;
K : capable of work hardening;
N : non-magnetizable;
P : impact resistant;
R : rust resistant;
S : cutting ability (high speed, ect.
T : high temperature strength as for for high temperature steels;
Z : heat resistant (non-scaling), i.e. for temperatures over about 600 ^{o}C

WORKS DESIGNATION

LUNA ARC WELDING ELECTRODES

ELECTRODES FOR

WELDING UN-ALLOYED

AND FINE GRAIN STEEL

LUNA 10

AWS/SFA5.1 E 6010

Typical Applications And Characteristics

LUNA 10 is a medium coated, DC, cellulosic electrode for welding vertical-down in pipeline and storage tank construction. Recommended for root filler lays in pipeline applications. An extremely fast deposition rate can be obtained by using a "touch" or short-arc technique, The electrode providing a very steady arc over a wide range of current values.

Typical All-Weld Metal Properties				
Composition (%)		Mechanical		
C	0.09	Yield stress	340	N/mm^2
Mn	0.50	Tensile strength	440	N/mm^2
Si	0.20	Elongation	24	%
		CVN Impact Energy	50 Joule	@ 0°C

Typical welding current

DC+					
Ø/L (mm)	2.6X300	2.6X350	3.2X350	4.0X350	5.0X350
Current min/max (A)	50-65	50-65	90-120	110-140	140-220

Approval	Color	End	Green
TIS. 49-2528	Coding	Side	Green
	Printing	G-10/E 6010	
	Welding Positions	Flat,horizontal, vertical-up vertical-down and overhead	

LUNA 11

AWS/SFA5.1 E 6011

Typical Applications And Characteristics

LUNA 11 is a medium coated, AC/DC, cellulose electrode for welding in all positions including vertical-down in pipeline and storage tank construction. An extremely fast deposition rate can be obtained by using a "touch" or short-arc technique, the electrode providing a very short arc over a wide range of current values.

Typical All-Weld Metal Properties

Composition (%)		Mechanical			
C	0.10	Yield stress	460	N/mm^2	
Mn	0.80	Tensile strength	570	N/mm^2	
Si	0.30	Elongation	25	%	
		CVN Impact Energy	60 Joule	@	-20°C

Typical welding current

AC or DC±				
Ø/L (mm)	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	50-65	90-120	130-160	170-210

Approval	Color	End	Green
LR TIS. 49-2528	Coding	Side	Blue
	Printing	G-11/E 6011	
	Welding Positions	Flat, horizontal, vertical-up, vertical-down and overhead	

LUNA 12

AWS/SFA5.1 E 6012

Typical Applications And Characteristics

LUNA 12 is a rutile coated electrode suitable for general fabrication mild steel work particularly where HV fillet welding is required. The outstanding characteristics are the extreme flexibility during operation combined with a self-releasing slag and regularity of the deposit and the absence of undercut. Designed primarily for downhand welding, but also suitable for use in other positions.

Typical All-Weld Metal Properties	
Composition (%)	**Mechanical**
C 0.06	Yield stress 380 N/mm^2
Mn 0.30	Tensile strength 455 N/mm^2
Si 0.20	Elongation 25 %
	CVN Impact Energy 50 Joule @ 0°C

Typical welding current

AC or DC±				
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	70-95	100-130	150-180	170-230

Approval	Color	End	Brown
	Coding	Side	White
	Printing	G-12/E 6012	
	Welding Positions	Flat, horizontal, vertical-up vertical-down and overhead	

LUNA 13

AWS/SFA5.1 E 6013

Typical Applications And Characteristics

LUNA 13 is a general purpose, medium coated, rutile electrode for welding in all positions, including vertical-downwards. Excellent striking and re-striking characteristics. Ideally for tack welding and multiple short run welds. Suitable for container and storage vessel also for rolling stock construction. Very easy to weld with beautiful bead appearance. Excellent slag removal.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.07	Yield stress	430 N/mm^2
Mn	0.30	Tensile strength	490 N/mm^2
Si	0.20	Elongation	24 %
		CVN Impact Energy	55 Joule @ 0°C

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	30-70	50-90	90-130	110-170	150-210

Approval	Color	End	Blue
TIS. 49-2528	Coding	Side	Red
	Printing	G-13/E 6013	
	Welding Positions	Flat, horizontal, vertical-up, vertical-down and overhead	

LUNA D-1

AWS/SFA5.1 E 6013

Typical Applications And Characteristics

LUNA D-1 is a rutile-cellulosic type stick electrode for a range of general fabrication application for workshop and site conditions. Excellent operability in all positions . Particularly suited where poor fit-up conditions prevail. Weld bead appearance is smooth with fine ripple formation.

Typical All-Weld Metal Properties				
Composition (%)		**Mechanical**		
C	0.07	Yield stress	440	N/mm^2
Mn	0.35	Tensile strength	540	N/mm^2
Si	0.27	Elongation	28	%
		CVN Impact Energy	50 Joule	@ 0°C

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	50-60	55-85	90-140	130-180	180-230

Approval	Color	End	blue
ABS LR TIS. 49-2528	Coding	Side	-
	Printing	G-D1/E 6013	
	Welding Positions	Flat, horizontal,vertical-up, vertical-down and overhead	

LUNA RB 36

AWS/SFA5.1 E 6013

Typical Applications And Characteristics

LUNA RB 36 is a rutile-cellulosic type stick electrode for a wide range of general fabrication application for workshop and site conditions. Excellent operability in all positions including vertical-down. Particularly suited where poor fit-up conditions prevail. Easy slag removal and low spatter loss. Weld bead appearance is smooth with fine ripple formation.

Typical All-Weld Metal Properties

Composition (%)		Mechanical		
C	0.07	Yield stress	420	N/mm^2
Mn	0.38	Tensile strength	550	N/mm^2
Si	0.30	Elongation	27	%
		CVN Impact Energy	50 Joule @	$0^{\circ}C$

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	40-60	50-90	90-130	110-170	150-210

Approval	Color	End	Blue
ABS	Coding	Side	Red
LR	Printing	G-RB36/E 6013	
NKK	Welding Positions	Flat, horizontal, vertical-up, vertical-down and overhead	
TIS. 49-2528			

LUNA L1

AWS/SFA5.1 E 7016

Typical Applications And Characteristics

LUNA L1 is a basic, easy to use, all positional, low hydrogen electrode. The control of the weld metal and slag enables the operator to be in command of the work at all times. Excellent impact values at sub-zero temperatures makes this electrode suitable for most types of fabrications where high mechanical properties is required. Ideal for shipbuilding, offshore structures.

Typical All-Weld Metal Properties

Composition (%)		Mechanical		
C	0.06	Yield stress	440	N/mm^2
Mn	0.90	Tensile strength	570	N/mm^2
Si	0.45	Elongation	29	%
P	0.040	CVN Impact Energy	80 Joule	@ -30°C
S	0.025			

Typical welding current

AC or DC±				
∅/L (mm)	2.6X350	3.2X350	4.0X400	5.0X400
Current min/max (A)	60-90	110-130	140-170	180-250

Approval	Color	End	
	Coding	Side	
	Printing	G-L1/E 7016	
	Welding Positions	Flat, horizontal, vertical-up, and overhead	

LUNA LD 52

AWS/SFA5.1 E 7016

Typical Applications And Characteristics

LUNA LD 52 is a basic, easy to use, all positional, low hydrogen electrode. The control of the weld metal and slag enables the operator to be in command of the work at all times. Excellent impact values at sub-zero temperatures makes this electrode suitable for most types of fabrications where high mechanical properties is required. Ideal for shipbuilding, offshore structures.

Typical All-Weld Metal Properties				
Composition (%)		Mechanical		
C	0.07	Yield stress	440	N/mm^2
Mn	0.80	Tensile strength	570	N/mm^2
Si	0.40	Elongation	29	%
		CVN Impact Energy	80 Joule	@ -30°C

Typical welding current

AC or DC±				
∅/L (mm)	2.6X350	3.2X350	4.0X400	5.0X400
Current min/max (A)	60-90	110-130	140-170	180-250

Approval			
ABS, LR, BV, NK, GL, DNV and TIS. 49-2528	Color	End	Purple
	Coding	Side	Red
	Printing	G-LD52/E 7016	
	Welding Positions	Flat, horizontal, vertical-up, and overhead	

LUNA LD 52U

AWS/SFA5.1 E 7016

Typical Applications And Characteristics

LUNA LD-52U is a low hydrogen, double coating, electrode meeting the highest quality requirements. Recommended for unalloyed, micro-alloyed low-alloyed steels of the medium tensile class. Suitable for root passes and all-position welding. Double-coating provides extremely stable arc with outstanding welding characteristics. Not affected by rust or paint on workplace surface.

Typical All-Weld Metal Properties				
Composition (%)		**Mechanical**		
C	0.05	Yield stress	470	N/mm^2
Mn	0.80	Tensile strength	590	N/mm^2
Si	0.60	Elongation	28	%
		CVN Impact Energy	80 Joule @ -20°C	

Typical welding current

AC or DC±					
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	40-60	90-140	140-190	190-250	-

Approval	Color	End	Grey
ABS, LR, BV,DNV and TIS. 49-2528	Coding	Side	Red
	Printing	G-LD52U/E 7016	
	Welding Positions	Flat, horizontal, vertical-up, and overhead	

LUNA 7018-1

AWS/SFA5.1 E 7018-1

Typical Applications And Characteristics

LUNA 7018-1 is a basic coated hydrogen controlled electrode for high mechanical property requirements and crack resistance. Also suitable for crack-resistant joint weld on higher carbon steels. The double coating provides very stable arc characteristics with excellent all-position weld-ability. Low spatter loss, ready slag detachment and regular bead appearance. COD tested for offshore applications.

