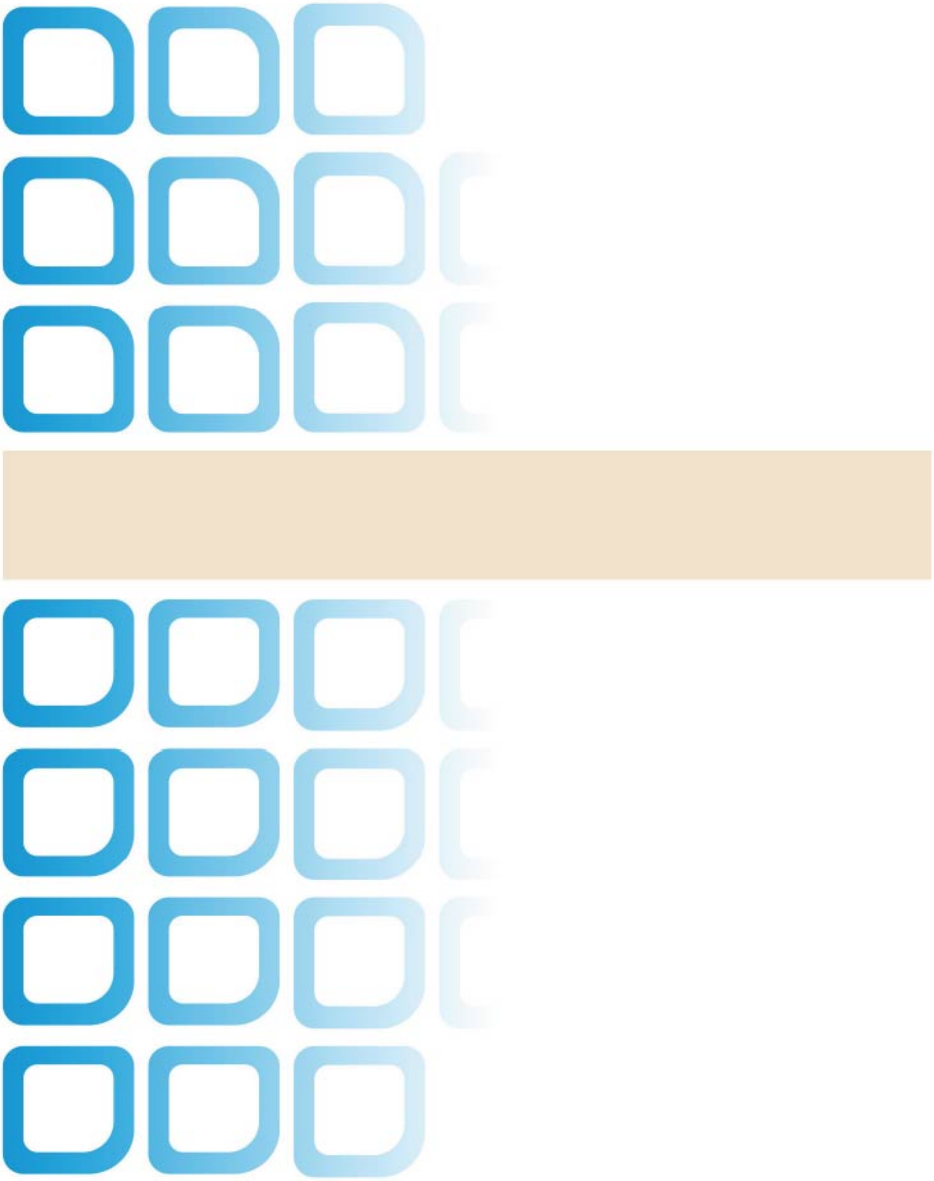
LINKWELD



Available List

CONTENTS

Covered Electrodes (SMAW)

CONTENTS

Covered Electrodes (SMAW)

CONTENTS

Covered Electrodes (SMAW)

Solid Wires (TIG&MIG)

CONTENTS

Solid Wires (TIG&MIG)

CONTENTS

Solid Wires (TIG&MIG)

Flux Cored Wires (FCAW)

CONTENTS

Flux Cored Wires (FCAW)

Submerged Wires & Fluxes (SAW)

CONTENTS

Submerged Wires & Fluxes (SAW)

Covered Electrodes (SMAW)

LKE-6010

AWS	A5.1 E6010
EN	E 38 0 C 2 1
JIS	Z3211 E4310

Characteristics:

LKE-6010 is a cellulose type electrode designed for all position welding. It has deep penetration, stable arc and good slag removability.

Applications:

It is suitable for welding of pressure pipes, pressure vessel, storage tanks and boiler.

Notes on Usage:

1.Use proper low currents are recommended.

2.Dry the electrodes at 60-70°c for 30~60 minutes.

3.Clean up the base metal to be free form contaminations.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.12	0.45	0.2	0.018	0.01

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -30 °c J
431	519	25	32

Welding position:

Sizes and recommended current range (DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		350	350	350	350
Amps	F	60-80	80-120	110-180	140-200
	V&OH	40-80	60-120	90-160	120-180
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-6011

AWS A5.1 E6011
EN E 38 0 C 1 1
JIS Z3211 E4311

Characteristics:

LKE-6011 is a cellulose type electrode designed for all position welding. It has excellent performance in vertical and overhead positions on root pass. It has deep penetration, good slag removability, stable arc and nice bead appearance.

Applications:

It is suitable for welding of heat transfer pipes, oil tanks, ships and boiler.

Notes on Usage:

1. Don't exceed the range of proper current.
2. Dry the electrodes at 60-70°c for 30~60 minutes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.12	0.45	0.25	0.015	0.01

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -30 °c J
429	530	28	50

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	60-90	80-120	110-160	160-200
	V&OH	50-80	75-110	90-150	120-180
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-6013

AWS	A5.1 E6013
EN	E 35 0 R 1 2
JIS	Z3211 E4313

Characteristics:

LKE-6013 is designed for high efficiency welding. Because of its thin flux coating the welding can be done with good slag removability, shallow penetration, less spatters, and beautiful bead.

Applications:

It is suitable for welding of vehicles, steel sheets and other light structures.

Notes on Usage:

1. Don't exceed the range of proper current and weld with AC or DC.
2. Dry the electrodes at 80-100°c for 30~60 minutes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.08	0.45	0.18	0.012	0.009

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV - 0 °C J
415	470	28	84

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		350	350	400	400
Amps	F	60-90	100-120	110-160	160-220
	V&OH	50-80	80-110	100-150	140-200
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-6013VD

AWS A5.1 E6013

Characteristics:

LKE-6013VD is designed for high efficiency welding. Because of its thin flux coating the welding can be done with good slag removability, shallow penetration, less spatters, and beautiful bead. Easy to welding all position especially vertical down

Applications:

It is suitable for welding of vehicles, steel sheets, galvanized plate and other light structures.

Notes on Usage:

1. Don't exceed the range of proper current and weld with AC or DC.
2. Dry the electrodes at 80-100°c for 30~60 minutes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.08	0.42	0.24	0.012	0.009

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV 0 °c J
420	520	28	80

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	400	400
Amps	F	60-90	100-120	110-160	160-220
	V&OH	50-80	80-110	100-150	140-200
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-6019

AWS	A5.1 6019
ISO	22560-B-E4319A
JIS	Z 3211 E4319

Characteristics:

LKE-6019 is an ilmenite type electrode and can be used in all-position welding. It has excellent mechanical properties and X-Ray performance, stable arc, and good weldability. The weld bead is good with deep penetration and hardly causes slag inclusion.

Applications:

It is important structural objects such as ship body, boiler, vehicle frame, oil tank, steel frame and suitable for structural steels, steel strip, thin steel plate, fabrication steels

Notes on Usage:

1.Dry the electrodes at 350-400°c for 1-2 hours before use.
2.Keep the arc as short as possible to prevent moisture pick-up.
3.Take the back-step method to prevent blowholes at the arc starting.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.090	0.45	0.08	0.02	0.004

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -20 °c J
450	500	27	50

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		350	350	450	450
Amps	F	80-100	130-150	160-190	200-240
	V&OH	70-100	90-150	130-160	170-200
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-7016

AWS	A5.1 E7016
EN	E 42 3 B 3 2
JIS	Z3212 D5016

Characteristics:

LKE-7016 is a low hydrogen type electrode for the welding of high tensile steel. The welding can be done with stable arc, less spatters, good slag removability, good slag covering and good X-ray soundness.

Applications:

It is suitable for low alloy steels, medium carbon steels, heavy steel plates, cast steels and steels of poor weldability. Due to good X-ray and mechanical properties, LKE-7016 is used for skill testing and competition by choice.

Notes on Usage:

1.Dry the electrodes at 300-350°c for 60 minutes, and keep at 100-150°c before use.

2.Take the backstep method to prevent blowholes at the arc starting.

3.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.080	1.0	0.53	0.012	0.008

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV , J	
490	560	31	0°C	-30°C
			150	112

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	400	400
		350	400	450	450
Amps	F	55-85	90-130	130-180	180-240
	V&OH	50-80	90-120	130-160	160-200
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-7018

AWS	A5.1 E7018
EN4	E 42 3 B 1 2
JIS	Z3212 D5016

Characteristics:

LKE-7018 is a low hydrogen type electrode for the welding of 490N/mm² grade high tensile steel. The welding can be done with high deposition rate, good X-ray soundness and mechanical properties.

Applications:

It is especially suitable for nuclear power stations, petroleum chemical plants, and heavy steel plates.

Notes on Usage:

1.Dry the electrodes at 300-350°c for 60 minutes and keep at 100-150°c before use.

2.Keep the arc as short as possible.

3.Take the back-step method to prevent blowholes at the arc starting.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.080	1.30	0.60	0.012	0.011

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV , J	
515	585	29	0 °c	-29 °c
			221	172

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		350	350	400	400
Amps	F	55-85	90-130	130-180	180-240
	V&OH	50-80	85-120	110-160	150-200
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-7018-1

AWS	A5.1 E7018-1
EN	E 42 4 B 3 2
JIS	Z3212 D5016

Characteristics:

LKE-7018-1 is a low hydrogen type electrode for the welding of 490N/mm² grade high tensile steel. The welding can be done with high deposition rate, good X-ray soundness and mechanical properties. With excellent impact value at temperature of -46°c.

Applications:

It is suitable for welding of nuclear reactor vessels, pressure vessels, LPG tanks ect.

Notes on Usage:

1.Dry the electrodes at 300-350°c for 60 minutes and keep at 100-150°c before use.

2.Keep the arc as short as possible.

3.Take the back-step method to prevent blowholes at the arc starting.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.060	1.38	0.58	0.02	0.005

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -46 °c J
500	585	30	81

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		350	350	450	450
Amps	F	55-85	90-130	130-180	170-240
	V&OH	50-80	90-120	110-160	150-180
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-7018-H4R

AWS A5.1 E7018-H4R
EN 2560-A E 42 4 B 4 2 H5

Characteristics:

LKE-7018-H4R is a low hydrogen type electrode for the welding of 490N/mm² grade high tensile steel. It is designed for single and multiple pass applications. The welding can be done with good appearance, stable arc and low spatter. With excellent mechanical properties, impact value at temperature of -40°c and low diffusible hydrogen.

Applications:

It is suitable for welding of low alloy steels, medium carbon steels, heavy steel plates, cast steels, aluminum killed steel of LPG and especially for welding of steels with poor weldability.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 1-2 hours before use.
2.Keep the arc as short as possible to prevent moisture pick-up.
3.Take the back-step method to prevent blowholes at the arc starting.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.070	1.10	0.50	0.02	0.004

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -40 °c J
490	560	29	>47

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		350	350	450	450
Amps	F	80-100	130-150	160-190	200-240
	V&OH	70-100	90-150	130-160	170-200
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-7018-1 H4

AWS	A5.1 E7018-1 H4
EN	E 46 4 B 3 2
JIS	Z3212 D5016

Characteristics:

LKE-7018-1H4 is a low hydrogen type electrode for the welding of 490N/mm² grade high tensile steel. It is designed for single and multiple pass applications. The welding can be done with good appearance, stable arc and low spatter. With excellent mechanical properties, impact value at temperature of -46°c and low diffusible hydrogen.

Applications:

It is suitable for welding of low alloy steels, medium carbon steels, heavy steel plates, cast steels, aluminum killed steel of LPG and especially for welding of steels with poor weldability.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 1-2 hours before use.

2.Keep the arc as short as possible to prevent moisture pick-up.

3.Take the back-step method to prevent blowholes at the arc starting.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.070	1.40	0.47	0.02	0.004

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -46 °c J
500	580	29	88

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		350	350	450	450
Amps	F	80-100	130-150	160-190	200-240
	V&OH	70-100	90-150	130-160	170-200
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-8016-G

AWS	A5.5 E8016-G
EN	E 46 A Z B 1 2 Z3212
JIS	D5316

Characteristics:

LKE-8016-G is a low hydrogen electrode for the welding of 550 N/mm^2 grade high tensile steel. With good strength property of deposited weld metal, slag removal, bead appearance and excellent weldability.

Applications:

It is suitable for welding of high carbon steel, low manganese steels, ships, high pressure vessels, pressure pipe and base metal ASTM A299/302/372, etc.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes before use.

2.Do not exceed the range of recommended because over heat input might decrease the impact value.

3.Keep the arc as short as possible.

4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.080	1.5	0.60	0.014	0.010

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -30 °c J	PWHT
480	600	30	49	620°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	90-130	130-180	180-240
	V&OH	80-120	110-160	150-200
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-9016-G

AWS	A5.5 E9016-G
EN	EN757 E 55 3 Z B T 1 2
JIS	Z 3212 D5816

Characteristics:

LKE-9016-G is a low hydrogen electrode for the welding of 620 N/mm² grade high tensile steel. With good mechanical property and X-ray test.

Applications:

It is suitable for welding of shipbuilding, machine fabrication, offshore structure, pressure vessel, high pressure pipe and base metals are forging cast iron, structural steel, steel pipe for heat transfer, pressure vessel, alloy steel, ASTM A202/486 Gr90/736 Gr3, etc..

Notes on Usage:

1.Preheat at 80°c is sometime required according to base metal or its thickness.
2.Do not exceed the range of recommended because over heat input might decrease the impact value.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo
0.085	1.40	0.50	0.02	0.05	1.1	0.30

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -40 °C J	PWHT
580	650	24	80	620 °cx1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	90-130	130-180	180-240
	V&OH	80-120	110-160	150-200
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-9018-G

AWS A5.5 E9018-G

Characteristics:

LKE-9018-G is high basic offshore electrode according the latest offshore requirements for sub zero temperatures down to -60°C. Suitable for steel types up to 550 MPa yield strength, excellent welding properties and extreme low hydrogen content. The weldmetal is suitable for longer post weld heat treatments as applied in Riser applications.

Applications:

It is suitable for the welding of Crane, heavy transport, platforms, vessel and lifting equipment in offshore, pipeline, riser and applications that require NACE requirements (less than 1% Nickel).

Notes on Usage:

1.Dry the electrodes at 350-400 °c for 60 minutes before use.
2.Take the back-step method at the arc starting.
3.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo
0.06	1.60	0.40	0.012	0.010	1	0.3

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -60°C (J)
590	680	21	50

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Amps	F	90-140	140-190	190-240
	V&OH	80-120	120-160	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-10018-G

AWS	A5.5 E10018-G
EN	EN757 E 62 5 Mn2NiMo B 3 2
JIS	Z3212 D7016

Characteristics:

LKE-10018-G is a low hydrogen electrode for the welding of 690 N/mm² grade high tensile steel. With excellent crack resistance, good mechanical property and bead appearance.

Applications:

It is suitable for build-up welding before hardfacing. Proper base metals are forging cast iron, structural steel(HT70), pressure vessel(ASTM A225 Gr.C), carbon steel plate for mechanical fabrication(S45C),SAE 1345, ect..

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes and keep at 100-150°c before use.

2.Preheat the plates at 100-150°c is before welding.

3.Keep the arc as short as possible.

4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo	Cr	V
0.065	1.40	0.50	0.02	0.005	1.85	0.30	0.01	0.008

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -50 °c J
668	745	22	60

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	120-150	160-200	180-240
	V&OH	105-125	130-150	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-11018-G

AWS	A5.5 E11018-G
EN	EN757 E 69 5 Mn2NiMo B 3 2
JIS	Z3212 D8016

Characteristics:

LKE-11018-G is a low hydrogen electrode for the welding of 760 N/mm² grade high tensile steel. With excellent crack resistance, good mechanical property, bead appearance and lower moisture pick up. It is provided with good arc and easy slag removal.

Applications:

It is suitable for welding of TSTE 620V and TSTE 690V high tensile steel.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes and keep at 100-150°c before use.
2.Preheat the plates at 100°c is before welding.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo	Cr	V
0.07	1.50	0.40	0.02	0.005	2.0	0.35	0.02	0.008

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV J	
730	800	22	-40°C	-50°C
			71	55

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	120-150	160-200	180-240
	V&OH	105-125	130-150	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-11018-M

AWS A5.5 E11018-M

Characteristics:

LKE-11018-M is a low hydrogen electrode for the welding of 760 N/mm² grade high tensile steel. With excellent crack resistance, good mechanical property, bead appearance and lower moisture pick up. It is provided with good arc and easy slag removal.

Applications:

It is suitable for welding of TSTE 620V and TSTE 690V high tensile steel.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes and keep at 100-150°c before use.
2.Preheat the plates at 100°c is before welding.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo	Cr	V
0.10	1.50	0.30	0.01	0.005	2.3	0.35	0.02	0.008

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV J
750	810	24	-50°C
			80

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	120-150	160-200	180-240
	V&OH	105-125	130-150	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-11018-H4

AWS A5.5 E11018-H4

Characteristics:

LKE-11018-H4 is a low hydrogen electrode for the welding of 690 N/mm² grade high tensile steel. With excellent crack resistance, good mechanical property and bead appearance.

Applications:

It is suitable for build-up welding before hardfacing. Proper base metals are forging cast iron, structural steel(HT70), pressure vessel(ASTM A225 Gr.C), carbon steel plate for mechanical fabrication(S45C),SAE 1345, ect..

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes and keep at 100-150°c before use.
2.Preheat the plates at 100-150°c is before welding.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo	Cr	V
0.065	1.50	0.40	0.02	0.005	2.00	0.30	0.04	0.015

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -50 °c J
760	830	22	70

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	120-150	160-200	180-240
	V&OH	105-125	130-150	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-12018-G

AWS A5.5 E12018-G
EN EN757 E 79 5 Mn2NiMo B 3 2

Characteristics:

LKE-12018-G is a low hydrogen electrode for the welding of 830 N/mm² grade high tensile steel. With excellent crack resistance, good mechanical property and bead appearance. It is provided with good arc and easy slag removal.

Applications:

It is suitable for welding of heat treatable low alloy steel such as SCM21/4 Cr-Mo steel,SNCM8 Ni-Cr-Mo steel. Proper base metals are also including forging cast iron(ASTM A486 Gr.120/A508 Gr.5a.4a),pressure vessel steel plate (A543 Gr.B3C3),ect.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes and keep at 100-150°c before use.
2.Preheat the plates at 150-200°c is before welding.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo	Cr	V
0.06	1.40	0.40	0.025	0.003	2.0	0.4	0.7	0.008

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -50 °c J
840	920	22	50

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	120-150	160-200	180-240
	V&OH	105-125	130-150	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-7010-A1

AWS A5.5 E7010-A1

Characteristics:

LKE-7010-A1 is a high cellulose type electrode for DC(+) welding . The welding can be done in all positions with good crack resistance, deep penetration, stable arc, and good performance.

Applications:

It is especially suitable for welding of the pipes, high pressure pipes, oil tanks, and boilers due to its good X-ray soundness.

Notes on Usage:

1.Dry the electrodes at 70-100°c for 30-60 minutes before use.

2.Pre-heat the work piece at 100-200°c and PWHT at 620-680°c

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Mo
0.090	0.57	0.20	0.014	0.011	0.52

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
480	570	28	620 °c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Amps	F	50-80	80-120	110-160	150-200
	V&OH	40-70	70-110	90-150	120-180
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-7018-A1

AWS	A5.5 E7018-A1
EN	EN1599 E Mo B 3 2
JIS	Z3223 DT 1216

Characteristics:

LKE-7018-A1 is an iron powder low hydrogen type electrode for 490N/mm² high tensile steel. It provides high welding efficiency due to the addition iron powder. The weld metal contains 0.5% Mo.

Applications:

it is suitable for chemical plants, petroleum refinery plants and other casting steels.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes before use.

2.Take the backstep method at the arc starting.

3.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Mo
0.080	0.78	0.54	0.012	0.013	0.56

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
490	575	31	620 °c x 1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Amps	F	90-140	140-190	190-240
	V&OH	80-120	120-160	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-8018-B2

AWS	A5.5 E8018-B2
EN	EN1599 E CrMo1 B 3 2
JIS	Z3223 DT2318

Characteristics:

LKE-8018-B2 is an iron powder low hydrogen electrode. The weld metal contains 1.25%Cr-0.5%Mo that makes the electrodes more suitable at 550 °c ,With the characters of quiet and stable arc, little spatter.

Applications:

It is suitable for welding of piping steels (STPA22,23, A335-P11, P12), casting steels (A217-WC6), and forging steels (A182-F11,F12).

Notes on Usage:

1.Dry the electrodes at 350-400 °c for 60 minutes before use.

2.Take the back-step method at the arc starting.

3.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo
0.080	0.80	0.60	0.012	0.010	1.40	0.54

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	PWHT
590	675	26	690°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Amps	F	90-140	140-190	190-240
	V&OH	80-120	120-160	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-9018-B3

AWS	A5.5 E9018-B3
EN	EN1599 E CrMo2 B 3 2
JIS	Z3223 DT2418

Characteristics:

LKE-9018-B3 is an iron powder low hydrogen type electrode for low alloy heat resistance steel. The weld metal contains 2.25%Cr-1%Mo which the service temperature is at 550 °c. Good creep rupture strength also can be obtained at high temperature.

Applications:

It is suitable for welding of piping steels (STPA24, A335-P22), boilers (STBA24), heat exchanger pipes (A182-F22, A336-F22)

Notes on Usage:

1.Dry the electrodes at 350-400 °c for 60 minutes before use.

2.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo
0.080	0.69	0.70	0.013	0.011	2.32	1.07

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	PWHT
620	725	24	690°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Amps	F	90-140	140-190	190-240
	V&OH	80-120	120-160	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-8016-B6

AWS	A5.5 E8016-B6
EN	EN1599 E CrMo5 B 1 2
JIS	Z3223 DT2516

Characteristics:

LKE-8016-B6 is a low hydrogen electrode. The weld metal contains 5%Cr-0.5%Mo. With high tensile strength, good toughness and good heat resistance can be obtained.

Applications:

It is suitable for welding of 5%Cr-0.5%Mo steel such as ASTM A387 Gr.5 for refineries, petrochemical and electric power plants including pipe (ASTM A213-T5,A335-P5),drawing steel(A387-5),forging(A182-F5),etc.

Notes on Usage:

1.Dry the electrodes at 350-400 °c for 60 minutes before use.
2.Do not exceed the range of recommended because over heat input might decrease the impact value.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.
5.Preheat the workpiece at 250-350°C and proceed PWHT.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo
0.070	0.65	0.3	0.02	0.008	5.5	0.55

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
617	715	23	740°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	80-130	100-160	160-210
	V&OH	70-110	80-130	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-8016-B8

AWS	A5.5 E8016-B8
EN	EN1599 E CrMo9 B 1 2
JIS	Z3223 DT2616

Characteristics:

LKE-8016-B8 is a low hydrogen electrode. The weld metal contains 9%Cr-1%Mo.With high tensile strength, good toughness and good heat resistance can be obtained.