Composition (%)		Mechanical			
C	0.06	Yield stress	470	N/mm^2	
Mn	1.27	Tensile strength	560	N/mm^2	
Si	0.30	Elongation	29	%	
		CVN Impact Energy	90 Joule	@	-46 °C

Typical welding current

DC +					
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	60-100	90-140	140-190	180-240	-

Approval	Color	End	White
ABS	Coding	Side	Silver
LR	Printing	G-7018-1/E 7018-1	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 7018G

AWS/SFA5.5 E 7018-G

Typical Applications And Characteristics

LUNA 7018-G is a basic coated hydrogen controlled electrode for welding low alloy Ni-steels and high C. Mn steels with high impact values at temperature down to -60° C. The toughness of LUNA 7018-G weld metal is retained after the prolonged stress relief which has to be applied to very thick walled pressure vessels used in nuclear plant. The arc stability is good with low spatter loss. Slag detachability is excellent.

Typical All-Weld Metal Properties			
Composition (%)		Mechanical	
C	0.06	Yield stress	390 N/mm^2
Mn	1.20	Tensile strength	490 N/mm^2
Si	0.30	Elongation	26 %
Ni	0.95	CVN Impact Energy	80 Joule @ -30°C

Typical welding current

DC +					
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	65-100	90-140	140-190	180-250	-

Approval	Color	End	White
	Coding	Side	Silver
	Printing	G-7018-G/E 7018-G	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 7018 LT

AWS/SFA5.1 E 7018

Typical Applications And Characteristics

LUNA 7018 LT is a basic coated hydrogen controlled electrode depositing mild steel weld metal of excellent mechanical properties. This can be operated on both AC and DC combining easy slag removal and good weld appearance with excellent penetration. An addition of iron powder is included in the electrode coating which gives a weld metal recovery of approximately 115 %

Typical All-Weld Metal Properties

Composition (%)		Mechanical		
C	0.06	Yield stress	460	N/mm^2
Mn	1.08	Tensile strength	570	N/mm^2
Si	0.52	Elongation	27	%
		CVN Impact Energy	80 Joule	@ -20°C

Typical welding current

AC or DC±				
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	60-90	90-130	110-180	160-230

Approval	Color	End	Blue
ABS	Coding	Side	Gray
LR	Printing	G-7018LT/E 7018	
TIS. 49-2528	Welding Positions	Flat, horizontal, vertical-up, and overhead	

LUNA 7024

AWS/SFA5.1 E 7024

Typical Applications And Characteristics

LUNA 7024 is a rutile coated iron power high recovery electrode depositing weld metal of good metallurgical properties quickly and economically. Designed for downhand and fillet welding. LUNA 7024 has a recovery of approximately 160 %. The arc is smooth and consistent with very little spatter. Striking and re-striking qualities are excellent.

Typical All-Weld Metal Properties

Composition (%)		Mechanical			
C	0.09	Yield stress	525	N/mm^2	
Mn	0.60	Tensile strength	641	N/mm^2	
Si	0.38	Elongation	26	%	
		CVN Impact Energy	47	Joule	@ -20°C

Typical welding current

AC or DC-					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	70-90	90-120	130-160	180-220	270-320

Approval	Color	End	Blue
	Coding	Side	Red
	Printing	G-7024/E 7024	
	Welding Positions	Flat	

LUNA 8016 G

AWS/SFA5.5 E 8016-G

Typical Applications And Characteristics

LUNA 8016-G is a low hydrogen electrode giving a weld metal with less than 1 % nickel and a minimum tensile strength of 600 N/mm^2 in both the as welded and stress relieved condition. Excellent low temperature toughness is obtained. Ideally suited for both root and filling applications giving weld metal consistently free form radiographic defects.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
Mn	1.60	Yield stress	530 N/mm^2
Si	0.45	Tensile strength	650 N/mm^2
Ni	0.80	Elongation	25 %
Mo	0.20	CVN Impact Energy	60 Joule @ -20°C

Typical welding current

AC or DC +			
∅/L (mm)	3.2X350	4.0X400	5.0X400
Current min/max (A)	90-140	150-180	160-250

Approval	Color	End	Purple
	Coding	Side	Purple
	Printing	G-8016-G/E 8016-G	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 8018 G

AWS/SFA5.5 E 8018-G

Typical Applications And Characteristics

LUNA 8018-G is a basic coated hydrogen controlled electrode for welding low-alloy creep-resisting CrMoV-steels. Maximum operation temperature 550° C. Good weldability in all-position. Low spatter loss, ready slag detachment. Keep the DC welding by preference.

Typical All-Weld Metal Properties					
Composition (%)		**Mechanical**			
C	0.06	Yield stress	510	N/mm^2	
Mn	1.40	Tensile strength	620	N/mm^2	
Si	0.30	Elongation	30	%	
Ni	0.80	CVN Impact Energy	20	Joule	@ -40°C

Typical welding current

DC +					
∅/L (mm)	2.6X300	2.6X350	3.2X350	4.0X400	5.0X400
Current min/max (A)	65-100	65-100	90-140	140-180	190-240

Approval	Color	End	Purple
	Coding	Side	Gray
	Printing	G-8018-G/E 8018-G	
	Welding Positions	Flat, horizontal, and vertical-up	

LUNA 9018 G

AWS/SFA5.5 E 9018-G

Typical Applications And Characteristics

LUNA 9018-G is a basic coated hydrogen controlled electrode for fine grain steels having a tensile strength of 640-735 N/mm^2 .The deposited metal has an excellent impact value. Steels that are sensitive to heat-input must be welded with minimum of weaving. Low spatter loss with easy slag removal. DC welding by preference.

Typical All-Weld Metal Properties				
Composition (%)		**Mechanical**		
C	0.06	Yield stress	570	N/mm^2
Mn	1.40	Tensile strength	660	N/mm^2
Si	0.60	Elongation	29	%
Ni	1.39	CVN Impact Energy	28 Joule	@ -30°C

Typical welding current

DC +					
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	65-100	90-140	140-180	190-240	-

Approval	Color	End	Purple
	Coding	Side	Gray
	Printing	G-9018-G/E 9018-G	
	Welding Positions	Flat, horizontal, and vertical-up	

LUNA 11018 M

AWS/SFA5.5 E 11018-M

Typical Applications And Characteristics

LUNA 11018-M is a high quality basic coated hydrogen controlled electrode specially designed for welding high strength quenched and tempered steels in the 750-850 N/mm^2 tensile range on applications requiring high notch ductility at sub-zero temperatures. Good weldability in all positions with weld metal of highest quality. Suitable for the most critical applications. Low spatter loss and easy slag removal.

Typical All-Weld Metal Properties

Composition (%)		Mechanical		
C	0.07	Yield stress	720	N/mm^2
Mn	1.50	Tensile strength	760	N/mm^2
Si	0.30	Elongation	21	%
Ni	2.00	CVN Impact Energy	55 Joule @	-50°C
Cr	0.40			
Mo	0.40			

Typical welding current

AC or DC ±				
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	65-100	90-140	140-190	180-240

Approval	Color	End	Silver
	Coding	Side	Gray
	Printing	G-11018-M/E 11018-M	
	Welding Positions	Flat, horizontal, and vertical-up	

WORKS DESIGNATION

LUNA ARC WELDING ELECTRODES

ELECTRODES FOR WELDING CREEP RESISTANT STEELS

LUNA 8018 B2

AWS/SFA5.1 E 8018-B2

Typical Applications And Characteristics

LUNA 8018-B2 is a basic coated hydrogen controlled electrode for low alloy and creep-resisting CrMo-steels. Maximum operation temperature 550° C. Suitable for welding of thick steam pipe and repairing of cast steel. Low spatter loss, ready slag detachment. Keep the arc short. Preheating 200-250° C Stress relieving 620° C. DC welding by pre-fence.

Typical All-Weld Metal Properties					
Composition (%)		**Mechanical**			
C	0.10	Yield stress	450	N/mm^2	
Mn	0.80	Tensile strength	560	N/mm^2	
Si	0.40	Elongation	20	%	
Cr	1.20	CVN Impact Energy	50	Joule @	-30° C
Mo	0.50				

Typical welding current

DC +					
∅/L (mm)	2.6/300	3.2/350	4.0/400	5.0/400	-
Current min/max (A)	60/90	90/130	140/180	190/230	-

Approval	Color	End	Brown
	Coding	Side	White
	Printing	G-8018-B2/E 8018-B2	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 9018 B3

AWS/SFA5.1 E 9018-B3

Typical Applications And Characteristics

LUNA 9018-B3 is a basic coated hydrogen controlled electrode for welding 2.3 % Cr, 1.0 % Mo type creep resisting steels. The electrode depositing a weld metal of high metallurgical and radiographic quality in all positions. Maximum operation temperature 600° C. Suitable for welding of thick steam pipe and repairing of cast steel. Low spatter loss, ready slag detachment. Keep the arc short. Preheating 200-250° C. Stress relieving 620-740° C. DC welding by prefence.