Applications:

It is suitable for welding of 9%Cr-1%Mo steel such as ASTM A387 Gr.9 for refineries, petrochemical and electric power plants including pipe (ASTM A199-T9,A335-P9),drawing steel(A387-9),forging(A182-F9),etc.

Notes on Usage:

1.Dry the electrodes at 350-400 °c for 60 minutes before use.
2.Do not exceed the range of recommended because over heat input might decrease the impact value.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.
5.Preheat the workpiece at 250-350°C and proceed PWHT.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo
0.070	0.72	0.50	0.018	0.006	9.8	1.04

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
600	715	23	740°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	80-120	100-150	160-210
	V&OH	70-110	80-130	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-8018-B8

AWS A5.5 E8018-B8

Characteristics:

LKE-8018-B8 is an iron powder low hydrogen type electrode for low alloy heat resistance steel. The weld metal contains 9%Cr-1%Mo which the service temperature is at 550 °c. Good creep rupture strength also can be obtained at high temperature.

Applications:

It is suitable for welding of ASTM A213-T9 and A355-P9

Notes on Usage:

1.Dry the electrodes at 350-400 °c for 60 minutes before use.
2.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo
0.07	0.80	0.30	0.013	0.011	8.60	1.00

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	PWHT
540	670	22	690°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	400	400
Amps	F	90-140	140-190	190-240
	V&OH	80-120	120-160	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-9015-B91H4

AWS A5.5 E9015-B91H4

Characteristics:

LKE-9015-B91H4 is is designed to weld martensitic 95% Cr & 1% Mo-V steels known by the designations T91, P91 or Grade 91. These steels are designed to provide improved creep strength, fatigue, oxidation, and corrosion resistance at elevated temperatures. It also provides good weld metal ductility and high charpy values at room temperature.

Applications:

It is suitable for welding of Pipeline, Petrochemical and Power Generation

Notes on Usage:

1.Preheat at 80°c is sometime required according to base metal or its thickness.
2.Do not exceed the range of recommended because over heat input might decrease the impact value.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	V	Cr	Ni	Mo
0.10	0.75	0.18	0.21	8.55	0.21	0.93

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -20 °c J	PWHT
580	720	25	50	620 °cx1hr

Welding position:

Sizes and recommended current range (DC<+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	90-130	130-180	180-240
	V&OH	80-120	110-160	150-200
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-9015-B92H4

AWS A5.5 E9015-B92H4

Characteristics:

LKE-9015-B92H4 is is designed to weld martensitic B9 (P92) alloyed steel: 9Cr steel to weld equivalent 'type 92' steels modified with tungsten, vanadium, niobium, nitrogen, and a small addition of boron to give improved long term creep properties

Applications:

It is suitable for welding of Headers, Main steam piping, Turbine castings and Power generating plants

Notes on Usage:

1.Preheat at 80°c is sometime required according to base metal or its thickness.
2.Do not exceed the range of recommended because over heat input might decrease the impact value.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	V	Cr	Ni	Mo	W
0.11	0.60	0.25	0.21	9.00	0.60	0.45	1.70

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -20 °c J	PWHT
620	740	22	50	620 °cx1hr

Welding position:

Sizes and recommended current range (DC<+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	90-130	130-180	180-240
	V&OH	80-120	110-160	150-200
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-9016-B91

AWS A5.5 E9016-B91

Characteristics:

LKE-9016-B91 is a low hydrogen electrode. The weld metal contains 9%Cr-1%Mo and some little Nb,V to improve the creep problem at prolonged high temperature. With stable arc, low spatter and easy slag removal.

Applications:

It is suitable for welding of the steel such as ASTM A213-T91, A335 P91, A387 Gr.91,A182 F91.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes before use.
2.Do not exceed the range of recommended because over heat input might decrease the impact value.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.
5.Preheat the workpiece at 250-350°c and proceed PWHT.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo	Nb	V	N
0.085	0.7	0.25	0.01	0.009	9.0	1.00	0.04	0.20	0.05

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
655	789	20	740°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	80-130	100-160	160-210
	V&OH	70-110	80-130	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-9018-B91

AWS A5.5 E9018-B91

Covered Electrodes (SMAW)

Characteristics:

LKE-9018-B91 is designed to weld equivalent 'type T91' CrMo steels modified with small additions of niobium and vanadium to give improved long term creep properties. These consumables are specifically intended for high integrity structural service at elevated temperature so the minor alloy additions responsible for its creep strength are kept above the minimum considered necessary to ensure satisfactory performance.

Applications:

It is suitable for welding of the steel such as ASTM A213-T91, A335 P91, A387 Gr 91,A182 F91

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes before use.
2.Do not exceed the range of recommended because over heat input might decrease the impact value.
3.Keep the arc as short as possible.
4.Take the back-step method at the arc starting to prevent blowholes.
5.Preheat the workpiece at 250-350°c and proceed PWHT.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo	Nb	V	Ni
0.09	0.9	0.30	0.01	0.009	9.0	1.00	0.06	0.20	0.6

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	PWHT
550	700	20	740°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	80-130	100-160	160-210
	V&OH	70-110	80-130	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-8018-G

AWS A5.5 E8018-G
JIS Z3212 D5316

Characteristics:

LKE-8016-G is an electrode for the welding of 550 N/mm² grade low-temperature service steel. With good toughness can be obtained at -45°c due to containing of 0.8%Ni.

Applications:

It is suitable for welding of Aluminum Killed Steel use at LPG tanks including high-carbon steel, low Manganese alloy steel, cast iron, steel pipe for low temperature service, pressure vessel, etc.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes before use.
2.Do not exceed the range of recommended because over heat input might decrease the impact value.
3.Keep the arc as short as possible.
4.Thick plate should be preheat at 50-100°c

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr
0.06	1.30	0.05	0.023	0.004	0.8	0.03

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -45 °c J	PWHT
530	630	30	85	620°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	100-140	140-180	180-230
	V&OH	90-130	120-160	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-8018-C1

AWS	A5.5 E8018-C1
EN	EN499 E 46 5 2Ni B 3 2
JIS	Z3241 DL5026-6P2

Characteristics:

LKE-8018-C1 is an iron powder low hydrogen electrode for the welding of low temperature service steel. Good impact value can be obtained at -60 °c. The weld metal contains 2.5%Ni, that will be suitable for the welding of low temperature service. The welding bead can be done with good X-ray soundness, equal fillet leg size, high efficiency, and nice bead appearance.

Applications:

It is suitable for high carbon steels, low Mn alloy steels, high tensile steels, cast steels, low temperature steel pipes, aluminum killed steels. Its features make the product being applied to shipbuilding, structural fabrication, bridge structure, pressure vessel.

Notes on Usage:

1.Dry the electrodes at 300-350 °c for 60 minutes before use.
2.Do not exceed the proper range of current, otherwise impact value will decrease.
3.Take the back-step method at the arc starting.
4.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni
0.080	0.98	0.64	0.014	0.008	2.55

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -60 °c J	PWHT
480	580	32	84	620°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	400	400
Amps	F	60-100	100-140	140-180	180-230
	V&OH	60-90	90-130	120-160	140-180
Weight per pack(kg)		5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-8018-C2

AWS	A5.5 E8018-C2
EN	E499 E 46 6 3Ni B 3 2
JIS	Z3241 DL5026-6P3

Characteristics:

LKE-8012-C2 is an iron powder low hydrogen electrode for the welding of low temperature service steel. The weld metal contains 3.5%Ni. Good impact value can be obtained at -73 °c. The welding can be done with good X-ray soundness, high deposition rate.

Applications:

It is suitable for the welding LPG tanks or 3.5%Ni steel for low temperature service.

Notes on Usage:

1.Dry the electrodes at 300-350 °c for 60 minutes before use.
2.Do not exceed the proper range of current, otherwise impact value will decrease.
3.Take the back-step method at the arc starting.
4.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni
0.070	0.90	0.57	0.014	0.008	3.40

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -73 °c J	PWHT
470	570	32	108	620°c x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	400	400
Amps	F	70-100	100-140	140-180	180-230
	V&OH	60-90	90-130	120-160	-
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-8018-C3

AWS	A5.5 E8018-C3
EN	EN499 E 46 4 1Ni B 3 2
JIS	Z3241 DL5026-4A1

Characteristics:

LKE-8018-C3 is an iron powder low hydrogen electrode for the welding of low temperature service steel in all positions. The weld metal contains 1.0%Ni. The welding can be done with good X-ray soundness, high deposition rate, and good impact value at -45 °c.

Applications:

It is suitable for the welding of LPG tanks.

Notes on Usage:

1.Dry the electrodes at 300-350 °c for 60 minutes before use.
2.Do not exceed the proper range of current, otherwise the impact value will decrease.
3.Take the back-step method at the arc starting.
4.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni
0.070	0.90	0.62	0.013	0.012	1.02

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -45 °c J
470	560	29	118

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	400	400
Amps	F	70-100	100-140	140-180	180-230
	V&OH	60-90	90-130	120-160	-
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-7018-W1

AWS A5.5 E7018-W1
JIS Z3214 DA5016G

Characteristics:

LKE-7018-W1 is an electrode for the welding of 490N/mm² grade high tensile steel.With good atmospheric corrosion resistance, good X-ray soundness and good crack resistance.

Applications:

It is suitable for welding of high tensile steel such as ASTM A588, COR-TEN A,B and also SPA-H,SMA 490 steel.

Notes on Usage:

1.Dry the electrodes at 350-400°c for 60 minutes before use.
2.Take the back-step method at the arc starting to prevent blowholes.
3.Keep the arc as short as possible.
4.While applying in plate with high restraint (such as the plates is thicker than 25mm),preheat at 80-100 °c is recommended.
5.Do not exceed the range of recommended because over heat input might decrease the impact value.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cu	Ni	Cr
0.06	0.60	0.50	0.02	0.01	0.50	0.35	0.25

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -20 °c J
470	578	31	142

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	100-140	140-180	180-230
	V&OH	80-130	120-160	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-8018-W2

AWS A5.5 E8018-W2
JIS Z3214 DA5016W

Characteristics:

LKE-8018-W2 is an electrode for the welding of 550 N/mm² grade high tensile steel. With good atmospheric corrosion resistance, good X-ray soundness and good crack resistance. The weld metal contains Cu, Ni and Cr.

Applications:

It is suitable for welding of high tensile steel such as SMA570W/P,ASTM A350/350M,etc.

Notes on Usage:

1. Dry the electrodes at 350-400 °c for 60 minutes before use.
2. Take the back-step method at the arc starting to prevent blowholes.
3. Keep the arc as short as possible.
4. While applying in plate with high restraint (such as the plates is thicker than 25mm) ,preheat at 80-100 °c is recommended.
5. Do not exceed the range of recommended because over heat input might decrease the impact value.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cu	Ni	Cr
0.05	0.70	0.42	0.02	0.006	0.60	0.7	0.52

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -20 °c J
510	600	26	132

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		3.2	4.0	5.0
Length (mm)		350	450	450
Amps	F	100-140	140-180	180-230
	V&OH	80-130	120-160	-
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-307-16

AWS A5.4 E307-16
EN EN1600 E 18 9 MnMo R 1 2
JIS Z3221 D307-16

Characteristics:

The weld metal of LKE-307 is a full austenite structure that contains 4-5% of Mn. With resistant to impact wearing and hot cracking.

Applications:

It is suitable for welding of stainless cladding steel, high tensile steel and self-hardening alloy steels with poor weldability.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.
2.Clean up the slag with stainless steel brush to prevent impurity.
3.Use small heat input to reduce dilution, prevent cracking and improve impact value.
4.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.06	4.20	0.50	0.035	0.01	19.20	9.5	1.0

Typical mechanical properties of weld metal

TS N/mm^2	EL %
600	42

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	60-90	80-130	130-170	180-210
	V&OH	50-70	70-110	100-130	-
Weight per pack(kg)		4/5	4/5	5	5
Weight per carton (kg)		20	20	20	20

LKE-308-16

AWS	A5.4 E308-16
EN	EN1600 E 19 9 R 1 2
JIS	Z3221 D308-16

Characteristics:

The weld metal of LKE-308 is a rutile electrode (19%Cr-10%Ni). It is suitable for the welding of AISI Types 304,301and 302 in all positions.

Applications:

It is suitable for welding of stainless steel piping in refinery, oil and gas industries, and chemical plants.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.

2.To make the cooling time as short as possible between 500-800°C to prevent the intergranular corrosion.

3.Clean up the slag with stainless steel brush to prevent impurity.

4.Use small heat input to reduce dilution, prevent cracking and improve impact value.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.06	1.30	0.35	0.014	0.008	19.38	9.90

Typical mechanical properties of weld metal

TS N/mm^2	EL %
570	47

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-308L-15

AWS A5.4 E308L-15

Characteristics:

The weld metal of LKE-308L is a rutile electrode for welding low carbon 18Cr-8Ni stainless steel. LKE-308L contains low carbon to avoid carbide precipitation during welding.

Applications:

It is suitable for welding of stainless steel piping in refinery, oil and gas industries, and chemical plants.

Notes on Usage:

1. Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.
2. To make the cooling time as short as possible between 500-800°C to prevent the intergranular corrosion.
3. Clean up the slag with stainless steel brush to prevent impurity.
4. Use small heat input to reduce dilution, prevent cracking and improve impact value.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.03	1.30	0.35	0.014	0.008	19.38	9.90

Typical mechanical properties of weld metal

TS N/mm^2	EL %
570	47

Welding position:

Sizes and recommended current range (DC<+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-308L-16

AWS	A5.4 E308L-16
EN	EN1600 E 19 9 L R 1 2
JIS	Z3221 D308L-16

Characteristics:

The weld metal of LKE-308L is a rutile electrode for welding low carbon 18Cr-8Ni stainless steel. LKE-308L contains low carbon to avoid carbide precipitation during welding.

Applications:

It is suitable for welding of stainless steel piping in refinery, oil and gas industries, and chemical plants.

Notes on Usage:

1. Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.
2. To make the cooling time as short as possible between 500-800°C to prevent the intergranular corrosion.
3. Clean up the slag with stainless steel brush to prevent impurity.
4. Use small heat input to reduce dilution, prevent cracking and improve impact value.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.03	1.30	0.35	0.014	0.008	19.38	9.90

Typical mechanical properties of weld metal

TS N/mm²	EL %
570	47

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-308H-16

AWS	A5.4 E308H-16
EN	EN 3581-A: E 19 9 H R
JIS	Z3221 ES308H-16

Characteristics:

Rutile-basic coated electrode for welding of creep resistant CrNi-alloyed austenitic stainless steels such as 304H. Controlled ferrite content of 3 – 8 FN. The deposit is resistant to embrittlement and scaling. Service temperatures up to 700°C. Excellent weldability in all positions except vertical down.

Applications:

It is suitable for welding stainless 304H and service temperatures up to 700°C.

Notes on Usage:

1. Preheating normally not necessary.
2. Material with a thickness exceeding 25 mm is preferably preheated up to 150°C.
3. Interpass temperature should not exceed 200°C. Re-drying at 120 – 200°C for min. 2 h if necessary.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.05	0.8	0.6	0.014	0.008	19.8	10.2

Typical mechanical properties of weld metal

TS N/mm²	EL %
580	40

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0
Length (mm)		300	350	350
Amps	F	45-75	70-110	110-145
	V&OH	40-70	65-100	100-140
Weight per pack(kg)		4/5	5	5
Weight per carton (kg)		20	20	20

LKE-309-16

AWS	A5.4 E309-16
EN	EN1600 E 23 12 R 1 2
JIS	Z3221 D309-16

Characteristics:

The weld metal of LKE-309 contains more Cr, Ni than LKE-308. The microstructure containing suitable quantity of ferrite, gives it an excellent resistance to hot cracking. It is suitable for welding of dissimilar metals, hardening alloy steel and steel with poor weldability.

Applications:

It is suitable for welding of stainless steel piping in refineries and chemical plants.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.

2.Use lower currents for dissimilar metals welding.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.034	1.00	0.75	0.03	0.010	23.60	12.8

Typical mechanical properties of weld metal

TS N/mm^2	EL %
600	41

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-309L-16

AWS	A5.4 E309L-16
EN	EN1600 E 23 12 L 1 2
JIS	Z3221 D309L-16

Characteristics:

The weld metal of LKE-309L contains more Cr, Ni than LKE-308L. The microstructure containing suitable quantity of ferrite, gives it an excellent resistance to hot cracking. It is suitable for welding of dissimilar metals, hardening alloy steel and steel with poor weldability.

Applications:

It is suitable for welding of stainless steel piping in refineries and chemical plants.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.

2.Use lower currents for dissimilar metals welding.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.03	1.26	0.65	0.02	0.01	23.76	13.44

Typical mechanical properties of weld metal

TS N/mm^2	EL %
600	41

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-309LMo-16

AWS	A5.4 E309MoL-16
EN	EN1600 E 23 12 L R 1 2
JIS	Z3221 D309MoL-16

Characteristics:

LKE-309MoL is a rutile electrode use as a buffer layer in welding acid resisting clad steels. With crack resistance and corrosion resistance at the high temperature due to higher Mo content.

Applications:

It is suitable for dissimilar metal welding of joining mild steel to stainless steel and steels difficult to weld.

Notes on Usage:

1.Dry the electrodes at 250-300°C for 60 minutes and keep at 100-150°C before use.

2.Use lower currents for dissimilar metals welding.

3.Keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.03	1.00	0.75	0.03	0.015	22.5	13.20	2.50

Typical mechanical properties of weld metal

TS N/mm²	EL %
598	40

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	4.8
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-309H-16

AWS A5.4 E309H-16

Characteristics:

The weld metal of LKE-309H is a rutile electrode for high temperature service. It is suitable for the welding of AISI Types 309H in all positions.

Applications:

It is suitable for welding stainless 309H and service temperatures up to 700°C.

Notes on Usage:

1. Preheating normally not necessary.
2. Material with a thickness exceeding 25 mm is preferably preheated up to 150°C.
3. Interpass temperature should not exceed 200°C. Re-drying at 120 – 200°C for min. 2 h if necessary.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.10	0.8	0.6	0.014	0.008	22.58	13.05

Typical mechanical properties of weld metal

TS N/mm²	EL %
580	38

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0
Length (mm)		300	350	350
Amps	F	45-75	70-110	110-145
	V&OH	40-70	65-100	100-140
Weight per pack(kg)		4/5	5	5
Weight per carton (kg)		20	20	20

LKE-310-16

AWS A5.4 E310-16
EN EN1600 E 25 20 R 1 2
JIS Z3221 D310-16

Characteristics:

Heat resistance, corrosion resistance and toughness of LKE-310 are good. The weld metal is a full austenite structure containing 25%Cr-20%Ni. It is not necessary to preheat and postweld heat treatment.

Applications:

It is suitable for the welding of dissimilar metals, low-temperature service stainless steel, mild steel and Cr-Mo steel.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes before use.
2.Use lower currents for dissimilar metals welding. Keep the interpass temperature below 150°C
3.The weld metal is a full austenite structure, which is easy to cause hot cracking.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.080	1.90	0.40	0.010	0.010	27.30	21.00

Typical mechanical properties of weld metal

TS N/mm²	EL %
590	38

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-312-16

AWS	A5.4 E312-16
EN	EN1600 E 29 9 R 12
JIS	Z3221 D312-16

Characteristics:

The weld metal of LKE-312 is a 29%Cr-9Ni% type stainless steel containing large content of ferrite which made it good crack resistance.

Applications:

It is excellent for the welding of dissimilar metals, cladding steel and steels with high harden ability.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.

2.Use lower currents for dissimilar metals welding. Keep the interpass temperature below 150°C

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.12	1.35	0.49	0.015	0.010	28.50	8.95

Typical mechanical properties of weld metal

TS N/mm²	EL %
760	29

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	5.0
Length (mm)		300	350	350	350
Amps	F	50-85	80-120	120-160	170-200
	V&OH	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-316-16

AWS A5.4 E316-16
EN EN1600 E 19 12 2 R 1 2
JIS Z3221 D316-16

Characteristics:

The weld metal of LKE-316 is a 18%Cr-12%Ni-2%Mo stainless steel which contains proper quantity of ferrite in austenitic structure. The corrosion resistance against sulfuric acid, phosphorous acid is excellent.

Applications:

It is suitable for chemical plants, cladding stainless steel.

Notes on Usage:

1.Dry the electrodes at 200-250℃ for 60 minutes and keep at 100-150℃ before use.
2.Use lower currents and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.06	1.20	0.35	0.016	0.010	19.50	13.20	2.50

Typical mechanical properties of weld metal

TS N/mm^2	EL %
570	40

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-316L-15

AWS A5.4 E316L-15

Characteristics:

The weld metal of LKE-316L is a 18%Cr-12%Ni-2%Mo.It possesses properties to LKE-316 except with a much lower carbon content which reduces susceptibility to sensitization during welding.

Applications:

It is suitable for welding of AISI 316,316L and cladding stainless steel.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.

2.Use lower currents and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.03	1.20	0.35	0.016	0.010	19.50	13.20	2.50

Typical mechanical properties of weld metal

TS N/mm²	EL %
570	40

Welding position:

Sizes and recommended current range (DC<+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-316L-16

AWS	A5.4 E316L-16
EN	EN1600 E 19 12 3 L 1 2
JIS	Z3221 D316L-16

Characteristics:

The weld metal of LKE-316L is a 18%Cr-12%Ni-2%Mo.It possesses properties to LKE-316 except with a much lower carbon content which reduces susceptibility to sensitization during welding.

Applications:

It is suitable for welding of AISI 316,316L and cladding stainless steel.

Notes on Usage:

1.Dry the electrodes at 200-250℃ for 60 minutes and keep at 100-150℃ before use.

2.Use lower currents and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.03	1.20	0.35	0.016	0.010	19.50	13.20	2.50

Typical mechanical properties of weld metal

TS N/mm²	EL %
570	40

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-316H-16

AWS	A5.4 E316H-16
EN	ISO 3581-B-ES316H-16
JIS	Z 3211 ES316-16

Characteristics:

The weld metal contains proper quantity of ferrite in austenitic structure. It provides higher strength and creep strength at high temperature due to higher carbon content. The corrosion resistance against acetic acid, sulphuric acid and phosphoric acid and crack resistance at high temperature can be improved by MO in 316H. It is suitable for chemical plants and LNG.

Applications:

It is suitable for welding stainless 316H and service temperatures up to 700℃.

Notes on Usage:

1. Preheating normally not necessary.
2. Material with a thickness exceeding 25 mm is preferably preheated up to 150℃.
3. Interpass temperature should not exceed 200℃. Re-drying at 120 – 200℃ for min. 2 h if necessary.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	Mo	Cr	Ni
0.10	1.0	0.6	0.030	2.20	18.30	12.00

Typical mechanical properties of weld metal

TS N/mm^2	EL %
590	39

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0
Length (mm)		300	350	350
Amps	F	45-75	70-110	110-145
	V&OH	40-70	65-100	100-140
Weight per pack(kg)		4/5	5	5
Weight per carton (kg)		20	20	20

LKE-317L-16

AWS A5.4 E317L-16
EN EN1600 E 19 13 4 L R 1 2
JIS Z3221 D317L-16

Characteristics:

The weld metal of LKE-317L is low carbon 19%Cr-12%Ni-3%Mo stainless steel which contains proper quantity of ferrite. Good corrosion resistance to sulfuric acid and organic acid can be obtained due to its Mo content. It is suitable for welding of chemical vessels and AISI 317L steel.

Applications:

It is suitable for welding of stainless steel piping and vessels in oil and gas industry, refineries and chemicals plants.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.
2.Use lower currents and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.034	1.49	0.36	0.015	0.010	19.60	13.85	3.52

Typical mechanical properties of weld metal

TS N/mm²	EL %
580	42

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-318-16

AWS A5.4 E318-16
JIS Z3221 D318-16

Characteristics:

LKE-318 is a modified 316 stainless steel which contains Nb. Good corrosion resistance to sulfuric acid and organic acid can be obtained due to its Mo and Nb content.

Applications:

It is suitable for welding of chemical vessels, pipe line and steel plate of AISI 316Ti/SUS 316-Ti.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.
2.Use lower currents and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo	Nb
0.04	0.85	0.75	0.030	0.010	18.50	11.50	2.50	0.40

Typical mechanical properties of weld metal

TS N/mm^2	EL %
580	41

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	60-90	80-130	130-170	180-210
	V&OH	50-70	70-110	100-130	-
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-347-16

AWS	A5.4 E347-16
EN	EN1600 E 19 9 Nb R 1 2
JIS	Z3221 D347-16

Characteristics:

LKE-347 is a niobium-bearing rutile electrode for Ti and Nb stabilized 18Cr-8Ni steels. Good intergranular corrosion resistance and heat resistance can be obtained due to its Nb content.It is use for AISI 347, 321, 304L steels.

Applications:

It is suitable for welding of stainless steel piping, boiler and gas turbine.

Notes on Usage:

1.Dry the electrodes at 200-250°C for 60 minutes and keep at 100-150°C before use.

2.Use lower currents and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Nb
0.04	1.30	0.60	0.020	0.015	19.50	9.10	0.60

Typical mechanical properties of weld metal

TS N/mm²	EL %
600	37

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.0	2.6	3.2	4.0	5.0
Length (mm)		250	300	350	350	350
Amps	F	30-55	50-85	80-120	100-150	140-180
	V&OH	20-50	45-80	70-110	90-135	-
Weight per pack(kg)		4/5	4/5	5	5	5
Weight per carton (kg)		20	20	20	20	20

LKE-410-16

AWS	A5.4 E410-16
EN	EN1600 E 13 R 1 2
JIS	Z3221 D410-16

Characteristics:

LKE-410 is used to give a martensitic weld metal of 13%Cr type for welding and building up of ferritic-martensitic steels. With good oxidization and corrosion resistance.

Applications:

It is suitable for welding of the AISI 410 and AISI 420.Typical applications include constructions exposed to aggressive sulphuric gases in refineries, oil and gas industries and chemical plants.

Notes on Usage:

1.Dry the electrodes at 250-300°C for 60 minutes and keep at 100-150°C before use.

2.Use lower currents and keep the arc as short as possible.

3.Preheat at 200-250°C, interpass temperature 180-250°C and post-weld heat treatment at 700-800°C

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni
0.03	0.35	0.60	0.025	0.010	12.50	0.40

Typical mechanical properties of weld metal

TS N/mm²	EL %	PWHT
540	24	750°C x1hr

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	60-90	80-130	130-170	180-210
	V&OH	50-70	70-110	100-130	-
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-2209-16

AWS A5.4 E2209-16
JIS Z3221 ES2209-16

Characteristics:

LKE-2209 is a designed to weld duplex stainless steels. With excellent pitting corrosion resistance, stress corrosion resistance and crack resistance.

Applications:

It is suitable for welding of chemical equipment, heat exchanger and pipes.

Notes on Usage:

1.Dry the electrodes at 250-300°C for 60 minutes and keep at 100-150°C before use.
2.Use lower currents and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	N	Cr	Ni	Mo
0.12	0.45	0.2	0.018	0.01	0.15	23.0	8.7	3.0

Typical mechanical properties of weld metal

TS N/mm²	EL %
785	26

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	60-90	80-130	130-170	180-210
	V&OH	50-70	70-110	100-130	-
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-2594-16

AWS A5.4 E2594-16
ISO E 25 9 4 N L R 4 2

Characteristics:

LKE-2594 is a designed to weld super duplex stainless steels. With excellent pitting corrosion resistance, stress corrosion resistance and crack resistance. Properties of the weld metal match those of the parent metal, offering high tensile strength and toughness as well as an excellent resistance to stress corrosion cracking and localized corrosion in chloride containing environments.

Applications:

It is suitable for welding of chemical equipment, heat exchanger and pipes. The operating temperature range is –50°C to 220°C.

Notes on Usage:

1.Dry the electrodes at 250-300°C for 60 minutes and keep at 100-150°C before use.
2.Use lower currents and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	N	Cr	Ni	Mo
0.03	1.0	0.4	0.018	0.01	0.23	24.8	9.3	3.7

Typical mechanical properties of weld metal

TS N/mm²	EL %
785	26

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	60-90	80-130	130-170	180-210
	V&OH	50-70	70-110	100-130	-
Weight per pack(kg)		4/5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-NiFe-CI

AWS A5.15 ENiFe-CI
JIS Z3252 DFCNiFe

Characteristics:

LKE-NiFe-CI is a covered electrode with graphite type coating and Fe-Ni alloy core rod. The weld metal provides low expansion coefficient, less hardening and good machining property. It is suitable for ductile cast iron, malleable cast iron and gray cast iron.

Applications:

For repairing of mining equipment, engine blocks, marine equipment and other heavy manufacturing equipment.

Notes on Usage:

1.Hot peening prevent the shrinkage stress.
2.Clean up to prevent contamination.
3.Preheat the base metal at 300 °c, PWHT at 500-600°c.
4.Use small amperage and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni
1.06	0.29	1.75	0.005	0.005	49.80

Typical mechanical properties of weld metal

TS N/mm^2	Vicker's Hardness (HV)
520	170-220

Welding position:

Sizes and recommended current range

Diameter (mm)	2.6	3.2	4.0	5.0
Length (mm)	300	350	350	350
Current Range	60-80	80-120	120-150	130-180
Weight per pack(kg)	5	5	5	5
Weight per carton (kg)	20	20	20	20

LKE-Ni-CI

AWS A5.15 ENi-CI
JIS Z3252 DFCNi

Characteristics:

LKE-Ni-CI is a covered electrode with graphite type coating and pure Ni alloy core rod. The weld metal provides excellent machining property, good tensile strength and good crack resistance.

Applications:

It is suitable for the repair welding of high pressure parts and cast iron products, etc

Notes on Usage:

1.Hot peening to prevent the shrinkage stress.
2.Clean up to prevent the contamination.
3.Preheat is not needed.
4.Use small amperage and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Fe
1.07	0.16	1.57	0.005	0.005	92.4	4.5

Welding position:

Sizes and recommended current range

Diameter (mm)	2.6	3.2	4.0	5.0
Length (mm)	300	350	350	350
Current Range	60-80	70-120	100-150	130-170
Weight per pack(kg)	5	5	5	5
Weight per carton (kg)	20	20	20	20

LKE-NiCrFe-1

AWS A5.11 ENiCrFe-1
JIS Z3224 DNiCrFe-1J

Characteristics:

LKE-NiCrFe-1 is a low hydrogen type covered electrode. The weld metal provides excellent machining property, good heat resistance, good corrosion resistance, good toughness especially at low temperature.

Applications:

It is suitable for the welding in all position of INCONEL ,INCONEL to stainless steel ,INCONEL to low alloy steel or stainless steel to low alloy steel.

Notes on Usage:

1.Use small amperage as possible and keep the arc as short as possible.
2.Dry the electrode at 350-400°c for 30-60 minutes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Nb	Fe	Co
0.06	3.20	0.24	0.006	0.007	14.50	71.10	2.20	9.23	0.11

Typical mechanical properties of weld metal

TS N/mm²	EL %	IV -196 °c J
620	42	89

Welding position:

Sizes and recommended current range (DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	60-90	70-115	95-145	140-180
	V&OH	55-80	65-110	85-135	-
Weight per pack(kg)		5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-NiCrFe-2

AWS A5.11 ENiCrFe-2
JIS Z3224 DNiCrFe-2

Characteristics:

LKE-NiCrFe-2 is a low hydrogen type and nickel-based covered electrode. The welding can be done in all position with good X-ray soundness and good crack resistance. The weld metal provides excellent mechanical properties which can satisfy the requirements of API and ASME for LNG tanks.

Applications:

It is suitable for welding of ASTM B163/166/167/168,Inconel600,cryogenic steels, martensitic to austenitic steels, dissimilar steels etc.

Notes on Usage:

1.Dry the electrode at 350-400°c for 30-60 minutes.
2.Use small amperage and keep the arc as short as possible.
3.Keep the interpass at 150°c.
4.Take back-step method to prevent blowhole at arc starting.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Nb	Fe	Mo
0.08	1.90	0.40	0.009	0.008	14.20	68.00	1.76	9.20	2.40

Typical mechanical properties of weld metal

TS N/mm²	EL %	IV -196 °c J
595	43	72

Welding position:

Sizes and recommended current range (DC <+>)

Diameter (mm)		2.6	3.2	4.0
Length (mm)		300	350	350
Amps	F	60-90	70-120	100-150
	V&OH	55-80	65-110	80-130
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-NiCrFe-3

AWS A5.11 ENiCrFe-3
JIS Z3224 DNiCrFe-3

Characteristics:

LKE-NiCrFe-3 is a low hydrogen type covered electrode. The welding can be done in all position with good heat resistance, oxidizations resistance and good corrosion resistance. Good toughness can be obtained at low temperature.

Applications:

It is suitable for welding of Inconel 600, dissimilar steels, heat-resistant steels including ASTM B163/166/167.168.

Notes on Usage:

1.Be sure to clean up the contamination on the plates.
2.Use small amperage and keep the arc as short as possible.
3.Dry the electrode at 350-400°c for 30-60 minutes.
4.Take back-step method to prevent blowhole at arc starting.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ti	Nb	Fe	Co	Ni
0.035	6.5	0.35	0.01	0.008	14.50	0.01	1.20	3.5	0.01	73.5

Typical mechanical properties of weld metal

TS N/mm²	EL %	IV -196 °c J
630	41	98

Welding position:

Sizes and recommended current range (DC <+>)

Diameter (mm)		2.6	3.2	4.0
Length (mm)		300	350	350
Amps	F	60-90	70-115	95-145
	V&OH	55-80	65-110	85-135
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-NiCrMo-3

AWS A5.11 ENiCrMo-3
JIS Z3224 DNiCrMo-3

Characteristics:

LKE-NiCrMo-3 is a nickel based low hydrogen type covered electrode which contains Mo and Nb. The excellent heat resistance and corrosion resistance can be obtained. It is suitable for chemical plant, nuclear reactor, Inconel 625, 9%Ni steel and dissimilar metals welding.

Applications:

Notes on Usage:

1.Dry the electrode at 350-400 °c for 30-60 minutes before use.
2.Use small amperage and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Nb	Fe	Mo
0.07	0.78	0.32	0.002	0.004	20.80	59.60	3.52	5.40	8.90

Typical mechanical properties of weld metal

YS N/mm²	TS N/mm²	EL %	IV -196 °c J
490	770	38	69

Welding position:

Sizes and recommended current range (DC <+>)

Diameter (mm)		2.6	3.2	4.0
Length (mm)		300	350	350
Amps	F	65-90	70-115	95-145
	V&OH	60-80	60-110	80-130
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-NiCrMo-4

AWS A5.11 ENiCrMo-4
JIS Z3224 DNiCrMo-4

Characteristics:

LKE-NiCrMo-4 is a nickel based low hydrogen type covered electrode which contains less C and Si to reduce carbide precipitation in grain boundary. The excellent heat resistance and corrosion resistance are obtained for chemical plant and FGD equipments.

Applications:

It is suitable for HASTELLOY C-276 and dissimilar metal welding.

Notes on Usage:

1.Dry the electrode at 350-400 °c for 30-60 minutes before use.
2.Use small amperage and keep the arc as short as possible.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	W	Fe	Mo
0.018	0.71	0.03	0.003	0.003	16.40	Bal.	3.54	5.30	16.82

Typical mechanical properties of weld metal

TS N/mm^2	EL %
735	39

Welding position:

Sizes and recommended current range (DC +)

Diameter (mm)		2.6	3.2	4.0
Length (mm)		300	350	350
Amps	F	60-90	70-115	95-145
	V&OH	60-80	60-110	80-130
Weight per pack(kg)		5	5	5
Weight per carton (kg)		20	20	20

LKE-NiCrMo-6

AWS A5.11 ENiCrMo-6

Characteristics:

LKE-NiCrMo-6 are AC,DC electrodes. For electrodes 3.2mm and less in size are suitable for all position and excellent weldability. Proper base metals are ASTM B333/334/353/522/553.

Applications:

For joining application of 9% Ni steel storage tank on LNG or liquefied Nitrogen, stabilized,non-stabilized Austenitic Cr Ni steel grades and cryogenic Ni steel with quenching and tempering.

Notes on Usage:

1.Dry the electrode at 350-400 °c for 60 minutes before use.

2.Keep the arc as short as possible.

3.Crater should be ground smooth or crater treatment.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Cr	Mo	Ni	Nb	W	Fe
0.029	2.52	0.53	14.40	7.27	67.1	0.93	1.66	5.51

Typical mechanical properties of weld metal

TS N/mm²	EL %	IV -196 °c J
685	40	74

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	90-120	120-160	160-220	230-300
	V&OH	70-110	80-120	110-150	230-300
Weight per pack(kg)		5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-NiCrMo-10

AWS A5.11 ENiCrMo-10

Characteristics:

Good corrosion-resistance against acetic acid and its anhydride, hot contaminated sulphuric and phosphoric acids and other contaminated oxidizing mineral acids. Intermetallic precipitation is widely prevented.

Applications:

For joining materials of the same and similar nature, e.g. material-no. 2.4602 (NiCr21Mo14W / UNS N06022) and special stainless steels. Furthermore it can be used for dissimilar joints of these alloys with low-alloyed materials and cladding

Notes on Usage:

1.Dry the electrode at 350-400 °c for 60 minutes before use.

2.Keep the arc as short as possible.

3.Crater should be ground smooth or crater treatment.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Cr	Mo	Ni	S	W	Fe
0.018	0.28	0.19	22.47	14.00	54.26	0.002	3.21	5.14

Typical mechanical properties of weld metal

TS N/mm²	EL %	IV -30 °c J
770	40	70

Welding position:

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	90-120	120-160	160-220	230-300
	V&OH	70-110	80-120	110-150	230-300
Weight per pack(kg)		5	5	5	5
Weight per carton (kg)		20	20	20	20

LKE-NiCu-7

AWS A5.11 ENiCu-7
JIS Z3224 DNiCu-7

Characteristics:

LKE-NiCu-7 is a low hydrogen type covered electrode. Excellent weldability and stress corrosion resistance are obtained.

Applications:

It is suitable for Monel 400, valves, pump and propeller of petrochemical plant.

Notes on Usage:

1.Dry the electrode at 350-400 °c for 30-60 minutes.
2.Use small amperage and keep the arc as short as possible.
3.Flat position welding is recommended.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cu	Ti	Fe
0.04	3.18	0.68	0.002	0.003	66.50	Bal.	0.18	0.51

Typical mechanical properties of weld metal

TS N/mm^2	EL %
505	43

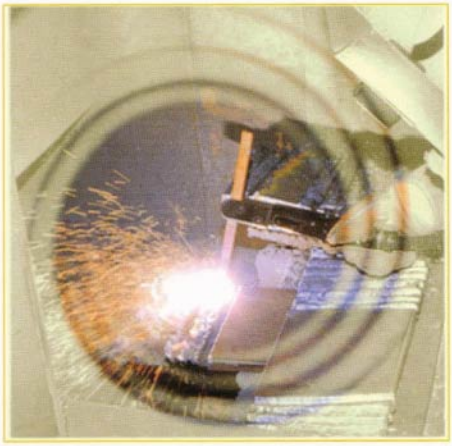
Welding position:

Sizes and recommended current range (DC <+>)

Diameter (mm)		2.6	3.2	4.0	4.8
Length (mm)		300	350	350	350
Amps	F	60-90	80-110	110-150	140-180
Weight per pack(kg)		5	5	5	5
Weight per carton (kg)		20	20	20	20

DC Carbon Arc Gouging

Gouging Carbon principle

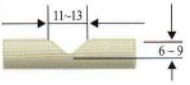


In the electric arc gouging method an electric arc is generated between the gouging carbon and the metal to be removed, causing the unwanted metal to melt. Meanwhile high-speed air is blown along the gouging carbon removing the melted metal. This gouging method is used comprehensively in industries worldwide.

Specifications

1.GOUGING CARBONS [DC] (For gouging, cutting and boring)

Model No.	Size (m/m)	Size (inch)	Current Range (amp)	Metal Removal (g/cm)	Groove Width (m/m)	Groove Depth (m/m)	Cutting Width (m/m)	Boring Dia. (m/m)
40G · GSS	4.0 x 305	5/32 x 12	150 ~ 200	Approx. 10	6 ~ 8	3 ~ 4	Approx. 7	Approx. 8
50G · GSS	5.0 x 305	3/16 x 12	150 ~ 200	〃 12	7 ~ 9	3 ~ 5	〃 8	〃 8
65G · GSS	6.5 x 305	1/4 x 12	200 ~ 250	〃 18	9 ~ 11	4 ~ 6	〃 9	〃 10
80G · GSS	8.0 x 305	5/16 x 12	250 ~ 350	〃 33	11 ~ 13	6 ~ 9	〃 11	〃 12
95G · GSS	9.5 x 305	3/8 x 12	350 ~ 450	〃 49	13 ~ 15	8 ~ 12	〃 13	〃 14
110G · GSS	11.0 x 305	7/16 x 12	450 ~ 600	〃 65	14 ~ 16	10 ~ 13	〃 14	〃 15
80GL	8.0 x 510	5/16 x 20	250 ~ 350	〃 32	11 ~ 13	6 ~ 9	〃 11	〃 12
95GL	9.5 x 510	3/8 x 20	350 ~ 450	〃 49	12 ~ 15	8 ~ 12	〃 13	〃 14
110GL	11.0 x 510	7/16 x 20	450 ~ 600	〃 65	14 ~ 16	10 ~ 13	〃 14	〃 15



80G
250 ~ 350A

Stable arc and excellent Performance efficiency

Excellent Quality Features

(1) High efficiency and low material consumption.
(2) Finely-shaped finish without bad effect on the base metal.
(3) Flaws in the welded part easily found.
(4) Available for both steel plate and for non-oxidated metal.
(5) Stable arc and noiseless workability guaranteed.
(6) Uniform quality, and simple operation ...for training of operators.

LKE-GOUGING

Characteristics and Applications :

LKE-Gouging is an electrode can be worked on AC or DC, and is suitable for steel structure gouging use. Because of the strong spray and high temperature arc, it can melt and cut various metals such as stainless steel, cast iron, copper and its alloys. It provides a more safe way for gouging than the general gas.

Notes on Usage:

1. Preparation:Dry the electrode at 70-80°C for 30-60 minutes before use.
2. Groove weld: Manipulate the electrode back and forth at the degree of 10 or 30 with work piece to divest slag.
3. Cutting or penetration: Take the weaving motion method, and keep the gouging in the required direction.

Sizes and recommended current range (AC or DC <+>)

Diameter (mm)	3.2	4.0	5.0
Amps	120-160	140-200	180-230

Solid Wires (TIG & MIG)

LKT-56

AWS A5.18 ER70S-6
JIS Z3316 YGT50

Characteristics:

LKT-56 is designed for welding of mild steel and 490N/mm² grade steel. Commonly used is butt or fillet welding. As an all-position welding rod for TIG welding, it is especially suitable for the root pass of pipe welding.

Applications:

It is suitable for welding of high pressure piping for shipbuilding, petro chemistry and nuclear power plant, etc.

Notes on Usage:

1. 100% Argon shielding gas with 99.997% high purity is recommended and the flow rate must be properly controlled. The flow rate is recommended 7-12l/min when arc current is 100-200Amp and it goes up to 12-15l/min when arc current rises to 200-300Amp.
2. Select right gas cup size and employ proper stick out of tungsten electrode.
3. To obtain a very clean weld pool, keep the weld plate free from dirt, rust, paint and any other atmospheric contamination.
4. Trailer Shield is required to ensure the weld pool completely shielded until solidification is complete and no porosity problem.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Mo	V	Cu
0.08	1.53	0.80	0.015	0.011	0.008	0.022	0.021	0.006	0.044

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -30 °c J
460	550	35	196

Sizes and recommended current range (DC <->)

Diameter (mm)	1.6	2.0	2.4
Length (mm)	915	915	915
Weight per box (kg)	5	5	5

LKM-56

AWS	A5.18 ER70S-6
JIS	Z3312 YGW12
ISO	14341-A G 38 3 C1 3Si1

Characteristics:

LKM-56 is designed for welding of mild steel and 490N/mm^2 grade steel. Commonly used is butt or fillet welding. It performs with smooth wire feeding, stable arc, low spatter loss and high deposition efficiency.

Applications:

It is suitable for welding of vehicles, ships, buildings and bridges

Notes on Usage:

1.Electrode Stick Out must be kept between 15-25 mm.

2.Use 100%CO_2 as shielding gas.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Mo	V	Cu
0.07	1.48	0.85	0.015	0.011	0.024	0.027	0.023	0.003	0.020

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -30 °c J
450	550	30	52

Sizes and recommended current range (DC <+>)

Diameter (mm)	0.9	1.0	1.2	1.6
Amps	50-200	80-250	30-350	170-500
Weight per spool (kg)	15	15	15/20	15/20

LKT-50

AWS A 5.18 ER70S-G
JIS Z3316 YGT50

Characteristics:

It is designed for welding of mild steel and 490N/mm² grade steel. Commonly used is butt or fillet welding. LKT-50 is an all-position welding rod for TIG welding. It is especially suitable for the root pass of pipe welding. Use DC(-) polarity.

Applications:

It is suitable for welding of high pressure piping for shipbuilding, petrochemistry and nuclear power plant, etc.

Notes on Usage:

1.Use 99.997% purity of Ar as shielding gas.
2.Clean the surface of base metal to prevent contamination.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cu	Ti
0.083	1.26	0.85	0.015	0.005	0.015	Bal.

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -30 °c J
440	550	33	62

Sizes and recommended current range (DC <->)

Diameter (mm)	1.6	2.0	2.4	2.6	3.2	4.0
Length (mm)	915	915	915	915	915	915
Weight per box (kg)	5	5	5	5	5	5

LKM-50

AWS A5.18 ER70S-G
JIS Z3312 YGW11

Characteristics:

It is designed for welding of mild steel and 490N/mm^2 grade steel. Commonly used is butt or fillet welding.LKM-50 can provide higher deposition efficiency in welding of thick plate with less fume and good bead appearance.

Applications:

It is suitable for welding of building, vehicles and bridges

Notes on Usage:

1.Electrode Stick Out must be kept between 15-25 mm.
2.Use 100%CO_2 as shielding gas.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ti
0.07	1.53	0.75	0.015	0.011	0.20

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -30 °c J
470	560	31	57

Sizes and recommended current range (DC <+>)

Diameter (mm)	1.2	1.4	1.6
Amps	100-350	150-400	200-500
Weight per spool(kg)	15/20	15/20	15/20

LKT-60

AWS A5.28 ER80S-G
JIS Z3316 GYT60

Characteristics:

It is designed for welding of high tensile 590N/mm^2 steel. Commonly used is flat or horizontal fillet welding. It is suitable for root pass welding of pipes and applied in welding Mn-Mo, Mn-Mo-Ni alloy high tensile steel.