Typical All-Weld Metal Properties				
Composition (%)		**Mechanical**		
C	0.12	Yield stress	450	N/mm^2
Mn	0.80	Tensile strength	750	N/mm^2
Si	0.40	Elongation	18	%
Cr	2.30	CVN Impact Energy	85 Joule @	-20° C
Mo	1.00			

Typical welding current

DC +					
∅/L (mm)	2.6/300	3.2/350	4.0/400	5.0/400	-
Current min/max (A)	60/90	90/130	140/180	190/230	-

Approval	Color	End	Brown
	Coding	Side	Red
	Printing	G-9018-B3/E 9018-B3	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA	WORKS DESIGNATION

LUNA ARC WELDING ELECTRODES

ELECTRODES FOR WELDING STAINLESS AND HEAT RESISTING STEELS

LUNA 307 A

AWS/SFA5.4 E 307-16

Typical Applications And Characteristics

LUNA 307 A is a special coated high-alloy, crack resistant electrode for welding difficult to weld steels and for joining dissimilar steels and manganese-alloyed steels. Also suitable as a buffer layer when hardfacing.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.11	Yield Stress	590 N/mm^2
Mn	8.10	Tensile strength	660 N/mm^2
Ni	8.56	Elongation	30 %
Cr	18.00		

Typical welding current

AC or DC±				
∅/L (mm)	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	40-60	80-100	100-130	120-160

Approval	Color	End	Yellow
	Coding	Side	Silver
	Printing	G-307A/E 307-16	
	Welding Positions	Flat	

LUNA 307 HR

AWS/SFA5.4 E 307-16

Typical Applications And Characteristics

LUNA 307 HR is a synthetic coated high-alloy, crack resistant electrode for welding difficult to weld steels and for joining dissimilar steels and manganese-alloyed steels. Also suitable as a buffer layer when hardfacing.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.06	Yield Stress	586 N/mm^2
Mn	5.60	Tensile strength	650 N/mm^2
Ni	8.77	Elongation	35 %
Cr	17.66		

Typical welding current

AC or DC±				
∅/L (mm)	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	60-90	110-140	140-180	180-220

Approval	Color	End	Yellow
	Coding	Side	purple
	Printing	G-307HR/E 307-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 308

AWS/SFA5.4 E 308-16

Typical Applications And Characteristics

LUNA 308 is a general purpose, austenitic electrode with rutile coating for welding corrosion-resistant CrNi-steels. Resistant to atmospheric and resistant to grain disintegration of operating temperatures up to 350° C. Very smooth weld with clean weld edge. Low spatter loss and easy slag removal. For welding AISI/ASTM 302,304

Typical All-Weld Metal Properties

Composition (%)		Mechanical		
C	0.04	Yield Stress	550	N/mm^2
Mn	0.70	Tensile strength	600	N/mm^2
Si	0.66	Elongation	35	%
Ni	9.74			
Cr	18.80			

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	30-50	50-75	75-110	110-150	140-190

Approval	Color	End	Yellow
TIS. 730-2530	Coding	Side	Orange
	Printing	G-308/E 308-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 308L

AWS/SFA5.4 E 308L-16

Typical Applications And Characteristics

LUNA 308L is a general purpose, extra low carbon, austenitic electrode with rutile coating for welding corrosion-resistant CrNi steels. Resistant to atmospheric and resistant to grain disintegration of operating temperatures up to 350° C. Very smooth weld with clean weld edge. Low spatter loss and easy slag removal. For welding AISI 302,304,304L,304LN

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.01	Yield stress	520 N/mm^2
Mn	0.70	Tensile strength	590 N/mm^2
Si	0.60	Elongation	40 %
Ni	10.00		
Cr	19.30		

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	30-50	50-75	75-110	110-150	140-190

Approval	Color	End	Yellow
LR	Coding	Side	Blue
TIS. 730-2530	Printing	G-308L/E 308L-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 309

AWS/SFA5.4 E 309-16

Typical Applications And Characteristics

LUNA 309 is a rutile coated electrode for welding corrosion-resistant and heat resistant Cr-and CrNi-steels. The high level of alloying elements makes this electrode also suitable for welding Cr-and CrNi steel to mild steel welding CrNi-clad steel. Very smooth weld with clean edge. Low spatter loss and excellent slag removability.

Typical All-Weld Metal Properties

Composition (%)		Mechanical	
C	0.04	Yield Stress	550 N/mm^2
Mn	1.00	Tensile strength	600 N/mm^2
Si	0.65	Elongation	30 %
Ni	13.00		
Cr	23.60		

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	30-50	40-70	70-100	110-140	120-160

Approval	Color	End	Silver
	Coding	Side	Red
	Printing	G-309/E 309-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 309

AWS/SFA5.4 E 309L-16

Typical Applications And Characteristics

LUNA 309L is a rutile extra-low carbon coated electrode for welding corrosion-resistant and heat resistant Cr-and CrNi-steels. The high level of alloying elements makes this electrode also suitable for welding Cr-and CrNi steel to mild steel welding CrNi-clad steel very smooth weld with clean edge. Low spatter loss and excellent slag removability.

Typical All-Weld Metal Properties

Composition (%)		Mechanical	
C	0.02	Yield Stress	520 N/mm^2
Mn	0.92	Tensile strength	570 N/mm^2
Si	0.63	Elongation	30 %
Ni	13.00		
Cr	23.50		

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	30-50	40-70	70-100	110-140	120-160

Approval	Color	End	Silver
	Coding	Side	Blue
	Printing	G-309L/E 309L-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 309Mo

AWS/SFA5.4 E 309Mo-16

Typical Applications And Characteristics

LUNA 309Mo is a synthetic rutile high recovery electrode yielding an austenitic ferritic deposit. Suitable for welding corrosion-resistant Cr-NiMo-steels to themselves and to mild or low-alloy steel. Also recommended as a buffer layer for stainless cladding applications on non-alloy steels. stable, well directed arc. smooth bead formation and clean weld edge. Low spatter loss with easy slag removal.

Typical All-Weld Metal Properties			
Composition (%)		Mechanical	
C	0.02	Yield Stress	520 N/mm^2
Mn	0.93	Tensile strength	550 N/mm^2
Si	0.77	Elongation	30 %
Ni	13.22		
Cr	23.10		
Mo	2.30		

Typical welding current

AC or DC±					
Ø/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	50-80	70-110	110-150	150-200	-

Approval	Color	End	Gold
	Coding	Side	Silver
	Printing	G-309Mo/E 309Mo-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 309MoL

AWS/SFA5.4 E 309MoL-16

Typical Applications And Characteristics

LUNA 309MoL is a synthetic rutile high recovery electrode yielding an austenitic ferritic deposit. Suitable for welding corrosion-resistant Cr-NiMo-steels to themselves and to mild or low-alloy steel. Also recommended as a buffer layer for stainless cladding applications on non-alloy steels. stable, well directed arc. smooth bead formation and clean weld edge. Low spatter loss with easy slag removal.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.02	Yield Stress	520 N/mm^2
Mn	0.90	Tensile strength	550 N/mm^2
Si	0.80	Elongation	30 %
Ni	13.36		
Cr	22.94		
Mo	2.20		

Typical welding current

AC or DC±					
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	50-80	70-110	110-150	150-200	-

Approval	Color	End	Gold
	Coding	Side	Silver
	Printing	G-309MoL/E 309MoL-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 310

AWS/SFA5.4 E 310-16

Typical Applications And Characteristics

LUNA 310 is a rutile coated electrode deposits nominally 25 % Cr, 20% Ni fully austenitic stainless steel weld metal and is normally used for joint welding and hardsurfacing of 25 % Cr/20 % Ni heat-resistance ferritic Cr steels, provided corrosion resistance in reducing sulfurous combustion gases is not specified. The weld metal is resistant to oxidation and scaling at temperature up to 1050°C. For welding AISI/ASTM 310S

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.09	Yield Stress	552 N/mm^2
Mn	2.47	Tensile strength	550 N/mm^2
Si	0.42	Elongation	30 %
Ni	20.03		
Cr	27.26		

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	30-50	40-70	70-100	110-140	120-160

Approval	Color	End	Gold
	Coding	Side	White
	Printing	G-310/E 310-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 316

AWS/SFA5.4 E 316-16

Typical Applications And Characteristics

LUNA 316 is a rutile high-alloy austenitic electrode for welding corrosion-resistant CrNiMo-steels resistant to atmospheric corrosion. Resistant to grain disintegration of operating temperatures up to 350° C. very smooth weld with clean weld edge. low spatter loss and easy slag removal. For welding AISI/ASTM 316

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.05	Yield Stress	520 N/mm^2
Mn	0.70	Tensile strength	550 N/mm^2
Si	0.70	Elongation	35 %
Ni	12.00		
Cr	19.30		
Mo	2.50		

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	30-50	50-75	75-110	110-150	140-190

Approval	Color	End	Yellow
	Coding	Side	Yellow
	Printing	G-316/E 316-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 316L

AWS/SFA5.4 E 316L-16

LUNA 316 L is a rutile high-alloy extra low carbon austenitic electrode for welding corrosion-resistant CrNiMo-steels resistant to atmospheric corrosion. Resistant to grain disintegration of operating temperatures up to 350° C. Very smooth weld with clean weld edge. low spatter loss and easy slag removal. For welding AISI/ASTM 316,316L,316LN,316H,316Ti

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.02	Yield stress	490 N/mm^2
Mn	0.70	Tensile strength	550 N/mm^2
Si	0.60	Elongation	30 %
Ni	12.12		
Cr	18.00		
Mo	2.20		

Typical welding current

AC or DC±					
∅/L (mm)	2.0X300	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	30-50	50-75	75-110	110-150	140-190

Approval	Color	End	Silver
LR	Coding	Side	Red
	Printing	G-316L/E 316L-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 347

AWS/SFA5.4 E 347-16

Typical Applications And Characteristics

LUNA 347 is a rutile coated electrode for welding corrosion-resistant, stabilized CrNi-steels. Also suitable for applications of heat-resistant steel up to 800° C. Smooth weld, well directed arc with clean edge. Outstanding slag removal.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.05	Yield Stress	520 N/mm²
Mn	0.80	Tensile strength	560 N/mm²
Si	0.70	Elongation	30 %
Ni	9.50		
Cr	19.00		
Nb	0.20		

Typical welding current

AC or DC±					
Ø/L (mm)	2.0X300	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	30-50	50-75	75-110	110-150	140-190

Approval	Color	End	Gold
	Coding	Side	Gray
	Printing	G-347/E 347-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA 680

AWS/SFA5.4 E 312-16

Typical Applications And Characteristics

LUNA 680 is a rutile austenitic-ferritic coated electrode with a 25-30 % ferrite content. The weld metal is extremely crack resistant and lends itself admirably to the welding of dissimilar and "difficult to weld" steels. It can be used for the welding of high nickel alloys without becoming fully austenitic due to nickel pick-up.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.10	Yield Stress	655 N/mm^2
Mn	0.83	Tensile strength	750 N/mm^2
Si	1.00	Elongation	24 %
Ni	9.70		
Cr	28.75		

Typical welding current

AC or DC±					
∅/L (mm)	2.6X300	3.2X350	4.0X350	5.0X350	-
Current min/max (A)	50-75	75-110	110-150	140-190	-

Approval	Color	End	Green
	Coding	Side	Green
	Printing	G-680/E 312-16	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

WORKS DESIGNATION

LUNA ARC WELDING ELECTRODES

ELECTRODES FOR

WELDING HARDFACING

APPLICATIONS

LUNA H 30

Typical Applications And Characteristics

LUNA H 30 is a basic coated SMAW for high hardsurfacing. Surfacing or rebuilding parts subjected to high compression stresses and high impact. Buffer layer on ferritic steels before hardsurfacing with electrodes providing higher abrasion resistance. Suitable for mill roll coupling shaft ends, gear teeth, crane and track pads.

Typical All-Weld Metal Properties	
Composition (%)	**Mechanical**
C 0.05 Mn 0.90 Si 0.40 Cr 1.00 Ni 3.00 Mo 0.80	Vickers hardness HV 30 300 HV

Typical welding current

AC or DC±			
∅/L (mm)	3.2X350	4.0X400	5.0X400
Current min/max (A)	110/140	130/175	170/230

Approval	Color	End	Black
	Coding	Side	Black
	Printing	G-H30 W	
	Welding Positions	Flat and horizontal	

LUNA H 300 B

Typical Applications And Characteristics

LUNA H 300 B is a low hydrogen type hardfacing electrode designed for welding medium-hard surfacing which is still machinable. Suitable for repairs of worn parts subject to rolling friction. Also suitable as a buffer layer in conjunction with deposits of higher hardness.

Typical All-Weld Metal Properties			
Composition (%)		Mechanical	
C	0.05	Single Layer	270 HV
Mn	0.80	Multiple Layer	300 HV
Si	0.70		
Cr	3.20		

Typical welding current

AC or DC±					
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400	5.0X450
Current min/max (A)	60-80	110-130	140-180	190-240	190-240

Approval	Color	End	Brown
	Coding	Side	Red
	Printing	G-H300 B	
	Welding Positions	Flat, horizontal and vertical-up	

LUNA H 350 B

Typical Applications And Characteristics

LUNA H 350 B is a basic type electrode depositing a tough chromium manganese alloyed weld metal sufficiently hard to resist serious deformation under fairly heavy impact and rolling loads. Yet with good resistance to medium abrasive wear Recommended for hardfacing applications where maximum hardness consistent with reasonable machinability is required. Also suitable as a buffer layer and for building up multi-layer deposit on badly worn components.

Typical All-Weld Metal Properties	
Composition (%)	**Mechanical**
C 0.10	Single Layer 320 HV
Mn 0.80	Multiple Layer 350 HV
Si 0.35	
Cr 2.50	

Typical welding current

AC or DC±				
∅/L (mm)	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	90-120	120-170	180-260	-

Approval	Color	End	White
	Coding	Side	Blue
	Printing	G-H350 B	
	Welding Positions	Flat, horizontal and vertical-up	

LUNA H 350 R

DIN 8555/E 1-UM-350

Typical Applications And Characteristics

LUNA H 350 R is a general purpose rutile coated hardfacing electrode depositing a tough chromium manganese alloy weld metal sufficiently hard to resist serious deformation under fairly heavy impact and rolling loads, yet with good resistance to medium abrasive ware. Recommended for hardfacing applications where maximum hardness consistent which reasonable machinability is required. Also suitable as-buffer layer and for building up multi-layer deposits on badly worn components.

Typical All-Weld Metal Properties	
Composition (%)	**Mechanical**
C 0.14	Single Layer 32 HRC
Mn 0.54	Multiple Layer 35 HRC
Si 0.45	
Cr 2.08	

Typical welding current

AC or DC±				
∅/L (mm)	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	90-120	120-170	180-260	-

Approval	Color	End	Purple
	Coding	Side	Blue
	Printing	G-H350 R	
	Welding Positions	Flat, horizontal	

LUNA H 450 R

DIN 8555/E 1-UM-450

Typical Applications And Characteristics

LUNA H 450 R is a rutile coated hardfacing electrode depositing alloyed weld metal with a hardness of approximately 450 HV which for many applications can be applied directly on hardenable steels. particularly suitable for the reclaimation and fabrication of new metal cutting or forming equipment.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	0.20	Single Layer	45 HRC
Mn	0.70	Multiple Layer	47 HRC
Si	0.20		
Mo	1.00		
Cr	4.00		

Typical welding current

AC or DC±				
∅/L (mm)	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	105-125	130-160	180-210	-

Approval	Color	End	Purple
	Coding	Side	Orange
	Printing	G-H450 R	
	Welding Positions	Flat, horizontal	

LUNA H 600 R

DIN 8555/E 2-UM-55

Typical Applications And Characteristics

LUNA H 600 R is a rutile coated hardfacing electrode for surfacing worn parts of civil engineering, construction and mining machinery to be used without machining. Deposited metal of approximately 600 HV provides high toughness in spite of high hardness and excellent abrasion resistance to medium impact.

Typical All-Weld Metal Properties	
Composition (%)	**Mechanical**
C 0.55 Mn 0.15 Si 1.10 Cr 2.42	Single Layer 52 HRC Multiple Layer 55 HRC

Typical welding current

AC or DC±				
∅/L (mm)	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	85-140	100-170	190-210	-

Approval	Color	End	Gray
	Coding	Side	Orange
	Printing	G-H600 R	
	Welding Positions	Flat, horizontal	

LUNA H 600 B

Typical Applications And Characteristics

LUNA H 600 B is a basic coated hardfacing electrode for tough, extremely hard surfacing, of component parts subject to severe wear conditions. Crack and pore free deposit, which will withstand shock and impartcabrasion. Can be machined by grinding only. Good weldability in all positions. Glad is easily to remove.