Applications:

It is suitable for welding of high strength steel used in steel construction, pressure vessels, vehicles and bridges

Notes on Usage:

1.Electrode Stick Out must be kept between 15-25 mm.
2.Use 100%CO_2 as shielding gas and the flow rate must be controlled that recommended 7-12l/min when arc current is 100-200Amp and goes up to 12-15l/min when arc current rises to 200-300Amp.
3.Proper welding parameter shall be adopted for better welding performance.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Mo
0.08	1.72	0.67	0.015	0.011	0.33

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %
540	660	29

Sizes available

Diameter (mm)	2.4
Length(mm)	915
Weight per box(kg)	5

LKM-60

AWS A5.18 ER80S-G
JIS Z3312 YGWJ18

Characteristics:

LKM-60 is designed for welding of mild steel and 590N/mm^2 grade steel. Commonly used is butt or fillet welding. It can be operated with a wider range of welding currents.

Applications:

It is suitable for welding of high strength steel used in vehicles, buildings and bridges

Notes on Usage:

1.Electrode Stick Out must be kept between 15-25 mm.
2.Use 100%CO_2 as shielding gas.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Mo	Cu
0.07	1.52	0.67	0.015	0.011	0.20	0.10

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -30 °c J
510	598	30	52

Sizes and recommended current range (DC <+>)

Diameter (mm)	1.2	1.6
Amps	100-350	200-500
Weight per spool (kg)	15	15

LKT-75
LKM-75

AWS A5.28 ER110S-G

Characteristics:

LKT-75 is designed for welding of low alloy and 590N/mm^2 grade steel. Commonly used is butt or fillet welding. It can be operated with a wider range of welding currents.

Applications:

It is suitable for welding of high strength steel used in vehicles, buildings and bridges

Notes on Usage:

1.Electrode Stick Out must be kept between 15-25 mm.

2.Use 100%Ar_2 as shielding gas.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	Cr	Ni	Cu
0.08	1.7	0.67	0.015	0.42	0.85	0.10

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -40 ^{o}c J
730	840	20	85

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-80B2

AWS A5.28 ER80S-B2

Characteristics:

LKT-80B2 with 12.5%Cr and 0.5%Mo, is designed for welding low-alloy steels with high tensile strength and creep-resistance steels such as ASTM type A199-76, A200-75, A213-76d, A335-76, A369-76, A387-76.

Applications:

It is suitable for welding of pipelines in pressure vessels and boilers with operating temperatures up to about 500°C

Notes on Usage:

1. Use DC(-) current and 100%Argon gas at proper flow rate.
2. In order not to derogate the weld metal quality from particle. Be sure to clean up the contaminations on base metal and welding seam.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo	Cu
0.09	0.60	0.49	0.010	0.007	1.42	0.52	0.15

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	PWHT
529	637	27	620°C x1hr

Sizes available

Diameter (mm)	1.6	2.0	2.4	3.2
Length(mm)	915	915	915	915
Weight per box(kg)	5	5	5	5

LKT-90B3

AWS A5.28 ER90S-B3

Characteristics:

LKT-90B3 with 2.5%Cr and 1%Mo, is designed for welding low-alloy steels with high tensile strength and creep-resistance steels such as SA387 Grade 22, A355 Grade P22 or similar materials.

Applications:

It is suitable for welding of pipelines in pressure vessels and boilers with operating temperatures up to about 550°C

Notes on Usage:

1. Use DC(-) current and 100%Argon gas at proper flow rate.
2. In order not to derogate the weld metal quality from particle. Be sure to clean up the contaminations on base metal and welding seam.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo	Cu
0.09	0.58	0.48	0.008	0.007	2.37	0.97	0.15

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
570	650	25	690°C x1hr

Sizes available

Diameter (mm)	1.6	2.0	2.4	3.2
Length(mm)	915	915	915	915
Weight per box(kg)	5	5	5	5

LKT-90B9

AWS A5.28 ER90S-B9

Characteristics:

LKT-90B9, The weld metal contains 9%Cr-1%Mo and some little Nb,V to improve the creep problem at prolonged high temperature. It's designed for welding low-alloy steels with high tensile strength and creep-resistance steels such as A355 Grade P91 or similar materials.

Applications:

It is suitable for welding of pipelines in pressure vessels and boilers with operating temperatures up to about 700°C

Notes on Usage:

1. Use DC(-) current and 100%Argon gas at proper flow rate.
2. In order not to derogate the weld metal quality from particle. Be sure to clean up the contaminations on base metal and welding seam.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Mo	Cu
0.09	0.58	0.48	0.008	0.007	8.85	0.97	0.15

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
570	650	25	690°C x1hr

Sizes available

Diameter (mm)	1.6	2.0	2.4	3.2
Weight per box(kg)	5	5	5	5

LKT-308L
LKM-308L

AWS	A5.9 ER308L
EN	EN12072 G 19 9 L
JIS	Z3321 Y308L

Characteristics:

It is designed with lower range carbon to help prevent intergranular corrosion. It suitable for welding of low carbon 18%Cr-8%Ni stainless steel such as AISI301, 302, 304L, 308L.It is also used for joining some dissimilar 300 series stainless steel.

Applications:

It is used for oil and gas refineries, stainless steel sheet metal works, rail car fabrication industry include welding of AISI301, 302 and 308 in chemical.

Notes on Usage:

1. For TIG process, use DC(-) current , Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Si
0.025	20.20	10.30	1.65	0.42

Typical mechanical properties of weld metal

TS N/mm^2	EL %
580	42

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-308LSi
LKM-308LSi

AWS A5.9 ER308LSi
JIS Z3321 Y308LSi

Characteristics:

It is modified 308L austenitic stainless steel to higher silicon content to improve welding properties such as higher welding speed.

Applications:

It is used for oil and gas refineries, stainless steel sheet metal works, rail car fabrication industry include welding of AISI 308L in chemical.

Notes on Usage:

1. For TIG process, use DC(-) current , Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Si
0.025	19.90	10.40	2.25	0.78

Typical mechanical properties of weld metal

TS N/mm²	EL %
590	42

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-308H
LKM-308H

AWS A5.9 ER308H

Characteristics:

It is designed with high range carbon to help prevent corrosion at high temperature. It suitable for welding of high carbon 18%Cr-8%Ni stainless steel

Applications:

It is used for oil and gas refineries, gas turbine, Power plant, Boiler and pressure vessel operate at high temperature

Notes on Usage:

1. For TIG process, use DC(-) current , Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Si
0.06	20.20	10.30	1.65	0.42

Typical mechanical properties of weld metal

TS N/mm^2	EL %
600	35

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-309L
LKM-309L

AWS	A5.9 ER309L
EN	EN12072 G 23 12 L
JIS	Z3321 Y309L

Characteristics:

It is the low carbon content designed to prevent intergranular corrosion.It is used to join similar 309L alloys or join 300 series stainless steels to carbon or low alloy steels.

Applications:

It is used for oil and gas refineries, include welding of AISI 309 in chemical and welding of dissimilar base metals of stainless and carbon steels.

Notes on Usage:

1. For TIG process, use DC(-) current , Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Si
0.024	23.80	12.80	1.98	0.39

Typical mechanical properties of weld metal

TS N/mm^2	EL %
590	40

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-309LSi
LKM-309LSi

AWS A5.9 ER309LSi

Characteristics:

It is modified 309L austenitic stainless steel to higher silicon content to improve welding properties such as higher welding speed.

Applications:

It is used for oil and gas refineries, include welding of 22%Cr-12%Ni stainless steel, AISI 304L,316L in chemical and welding of dissimilar base metals of stainless and carbon steels.

Notes on Usage:

1. For TIG process, use DC(-) current, Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Si
0.024	23.90	13.50	2.35	0.39

Typical mechanical properties of weld metal

TS N/mm²	EL %
600	39

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-309LMo
LKM-309LMo

AWS A5.9 ER309LMo

Characteristics:

LKM/LKT-309LMo is a modified type of LKM/LKT-309L with the addition of molybdenum. It designed for 100% CO2 gas and all-position welding. It performs with smooth arc transfer, low spatter level, fast freezing slag and, good heat and corrosion resistance.

Applications:

It is suitable for welding stainless steel to unalloyed steel. It is also used for buffer layers of clad steels.

Notes on Usage:

1. For TIG process, use DC(-) current , Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Mo
0.02	23.30	13.86	1.89	2.20

Typical mechanical properties of weld metal

TS N/mm^2	EL %
600	43

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-310
LKM-310

AWS	A5.9 ER310
EN	EN12072 G 25 20
JIS	Z3321 Y310

Characteristics:

It is austenitic stainless steel filler metal with good general oxidation resistance at high temperature. It is excellent corrosion and heat resistance, ideal for welding and building up parts for heat treatment and case hardening furnaces and other burners.

Applications:

It is suitable for welding of 25%Cr-20%Ni stainless steel and dissimilar steels. Typical application include marine, re-conditioning and refurbishment industries.

Notes on Usage:

1. For TIG process, use DC(-) current, Argo Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Si
0.12	27.00	21.50	1.36	0.49

Typical mechanical properties of weld metal

TS N/mm²	EL %
610	41

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-312
LKM-312

AWS A5.9 ER312
JIS Z3321 Y312

Characteristics:

It is austenitic stainless steel filler metal for welding of 29%Cr-9%Ni types. It is widely used for joining of dissimilar metals to join 300 series stainless steels to carbon or low alloy steels.

Applications:

Typical applications include marine, re-conditioning and refurbishment industries.

Notes on Usage:

1. For TIG process, use DC(-) current, Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Si
0.03	29.50	9.50	1.20	0.50

Typical mechanical properties of weld metal

TS N/mm^2	EL %
710	26

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-316L
LKM-316L

AWS A5.9 ER316L
JIS Z3321 Y316L

Characteristics:

It is austenitic stainless steel filler metal for welding of 18%Cr-12%Ni-2%Mo types. The molybdenum increased pitting corrosion resistance. The low carbon content improved intergranular corrosion.

Applications:

Typical applications include welding of 18%Cr-12%Ni-2%Mo stainless steel in chemical, oil and gas refineries.

Notes on Usage:

1. For TIG process, use DC(-) current, Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mo	Mn	Si
0.023	19.60	13.1	2.30	1.45	0.50

Typical mechanical properties of weld metal

TS N/mm^2	EL %
580	40

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-316LSi
LKM-316LSi

AWS A5.9 ER316L
JIS Z3321 Y316LSi

Characteristics:

It is modified 316L austenitic stainless steel to higher silicon content to improve welding properties such as higher welding speed. With excellent creep strength and resistance to pitting corrosion.

Applications:

Typical applications include welding of 18%Cr-12%Ni-2%Mo stainless steel in chemical, oil and gas refineries.

Notes on Usage:

1. For TIG process, use DC(-) current, Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mo	Mn	Si
0.024	18.60	12.20	2.40	1.50	0.65

Typical mechanical properties of weld metal

TS N/mm²	EL %
580	39

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-347
LKM-347

AWS A5.9 ER347

Characteristics:

LKT/LKM-347 is a niobium-bearing rutile electrode for Ti and Nb stabilized 18Cr-8Ni steels. Good inter-granular corrosion resistance and heat resistance can be obtained due to its Nb content. It is use for AISI 347, 321, 304L steels.

Applications:

It is suitable for welding of stainless steel piping, boiler and gas turbine.

Notes on Usage:

1. For TIG process, use DC(-) current , Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Mo
0.02	21.30	10.86	1.89	0.20

Typical mechanical properties of weld metal

TS N/mm^2	EL %
580	38

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-409Nb
LKM-409Nb

AWS A5.9 ER409Nb

Characteristics:

LKT/LKM-409Nb is a ferritic stainless steel filler wire suitable to weld 409 or 409Ti base stainless steels. The addition of niobium results in a preferential reaction with carbon, which prevent the chromium from forming carbides. This improves corrosion resistance, increases strength at elevated temperatures and promotes a ferritic microstructure. It is used primarily in the automotive industry for welding catalytic converters and other parts of the exhaust system. For best results, welding must be done in a low heat input procedure and is not recommended for multi-pass applications.

Notes on Usage:

1. For TIG process, use DC(-) current , Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Nb
0.024	11.5	0.47	0.68	0.77

Typical mechanical properties of weld metal

TS N/mm²	EL %
520	38

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-430
LKM-430

AWS A5.9 ER430

Characteristics:

It is a ferrite stainless steel with good ductility in heat-treated condition. It is used for welding 17%Cr steel, overlays and thermal spraying.

Applications:

It is suitable for welding of 409 and 430 stainless steel types. Typical applications are used for automotive exhaust fabricators such as front pipe, bellows, flange.

Notes on Usage:

1. For TIG process, use DC(-) current , Argon Shield and Tungsten Electrode.
2. For MIG process, use Spray Transfer or Short Circuit Transfer mode.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.
4. Preheat of the joint to minimum of 150°C before welding.

Typical chemical composition of weld metal (wt%)

C	Cr	Mn	Si	Ni	Fe
0.06	16.2	0.42	0.34	0.38	Balance

Typical mechanical properties of weld metal

TS N/mm^2	EL %	PWHT
530	25	780°Cx2hr

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-2209
LKM-2209

AWS A5.9 ER2209

Characteristics:

It is design for welding duplex stainless steel such as 2205.With good resistance to intergranular corrosion, pitting and stress corrosion cracking especially in environments containing H2S and chlorides.

Applications:

It is suitable for welding of 22%Cr duplex stainless steel.

Notes on Usage:

1. For TIG process, use DC(-) current .
2. For MIG process, use DC(+) current.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Cr	Ni	Mo	N	Cu
0.01	1.66	0.41	22.6	8.70	3.18	0.151	0.12

Typical mechanical properties of weld metal

TS N/mm²	EL %
745	27

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

AWS A5.9 ER2209

ISO 14343-A G 25 9 4 NL

Characteristics:

It designed for 3Dprinting of bigger structures enabling three dimensional, faster cooling conditions. Provides a ferritic-austenitic weld metal. Superduplex grades are offering high tensile strength and toughness as well as an excellent resistance to stress corrosion cracking and localized corrosion in chloride containing environments.

Applications:

It is suitable for welding of duplex or super duplex stainless steel

Notes on Usage:

1. For TIG process, use DC(-) current .
2. For MIG process, use DC(+) current.
3. 98%Argon – 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Cr	Ni	Mo	N	Cu
0.01	0.60	0.46	24.90	9.20	3.90	0.28	0.13

Typical mechanical properties of weld metal

TS N/mm^2	EL %
830	28

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-NiCrMo-3
LKM-NiCrMo-3

AWS A5.14 ERNiCrMo-3
JIS Z3334 YNiCrMo-3

Characteristics and Applications:

It is suitable for welding of Ni-Cr-Mo alloys(Hastelloy C).Surfacing steel with Ni-Cr-Mo weld metal.

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Fe	Nb	Mo
0.01	22.18	65.24	0.3	0.25	3.61	8.67

Typical mechanical properties of weld metal

TS N/mm^2	EL %
786	42

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-NiCrMo-4
LKM-NiCrMo-4

AWS A5.14 ERNiCrMo-4
JIS Z3334 YNiCrMo-4

Characteristics and Applications:

It is suitable for welding of low carbon Ni-Cr-Mo alloys, low carbon Ni-Cr-Mo alloys to steel and other nickel base alloys

Typical chemical composition of weld metal (wt%)

C	Cr	Ni	Mn	Fe	W	Mo
0.01	15.67	Bal.	0.40	5.910	3.12	15.96

Typical mechanical properties of weld metal

TS N/mm^2	EL %
745	41

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-NiCrMo-10
LKM-NiCrMo-10

AWS	A5.14 ERNiCrMo-10
ISO	18274: S Ni 6022
JIS	Z 3324 S Ni6022

Characteristics:

Nickel-base solid wire ERNiCrMo-10 type for joining and surfacing of matching and similar alloys and cast alloys.

Applications:

For welding the cladded side of plates of matching and similar alloys. High corrosion resistance in reducing and oxidizing environments.

Notes on Usage:

1. Suggested heat input is max. 1.0 kJ/mm and interpass temperature max. 100°C.
2. Preheating and post-weld heat treatment not required.
3. In special cases, solution annealing can be performed at 1100-1150°C followed by water quenching.
4. For MIG welding: Polarity DC+. Shielding gas: Ar + 30% He + 2% H 2 , Gas flow 15 – 20 l/min.
5. For automatic TIG welding: Polarity DC-. Shielding gas: Ar or Ar + 30% He + 2% H 2 , Gas flow 5 – 12 l/min.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Cr	Ni	Mo	W	Fe
0.01	<0.5	<0.1	22.6	Bal.	13	2.5	2

Typical mechanical properties of weld metal

TS N/mm²	EL %
700	30

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-NiCr-3
LKM-NiCr-3

AWS A5.14 ERNiCr-3
JIS Z3334 YNiCr-3

Characteristics and Applications:

It is suitable for welding of Ni-Cr-Fe alloys(Inconel 600 alloy), dissimilar metals welding and overlaying.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Cr	Ti	Fe	Nb	Ni
0.02	2.94	0.15	19.1	0.37	1.90	2.47	Bal.

Typical mechanical properties of weld metal

TS N/mm^2	EL %
660	37

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-NiCu-7
LKM-NiCu-7

AWS A5.14 ERNiCu-7
JIS Z3334 YNiCu-7

Characteristics and Applications:

It is suitable for welding of Ni-Cu alloys(Monel).

Typical chemical composition of weld metal (wt%)

C	Al	Ni	Mn	Fe	Cu	Ti	Si
0.018	0.028	65.24	3.50	0.55	Bal.	2.14	0.30

Typical mechanical properties of weld metal

TS N/mm^2	EL %
566	41

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-4043
LKM-4043

AWS A5.10 ER4043

Characteristics and Applications:

It is a silicon-alloyed aluminum. It is suitable for welding base metal 3003, 3004, 5052, 6061, 6063 and casting alloys 43, 355, 356 and 214.

Typical chemical composition of weld metal (wt%)

Si	Mn	Zn	Fe	Al
5.0	0.02	0.05	0.20	Bal.

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %
125	187	8

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-5356
LKM-5356

www.linkweldthailand.com

AWS A5.10 ER5356

Characteristics and Applications:

It is a magnesium-alloyed aluminum. With good corrosion resistance when exposed to salt water. It is suitable for welding base metals 5050, 5052, 5083, 5356, 5454 and 5456.

Typical chemical composition of weld metal (wt%)

Si	Mn	Mg	Fe	Al
< 0.2	0.15	5.0	< 0.20	Bal.

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %
132	269	17

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-5183
LKM-5183

AWS A5.10 ER5183

ISO 18273: S Al 5183

Characteristics:

Solid wire for MIG and TIG of AlMg alloys. Seawater resistant weld metal. Good colour matching with base metal after anodizing. Thorough cleaning of the workpiece bevels is necessary prior to welding.

Applications:

Railroad cars, shipbuilding, transportation equipment and pressure vessels

Notes on Usage:

1. For TIG process, use DC(-) current .
2. For MIG process, use DC(+) current.
3. 98%Argon + 2%O_2 shielding gas is recommended in MIG process.

Typical chemical composition of weld metal (wt%)

Al	Mn	Mg	Cr	Fe	Si	Zn	Ti
Bal.	0.5-1.0	4.3-5.2	0.05-0.25	<0.40	<0.40	<0.25	<0.15

Typical mechanical properties of weld metal

TS N/mm^2	EL %
275	15

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-Cu
LKM-Cu

AWS A5.7 ERCu

Characteristics and Applications:

It is a copper alloyed developed to provide dense, high quality deposits for use in joining and overlay with inert gas process. It may suitable for welding galvanized steel and deoxidized copper to mild steel where high strength not require.

Typical chemical composition of weld metal (wt%)

Si	Mn	Sn	Cu
0.2	0.2	0.7	≥98.0

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %
100	220	23

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

LKT-CuSi
LKM-CuSi

AWS A5.7 ERCuSi-A

Characteristics and Applications:

It is a copper-silicon (silicon-bronze) alloy. It suitable for welding of copper, copper-silicon, and copper-zinc base metal and also to steel. It also used to weld on coated steels and surface areas subject to corrosion.

Typical chemical composition of weld metal (wt%)

Si	Mn	Cu
3.0	1.0	Bal.

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %
160	300	23

Sizes available

MIG Solid Wire(mm)	0.8	0.9	1.0	1.2
TIG Rods(mm)	1.6	2.0	2.4	3.2

Flux Cored Wires (FCAW)

LFC-70

AWS	A5.18 E70C-3M/6M
EN	EN758 T 42 2 PM1 H10
JIS	Z3313 YFW-A50DR

Characteristics:

LFC-70 is a metal cored wire suitable for used with Ar/CO_2 for mild steel and 490 N/mm^2 high tensile steel, its deposition rate is 10-30% higher than a solid wire. Multi-layer welding can be performed without removing slag.

Applications:

It is suitable for the multi-layer welding of thick plate welding in such applications as steel structure, bridges, shipbuilding, vehicles, storage tanks, etc.

Notes on Usage:

1. Use DC(+) polarity.
2. Maintain inter-pass temperature under 150°C for multi-layer welding.
3. Trailer Shield is required to ensure the weld pool completely shield by 75-80%Ar,25-20%CO_2 gas until solidification is complete and no porosity problem.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.04	1.50	0.63	0.012	0.010

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV J	
			-20°C	-30°C
545	595	28	57	45

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm		1.6 mm	
Welding Position	F	HF	F	HF
Voltage(Volt)	25-35	25-38	25-35	28-38
Current(Amp)	150-300	180-300	220-400	270-440
Stick out(mm)	15-25	15-25	20-30	20-30
Flow rate(l/min)	15-25	15-25	20-25	20-25
Weight per spool (kg)	15		15	

LFC-77

AWS	A5.18 E70C-6M
EN	EN758 T 46 4 MM3 H5
JIS	Z3313 YFW-A502R

Characteristics:

LFC-77 is a metal cored wire. It feature smooth spray arc, low slag volume, low spatter, low fume emission,good penetration, high resistance to porosity, and excellent low temperature impact toughness under -40°C.

Applications:

It is suitable for the multi-layer welding onheavy plate thickness, steel structure, and storage vessels.

Notes on Usage:

1. Use DC(+) polarity.
2 .Shielding gas should be 75-80%Ar+25-20%CO_2.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.06	1.45	0.54	0.015	0.005

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -40°CJ
580	630	24	65

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	26-34	28-35
Current(Amp)	200-320	250-350
Stick out(mm)	15-25	15-25
Flow rate(l/min)	20-25	20-25
Weight per spool (kg)	15	15

LFC-701

AWS	A5.20 E70T-1C
EN	EN758 T 42 2 R C 3 H10
JIS	Z3313 YFW-C50DM

Characteristics:

LFC-701 is a flux cored wire suitable for flat and horizontal position welding. With excellent stable arc, low spatter, good slag detachability and deposition rate. It has good porosity resistance for fillet welding of zinc-primer coated steels.

Applications:

It is widely used for shipbuilding, bridge construction, offshore structure and general fabrication.