Typical All-Weld Metal Properties	
Composition (%)	**Mechanical**
C 0.50 Mn 0.30 Si 0.40 Cr 7.00 Mo 0.50	Vickers hardness As welded 670-770 HV

Typical welding current

AC or DC±				
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	70-90	100-140	140-180	190-240

Approval	Color	End	Gray
	Coding	Side	Orange
	Printing	G-H600 B	
	Welding Positions	Flat, horizontal and vertical-up	

LUNA H 60 W

DIN 8555/E 10-UM-60

Typical Applications And Characteristics

LUNA H 60 W is a rutile coated electrode for welding corrosion-resistant, stabilized CrNi-steels. Also suitable for applications of heat-resistant steel up to 800° C. Smooth weld, well directed arc with clean edge. Outstanding slag removal.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	4.20	Hardness	60 HRC
Mn	1.20		
Cr	35.00		
Si	0.70		

Typical welding current

AC or DC±			
∅/L (mm)	3.2/350	4.0/400	5.0/400
Current min/max (A)	85/140	100/170	190/210

Approval	Color	End	Brown
	Coding	Side	-
	Printing	G-H60 W	
	Welding Positions	Flat, horizontal	

LUNA H 65

Typical Applications And Characteristics

LUNA H 65 this electrode gives a high carbon, alloy-chromium carbide deposit to produce very high hardness, resistance to extreme abrasion, and thermal stability up to 450 °C coupled with some corrosion resistance. Use for surfacing : sla crushers, ore processors, furnace guides, rollers and molds in steel, ceramic, cement Equipment in contact with hot metal, slag and hot gases at temperatures in excess of 450 °C.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	6.50	Hardness	65 HRC
Mn	1.50		
Cr	24.50		
Si	1.50		
Nb	7.00		

Typical welding current

AC or DC+				
∅/L (mm)	2.6X300	3.2X350	4.0X400	5.0X400
Current min/max (A)	90-120	110-160	150-220	190-280

Approval	Color	End	-
	Coding	Side	-
	Printing	G-H65	
	Welding Positions	Horizontal Vertical-up and Half-up	

LUNA H 67 W

DIN 8555/E 10-UM-65

Typical Applications And Characteristics

LUNA H 67 W is a basic coated shielded metal arc welding electrode for hardsurfacing. Extra hardsurfacing of parts undergoing heavy abrasion and moderate impacts. Service temperature : max.600° C. Deposited metal of approximately provides high toughness in spite of high hardness and excellent abrasion resistance to medium impact. Re-drying temperature is 150° C for 1 hr. 30 mins.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
C	5.67	Hardness	65 HRC
Cr	31.61		
Si	0.07		
V+Nb+W	12.14		

Typical welding current

AC or DC+				
Ø/L (mm)	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	150-170	180-200	210-250	-

Approval	Color	End	Magenta
	Coding	Side	White
	Printing	G-H67 W	
	Welding Positions	Flat and horizontal	

LUNA H 7

DIN 8555/E 10-UM-65

Typical Applications And Characteristics

LUNA H 7 is a basic coated shielded metal arc welding electrode for hardsurfacing of parts undergoing heavy abrasion and moderate impacts. Service temperature : max.600°C. Deposited metal of approximately provides high toughness in spite of high hardness and excellent abrasion resistance to medium impact.

Typical All-Weld Metal Properties				
Composition (%)		Mechanical		
C	4.0-5.0	Hardness	62-67	HRC
Cr	20.0-30.0			
Mn	0.1-0.3			
Si	1.0-2.0			
V	1.0-2.0			
Mo	4.0-7.0			
Nb	4.0-6.0			
W	2.0-3.0			

Typical welding current

AC หรือ DC±			
∅/L (mm)	3.2X350	4.0X400	5.0X400
Current min/max (A)	150-170	180-200	210-250

Approval	Color	End	Magenta
	Coding	Side	White
	Printing	G-H 7	
	Welding Positions	Flat and horizontal	

LUNA H 7S

555/E 10-UM-65

Typical Applications And Characteristics

LUNA H 7S is a basic coated shielded metal arc welding electrode for hardsurfacing. Extra hard surfacing of parts undergoing heavy abrasion and moderate impacts. Service temperature : max.600° C. Deposited metal of approximately provides high toughness in spite of high hardness and excellent abrasion resistance to medium impact.

Typical All-Weld Metal Properties	
Composition (%)	**Mechanical**
C 5.67 Cr 31.61 Si 0.07 V+Nb+W 12.14	Hardness 65 HRC

Typical welding current

AC or DC+				
∅/L (mm)	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	150-170	180-200	210-250	-

Approval	Color	End	Magenta
	Coding	Side	White
	Printing	G-H 7S	
	Welding Positions	Flat and horizontal	

LUNA H 8

DIN 8555/E 10-UM-65

LUNA H 8 is a basic coated shielded metal welding electrode with extra molybdenum to prevent hot crack suitable for hard surfacing plus extra hard surfacing of parts undergoing heavy abrasion and moderate impacts. Service temperature: max. 600 ๐C. Deposited metal of approximately provides high toughness in spite of high hardness and excellent abrasion resistance to medium impact. Re-drying temperatur is 150 ๐C for 1 hr. 30 mins.

Typical All-Weld Metal Properties			
Composition (%)		Mechanical	
C	2.0-7.0	Hardness	62-67 HRC
Cr	21.0-40.0		
Mo	6.0-10.0		
Nb	5.0-7.0		
W	2.0-2.6		
V	1.0-3.0		

Typical welding current

AC หรือ DC±			
∅/L (mm)	3.2X350	4.0X400	5.0X400
Current min/max (A)	150-170	180-200	210-250

Approval	Color	End	-
	Coding	Side	-
	Printing	G-H 8	
	Welding Positions	Flat and horizontal	

LUNA HF 800 K

Typical Applications And Characteristics

LUNA HF 800 K deposits the weld metal of extremely hard martensile structure which contains dispersed of carbides and borides. It is applicable to such on abrasion that a weld metal of ordinary martensile structure can not withstand. Multi-layer hardsurfacing is not applicable due to loss crack resistibility. Machining is impossible on the weld metal under as-welded condition.

Typical All-Weld Metal Properties			
Composition (%)		Mechanical	
C	0.80	Hardness	750 HV
Mn	0.90		
Si	1.00		
Cr	7.42		
B	0.30		

Typical welding current

AC or DC+			
∅/L (mm)	3.2X350	4.0X450	5.0X450
Current min/max (A)	90-130	130-180	190-240

Approval	Color	End	Black
	Coding	Side	-
	Printing	G-HF 800K	
	Welding Positions	Flat and horizontal	

LUNA Mn

Typical Applications And Characteristics

LUNA Mn is a basic manganese-alloyed electrode specially designed for ware resistant hardfacing on building machines and gravel mixers as well as for parts subject to impact and friction abrasion.

Typical All-Weld Metal Properties			
Composition (%)		Mechanical	
C	0.70	Vickers hardness HV 30	HV
Mn	13.00	As-welding	180-200
Si	0.30	After work-hardening	550-700
		Work hardening : Normally results in service, but can also be enhanced by peeing.	

Typical welding current

AC or DC+				
Ø/L (mm)	3.2X350	4.0X400	5.0X400	-
Current min/max (A)	110-135	140-175	180-230	-

Approval	Color	End	Black
	Coding	Side	Black
	Printing	G-Mn	
	Welding Positions	Flat and horizontal	

LUNA SUGAR 80

DIN 8555 E 10-UM-60

Typical Applications And Characteristics

LUNA SUGAR 80 is a basic coated shielded metal arc welding electrode for hardsurfacing. The hardsurfacing rollers in sugar mills, restrikes automatically even on wet base materials, allows to deposit efficient shaped dots. Good weld bead aspect even at high travel speeds. Suitable for mill rollers in sugar manufactories.

Typical All-Weld Metal Properties	
Composition (%)	**Mechanical**
C 3.5 Cr 28.00	Hardness 58 HRC

Typical welding current

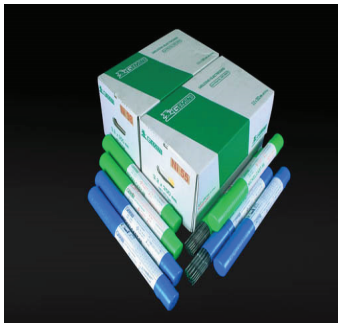
AC or DC+		
Ø/L (mm)	3.2X350	4.0X450
Current min/max (A)	140-160	180-270

Approval	Color	End	-
	Coding	Side	-
	Printing	G-SUGAR80	
	Welding Positions	Flat and horizontal	

WORKS DESIGNATION

LUNA ARC WELDING ELECTRODES

ELECTRODES FOR WELDING CAST IRON AND NON-FERROUS METALS



LUNA Ni 55

AWS/SFA5.15/E NiFe-Cl

Typical Applications And Characteristics

LUNA Ni 55 An all positional electrode depositing a 55% Ni/45 % Fe weld metal designed specially for strength welding. Grey cast iron and malleable cast iron with steel. Also designed to operate at low current which minimizes heat input and thus facilitates the "cold welding" of cast iron. Weld induced stresses can be reduced by hammer peening. Stable arc with clean bead appearance. The weld metal is fully machinable.

Typical All-Weld Metal Properties			
Composition (%)		Mechanical	
C	0.44	Yield strength	310 N/mm^2
Mn	0.73	Tensile strength	450 N/mm^2
Si	0.80	Elongation	10 %
Ni	54.00	Vickers Hardness HV30	190 HV

Typical welding current

AC or DC±				
∅/L (mm)	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	50-80	80-110	120-170	160-200

Approval	Color	End	Green
TIS. 732-2531	Coding	Side	Brown
	Printing	G-Ni55/E NiFe-Cl	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA Ni 98

AWS/SFA5.15/E Ni-Cl

Typical Applications And Characteristics

LUNA Ni 98 is a pure nickel electrode which is universally used for welding all types of cast iron. Specially designed to operate at low currents which minimizes heat input and thus facilitates the "cold welding" of cast iron. Weld induced stresses can be reduced by hammer peening. Stable arc with clean bead appearance. The weld metal is fully machinable.