Notes on Usage:

1. Use DC(+) polarity.
2. Use CO_2 as shielding gas.
3. Proper preheat at range 50-150°C and maintain interpass temperature under 150°C.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.05	1.55	0.60	0.017	0.007

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV J	
			-20°C	-30°C
550	595	27	90	70

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm		1.6 mm	
Welding Position	F	HF	F	HF
Voltage(Volt)	25-35	25-38	25-35	28-38
Current(Amp)	150-300	180-300	220-400	270-440
Stick out(mm)	15-25	15-25	20-30	20-30
Flow rate(l/min)	15-25	15-25	20-25	20-25
Weight per spool (kg)	15		15	

LFC-711

AWS	A5.20 E71T-1C
EN	EN758 T 46 2 P C 1 H10
JIS	Z3313 YFW-C50DR

Characteristics:

LFC-711 is a flux-cored wire design to be use with CO_2 gas. It can be used on all-position welding with both single and multiple pass welds on mild steels and 490N/mm^2 high tensile steel. With good impact toughness, less fume, stable arc, easy slag removal and excellent X-Ray inspection.

Applications:

It is widely used for shipbuilding, storage vessels, structural fabrication, machinery and piping etc.

Notes on Usage:

1. Use DC(+) polarity.
2. Use CO_2 as shielding gas.
3. In order to get enough penetration in the downhand weld position, maintain a little bit higher welding speed by stringer manipulation for the first pass.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.037	1.30	0.42	0.020	0.010

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -29°CJ
485	555	29	80

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	20-30
Flow rate(l/min)	15-25	20-25
Weight per spool (kg)	15	15

LFC-711M

AWS	A5.20 E71T-1M/9M
EN	EN758 T 46 2 P M 1 H10
JIS	Z3313 YFW-A502R

Characteristics:

LFC-711M is a flux-cored wire design to be use with Ar/CO_2 gas. It can be used on all-position welding with both single and multiple pass welds on mild steels and 490N/mm^2 high tensile steel. With good impact toughness, less fume, stable arc, easy slag removal and excellent X-Ray inspection.

Applications:

It is widely used for shipbuilding, storage vessels, structural fabrication, machinery and piping etc.

Notes on Usage:

1. Use DC(+) polarity.
2. Use 75-85%Ar + 25-15%CO_2 as shielding gas.
3. In order to get enough penetration in the down hand weld position, maintain a little bit higher welding speed by stringer manipulation for the first pass.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.05	1.25	0.45	0.015	0.007

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -29°C J
540	590	28	95

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	20-30
Flow rate(l/min)	15-25	20-25
Weight per spool (kg)	15	15

LFC-711Ni

AWS A5.20 E71T-1CJ/9CJ
EN EN758 T 42 4 P C 1

Characteristics:

LFC-711Ni is a flux-cored wire design to be use with CO_2 gas. It can be used on all-position welding on 490N/mm^2 high tensile steel. With stable arc, less spatter, easy slag removal and excellent X-Ray inspection. It provides good low-temperature impact value due to 0.4%Ni in weld metal.

Applications:

It is widely used for shipbuilding, vessels, piping, off-shore plateform, low temperature service storage tanks, etc.

Notes on Usage:

1. Use DC(+) polarity.
2. Use CO_2 as shielding gas.
3. In order to get enough penetration in the down hand weld position, maintain a little bit higher welding speed by stringer manipulation for the first pass.
4. Keep dry during handling and storage.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni
0.05	1.35	0.43	0.018	0.009	0.45

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -40°CJ
515	575	29	80

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-32	25-40
Current(Amp)	130-250	200-400
Stick out(mm)	15-25	20-30
Flow rate(l/min)	15-25	20-25
Weight per spool (kg)	15	15

LFC-715

AWS A5.20 E71T-5C/5M
EN EN758 T 46 3 P C/M 1

Characteristics:

LFC-715 is a flux-cored wire design to be use with CO_2 or Ar/Co_2 gas mixture. It can be used on all-position welding on 490N/mm² high tensile steel. It can obtain better impact toughness than E71T-5 in low temperature.

Applications:

It is widely used for shipbuilding, structural fabrication and machinery.

Notes on Usage:

1. Use DC(+) polarity.
2. Use CO_2 as shielding gas.
3. In order to get enough penetration in the down hand weld position, maintain a little bit higher welding speed by stringer manipulation for the first pass.
4. Keep inter-pass temperature under 150°C whiling in multiple-pass welding.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.05	1.45	0.50	0.015	0.007

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -30°C J
510	570	29	65

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm		1.6 mm	
Welding Position	Flat	Vertical-up	Flat	Vertical-up
Voltage(Volt)	30-34	25-26	33-40	26-28
Current(Amp)	250-300	150-220	300-400	160-220
Stick out(mm)	10-15	10-15	15-30	15-30
Flow rate(l/min)	15-25	15-25	15-25	15-25
Weight per spool (kg)	15		15	

LFC-704

AWS A5.20 E70T-4
EN EN758 T 42 Z W N 3

Characteristics:

LFC-704 is a self-shield flux-cored wire. It featuresgood slag removal and friendly to manage variant weld joints by longer sticking out. The welding for heavy machinery, large construction component is appropriate also stiffens in large building.

Applications:

It is widely used for site general fabrication and structural.

Notes on Usage:

1. Use DC(+) polarity.
2 .Keep dry while in storage and delivery.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Al
0.28	0.45	0.30	0.015	0.005	1.50

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %
445	570	25

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	2.4 mm	2.8 mm
Welding Position	F,HF	F,HF
Voltage(Volt)	26-34	27-36
Current(Amp)	250-400	280-450
Stick out(mm)	40-60	40-60
Weight per spool (kg)	15	15

LFC-707

AWS A5.20 E70T-7
EN EN758 T 42 Z W N 3

Characteristics:

LFC-707 is a self-shield flux-cored wire designed for high penetration welding. With good X-ray inspection, desultfuration reduce cracking in welding thick plates, and constrained joints and medium-carbon steel. It is suitable for flat, horizontal and downhill position.

Applications:

It is widely used for general fabrication and structural weldment where high deposition with good penetration and/or fast travel speed is need.

Notes on Usage:

1. Use DC(-) polarity.
2 .Keep dry while in storage and delivery.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Al
0.28	0.45	0.15	0.016	0.005	1.50

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %
450	630	26

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	2.4 mm	2.8 mm
Welding Position	F,HF,VU,VD	F,HF,VU,VD
Voltage(Volt)	26-34	28-38
Current(Amp)	250-400	280-450
Stick out(mm)	40-60	40-60
Weight per spool (kg)	15	15

LFC-811A1

AWS A5.29 E81T-A1C

Characteristics:

LFC-811A1 is a 0.5% Molybdenum alloyed flux cored wire which prevents deterioration in tensile strength after stress relief and extended service temperature. With good weldability ,stable arc and efficiency in all position welding.

Applications:

It is suitable for welding high-strength and matching creep-resisting steels.

Notes on Usage:

1. Use DC(+) polarity.
2. Use 100% CO_2 shielding gas.
3. Pre-heat at 100-200°C and PWHT at 600-650°C.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Mo
0.05	0.75	0.35	0.014	0.005	0.55

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
570	620	26	620°C x1hr

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	15-25
Flow rate(l/min)	15-25	15-25
Weight per spool (kg)	15	15

LFC-811B2

AWS A5.29 E81T-B2C

Characteristics:

LFC-811B2 is a gas-shielded and rutile flux cored wire intended for 1-1.25%Cr-0.5%Mo low alloy steel. Use 100% CO_2 shield gas.With good weldability ,stable arc, less spatter and good bead appearance in all position welding.

Applications:

It is suitable for welding Cr-Mo steel pipe and Cr-Mo steel with requiring high creep resistance.

Notes on Usage:

1. Use DC(+) polarity.
2. .Use 100% CO_2 shielding gas.
3. Pre-heat at 150-300°C and PWHT at 620-720°C.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Mo	Cr
0.06	0.85	0.42	0.014	0.008	0.55	1.17

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
560	640	23	690°C x1hr

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	15-25
Flow rate(l/min)	15-25	15-25
Weight per spool (kg)	15	15

LFC-911B3

AWS A5.29 E91T-B3C

Characteristics:

LFC-911B3 is a gas-shielded flux cored wire intended for 2.25%Cr-1%Mo low alloy steel. Use 100% CO_2 shield gas.With good weldability ,stable arc, less spatter and good bead appearance in all position welding.

Applications:

It is suitable for welding Cr-Mo steel pipe and Cr-Mo steel with requiring high creep resistance.

Notes on Usage:

1. Use DC(+) polarity.
2. Use 100% CO_2 shielding gas.
3. Pre-heat at 200-350°C and PWHT at 620-720°C.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Mo	Cr
0.06	0.78	0.45	0.016	0.011	1.10	2.27

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	PWHT
645	730	20	690°C x1hr

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	15-25
Flow rate(l/min)	15-25	15-25
Weight per spool (kg)	15	15

LFC-811Ni1

AWS A5.29 E81T1-Ni1C

Characteristics:

LFC-811Ni1 is a titania type flux-cored wire.Use 100% CO_2 shield gas. It is designed for welding 590 N/mm² grade high tensile steel for low temperature.With good weldability ,stable arc, less spatter, good bead appearance and good impact toughness down to -30°C.

Applications:

It is suitable for welding on construction machinery, shipbuilding, offshore, bridge, storage thanks and piping.

Notes on Usage:

1. Use DC(+) polarity.
2. .Use 100% CO_2 shielding gas.
3. Pre-heat at 50-150°C is required depending on steels, plate thickness and restraint.
4. Proper heat input can obtain required impact value.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo
0.05	1.25	0.55	0.018	0.006	1.00	0.18

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -30°C J
590	640	26	110

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	15-25
Flow rate(l/min)	15-25	15-25
Weight per spool (kg)	15	15

LFC-811Ni2

AWS A5.29 E81T1-Ni2C
EN EN758 T 46 4 2Ni P C1 H10

Characteristics:

LFC-811Ni2 is a titania type flux-cored wire.Use 100% CO_2 shield gas. It is designed for welding 590 N/mm^2 grade high tensile steel for low temperature.With good weldability ,stable arc, less spatter, good bead appearance and good impact toughness down to -40°C.

Applications:

It is suitable for welding on construction machinery, bridge,storage thanks and piping.

Notes on Usage:

1. Use DC(+) polarity.
2. Use 100% CO_2 shielding gas.
3. Pre-heat at 50-150°C is required depending on steels, plate thickness and restraint.
4. Proper heat input can obtain required impact value.
5. Maintain interpass temperature under 150°C in multipass welding is good for mechanical property.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni
0.05	1.1	0.40	0.016	0.016	2.55

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -40°C J
540	630	26	50

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	15-25
Flow rate(l/min)	15-25	15-25
Weight per spool (kg)	15	15

LFC-911Ni2

AWS A5.29 E91T1-Ni2C

Characteristics:

LFC-911Ni2 is a titania type flux-cored wire.Use 100% CO_2 shield gas.With good weldability ,stable arc, less spatter, good bead appearance and good impact toughness down to -40°C.

Applications:

It is suitable for welding 2-3%Ni steel and 620N/mm² grade high tensile steel on structural fabrication, bridges,storage thanks, shipbuilding and piping.

Notes on Usage:

1. Use DC(+) polarity.
2. Use 100% CO_2 shielding gas.
3. Proper heat input can obtain required impact value.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Mo
0.06	1.25	0.45	0.015	0.007	2.60	0.18

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL %	IV -40°C J
650	710	21	50

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	15-25
Flow rate(l/min)	15-25	15-25
Weight per spool (kg)	15	15

LFC-811K2

AWS A5.29 E81T1-K2C

Characteristics:

LFC-811K2 is a titania type flux-cored wire. Use 100% CO_2 shield gas. It is designed for welding 560 N/mm^2 grade high tensile steel for low temperature.The weld metal contains 1.5%Niand makes good impact toughness down to -60°C. With good weldability ,stable arc, less spatter in all position welding.

Applications:

It is suitable for butt or fillet welding for LNG and LPG carriers,storage thanks and low temperature service steel.

Notes on Usage:

1. Use DC(+) polarity.
2. Use 100% CO_2 shielding gas.
3. Proper heat input can obtain required impact value.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni
0.04	1.35	0.45	0.016	0.008	1.60

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -60°C J
580	640	27	50

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	15-25
Flow rate(l/min)	15-25	15-25
Weight per spool (kg)	15	15

LFC-811W2

AWS A5.29 E81T1-W2C

Characteristics:

LFC-811W2 is a titania type flux-cored wire. Use 100% CO_2 shield gas.With excellent mechanical property, good weldability ,stable arc, less spatter and smooth bead appearance in all position welding.

Applications:

It is suitable for butt or fillet weldingof 590 N/mm^2 weather –proof grade steeland ASTM A588, A242, A333 or COR-TEN 60 (used normally without painting)

Notes on Usage:

1. Use DC(+) polarity.
2. .Use 100% CO_2 shielding gas.
3. Proper heat input can obtain required impact value.
4. Preheat is required and interpass Temperature should be controlled around 50-150°C.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Cu
0.03	1.15	0.57	0.015	0.007	0.65	0.60	0.45

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL %	IV -30°C J
550	620	24	59

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm	1.6 mm
Voltage(Volt)	25-40	25-40
Current(Amp)	130-300	200-400
Stick out(mm)	15-25	15-25
Flow rate(l/min)	15-25	15-25
Weight per spool (kg)	15	15

LFC-308H

AWS A5.22 E308HT1-1
JIS Z3323 TS308H-FC1

Characteristics:

LFC-308 is a special for 100% CO_2 gas and all-position welding. With excellent slag removal, good resistance to intergranular corrosion and has higher tensile strength than LFC-308L.It also can be used as an intermediate layer for hardfacing.

Applications:

It is suitable for weldingof 18Cr-8Ni austenitic steels such as AISI304, AISI301, AISI302, SUS304H.

Notes on Usage:

1. Use 100% CO2 shielding gas.
2. Keep dry while in storage and delivery.
3. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Cu	Mo
0.03	1.64	0.50	0.028	0.009	9.54	20.37	0.23	0.10

Typical mechanical properties of weld metal

TS N/mm²	EL %
586	40

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm		1.6 mm	
Welding Position	F,H	V-UP,OH	F,H	V-UP,OH
Voltage(Volt)	23-33	24-30	27-32	-
Current(Amp)	140-220	120-220	200-300	-
Stick out(mm)	15-20	15-20	15-20	-
Flow rate(l/min)	20-25	20-25	20-25	-
Weight per spool (kg)	12.5		12.5	

LFC-308L

AWS	A5.22 E308LT1-1
EN	EN12073 T 19 9 L P C 1
JIS	Z3323 TS308L-FC1

Characteristics:

LFC-308L is designed for 100% CO_2 gas and all-position welding. With excellent slag removal, low spatter and good intergranularcorrosionresistance.

Applications:

It is suitable for weldingof austenitic steels types 301, 302, 304, 304L, stabilised321, CF-8 and CF-3.

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Keep dry while in storage and delivery.
3. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Cu	Mo
0.029	1.63	0.56	0.025	0.008	9.93	19.50	0.08	0.06

Typical mechanical properties of weld metal

TS N/mm^2	EL %
565	40

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5			

LFC-309L

AWS	A5.22 E309LT1-1
EN	EN12073 T 23 12 L P C 1
JIS	Z3323 TS309L-FC1

Characteristics:

LFC-309L is designed for 100% CO_2 gas and all-position welding. It performs with smooth arc transfer, low spatter level, fast freezing slag and good hot crack resistance.

Applications:

It is suitable for weldingdissimilar alloys in wrought or cast forms, or used in dissimilar welding such as low alloy steel, heat resistance steel and clad steel.

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Use DC(+) polarity.
3. Keep dry while in storage and delivery.
4. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Cu	Mo
0.026	1.51	0.55	0.024	0.009	12.78	24.07	0.07	0.06

Typical mechanical properties of weld metal

TS N/mm^2	EL %
565	39

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5			

LFC-309LMo

AWS A5.22 E309LMoT1-1
EN EN12073 T 23 12 L P C 2

Characteristics:

LFC-309LMo is a modified type of LFC-309L with the addition of molybdenum. It designed for 100% CO_2 gas and all-position welding. It performs with smooth arc transfer, low spatter level, fast freezing slag and, good heat and corrosion resistance.

Applications:

It is suitable for weldingstainless steel to unalloyed steel. It is also used for buffer layers of clad steels.

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Use DC(+) polarity.
3. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.
4. To get enough penetration in the down hand welding position recommend maintaining a higher welding speed.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.025	1.50	0.57	0.023	0.01	22.93	12.70	2.35

Typical mechanical properties of weld metal

TS N/mm^2	EL %
685	33

Welding Position

Sizes and recommended current range (DC <+>)

Parameters \ Diameter (mm)	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5			

LFC-309H

AWS A5.22 E309HT1-1
JIS Z3323 TS308H-FC1

Characteristics:

LFC-309H is a special for 100% CO_2 or Ar+15-25%CO2 gas and all-position welding. With excellent slag removal, good resistance to intergranular corrosion and good for welding dissimilar meals.

Applications:

It is suitable for welding of dissimilar metals such as stainless steel and carbon steel or stainless steel andlow alloy

Notes on Usage:

1. Use 100% CO2 or Ar+15-25%CO2 shielding gas.
2. Keep dry while in storage and delivery.
3. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Cu	Mo
0.03	1.60	0.50	0.028	0.009	12.70	21.35	0.23	0.10

Typical mechanical properties of weld metal

TS N/mm²	EL %
580	40

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm		1.6 mm	
Welding Position	F,H	V-UP,OH	F,H	V-UP,OH
Voltage(Volt)	24-33	23-30	27-37	24-33
Current(Amp)	140-220	120-200	200-300	140-220
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5		12.5	

LFC-310

AWS A5.22 E310LT1-1

Characteristics:

Provides a fully austenitic weld metal and is therefore somewhat more sensitive to hot cracking than 316 grades. Welding should be performed with low heat input, interpass temperature and dilution with parent metal.

Applications:

for joining and surfacing of matching / similar heat resistant steels / cast steel grades, ferritic chromium steels, 14 %-Mn steels.

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Use DC(+) polarity.
3. Trailer Shield is required to ensure the weld pool completely shield until solidi ication is complete and no porosity problem.
4. To get enough penetration in the down hand welding position recommend maintaining a higher welding speed.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.054	2.15	0.71	0.015	0.006	25.90	21.18	0.46

Typical mechanical properties of weld metal

TS N/mm^2	EL %
570	36

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5			

LFC-312

AWS A5.22 E312T1-1
JIS Z3323 : TS312-FB1

Characteristics:

LFC-308L is designed for welding of high carbon steels and for the first layer cladding of carbon and low alloy steels. The best results are obtainable when the buttering technique is used.

Applications:

It is suitable for welding buttering and cladding of austenitic steels types 303, 416, 430F

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Keep dry while in storage and delivery.
3. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Cu	Mo
0.05	1.23	0.66	0.025	0.008	9.60	28.30	0.08	0.06

Typical mechanical properties of weld metal

TS N/mm^2	EL %
780	30

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	15			

LFC-316L

AWS A5.22 E316LT1-1
JIS Z3323 TS316L-FC1

Characteristics:

LFC-316L is designed for 100% CO_2 gas and all-position welding. It performs with excellent slag removal, almost spatter-free and high intergranular corrosion resistance to pressure vessel application.

Applications:

It is suitable for welding 18%Cr-12%Ni-2%Mo stainless steel including type of 316, 316L, CF-8M and CF-3M.

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Use DC(+) polarity.
3. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.
4. To get enough penetration in the down hand welding position recommend maintaining a higher welding speed.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.027	0.69	0.025	0.01	0.011	18.8	12.63	2.68

Typical mechanical properties of weld metal

TS N/mm²	EL %
560	42

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5			

LFC-316H

AWS A5.22 E316HT1-1

Characteristics:

LFC-316H is designed for 100% CO_2 gas and all-position welding. It performs with excellent slag removal, almost spatter-free and high intergranular corrosion resistance to pressure vessel and high temperature application.

Applications:

It is suitable for welding 304H 308H 316H

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Use DC(+) polarity.
3. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.
4. To get enough penetration in the down hand welding position recommend maintaining a higher welding speed.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo
0.055	0.69	0.025	0.01	0.008	18.8	12.63	2.75

Typical mechanical properties of weld metal

TS N/mm²	EL %
570	44

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5			

LFC-318

AWS A5.22 E318T1-1

Characteristics:

LFC-318 is designed for 100% CO_2 gas and all-position welding. It performs with smooth arc transfer, low spatter level, fast freezing slag and good hot crack resistance.

Applications:

It is suitable for welding stabilized stainless steel as CrNi(N) and CrNiMo(N)

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Use DC(+) polarity.
3. Keep dry while in storage and delivery.
4. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Ni	Cr	Nb	Mo
0.026	1.51	0.55	0.024	0.009	11.50	18.64	0.36	2.78

Typical mechanical properties of weld metal

TS N/mm^2	EL %
600	45

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	15			

LFC-347

AWS	A5.22 E347T1-1
EN	EN12073 T 19 9 Nb P C 2
JIS	Z3323 TS347-FC1

Characteristics:

LFC-347L is designed for 100% CO_2 gas and all-position welding. It performs with excellent slag removal, almost spatter-free. It provides good corrosion resistance in service temperature up to 760 degree c

Applications:

It is suitable for welding stabilized stainless steels such as types 347 and 321, nonstabilized austenitic stainless steel such as types 301, 302, 304 and CF-8.

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Use DC(+) polarity.
3. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.
4. To get enough penetration in the down hand welding position recommend maintaining a higher welding speed.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo	Nb
0.03	1.48	0.54	0.029	0.009	19.56	10.50	0.10	0.54

Typical mechanical properties of weld metal

TS N/mm^2	EL %
627	35

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm		1.6 mm	
Welding Position	F,HF	H	F-HF	V-Up, OH
Voltage(Volt)	23-33	24-30	27-32	-
Current(Amp)	140-220	120-200	200-300	-
Stick out(mm)	15-20	15-20	15-20	-
Flow rate(l/min)	20-25	20-25	20-25	-
Weight per spool (kg)	15		15	

LFC-2209

AWS	A5.22 E2209T1-1
EN	EN12073 T 22 9 3NL P C 2
JIS	Z3323 TS2209-FC1

Characteristics:

LFC-2209 is a flux cored wire designed to weld duplex stainless steel such as UNS S31803 (Alloy 2205).With excellent pitting corrosion, stress corrosion resistance and crack resistance.

Applications:

It is suitable for welding of heat exchanger, chemical equipment, pumps, vessels and pipes processing chloride containing solutions.

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.
3. Follow the recommended welding parameter to achieve good sound welds.
4. To prevent the welding defects due to improper gas shielding, the welding place should have the proper protection from wind.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo	Cu	N
0.029	0.85	0.68	0.025	0.009	22.57	8.36	3.2	0.08	0.16

Typical mechanical properties of weld metal

TS N/mm^2	EL %
786	26

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5			

LFC-2594

AWS A5.22 E2594T1-1

Characteristics:

LFC-2594 is a Flux cored wire designed to welding ferritic-austenitic superduplex steel and equivalent. Can also be used for joints between superduplex grades and austenitic stainless steels or carbon steels. High tensile strength as well as an excellent resistance to stress corrosion cracking and localized corrosion in chloride containing environments. The operating temperature range is –40°C to 220°C

Applications:

It is suitable for welding of heat exchanger, chemical equipment, pumps, vessels and pipes processing chloride containing solutions.

Notes on Usage:

1. Use 100% CO_2 shielding gas.
2. Trailer Shield is required to ensure the weld pool completely shield until solidification is complete and no porosity problem.
3. Follow the recommended welding parameter to achieve good sound welds.
4. To prevent the welding defects due to improper gas shielding, the welding place should have the proper protection from wind.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S	Cr	Ni	Mo	Cu	N
0.025	0.9	0.7	0.025	0.009	25.27	9.4	3.2	0.08	0.16

Typical mechanical properties of weld metal

TS N/mm^2	EL %
800	27

Welding Position

Sizes and recommended current range (DC <+>)

Diameter (mm) / Parameters	1.2 mm			
Welding Position	F,HF	H	V-UP	OH
Voltage(Volt)	24-33	25-29	24-28	25-29
Current(Amp)	130-220	140-180	130-160	150-180
Stick out(mm)	15-20	15-20	15-20	15-20
Flow rate(l/min)	20-25	20-25	20-25	20-25
Weight per spool (kg)	12.5			

Submerged Wires & Fluxes (SAW)

LSF-38 x LSW-EM12K

AWS A5.17 F7A2-EM12K
JIS Z3183 S502-H

Characteristics:

LSF-38 is an active flux. It isdesigned for butt or fillet welding on sheet metal with nice bead appearance, porosity resistance and good slag removal. It is recommend for single pass welding steel plate under 25 mm thick.

Applications:

Typical applications include pressure vessels, H beam, pipe-mill application, shipbuilding and general steel structure.

Notes on Usage:

1. Dry the flux at 350°C for 60 minutes before use.
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.09	1.33	0.6	0.015	0.010

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV -30°C J
415	525	31	46

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF-39 x LSW-EM12K

AWS A5.17 F7A2-EM12K

Characteristics:

LSF-39 is an active flux. It is designed for butt or fillet welding on sheet metal with nice bead appearance, porosity resistance and good slag forming and removing and improved toughness. prevent porosity during welding. It is recommend for single pass welding steel plate under 25 mm thick.

Applications:

Typical applications include pressure vessels, H beam, pipe-mill application, shipbuilding, LPG Tank and general steel structure.

Notes on Usage:

1. Dry the flux at 350°C for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.09	1.33	0.6	0.015	0.010

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL%	IV -20°C J
436	533	27.5	67

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF-56 x LSW-EM12K

AWS A5.17 F7A4-EM12K
JIS Z3183 S502-H

Characteristics:

LSF-56 is a neutral flux. It isdesigned for multi-pass groove welds. With nice bead appearance, porosity resistance and good slag removability. High welding efficiency, good toughness can be obtained. It produces good impact property and minimum 500N/mm²tensile strength when used with LSW-EM12K.

Applications:

Typical applications include pressure vessels, shipbuilding and general steel structure.

Notes on Usage:

1. Dry the flux at 350°C for 60 minutes before use.
2. When performing first pass welding, it is recommend to use lower current to prevent cracking.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.08	1.60	0.23	0.019	0.015

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV J	
			-30°C	-40°C
460	560	29	55	40

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF-56 x LSW-EH14

AWS A5.17 F7A4-EH14
JIS Z3183 S502-H

Characteristics:

LSF-56 is a neutral flux. It is designed for butt or fillet submerged arc welding in combination with LSW-EH14.With nice bead appearance, good porosity resistance and good slag removability.

Applications:

Typical applications include pressure vessels, shipbuilding, boilers and general steel structure.

Notes on Usage:

1. Dry the flux at 350°C for 60 minutes before use.
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.08	1.72	0.24	0.011	0.011

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV -40°C J
490	585	30	48

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF-121T x LSW-EM12K

AWS A5.17 F7A6-EM12K

Characteristics:

LSF-121T is a wire flux combination, Suitable for welding single and multiple wires application. Designed for two-runs or multiple layers with both AC and DC technique. Has excellent slag detach ability and good operation performance. Good mechanical properties at low temperatures can be achieved if it is combined with appropriate wire. It is suitable to be applied in following industries.

Applications:

Typical applications include pressure vessels, H beam, pipe-mill application, shipbuilding and general steel structure.

Notes on Usage:

1. Dry the flux at 350°C for 6min. 120 minutes before use.
2. Suitable for multi-pass welding of thick plates.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.07	1.26	0.3	0.015	0.010

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL%	IV -60°C J
415	525	31	70

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF-121T x LSW-EG-F3

AWS A5.23 F9P8-EG-F3

Characteristics:

LSF-121T s designed for multi-pass groove welds. With nice bead appearance, porosity resistance and good slag removability. High welding efficiency, high toughness at low temperature can be obtained. It produces good impact property and minimum 500N/mm² tensile strength when used with LSW-EG-F3

Applications:

Typical applications include pressure vessels, shipbuilding and general steel structure.

Notes on Usage:

1. Dry the flux at 350°C for 60 minutes before use.
2. When performing first pass welding, it is recommend to use lower current to prevent cracking.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	P	S
0.08	1.42	0.33	0.009	0.005

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV J
550	650	23	-80°C
			55

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF-40 x LSW-EB2

AWS A5.23 F8P2-EB2-B2

Characteristics:

LSW-EB2 is a weld metal possesses good high temperature properties and meets radiographic quality. Copper coated 1.25Cr-0.5Mo solid wire for submerged arc welding. These wires are suitable for welding of creep resistance and similar composition high strength steels.

Applications:

Its is suitable for welding of pipes and tubes of matching compositions in power plants, refineries, petrochemicals, fertilizers plants

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	Cu	Cr	Si	S
0.08	0.65	0.50	0.15	1.20	0.20	0.010

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV -20°c J
560	630	25	30

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF40 x LSW-EB3

AWS A5.23 F8P2-EB3-B3

Characteristics:

LSW-EB3 is a CrMo-alloyed low impurity wire electrode (suitability for step-cooling) for submerged arc welding of heat-resistant steels in boiler and pressure vessel construction as well as pipe manufacture.

Applications:

Its is suitable for welding of pipes and tubes of matching compositions in power plants, refineries, petrochemicals, fertilizers plants

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	P	Cr	Si	S
0.08	0.65	1.03	0.017	2.75	0.20	0.010

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV -20°c J
560	650	25	50

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF40 x LSW-EB6

AWS A5.23 F8P2-EB6-B6

Characteristics:

LSW-EB6 is Copper coated solid wire for submerged arc welding. These wires are suitable for similar composition high strength & quenched steels.

Applications:

Its is suitable for welding of ASTM steels: Grade ASTM A213Gr.T5 A335 Gr.P5, A217 Gr.C5 etc.

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	P	Cr	Cu	Si
0.09	0.55	0.50	0.017	5.50	0.15	0.40

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV -20°c J
540	650	25	40

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF40 x LSW-EB8

AWS A5.23 F8P2-EB8-B8

Characteristics:

LSW-EB8 is high temperature, creep resistant steel 9%Cr-1%Mo martensitic steel. Approved for service temperatures up to 600 °C. Used for heat exchangers, boiler superheater tubing, piping and pressure vessels for the oil and gas industries.

Applications:

Its is suitable for welding of 9%Cr-1%Mo creep heat-resistant martensitic steels .ASTM: A182 F9, A199 T9, A200 T9, A213 T9, A234 WP9, A335 grade 9, A336 F9, A387 grade 9 DIN: X12CrMo 9-1, X7CrMo 9-1, GS-12CrMo 10-1.

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	P	Cr	Cu	Si
0.09	0.50	1.03	0.017	9.20	0.15	0.32

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV -20℃ J
540	650	25	40

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF40 x LSW-EB91

AWS A5.23 F9P2-EB91-B91

Characteristics:

LSW-EB91 is welding for high temperature, creep resistant, modified 9%Cr1%Mo martensitic steel (T91/P91). Approved for service temperatures up to 650°C. Alloy T91/P91 is widely used in the power generating, ultra-super-critical (USC) power plant boilers and turbines, chemical and oil and gas industries.

Applications:

Its is suitable for welding of P91, 9%Cr1%Mo modified, creep resisting martensitic steels X10CrMoVNb9-1 ASTM: A182/A336 grade F91, A213 grade T91, A217 grade C12A, A234 grade WP91, A335 grade P91, A387 grade 91

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	V	Cr	Ni	Nb
0.10	1.10	0.95	0.20	9.20	0.98	0.32

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%	IV -20°c J
580	700	25	40

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF68 x LSW-EG-G

AWS A5.23 F8A4-EG-G

Characteristics:

LSW-EG-G For the welding of 550MPa weather-proof steels. It combines with LSF-68, for submerged arc welding application. Provides soft and stable arc, lessspatter, nice welding appearance, good slag removal, less fumes, excellent weldability. Presents good corrosion and anti-cracking resistance.

Applications:

Its is suitable for a low temperature at -40℃ services, commonly used in railway and bridge constructions.

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Ni	P	Cr	Cu	Si
0.06	1.47	0.39	0.008	0.47	0.30	0.24

Typical mechanical properties of weld metal

YP N/mm^2	TS N/mm^2	EL%	IV -40˚c J
481	585	28	60

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF600 x LSW-NiCrMo-3

AWS A5.14 ERNiCrMo-3

Characteristics:

LSW-NiCrMo-3 is a nickel based low hydrogen type solid wire which contains Mo and Nb. The excellent heat resistance and corrosion resistance can be obtained. It is suitable for chemical plant, nuclear reactor, Inconel 625, 9%Ni steel and dissimilar metals welding.

Applications:

Typical applications include pressure vessels, H beam, pipe-mill application, shipbuilding, LPG Tank and general steel structure.

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	Ni	Cr	Nb
0.01	0.3	8.67	65.24	22.18	3.61

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%
690	780	38

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF600 x LSW-NiCrMo-4

AWS A5.14 ERNiCrMo-4

Characteristics:

LSW-NiCrMo-4 is a nickel based low hydrogen type solid wire which contains less C and Si to reduce carbide precipitation in grain boundary. The excellent heat resistance and corrosion resistance are obtained for chemical plant and FGD equipments.

Applications:

It is suitable for welding of low carbon Ni-Cr-Mo alloys, low carbon Ni-Cr-Mo alloys to steeland other nickel base alloys

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	Ni	Cr	W	Fe
0.01	0.4	15.95	Bal.	15.67	3.12	5.91

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%
670	745	40

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF600 x LSW-NiCrMo-10

AWS A5.14 ERNiCrMo-10

Characteristics:

LSW-NiCrMo-10 is a nickel based low hydrogen type solid wire which good corrosion-resistance against acetic acid and its anhydride, hot contaminated sulphuric and phosphoric acids and other contaminated oxidizing mineral acids. Intermetallic precipitation is widely prevented.

Applications:

For welding the cladded side of plates of matching and similar alloys. High corrosion resistance in reducing and oxidizing environments.

Notes on Usage:

1. Dry the flux at 350℃ for 60 minutes before use
2. Not recommended to welding more than two passes.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	Ni	Cr	W	Fe
0.01	0.4	13.00	Bal.	22.60	2.5	2

Typical mechanical properties of weld metal

YP N/mm²	TS N/mm²	EL%
620	700	30

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF30 x LSW-308/308L

AWS A5.9 ER308/308L
JIS Z3324 S308/308L

Characteristics:

LSF-30 is an agglomerated flux adding proper contents of alloying element to maintain the stability of the contents of ferrite in weld metal. It isdesigned for welding with stainless steel 308/308L to gain characteristics of great crack and corrosion resistibility and mechanical property. With good weldability, slag removal, stable arc, smooth bead appearance and welding efficiency.

Applications:

It is suitable for welding of stainless steel 308/308L.

Notes on Usage:

1. Dry the flux at 300-350°C for 60 minutes before use.
2. To get the corrosion resistibility and mechanical properties on heat effect zone, recommend to use low heat input.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Ni	Cr
0.03	1.58	0.65	9.20	19.2

Typical mechanical properties of weld metal

TS N/mm^2	EL%	IV -196°C J
570	40	-

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF330 x LSW-308H

AWS A5.9 ER308H

Characteristics:

LSF-330 is an agglomerated flux adding proper contents of alloying element to maintain the stability of the contents of ferrite in weld metal. It is designed for welding with stainless steel 308H to gain characteristics of great crack and corrosion resistibility and mechanical property. With good weldability, slag removal, stable arc, smooth bead appearance and welding efficiency

Applications:

It is suitable for welding of stainless steel 308H.

Notes on Usage:

1. Dry the flux at 300-350°C for 60 minutes before use.
2. To get the corrosion resistibility and mechanical properties on heat effect zone, recommend to use low heat input.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Ni	Cr
0.05	1.64	0.50	9.54	20.37

Typical mechanical properties of weld metal

TS N/mm²	EL%	IV -196°C J
567	41	-

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF30 x LSW-309/309L

AWS A5.9 ER309/309L
JIS Z3324 S309/309L

Characteristics:

LSF-30 is an agglomerated flux adding proper contents of alloying element to maintain the stability of the contents of ferrite in weld metal. It isdesigned for welding with stainless steel 309/309L to gain characteristics of great crack and corrosion resistibility and mechanical property. With good weldability, slag removal, stable arc, smooth bead appearance and welding efficiency.

Applications:

It is suitable for welding of stainless steel 309/309L.

Notes on Usage:

1. Dry the flux at 300-350°C for 60 minutes before use.
2. To get the corrosion resistibility and mechanical properties on heat effect zone, recommend to use low heat input.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Ni	Cr
0.03	1.48	0.62	13.32	23.25

Typical mechanical properties of weld metal

TS N/mm^2	EL%	IV -196°C J
567	41	-

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF30xLSW-316/316L

AWS A5.9 ER316/316L
JIS Z3324 S316/316L

Characteristics:

LSF-30 is an agglomerated flux adding proper contents of alloying element to maintain the stability of the contents of ferrite in weld metal. It isdesigned for welding with stainless steel 316/316L to gain characteristics of great crack and corrosion resistibility and mechanical property. With good weldability, slag removal, stable arc, smooth bead appearance and welding efficiency.

Applications:

It is suitable for welding of stainless steel 316/316L.

Notes on Usage:

1. Dry the flux at 300-350°C for 60 minutes before use.
2. To get the corrosion resistibility and mechanical properties on heat effect zone, recommend to use low heat input.

Typical chemical composition of weld metal (wt%)

C	Mn	Si	Ni	CR	Mo
0.03	1.70	0.40	11.20	19.00	2.13

Typical mechanical properties of weld metal

TS N/mm²	EL%	IV -196°C J
550	42	40

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF330 x LSW-317L

AWS A5.9 ER317L

Characteristics:

LSF-330 is an agglomerated flux adding proper contents of alloying element to maintain the stability of the contents of ferrite in weld metal. It is designed for welding with stainless steel 317L to gain characteristics of great crack and corrosion resistibility and mechanical property. With good weldability, slag removal, stable arc, smooth bead appearance and welding efficiency

Applications:

It is suitable for welding of stainless steel 2209

Notes on Usage:

1. Dry the flux at 300-350°C for 60 minutes before use.
2. To get the corrosion resistibility and mechanical properties on heat effect zone, recommend to use low heat input.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	Ni	Cr
0.03	1.65	2.64	8.04	21.75

Typical mechanical properties of weld metal

TS N/mm²	EL%	IV -196°C J
680	29	-

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF340 x LSW-347

AWS A5.9 ER347

Characteristics:

LSF-340 is an agglomerated flux adding proper contents of alloying element to maintain the stability of the contents of ferrite in weld metal. It is designed for welding with stainless steel 347 to gain characteristics of great crack and corrosion resistibility and mechanical property. With good weldability, slag removal, stable arc, smooth bead appearance and welding efficiency

Applications:

It is suitable for welding of stainless steel 2209

Notes on Usage:

1. Dry the flux at 300-350°C for 60 minutes before use.
2. To get the corrosion resistibility and mechanical properties on heat effect zone, recommend to use low heat input.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	Ni	Cr
0.07	1.45	0.67	10.12	20.06

Typical mechanical properties of weld metal

TS N/mm²	EL%	IV -196°C J
670	29	-

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

LSF330 x LSW-2209

AWS A5.9 ER2209

Characteristics:

LSF-330 is an agglomerated flux adding proper contents of alloying element to maintain the stability of the contents of ferrite in weld metal. It is designed for welding with stainless steel 2209 to gain characteristics of great crack and corrosion resistibility and mechanical property. With good weldability, slag removal, stable arc, smooth bead appearance and welding efficiency

Applications:

It is suitable for welding of stainless steel 2209

Notes on Usage:

1. Dry the flux at 300-350°C for 60 minutes before use.
2. To get the corrosion resistibility and mechanical properties on heat effect zone, recommend to use low heat input.

Typical chemical composition of weld metal (wt%)

C	Mn	Mo	Ni	Cr
0.01	1.66	3.18	8.70	22.6

Typical mechanical properties of weld metal

TS N/mm^2	EL%	IV -196°C J
720	30	-

Sizes available, Package:

Wire: Diameter (mm)	2.4	3.2	4.0
Wire: Weight per roll (kg)	25	25	25
Flux: Weight per bag(kg)	25	25	25

Reference

Mechanical Properties Of Weld Metal

The mechanical properties of a metal describe its suitability for any given application and provide a performance forecast. Mechanical properties are of the utmost concern in welding consumable qualification since weld deposits must often provede service characteristics equal to or better than those of the base metal. The properties considered most often (and those that are frequently cited in Welding Consumable Specification requirements) are **Strength, Hardness, Ductility and Impact Resistance.**

1. Strength :

A metal's " Strength " is its capacity to withstand external forces without breaking. In a tension test, under stretch loading, a specimen reveals several features - including elastic limit, elongation, yield point, yield strength, tensile strength and reduction in area. During the test, load is increased gradually and the specimen stretches in direct proportion to the load until it reaches its **Yield Point.** At any point up to the yield point, if the load is relaxed, the specimen will return to its original dimensions. Beyond the yield point, the specimen continues to elongate without an increase in load. An increase in load after the yield point brings the specimen to another critical point - **Tensile Strength, or Ultimate Tensile Strength** - at which the specimen breaks. Yield point and tensile strength values (in psi or Mpa) are obtained by dividing the load at these points by the original cross-sectional area of the specimen.

2. Hardness :

A metal's hardness is its capacity to resist surface indentation by a contacting medium. Measuring the indent size of a hardened steel ball or a diamond upon the surface of a specimen assigns value to a metal's hardness. Indent size is translated to a harness value. Typical units of measure being **Rockwell Hardness** (HRA' HRB & HRC Scales) , **Vickers Hardness** (HV20 & HV30 Scales) and **Brinel Hardness**.

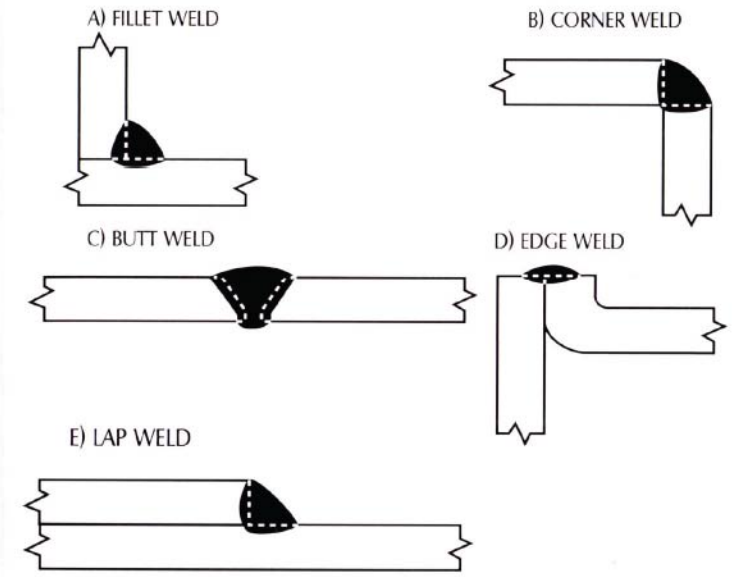
3. Ductility :

Ductility is the characteristic of metal that allows it to withstand strectching and other deformation without breaking and to hold a new shape after external forces have been removed. Determined in a tensile test, **Percent of Elongation** is the measure of ductility. Gauge marks are made 50 mm (2 inches) apart, bounding the point at which fracture will occur, on a test spcimen. The increase in gauge length, divided by the original length, X 100 , equals the elongation percentage. Ductility can also be measured in a bend test.

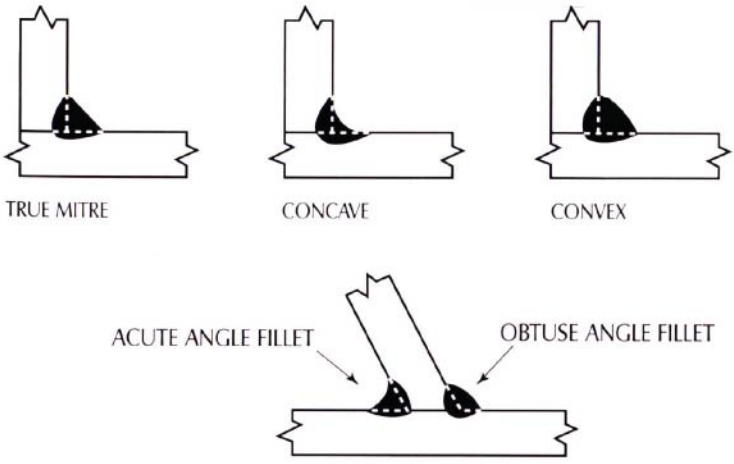
4. Impact Resistance :

This property is assessed in terms of **Impact Strength or Impact Toughness**, determined most often in a **Charpy Vee Notch (CVN) or Charpy Test**. The specimen, a beam with a notch at its centre ("V-notch" preparation is most common), is supported at both ends and struck with a pendulum on the side opposite the notch. Measuring the energy absorbed during the test, (weight of pendulum X height of pendulum on the side opposite the notch. Measuring the energy absorbed during gives an impact-strength value in **joules or foot-pounds**. Since steels often become more brittle (less able to absorb energy) at lower temperatures, impact tests are often carried out at a range of low temperatures.

BASIC TYPES OF WELDED JOINTS:

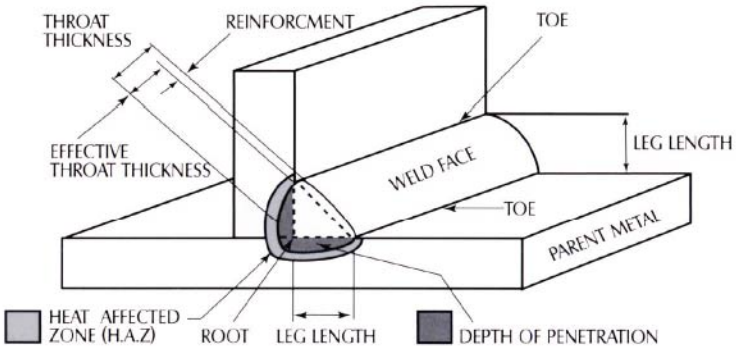


TERMINOLOGY OF WELD JOINTS:



BASIC TYPES OF WELDED JOINTS CONT.