Typical All-Weld Metal Properties

Composition (%)		Mechanical		
C	0.43	Yield Stress	300	N/mm^2
Mn	0.15	Tensile Strength	400	N/mm^2
Ni	97.80	Elongation	5	%
		Vickers Hardness HV30	130	HV

Typical welding current

AC or DC ±				
∅/L (mm)	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max (A)	50-80	80-110	110-150	150-190

Approval	Color	End	Green
TIS. 732-2531	Coding	Side	Green
	Printing	G-Ni98/E Ni-Cl	
	Welding Positions	Flat, horizontal, vertical-up and overhead	

LUNA BRONZE 55 AWS A5.6 E CuSn-C

Typical Applications And Characteristics

LUNA BRONZE 55 is a basic tin-bronze electrode depositing a weld metal containing approximately 90 % copper and 7 % tin. The deposit also has good corrosion resistance in ambient environments in which steel would normally rust. Suitable for welding a wide range of bronzes, brass and copper alloys. The electrode is also suitable for welding these materials to mild steel and can be used for welding cast iron.

Typical All-Weld Metal Properties			
Composition (%)		**Mechanical**	
Cu	91.00	Yield stress	300-350 N/mm^2
Mn	0.40	Vickers Hardness	70-100 HV
Sn	7.50		
P	0.30		

Typical welding current

DC Only				
∅/L (mm)	2.6/300	3.2/350	4.0/350	5.0/350
Current min/max (A)	40/70	70/100	120/160	160/200

Approval		Color	End	Yellow
		Coding	Side	Brow
		Printing	G-BRONZE 55/E CuSn-C	
		Welding Positions	Flat, horizontal, vertical-up and overhead	

WORKS DESIGNATION

LUNA ARC WELDING ELECTRODES

ELECTRODES FOR

GOUGING AND CUTTING

LUNA 71

CHAMFERTRODE

LUNA CHAMFERTRODE

Typical Applications And Characteristics

LUNA CHAMFERTRODE electrodes are specially designed for powerfully effective cutting and grooving which can also be used for gouging and hole-piercing. It gives a concentrated, forceful arc capable of penetrating plates up to 2.5 mm. in thickness.

Typical Data

Cutting on AC supply (min. OVC 75)			
Plate Material (mm)	Ø (mm)	Current (A)	Cutting speed (cm/mm)
12 mild steel	2.6	130	7.0
12 mild steel	3.2	190	10.5
20 mild steel	4.0	280	8.5
25 mild steel	5.0	350	8.5

Grooving on DC (pole+) supply

Depth (mm)	Ø (mm)	Current (A)	Grooving speed (cm/mm)
3	2.6	150	26
3	3.2	200	36
3	4.0	280	39
3	5.0	350	49

Piercing on AC supply

OVC (V)	Plate material (mm)	Ø (mm)	Current (A)	Seconds to pierce	Hole size (mm)
75	6 mild steel	2.6	150	4	4
75	10 mild steel	3.2	200	5	7
75	20 mild steel	4.0	280	16	8
94	25 mild steel	5.0	350	11	10

Typical current parameters

AC or DC±				
Ø/L (mm)	2.6X300	3.2X350	4.0X350	5.0X350
Current min/max(A)	120-150	160-200	200-280	280-350

TECHNICAL AND GENERAL INFORMATIONS

Almost every metal known can be welded by one precess or another. The arc welding processes used primarily for steels include shielded metal arc, Gas metal arc and Flux cored arc.

Steel has many different properties depending on the amount of alloy in them. Welding electrodes should be selected based on the composition of the steel to be welded. Steels are manufactured and specified in many different ways. In general steels are classified according to the carbon content, that is, low carbon, medium carbon or high carbon steels. In addition they are also under many trade names and specifications. The following is a brief listing of some of the specifications in use.

ASTM - The American Society for Testing Materials sponsors specifications covering many different type of steels. Their specification is always prefixed by **ASTM.**

API - The American Petroleum Institute specifies steels usually employed in pipe.

ASME - The American Society of Mechanical Engineers specifies steels but in general utilize the same numbers as the **ASTM** specifications.

Military and Federal Specifications - The Government specifications are usually indicated by the letters **MIL** or **QQ.**

SAE and AISI - The Society of Automotive Engineers and the American Iron and steel Institute have a very complete listing of steels using code numbers that indicate the steel composition. Stainless steels are covered by the **AISI** numbers.

LUNA WELDING POSITIONS ACCORDING ASME AND ISO 6947

1F
PA

2F
PB

3F
PF ↑
PG ↓

4F
PD

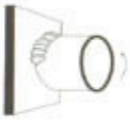
1F
PA

2F
PB

2F
PB

4F
PD

5F
PF ↑
PG ↓



1G
PA

2G
PC

3G
PF ↑
PG ↓

4G
PE

1G
PA

2G
PC

5G
PF ↑
PG ↓

6G
H-L045

When dealing with the weldability of unalloyed and low steels, it is important to note that steels with a carbon content of up to approx.0,23% are easily weldable. Steels with a carbon content between 0,23% and 0,35% can still be welded, provided they are correctly heat-treated and a correct choice of electrode is made. Steels with a carbon content between 0,35% and 0,60% can be welded if the conditions described hereafter are fulfilled. Other alloying elements, apart from the carbon content, influence the hardening behave our of a steel and therefore its weldability. The determination of the carbon equivalent (K) is useful in this case.

The carbon equivalent (K) is a number which is obtained after converting the content value of the other alloying elements, as if they were being replaced by carbon. This number is used to indicate the sensitivity of a steel to hardening cracks. The carbon equivalent is only valid for unalloyed and alloy construction steels in which no martensite is present.

Carbon equivalent

$$K = C\% + \frac{Mn\%}{6} + \frac{Cr\%}{5} + \frac{Ni\%}{15} + \frac{Mo\%}{4} + \frac{Cu\%}{13} + \frac{P\%}{2}$$

This formular is valid for steels with content in alloying elements up to

C 0,5%, Mn 1,6%, Cr 1,0%, Ni 3,5% Mo 0,6% and Cu 1,0%

Practical use of the K-Value is made according to the following table.

PREHEATING STEELS BEFORE WELDING

K value	Electrode diameter	Plate thickness in mm							
		Butt welds				Fillet welds			
		6	12	25	50	6	12	25	50
0,35	3,25	0	0	0	0	0	0	0	100
	4	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0
0,40	3,25	0	0	0	150	0	0	100	200
	4	0	0	0	0	0	0	0	150
	5	0	0	0	0	0	0	0	100
	6	0	0	0	0	0	0	0	100
0,45	3,25	0	0	150	250	0	100	250	300
	4	0	0	100	200	0	0	200	250
	5	0	0	0	150	0	0	100	200
	6	0	0	0	100	0	0	0	150
0,50	3,25	0	0	250	350	0	150	350	(450)
	4	0	0	150	300	0	100	250	400
	5	0	0	100	200	0	0	200	350
	6	0	0	0	150	0	0	150	300
0,55	3,25	0	150	400	(550)	100	300	(500)	-
	4	0	0	300	(450)	0	200	(450)	-
	5	0	0	150	350	0	100	350	(600)
	6	0	0	150	300	0	0	300	(600)
0,60	3,25	150	400	-	-	350	-	-	—
	4	100	250	-	-	250	(600)	-	—
	5	0	100	(500)	(600)	150	300	(600)	—
	6	0	0	350	500	0	150	(500)	—
0,65	3,25	300	-	-	—	-	-	—	—
	4	200	350	-	—	-	-	—	—
	5	0	150	(600)	—	200	(600)	—	—
	6	0	0	(500)	—	100	300	—	—
0,70	3,25	400	-	-	—	-	-	—	—
	4	300	500	-	—	-	-	—	—
	5	200	400	-	—	400	(600)	—	—
	6	0	200	(600)	—	200	400	—	—
0,75	5	400	500	—	—	(600)	-	—	—
	6	200	400	—	—	(450)	(600)	—	—

0 : No preheating necessary;-: The required preheating temperature is too high to be of practical

The preheating temperature in ^{o}C is dependent on: K-volue,plate thickness and electrode diameter(acc. To Mrosko).

The aim of this table is to help avoid failures which result from incorrect preheating.

WELDING OF CAST IRON

The chemical composition and the special structure of cast iron require a few important basic rules to be observed when welding Grey cast iron is an iron-carbon-silicon alloy. The carbon can be present in two forms :

-As a carbon -iron compound (cementite, Fe_3C)

-As free carbon, in the form of lamellar graphite or graphite nodules.

If the metal cools down too quickly from the welding temperature, there is not enough time for the carbon to precipitate as free carbon, and a hard and brittle white cast iron is formed (cementite, ledeburite martensite). This occurs especially when a filler metal of similar composition to the parent metal is used. To prevent this happening, the workpiece must be be be preheated and allowed to cool slowly after welding. The use of a dissimilar filler metal (cast iron electrode with a nickel core) makes it possible to keep the heat input, and therefore the formation of hard transition zones, within narrow limits and to obtain welded joints of faultless mechanical quality.

The following rules must be strictly observed, in order to obtain the best possible results:

Workpiece preparation:

-Clean base material of all foreign matter (e.g. oil, grease, rust).

-Groove out cracks (included angle of approx. 90^0) and drill a hole each end.

-For welded joints, bevel edges in V, X ou U-form (included angle of approx.

90^0) , depending wheels, pneumatic tools, by hand filling or using the LUNA Chamfertrode gouging electrode.