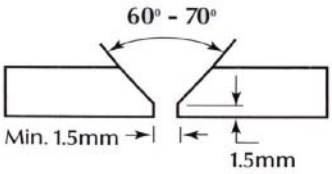
FILLET WELD DEFINITIONS:



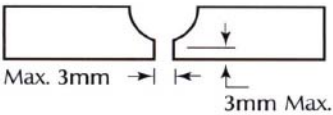
BUTT WELD - PREPARATIONS:

CLOSED SQUARE BUTT
Suitable for plate up to 5mm in thickness

OPEN SQUARE BUTT
>3mm ≤8mm

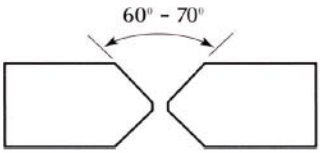


SINGLE VEE BUTT
>6mm ≤16mm

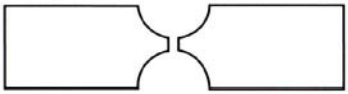


SINGLE U BUTT
>8mm <25mm

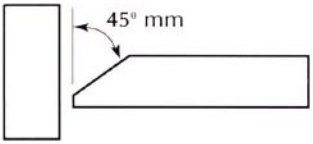
BUTT WELD - PREPARATIONS cont:



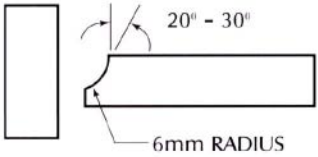
DOUBLE VEE BUTT
>16mm ≤40mm



DOUBLE U BUTT
Used on plate over
25mm thick

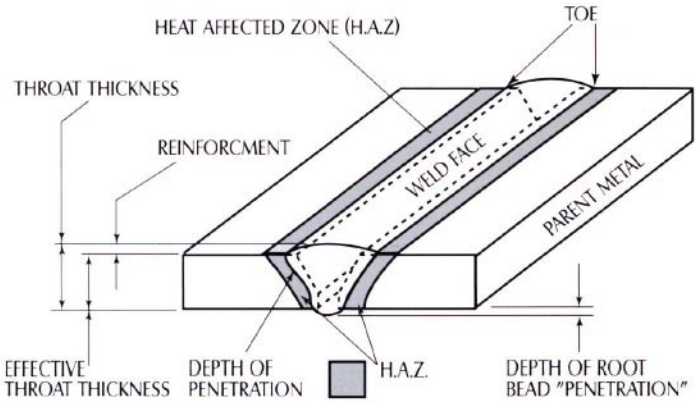


SINGLE BEVEL BUTT WELD
>6mm ≤25mm



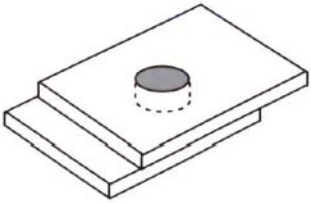
SINGLE J BEVEL BUTT WELD
>8mm 25mm

(i) BUTT WELD - DEFINTIONS:

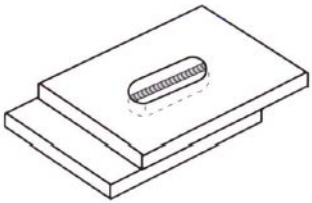


BASIC TYPES OF WELDED JOINTS CONT.

OTHER WELDS:



PLUG WELDS



SLOT WELDS

PLATE AND PIPE POSITIONS TO ISO AND AS/AWS STANDARDS:

- ISO STANDARD 6947
- AUSTRALIAN STANDARD AS 3545
- AMERICAN WELDING SOCIETY AWS A3.0

PLATE AND PIPE WELDING POSITIONS TO ISO:

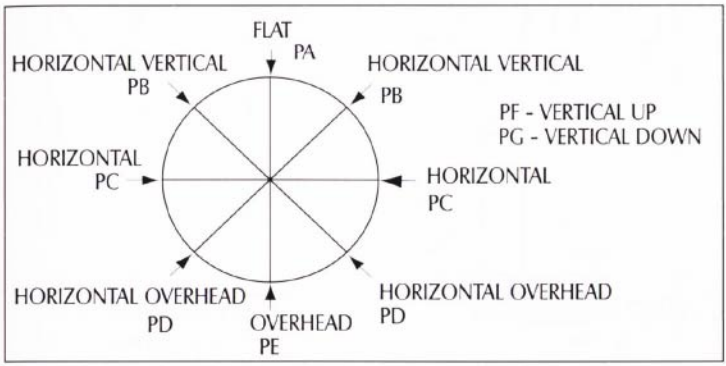
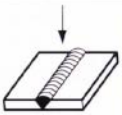
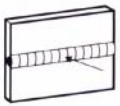
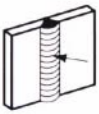
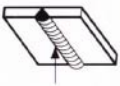
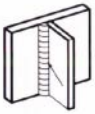
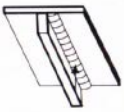
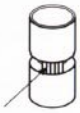
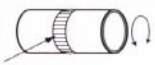
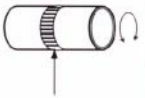
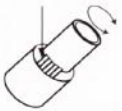
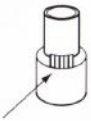
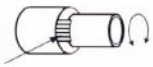
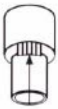


PLATE POSITIONS:

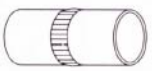
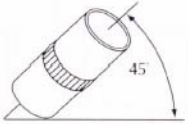
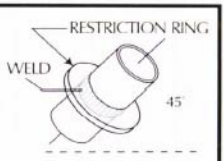
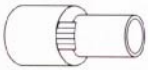
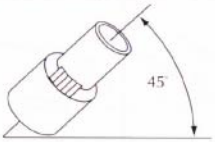
WELD	FLAT	HORIZONTAL	VERTICAL	OVERHEAD
BUTT	 1G / PA	 2G / PC	 3G / PF / PG	 4G / PE
FILLET	 1F / PA	 2F / PB	 3F / PF / PG	 4F/ PE

WELDING POSITIONS AND SYMBOLS CONT.

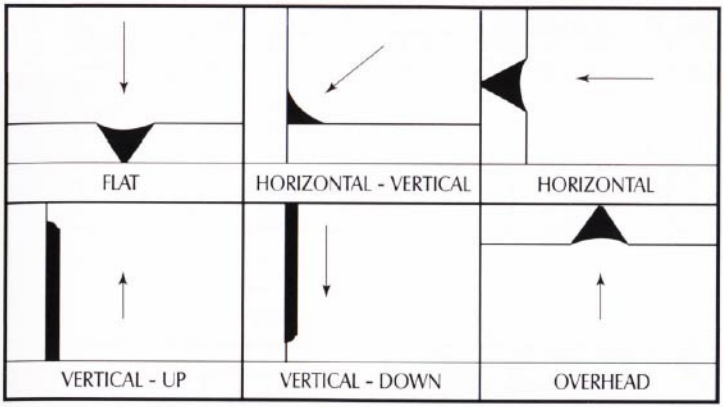
PIPE POSITIONS - ROTATED OR ROLLED:

	FLAT	HORIZONTAL	VERTICAL	OVERHEAD
BUTT	 1G / PA	 2G / PC	 3G /PF	 4G / PE
FILLET	 1F / PA	 2F /PC	 *3F/PF (AWS 2F,R)	 *4F/PE (AWS 4F,F)

PIPE POSITIONS - FIXED POSITION:

BUTT	 5G / PF PG	 6G /H -L045	 6GR
FILLET	 5F / PF PG	 * 6F / L45 PA	

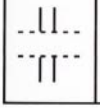
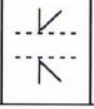
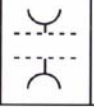
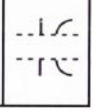
WELDING DIRECTIONS OR POSITIONS:



COMPARISON OF BASIC DRAWING (PRINTS) WELDING SYMBOLS:

(i) AS 1101.3 / AWS A2.4

AS 1101.3 BUTT WELD / AWS A2.4 GROOVE WELD

BUTT WELD							
SQUARE	SCARF	V	BEVEL	U	J	FLARE- V	FLARE BEVEL
							

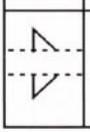
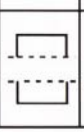
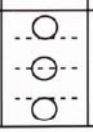
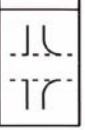
(i) AS 1101.3

FILLET WELD	PLUG WELD OR SLOT WELD	SPOT WELD OR PROJECTION WELD	SEAM WELD	BACKING RUN OR BACKING WELD	SURFACING	FLANGE WELD	
						EDGE	CORNER
							

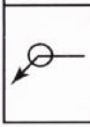
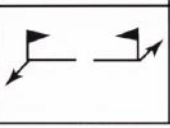
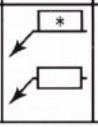
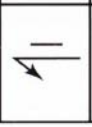
WELDING POSITIONS AND SYMBOLS CONT.

COMPARISON OF BASIC DRAWING (PRINTS) WELDING SYMBOLS conts.:

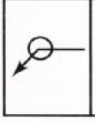
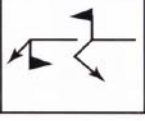
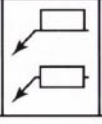
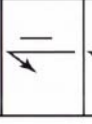
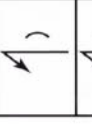
AWS A2.4

FILLET	PLUG OR SLOT	STUD	SPOT OR PROJECTION	SEAM	BACK OR BACKING	SURFACING	FLANGE	
							EDGE	CORNER
								

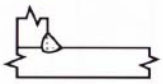
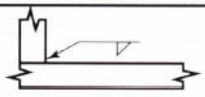
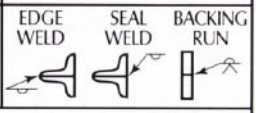
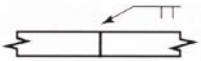
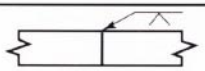
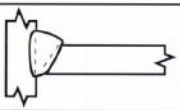
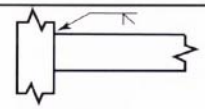
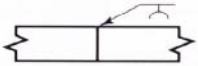
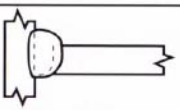
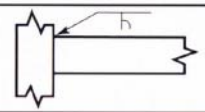
AS 1101.3

WELD ALL AROUND	SITE WELD	COMPLETE PENETRATION FROM ONE SIDE	BACKING OR SPACER MATERIAL	CONTOUR		
				FLUSH	CONVEX	CONCAVE
						

AWS A2.4

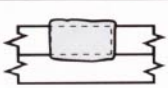
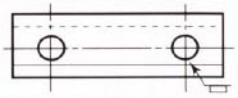
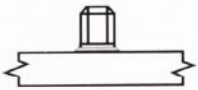
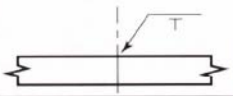
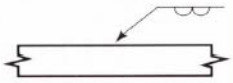
WELD ALL AROUND	SITE WELD	MELT THROUGH	CONSUM. INSERT (SQUARE)	BACKING OR SPACER (RECTANGLE)	CONTOUR		
					FLUSH OR FLAT	CONVEX	CONCAVE
							

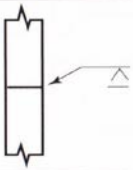
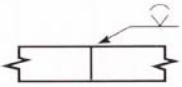
HOW WELDING SYMBOLS ARE USE cont.:

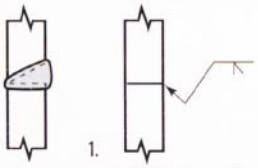
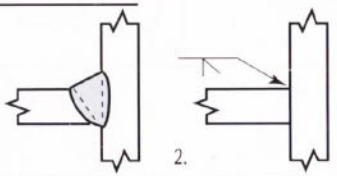
TYPE OF WELD	SKETCH OF WELD	SYMBOL	INDICATION OF DRAWING
FILLET WELD			
BEAD			
BUTT WELDS			
GENERAL BUTT	FULL PENETRATION BUTT WELD BY A WELDING PROCEDURE TO BE AGREED		
SQUARE BUTT			
SINGLE 'V' BUTT			
SINGLE BEVEL BUTT			
SINGLE 'U' BUTT			
SINGLE 'J' BUTT			

WELDING POSITIONS AND SYMBOLS CONT.

HOW WELDING SYMBOLS ARE USED cont.:

TYPE OF WELD	SKETCH OF WELD	SYMBOL	INDICATION OF DRAWING
PLUG OR SLOT			
STUD			
SURFACING			

WELD FINISH			
TYPE OF WELD	SYMBOL	INDICATION OF DRAWING	SKETCH OF WELD
FLUSH FINISH			
CONVEX FINISH			

CRANKED ARROW
A. A CRANKED ARROW IS USED WITH A BEVEL OR "J" WELD SYMBOL POINTING TOWARD THE PLATE WHICH IS PREPARED. SEE 1 B. IF PLATE TO BE PREPARED IS OBVIOUS THE CRANK IS OMITTED. SEE 2
 

Types of Defects:

- EXTERNAL DEFECTS: Can be indenfied by a visual inspection method eg: Dye Penetrant and Magnetic Particle testing
- INTERNAL DEFECTS: Require a Non-Destructive testing (NDT) method eg: X-Ray or Ultrasonic testing.

(i) Main Causes :

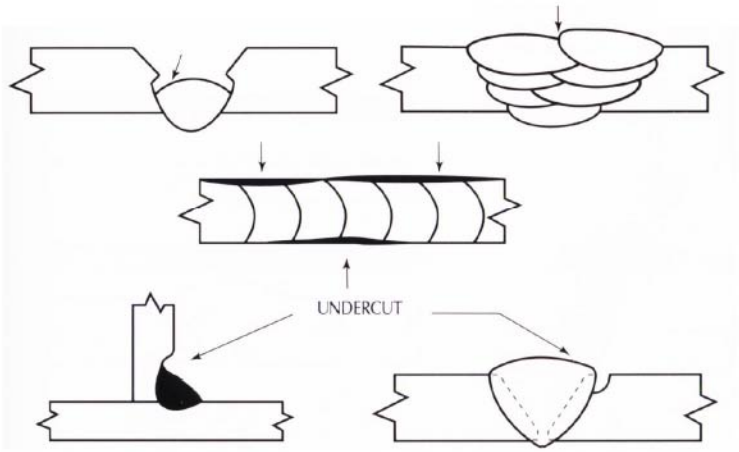
- Welding operators carelessness or lack of skill.
- Adverse working conditions (Hot - Cold).
- Poor Design or lack of preparation.

(ii) Main Defects :

- Undercut.
- Slag inclusions.
- Porosity.
- Overlap or over-roll.
- Lack of fusion.
- Incomplete Penetration.
- Weld cracking.
- Joint Misalignment.

Undercut:

- Definition: A groove at the toe or root of a weld either on the weld face or in previously deposited weld metal.



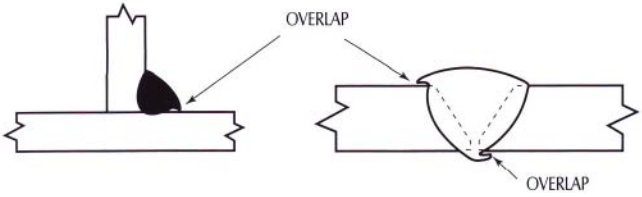
Cause:
- Excessive amperage.
- Too long an arc length.
- Excessive weaving of the electrode.
- Too fast a rate of travel.
- Angle of electrode too inclined to the joint face.

Result: A stress concentration site and a potential site for fatigue

DEFECTS IN WELDING CONT.

Overlap or over-roll:

▲ Definition: An imperfection at the toe or root of a weld caused by metal flowing onto the surface of the parent metal without fusing to it

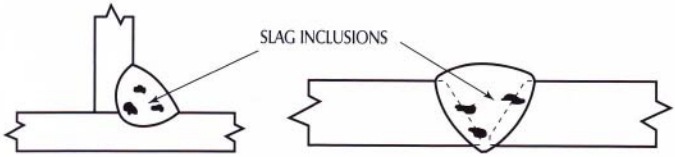


Causes :
- Incorrect rate of travel.
- Incorrect "angle of approach".
- Too large an electrode size.
- Too low an amperage.

Result : Has a similar effect as undercut and produces a stress concentration site due to the unfused weld metal.

Slag Inclusions:

▲ Definition: Refers ti any non-metallic material in a completed weld joint. These inclusions can create a weak point in the weld deposit

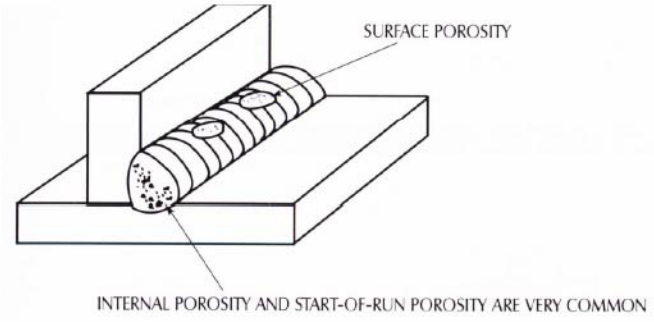


Causes :
- Failure to remove slag from previous runs.
- Insufficient amperage.
- Incorrect electrode angle or size.
- Faulty preparation.

Result : Slag inclusions reduce the cross sectional area strength of the weld and serve as a potential site for cracking.

Porosity:

▲ Definition: A hole or cravity found internally or externally in the weld. Porosity can originate from wet electrodes, electrode flux breking down or from impurities on the surface of the parent metal.
Also known as "Piping" , :Blow or Worm Holes"

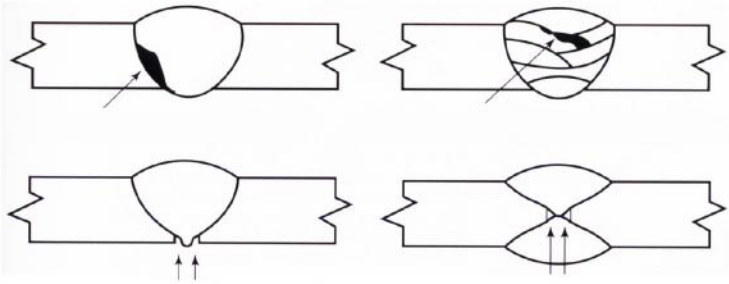


Other Causes: - Unclean parent metal surface ie. oil, dust, dirt or rust contamaination.
- Incorrect electrode for parent metal.
- Inadequate gas shielding of thw arc.
- Parent metals with a high percentage of sulphur and phosphorus.

Result: Severely reduces the strength of the welded joint.
Surface porosity can allow a corrosive atmosphere to attack the weld metal which may cause failure

Lack of Fusion:

▲ Definition: A lack of bonding between the weld metal and the parent metal or between weld metal passes



DEFECTS IN WELDING CONT.

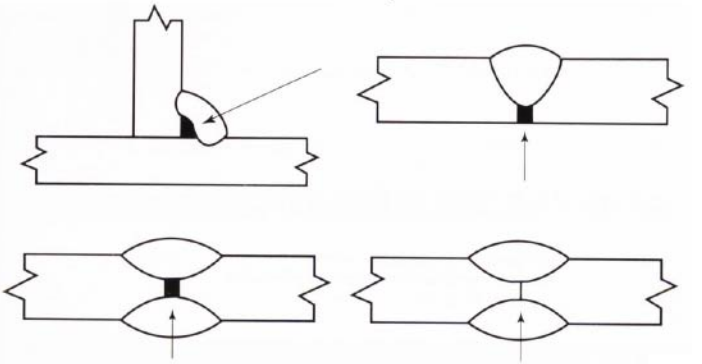
Lack of Fusion cont.:

Causes:
- Small electrodes used on cold and thick steel.
- Insufficient amperage.
- Incorrect electrode angle and manipulation.
- Rate of travel too fast, not allowing proper fusion.
- Unclean surface (mill scale, dirt, grease etc.).

Result: Weakens the welded joint and becomes a potential fatigue initiation site.

Incomplete Penetration:

▲ Definition: A failure of the weld metal to penetrate into the root of the joint.



Causes:
- Current too low.
- Unsufficient root gap.
- Too large an electrode size.

Result: Weakens the welded joint and becomes a potential fatigue initiation site.

Weld cracking:

▲ Definition: Planar (Two Dimensional) discontinuities produced by the tearing of parent or weld metal. Weld metal cracking can occur in either the plastic condition (hot shortness) or by fracturing when cold (cold shortness).
There are many types of cracks that can occur in the base

Weld cracking cont.:

Some common types of cracking include.

Crater Cracking: Hot cracking mainly caused by a failure to fill up the crater depression at the end of a weld pass.
Shrinkage stresses and inadequate weld metal in the crater causes crater cracking.

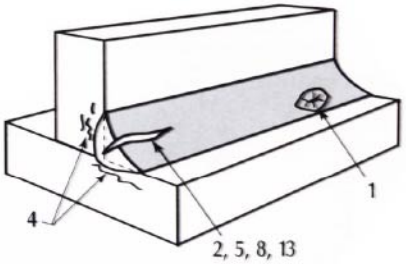
Underbead Cracks: Cold cracking that is usually in the Heat-affected zone (HAZ) of the parent metal.

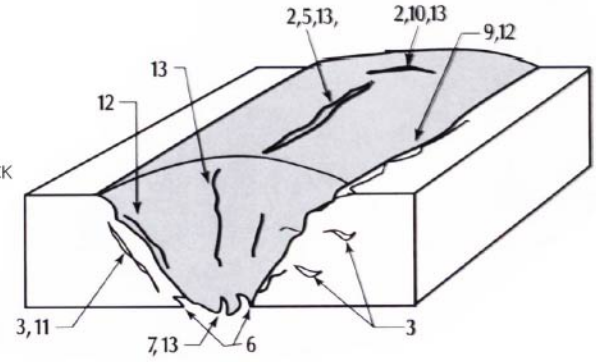
Longitudinal Crack: Usually a hot cracking phenomenon.
Cracking runs along the lenght of the weld.

Main Causes:
- Incorrect welding procedures and techniques.
  (eg. Wrong consumable or welding current, inadequate preheat etc.)
- Weld size may be too smal for the parts being welded.
- Base metal may contain a high carbon content (over 0.45%).
- Metals which contain high percentages of sulphur or phosphorus tend to crack easily, so Hydrogen controlled electrodes are recommended.
- Electrodes may be wet or damp.

CRACK TYPES:

1. CRATER CRACK
2. FACE CRACK
3. HEAT-AFFECTED ZONE CRACK
4. LAMELLAR TEAR
5. LONGITUDINAL CRACK
6. ROOT CRACK
7. ROOT SURFACE CRACK
8. THROAT CRACK
9. TOE CRACK
10. TRANSVERSE CRACK
11. UNDERBEAD CRACK
12. WELD INTERFACE CRACK
13. WELD METAL CRACK



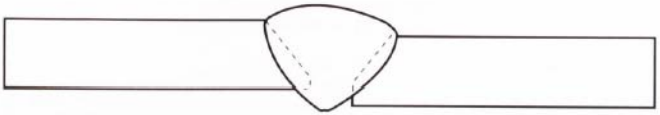


DEFECTS IN WELDING CONT.

Misalignment:

▲ Definition: Normally defined as an unnecessary or unintentional variation in the alignment of the parts being welded.

Misalignment is a common fault in prepared butt welds, and is produced when the root faces of the parent plate (or joint) are not placed in their correct position for welding.



Causes:
- Poor assembly of the parts to be welded.
- Inadequate tack welds that break or insufficient clamping that results in movement.

Result: Misalignment is a serious defect since failure to melt both edges of the root will result in stress concentration sites which in service may lead to premature fatigue failure of the joint.

Distortion:

Distortion to some degree is present in all forms of welding. In many cases it is so small that it is barely noticeable, but in other cases allowance has to be made before welding commences for the distortion that will subsequently occur.

The study of distortion is very complex and the following is a brief outline of the subject.

A) The cause of distortion - when under load metals strain or move and change shape.