Preheating and welding:

-If welding is carried out with electrodes of similar material or with gas welding rods, preheat the whole workpiece to approx. 600 ^{0}C

-Allow to cool alowly, in a furnace, in hot sand or ashes.

-When "cold welding" cast iron, deposit only short runs -20 to 30 mm long- followed by peening. The workpiece must not become more than hand-warm during welding.

-It is advisable to preheat workpiece of complicated shape to 300-350 ^{0}C before welding, even if this is done with dissimilar electrodes.

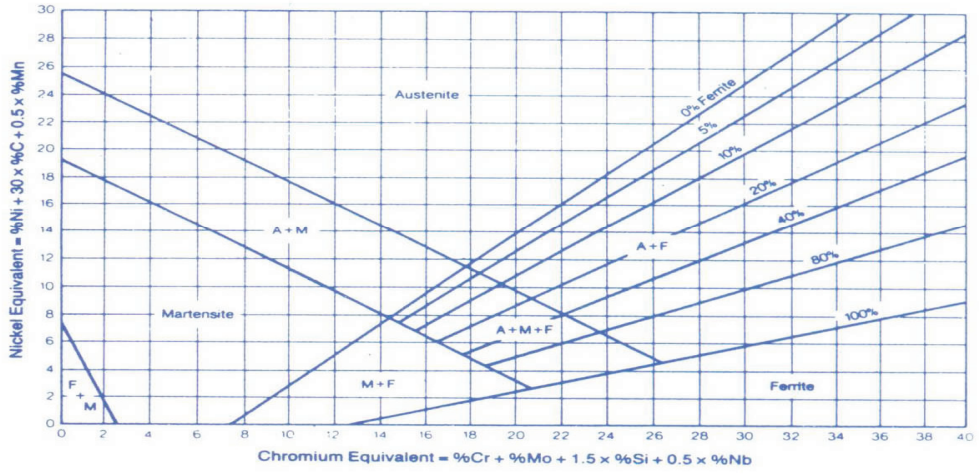
-Cracks which do not run through the whole workpiece should be welded from the outside towards the inside.

Seal welding of grey cast iron

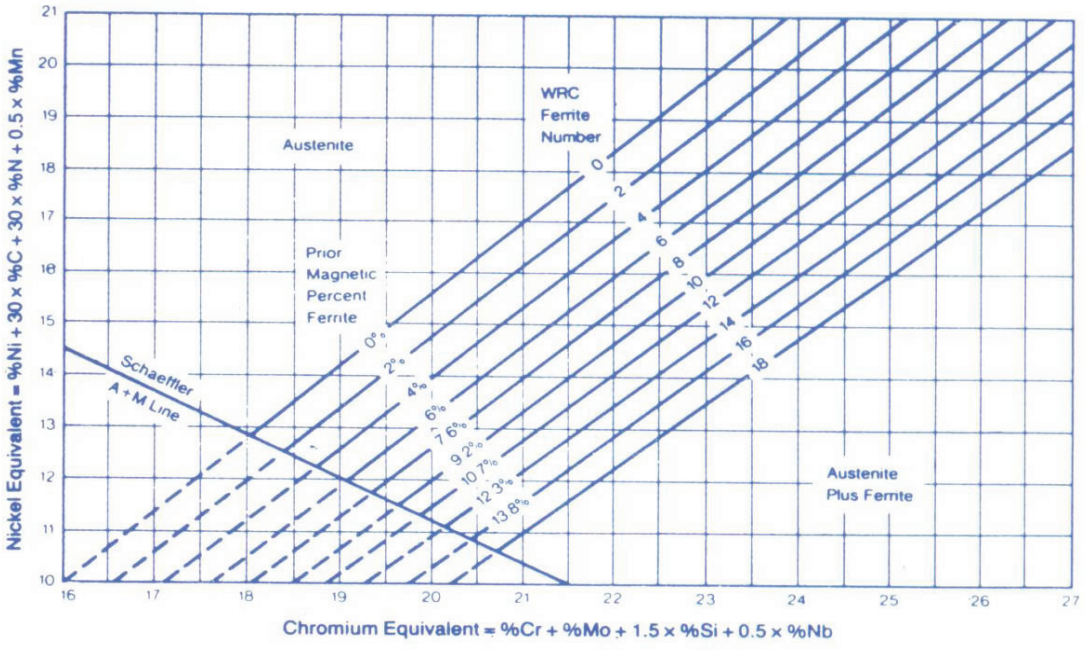
Absolutly tight sealing welds can only be obtained by welding on an entirely preheated workpiece.

SCHAEFFLER AND DELONG DIAGRAM

SCHAEFFLER DIAGRAM

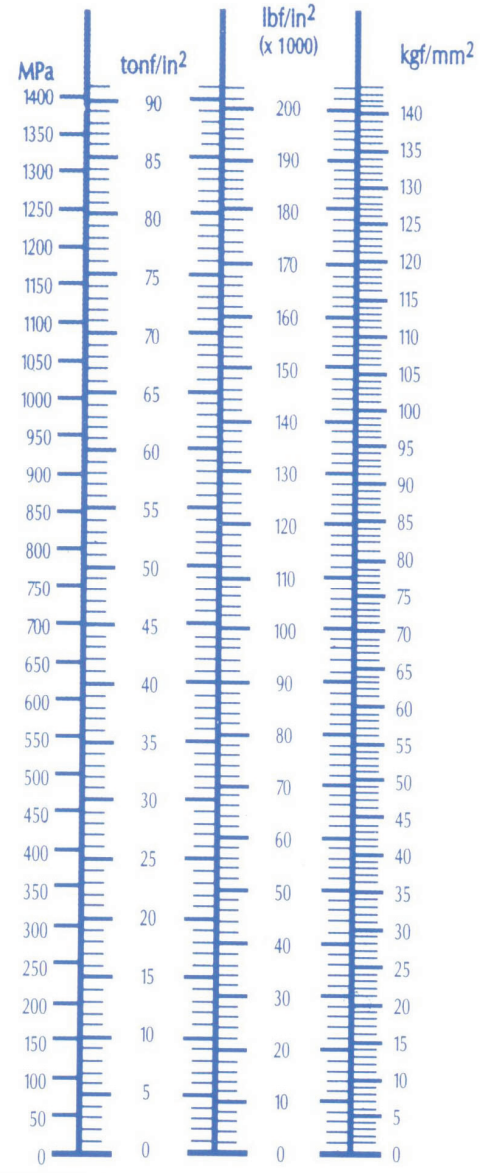


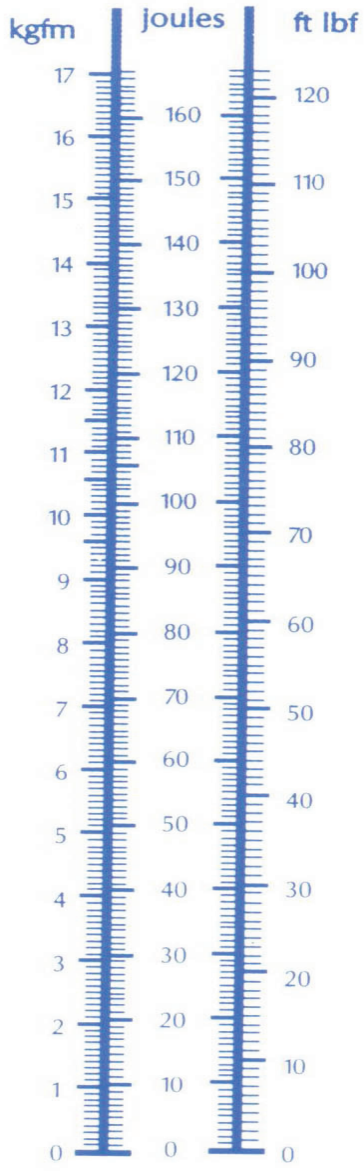
DELONG DIAGRAM



STRENGTH AND IMPACT ENERGY DATA CONVERSION

STRENGTH CONVERSIONS	IMPACT ENERGY CONVERSIONS





PHYSICAL PROPERTIES OF SOME METALS

ELEMENT	SYMBOL	MELTING POINT (^oC)	BOILING POINT AT 0,1 MPa (^oC)	DENSITY (g/cm^3)
Aluminium	Al	660	2060	2,7
Antimony	Sb	630,5	1440	6,62
Berylium	Be	1280	2770	1,82
Bismuth	Bl	271,3	1420	9,8
Boron	B	2300	2550	3,3
Cadmium	Cd	321	765	8,65
Carbon	C	3500	-	3,51
Chromium	Cr	1890	2500	7,19
Cobalt	Co	1495	2900	8,9
Copper	Cu	1083	2600	8,96
Gold	Au	1063	2970	19,32
Indium	In	156	2075	7,306
Iridium	Ir	2454	5300	22,5
Iron	Fe	1539	2740	7,87
Lead	Pb	327,4	1740	11,34
Lithium	Li	186	1370	0,53
Mangnesium	Mg	650	1110	1,74
Manganese	Mn	1245	2150	7,43
Mercury	Hg	-38,87	357	13,55
Molybdenum	Mo	2625	4800	10,2
Nikel	Ni	1455	2730	8,90
Palladium	Pa	1554	4000	12,0
Phosphorus	P	44	282	1,82
Platinum	Pt	1773,5	4410	21,45
Silver	Ag	960,5	2210	10,49
Silicon	Si	1430	2300	2,33
Strontium	Sr	770	1380	2,6
Sulphur	S	112,8	444,6	2,05
Tantalum	Ta	3000	5300	16,6
Tin	Sn	231,9	2270	7,298
Titanium	Ti	1730	-	4,54
Tungsten	W	3410	5930	19,3
Vanadium	V	1735	3400	6,0
Zinc	Zn	419,5	906	7,136
Zirconium	Zr	1750	2900	6,5

PHYSICAL PROPERTIES OF SOME ALLOYS

NAME	DENSITY (g/cm^3)	MELTING POINT (^oC)	TENSILE STRENGTH (N/mm^3)
STEEL	7,7-7,85	1450-1520	340-1800
GREY CAST IRON	7,1-7,3	1150-1250	150-400
AUSTENITIC Cr-Ni STEEL	7,8-7,9	1440-1460	600-800
Mg-ALLOYS	1,8-1,83	590-650	180-300
Al-ALLOYS	2,6-2,85	570-655	100-400
Zn-ALLOYS	5,7-7,2	380-420	140-300
BRASS	8,25	900-950	250-600
BRONZE	8,56-8,9	880-1040	200-300

LUNA INCHES TO MILLIMETER TABLE

INCHES		mm	INCHES		mm
1/64	.0156	0.40		.5118	13.00
	.0197	0.50	33/64	.5156	13.10
1/32	.0313	0.79	17/32	.5313	13.49
	.0394	1.00		.5315	13.50
3/64	.0469	1.19	35/64	.5469	13.89
	.0591	1.50		.5512	14.00
1/16	.0625	1.59	9/16	.5625	14.29
5/64	.0781	1.98		.5709	14.50
	.0787	2.00	37/64	.5781	14.68
3/32	.0938	2.38		.5906	15.00
	.0984	2.50	19/32	.5938	15.08
7/64	.1094	2.78	39/64	.6094	15.48
	.1181	3.00		.6102	15.50
1/8	.1250	3.18	5/8	.6250	15.88
	.1378	3.50		.6299	16.00
9/64	.1406	3.57	41/64	.6406	16.27
5/32	.1563	3.97		.6496	16.50
	.1575	4.00	21/32	.6563	16.67
11/64	.1719	4.37		.6693	17.00
	.1772	4.50	43/64	.6719	17.07
3/16	.1875	4.76	11/16	.6875	17.46
	.1969	5.00		.6890	17.50
13/64	.1969	5.16	45/64	.7031	17.86
	.2013	5.50		.7087	18.00
7/32	.2188	5.56	23/32	.7188	18.26
15/64	.2344	5.95		.7283	18.50
	.2362	6.00	47/64	.7344	18.65
1/4	.2500	6.35		.7480	19.00
	.2559	6.50	3/4	.7500	19.05
17/64	.2656	6.75	49/64	.7656	19.45
	.2756	7.00		.7677	19.50
9/32	.2813	7.14	25/32	.7813	19.84
	.2953	7.50		.7874	20.00
19/64	.2939	7.54	51/64	.7969	20.24
5/16	.3125	7.94		.8071	20.50
	.3150	8.00	13/16	.8125	20.64
21/64	.3281	8.33		.8268	21.00
	.3346	8.50	53/64	.8281	21.03
11/32	.3438	8.73	27/32	.8438	21.43
	.3543	9.00		.8465	21.50
23/64	.3594	9.13	55/64	.8594	21.83
	.3740	9.50		.8661	22.00
3/8	.3750	9.53	7/8	.8750	22.23
25/64	.3906	9.92		.8858	22.50
	.3937	10.00	57/64	.8906	22.62
13/32	.4063	10.32		.9055	23.00
	.4134	10.50	29/32	.9063	23.02
27/64	.4219	10.72	59/64	.9219	23.42
	.4331	11.00		.9252	23.50
7/16	.4375	11.11	15/16	.9375	23.81
	.4528	11.50		.9449	24.00
29/64	.4531	11.51	61/64	.9531	24.21
15/32	.4688	11.91		.9646	24.50
	.4724	12.00	31/32	.9688	24.61
31/64	.4844	12.30		.9843	25.00
	.4921	12.50	63/64	.9844	25.00
1/2	.5000	12.70		1.0000	25.40

TEMPERATURE CONVERSIONS TABLE

°F	°C	°F	°C	°F	°C	°F	°C
220	140	68	20.0	180	82.2	660	348.9
210	134	70	21.1	182	83.3	680	360.0
200	129	72	22.2	184	84.4	700	371.1
190	123	74	23.3	186	85.6	720	382.2
180	118	76	24.4	188	86.7	740	393.3
170	112	78	25.6	190	87.8	760	404.4
160	107	80	26.7	192	88.9	780	415.6
150	101	82	27.8	194	90.0	800	426.7
140	96	84	28.9	196	91.1	820	437.8
130	90	86	30.0	198	92.2	840	448.9
120	84	88	31.1	200	93.3	860	460.0
110	79	90	32.2	202	94.4	880	471.1
100	73	92	33.3	204	95.6	900	482.2
90	68	94	34.4	206	96.7	920	493.3
80	62	96	35.6	208	97.8	940	504.4
70	57	98	36.7	210	98.9	960	515.6
60	51	100	37.8	212	100.0	980	527.0
50	45.6	102	38.9	214	101.1	1000	538.0
40	40	104	40.0	216	102.2	1020	549.0
30	34.4	106	41.1	218	103.3	1040	560.0
20	28.9	108	42.2	220	104.4	1060	571.0
10	23.3	110	43.3	230	110.0	1080	582.0
0	17.8	112	44.4	240	115.6	1100	593.0
2	16.7	114	45.6	250	121.1	1120	604.0
4	15.6	116	46.7	260	126.7	1140	616.0
6	14.4	118	47.8	270	132.2	1160	627.0
8	13.3	120	48.9	280	137.8	1180	638.0
10	12.2	122	50.0	290	143.3	1200	649.0
12	11.1	124	51.1	300	148.9	1220	660.0
14	10	126	52.2	310	154.4	1240	671.0
16	8.9	128	53.3	320	160.0	1260	682.0
18	7.8	130	54.4	330	165.6	1280	693.0
20	6.7	132	55.6	340	171.1	1300	704.0
22	5.6	134	56.7	350	176.7	1320	716.0
24	4.4	136	57.8	360	182.2	1340	727.0
26	3.3	138	58.9	370	187.8	1360	738.0
28	2.2	140	60.0	380	193.3	1380	749.0
30	1.1	142	61.1	390	198.9	1400	760.0
32	0	144	62.2	400	204.4	1420	771.0
34	1.1	146	63.3	410	210.0	1440	782.0
36	2.2	148	64.4	420	215.6	1460	793.0
38	3.3	150	65.6	430	221.1	1480	804.0
40	4.4	152	66.7	440	226.7	1500	816.0
42	5.6	154	67.8	450	232.2	1520	827.0
44	6.7	156	68.9	460	237.8	1540	838.0
46	7.8	158	70.0	470	243.3	1560	849.0
48	8.9	160	71.1	480	248.9	1580	860.0
50	10.0	162	72.2	490	254.4	1600	871.0
52	11.1	164	73.3	500	260.0	1620	882.0
54	12.2	166	74.4	520	271.1	1640	893.0
56	13.3	168	75.6	540	282.2	1660	904.0
58	14.4	170	76.7	560	293.3	1680	916.0
60	15.6	172	77.8	580	304.4	1700	927.0
62	16.7	174	78.9	600	315.6	1720	938.0
64	17.8	176	80.0	620	326.7	1740	949.0
66	18.9	178	81.1	640	337.8	1760	960.0

COMPARISON OF HARDNESS SCALES

Vickers Hardness (DPH)	Brinell hardness 10 mm ball 3000 kg load		Rockwell hardness		Shore hardness	Tensile strength(kgf/ mm^2)
	Standard ball	Tungsten Carbide ball	B-scale	C-scale		(approx.)
1000	-	-	-	69	99	-
950	-	-	-	68	97	-
900	-	-	-	68	95	-
850	-	750	-	66	91	-
800	-	722	-	64	88	-
750	-	691	-	62	85	-
700	-	656	-	60	81	-
650	-	611	-	58	78	-
600	-	564	-	55	74	-
580	-	545	-	54	72	206
560	-	525	-	53	71	199
540	496	507	-	52	69	190
520	480	488	-	51	67	183
500	465	471	-	49	66	174
480	448	452	-	48	64	165
460	433	433	-	46	62	156
440	415	415	-	45	59	149
420	397	397	-	43	57	140
400	379	379	-	41	55	131
380	360	360	-	39	52	123
360	341	341	-	37	50	115
340	322	322	-	34	47	109
320	303	303	-	32	45	103
300	284	284	-	30	42	97
280	265	265	-	27	40	91
260	247	247	-	24	37	84
240	228	228	98	20	34	78
220	209	209	95	-	32	71
200	190	190	92	-	29	65
180	171	171	87	-	26	59
160	152	152	82	-	24	53
140	133	133	75	-	21	46
120	114	114	67	-	-	40
100	95	95	56	-	-	-