- Under light loading metals remain elastic (they return to their original shape or form after the load has been removed). This is known as the "elastic range".
- Under very high load, metals may be stressed to the point where they will not return to their origonal shape or form and this point is known as the "yield point". (YIELD STRESS)
- As metals are heated they expand and when cooled they contract. During welding, heating and cooling of metals occurs unevenly resulting in high stresses and the metal distorts.

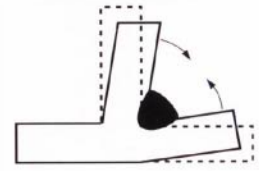
If these high stresses pass the elastic range and go over the yield point, some permanent distortion of the metals will occur. A metals yield stress is reduced at high temperatures.

*Distortion is the result of uneven expansion and contraction of heated metals.

Distortion Types - the three main types of distortion are:-

- Angular
- Longitudinal
- Transverse

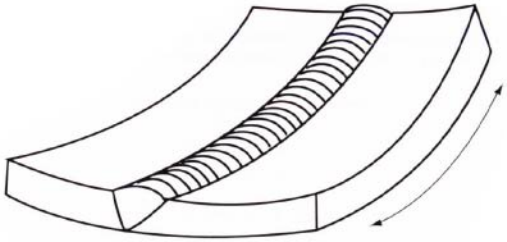
(i) ANGULAR DISTORTION



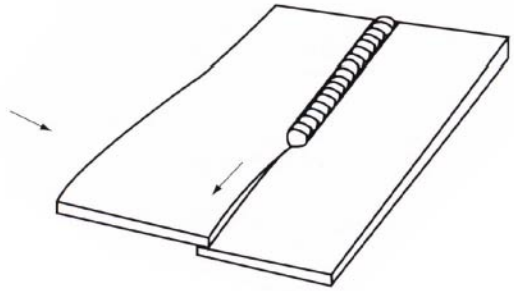
DISTORTION, CAUSE AND CONTROL CONT.

Distortion:

(ii) LONGITUDINAL DISTORTION



(iii) TRANSVERSE DISTORTION

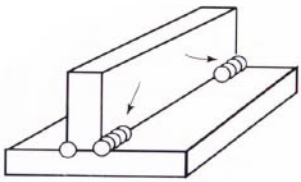


B) The **Control of distortion** can be broken up into three areas:-

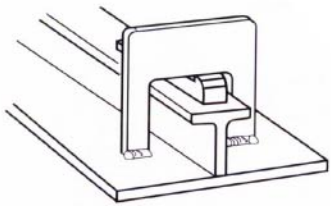
(i) Before welding
(ii) During welding
(iii) After welding

(i) The control of distortion **before** welding can be facilitated by:

- Tack Welding
- Jigs, clamps and fixtures
- Uniform pre-heating
- Pre-setting

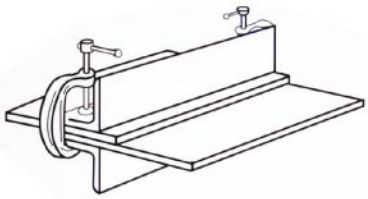


TACK WELDS



JIGS & FIXTURES

Distortion cont.:

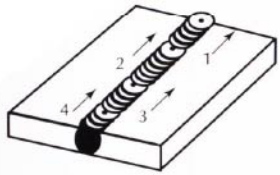


CLAMPS

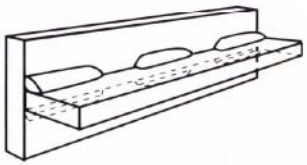
PRE-SETTING

(ii) The control of distortion **during** welding can be facilitated by:

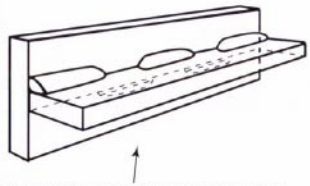
- Backstep Welding
- Intermittent "Chain" welding
- Intermittent "Staggered" welding
- Balanced sequence welding
- A correct welding procedure to reduce the size of the weld beads



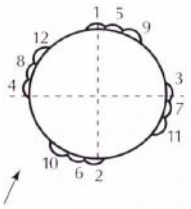
BACKSTEP WELDING



INTERMITTENT CHAIN WELDING



INTERMITTENT STAGGERED WELDING



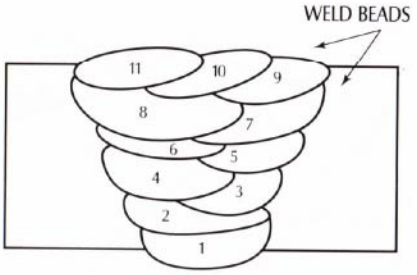
BALANCED SEQUENCE WELDING

DISTORTION, CAUSE AND CONTROL CONT.

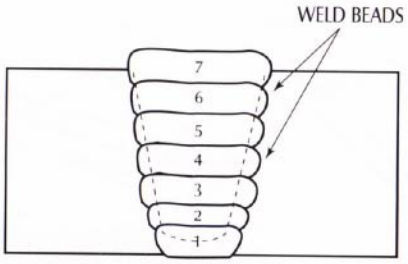
Distortion cont.:

The correct welding procedure uses a greater number of weld runs positioned to refine the grain size of the weld metal in the previous layer.

A small numer of heavy runs will cause more distortion due to the greater heat input, and the contraction stresses set up by the cooling of the larger deposit of weld metal.



LESS DISTORTION



MORE DISTORTION

(iii) The control of distortion **after** welding can be facilitated by:

- Slow Welding
- Flame straightening (also known as contra-heating)
- Stress Relieving
- Normalising
- Mechanical straightening

Distortion cont.:

Annealing - is a heat treatment process designed to soften matals for cold working or machining purposes. the job or finished work is nomally heated in a furnace so as the metal reaches its critical range (for .025% carbon steel @ 723-820°c) and then the work is very slowly cooled.

Stress Relieving - is the uniform heating of welded parts to a temperature below the critical range, followed by slow cooling. This process allows the yield point of the metal to be lowered allowing it to stretch or yield, so reducing the residual stresses in the work.

Normalising - is a process used to refine the grain structure of the metal so it improves its resistance to shock and fatigue.

In normalising the welded parts are heated just above the critical point (820°c for .025% carbon steel) for approximately 1 hour per 25mm thickness and then allowed to cool in still air.

Mechanical Straightening includes:

- Bend Pressing
- Hammering
- Rolling

Effects of The Alloying Elements

- **Carbon** – Carbon is the most effective, most widely used and lowest in cost alloying element available for increasing the hardness and strength of metal. Although carbon is a desirable alloying element, high levels of it can cause problems; therefore, special care is required when welding high carbon steels and cast iron.

- **Sulphur** – Sulphur is normally an undesirable element in steel because it causes brittleness. It may be deliberately added to improve the machinability of the steel.
  The sulphur causes the machine chips to break rather than form long curls and clog the machine. Normally, every effort is made to reduce the sulphur content to the lowest possible level becaues it can create welding difficulties.

- **Mlanganese** – Manganese in contents up to 1% is usually present in all low alloy steels as a deoxidizer and desulphurizer. That is to say, it readily combines with oxygen and sulphur to help negate the undesirable effect these elements have when in their natural state. Manganese also increases the tensile strength and hardenability of steel.

- **Chromium** – Chromium, in combination with carbon, is a powerful hardening alloying element. In addition to its hardening properties, chromium increases corrosion resistance and the strength of steel at high temperatures. Chromium ist he primary alloying element in stainless steel.

- **Nickel** – The greatest single property of steel that is improved by the presence of nickel is its ductility or notch toughness. In this respect, it is the most effective of all alloying elements in improving a steel's resistance to impact at low temperatures.

- **Molybdenum** – Molybdenum strongly increases the depth of the hardening characteristic of steel. It is quite often used in combination with chromium to improve the strength of the steel at high temperatures. This group of steels is usually referred to as chrome-moly steels.

- **Silicon** – Silicon is usually contained in steel as a deoxidizer. Silicon will add strength to steel but excessive amounts can reduce the ductility. Additional amounts of silicon are sometimes added to welding electrodes to increase the fluid flow of silicon are sometimes added to welding electrodes to increase the fluid flow of weld metal.

- **Phosphorus** - Phosphorus is usually contained in steel as a harmful residual element in steel because it greatly reduces ductility and toughness. Efforts are made to reduce it to its very lowest levels; however, phosphorus is added in very small amounts to some steels to increase strength.

- **Aluminum** - Aluminum is primarily used as a deoxidizer in steel. It may also be used in very small amounts to control the size of the grains.

- **Copper** - Copper contributes greatly to the corrosion resistance of carbon steel by retarding the rate of rusting at room temperature, but high levels of copper can cause welding difficulties.

- **Columbium** - Coulumbium is used in austenitic stainless steel to act as a stabilizer. Since the carbon in the stainless steel decreases the corrosion resistance, a means of making carbon ineffective must be found. Columbium has a greater affinity for carbon than chromium leaving the chromium free for corrosion protection.

- **Tungsten** - Tungsten is used in steel to given strength at high temperatures. Tungsten also joins with carbides that are exceptionally hard, and therefore have exceptional resistance to wear.

- **Vanadium** - Vanadium helps keep steel in the desirable fine grain condition after heat treatment. It also helps increase the depth of hardening and resists softening of the steel during tempering treatments.

- **Nitrogen** - Usually, efforts are made to eliminate hydregen, oxygen and nitrogen form steel because their presence can cause brittleness.

Guide to the ISO coding. ISO 2560

Mechanical properties

Electrode designation	Tensile strength[1]	Minimum elongation on L=5d	Temperature for minimum impact value of 28 J[2]
	MPa	%	C
E 43 0	430-510	-	-
E 43 1	430-510	20	+20
E 43 2	430-510	22	0
E 43 3	430-510	24	-20
E 43 4	430-510	24	-30
E 43 5	430-510	24	-40
E 51 0	510-610	-	-
E 51 1	510-610	18	+20
E 51 2	510-610	18	0
E 51 3	510-610	20	-20
E 51 4	510-610	20	-30
E 51 5	510-610	20	-40

1) Upper limit tolerance:+40 MPa
2) 1J = 0.102 kgf.m

Type of coating

A = Acid (iron oxide
AR = Acid (rutile)
B = Basic
C = Cellulosic
O = Oxidizing
R = Rutile (medium coated)
RR = Rutile (heavy coated
S = Other types

COMPULSORY

Example: E 51 3 B 160 20 H

% Metal recovery for not less than 110 % recovery

Low-hydrogen electrode

Welding positions

1. all positions
2. all positions, except vertical downward
3. flat butt weld, flat fillet weld, horizontal/vertical fillet weld
4. flat butt weld, flat fillet weld
5. as 3 and recommended for vertical downward

Current conditions

Symbol	Direct current Recommended polarity	Alternating current Minimum open circuit voltage V
0 [1]	+	
1	+ or –	50
2	–	50
3	+	50
4	+ or –	70
5	–	70
6	+	70
7	+ or –	90
8	–	90
9	+	90

OPTIONAL

1) Symbol reserved for electrodes used exclusively on direct current

NB! In the example above, it will be seen that E 51 3 B is compulsory, the remainder optional

Guide to the EN coding, EN 499. For covered electrodes for manual arc

E 46 3 1Ni B 5 4 H5

Symbol for strength and elongation

Symbol	min. yield strength[1] (MPa)	Tensile strength (MPa)	min. elongation[2] (%)
35	355	440-570	22
38	380	470-600	20
42	420	500-640	20
46	460	530-680	20
50	500	560-720	18

1) For the yield strength the lower yield (R_{el}) shall be used when yielding occurs, otherwise the 0.2% proof stress ($R_{p0.2}$) shall be used
2) $L_0 = 5d$

Symbol for impact properties

Symbol	Minimum av. impact energy 47J °C
Z	no requirements
A	+20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60

Symbol for chemical composition of all weld metal

Alloy symbol	Chemical composition[1)2)3)] %		
	Mn	Mo	Ni
no symbol	2.0	–	–
Mo	1.4	0.3 - 0.6	–
MnMo	>1.4 - 2.0	0.3 - 0.6	–
1Ni	1.4	–	0.6 - 1.2
2Ni	1.4	–	1.8 - 2.6
3Ni	1.4	–	>2.6 - 3.8
Mn1Ni	>1.4-2.0	–	0.6 - 1.2
1NiMo	1.4	0.3 - 0.6	0.6 - 1.2
Z	Any other agreed composition		

1) If not specified: Mo <0.2, Ni <0.3, Cr <0.2, V <0.05, Nb <0.05, Cu <0.3 (electrodes without gas shield only)
2) Single values shown in the table mean maximum values
3) The results shall be rounded to the same number of significant figures as in the specified value using the rules according to ISO 31-0, annex B Rule A.

Symbol for diffusible hydrogen (optional)

Symbol	Max. hydrogen content, ml/100g deposited weld metal
H 5	5
H 10	10
H 15	15

Symbol for the welding position

The welding positions are symbolised by a digit designating the positions for which the electrode is tested according to prEN-3 (00121205)
1: all positions
2: all positions
3: flat butt weld, flat fillet weld, horizontal/vertical weld
4: flat butt weld, flat fillet weld
5: as 3 and recommended vertical down welding

Symbol for recovery and type of current

Symbol	Weld metal recovery %		Type of current[1)2)]
1	≤105		ac + dc
2	≤105		dc
3	>105	≤125	ac + dc
4	>105	≤125	dc
5	>125	≤160	ac + dc
6	>125	≤160	dc
7	>160		ac + dc
8	>160		dc

1) In order to demonstrate operability on ac, tests shall be carried out with no load voltage not higher than 65V.
2) ac = alernation current
dc = direct current

Symbol for the type of electrode covering

A	Acid
C	Cellulosic
R	Rutile
RC	Rutile-cellulosic
RA	Rutile-acid
RB	Rutile-basic
B	Basic

S 35 4 AB S1

S	Submerged Arc welding

Symbol for tensile properties

Grade Designation	Yield Strength MPa (min)	Tensile Strength MPa	Elongation % (min)
35	355	440-570	22
38	380	470-600	20
42	420	500-640	20
46	460	530-680	20
50	500	560-720	18

Grade Designation	Yield Strength Parent Metal MPa (min)
3T	355
4T	420
5T	500

Chemical composition of flux

Symbol	Type of flux
MS	Manganese-silicate
CS	Calcium-silicate
ZS	Zirconium-silicate
RS	Rutile-silicate
AR	Aluminate-rutile
AB	Aluminate-basic
AS	Aluminate-silicate-basic
AF	Aluminate-fluoride-basic
FB	Fluoride-basic
Z	Any other composition

Symbol for impact properties

Grade Designation	Charpy-V Impact J (min)	Temp °C
Z	No requirements	
A	47	20
0	47	0
2	47	-20
3	47	-30
4	47	-40
5	47	-50
6	47	-60
7	47	-70
8	47	-80

Type of flux according to EN 760 and chemical composition of wire electrode

Grade Designation	C	Si	Mn	Ni	Mo	Cr	
S0	Any other agreed analysis						
S1	0.05-0.15	-0.15	0.35-0.60	-0.15	-0.15	-0.15	*)
S2	0.07-0.15	-0.15	0.80-1.30	-0.15	-0.15	-0.15	*)
S3	0.07-0.15	-0.15	1.30-1.75	-0.15	-0.15	-0.15	*)
S4	0.07-0.15	-0.15	1.75-2.25	-0.15	-0.15	-0.15	*)
S1Si	0.07-0.15	0.15-0.40	0.35-0.60	-0.15	-0.15	-0.15	*)
S2Si	0.07-0.15	0.15-0.40	0.80-1.30	-0.15	-0.15	-0.15	*)
S2Si2	0.07-0.15	0.40-0.60	0.80-1.20	-0.15	-0.15	-0.15	*)
S3Si	0.07-0.15	0.15-0.40	1.30-1.85	-0.15	-0.15	-0.15	*)
S4Si	0.07-0.15	0.15-0.40	1.85-2.25	-0.15	-0.15	-0.15	*)
S1Mo	0.05-0.15	0.05-0.25	0.35-0.60	-0.15	0.45-0.65	-0.15	*)
S2Mo	0.07-0.15	0.05-0.25	0.80-1.30	-0.15	0.45-0.65	-0.15	*)
S3Mo	0.07-0.15	0.05-0.25	1.30-1.75	-0.15	0.45-0.65	-0.15	*)
S4Mo	0.07-0.15	0.05-0.25	1.75-2.25	-0.15	0.45-0.65	-0.15	*)
S2Ni1	0.07-0.15	0.05-0.25	0.80-1.30	0.80-1.20	-0.15	-0.15	*)
S2Ni1.5	0.07-0.15	0.05-0.25	0.80-1.30	1.20-1.80	-0.15	-0.15	*)
S2Ni2	0.07-0.15	0.05-0.25	0.80-1.30	1.80-2.40	-0.15	-0.15	*)
S2Ni1Mo	0.07-0.15	0.05-0.25	0.80-1.30	0.80-1.20	0.45-0.65	-0.20	*)
S3Ni1.5	0.07-0.15	0.05-0.25	1.30-1.70	1.20-1.80	-0.15	-0.20	*)
S3Ni1Mo	0.07-0.15	0.05-0.25	1.30-1.80	0.80-1.20	0.45-0.65	-0.20	*)
S3Ni1.5Mo	0.07-0.15	0.05-0.25	1.20-1.80	1.20-1.80	0.30-0.50	-0.20	*)
*) Other elements:		Cu -0.30 Al -0.030					

Guide to the EN coding, EN 758. For covered electrodes for

T 46 3 1Ni B M 4 H5

Symbol for strength and elongation

Symbol	min. yield strength[1] (MPa)	Tensile strength (MPa)	min. elongation[2] (%)
35	355	440-570	22
38	380	470-600	20
42	420	500-640	20
46	460	530-680	20
50	500	560-720	18

1) For the yield strength the lower yield (R_{eI}) shall be used when yielding occurs, otherwise the 0.2% proof stress ($R_{p0.2}$) shall be used
2) $L_0 = 5d$

Symbol for impact properties

Symbol	Minimum av. impact energy 47J °C
Z	no requirements
A	+20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60

Symbol for chemical composition of all weld metal

Alloy symbol	Chemical composition[1)2)3)] %		
	Mn	Mo	Ni
no symbol	2.0	–	–
Mo	1.4	0.3 - 0.6	–
MnMo	>1.4 - 2.0	0.3 - 0.6	–
1Ni	1.4	–	0.6 - 1.2
1.5Ni	<1.6	–	1.2 - 1.8>
2Ni	1.4	–	1.8 - 2.6
3Ni	1.4	–	>2.6 - 3.8
Mn1Ni	>1.4-2.0	–	0.6 - 1.2
1NiMo	1.4	0.3 - 0.6	0.6 - 1.2
Z	Any other agreed composition		

1) If not specified: Mo <0.2, Ni <0.3, Cr <0.2, V <0.05, Nb <0.05, Cu <0.3 (electrodes without gas shield only)
2) Single values shown in the table mean maximum values
3) The results shall be rounded to the same number of significant figures as in the specified value using the rules according to ISO 31-0, annex B Rule A.

Symbol for diffusible hydrogen (optional)

Symbol	Max. hydrogen content, ml/100g deposited weld metal
H 5	5
H 10	10
H 15	15

Symbol for the welding position

The welding positions are symbolised by a digit designating the positions for which the electrode is tested according to prEN-3 (00121205)
1: all positions
2: all positions except vertical down
3: flat butt weld, flat fillet weld, horizontal/vertical weld
4: flat butt weld, flat fillet weld
5: as 3 and recommended vertical down welding

Description of core

Symbol	EN 758
gas-shielded R	Rutile base, slow freezing slag
P	Rutile base, fast freezing slag
B	Basic slag
M	Metal powder core
self-shielded U	
V	Rutile of basic/fluoride
W	Basic/fluoride, slow freezing slag
X	
Y	Basic/fluoride, fast freezing slag
Z	Other types
S	

Shielding gas

EN 758 symbol	
M	Argon mixture
C	CO_2
N	No shielding gas

CONSUMABLES CLASSIFICATION TABLES

S	Submerged Arc welding

Method of manufacture

Symbol	
F	Fused flux
A	Agglomerated flux
M	Mixed flux

Hydrogen content of deposited metal

Symbol	Hydrogen content ml/100 g deposited metal (max)
H5	5
H10	10
H15	15

Chemical composition of flux

Symbol	Type of flux
MS	Manganese-silicate
CS	Calcium-silicate
ZS	Zirconium-silicate
RS	Rutile-silicate
AR	Aluminate-rutile
AB	Aluminate-basic
AS	Aluminate-silicate-basic
AF	Aluminate-fluoride-basic
FB	Fluoride-basic
Z	Any other composition

Type of current

Symbol	
DC	Direct current only
AC	Alternating and direct current

Metallurgical behaviour

Symbol	Metallurgical behaviour	Contribution from flux
1	Burn-out	0.7 -
2	Burn-out	0.5 - 0.7
3	Burn-out	0.3 - 0.5
4	Burn-out	0.1 - 0.3
5		0 - 0.1
6	Pick-up	0.1 - 0.3
7	Pick-up	0.3 - 0.5
8	Pick-up	0.5 - 0.7
9	Pick-up	0.7 -

Application

Class	
1	SA welding of non alloy and low alloy steels
2	SA welding and surfacing of stainless and heat resisting Cr and Cr-Ni steels and/or Ni and Ni-based alloys
3	Surfacing purposes yielding a wear resisting weld metal by alloying C, Cr or Mo from flux

Class 1	Si and Mn as above
Class 2	Stating corresponding chemical symbols
Class 3	Stating corresponding chemical symbols

AWS A5.1-91 Carbon Steel Electrodes for Shielded Metal Arc Welding

The first two digits indicate the minimum required tensile strength in ksi.			
Weld Metal No:	Minimum Tensile Strength (psi)	Minimum Yield Strength (ksi)	Minimum Elongation
60	60,000	48 (1)	22% (2)
70	70,000	58 (1)	22% (2)

ELECTRODE

E 7 0 1 8 - 1 H$_4$ R

The third digit = Welding Positions	
4	Especially good Vertical-Down
2	Flat & H/V Fillets
1	All Positional

Optional Designators

8 = the fourth digit indicates the flux type and Welding Current / Polarity to be used. Eg: Hydrogen Controlled Low Iron Powder A.C. & D.C.+, medium penetration. See Table 2 for details.

R = the last letter indicates the coating is Moisture Resistant. Tested electrodes as received or conditioned shall exhibit not > 0.3% (by Wt) of moisture after exposure to an environment of 80°F & 80% relative humidity for a period of not less than 9 hours.

APPLICABLE to E7016, E7018 and E7024 type electrodes only. This number indicates that the electrode meets the requirements for improved impact toughness. In the case of an E7024 ductility "elongation" is also improved from 17%

Average Minimum Results	
Grade	CVN Impact Requirements.
E7016-1	20ft Lb @ -50°F (27J@ -46°C)
E7018-1	20ft Lb @ -50°F (27J@ -46°C)
E7024-1	20ft Lb @ 0°F (27J@ -46°C)

The second letter & sixth number indicates the diffusible hydrogen content of Deposited Weld Metal (DWM)	
H_4	≤ 4 mls H2/100g of DWM
H_8	≤ 8 mls H2/100g of DWM
H_{16}	≤ 16 mls H2/100g of DWM

CONSUMABLES CLASSIFICATION TABLES

AWS A5.1 Carbon Steel Electrodes for Shielded Metal Arc Welding cont.

AWS A5.1 Electrode Classification Summary - Table 2

Electorde Classification	Welding Positions	Type of Current and Polarity	Type of Flux Covering and slag Type or " Use "	Penetration
E6010	F, V, OH, H	D.C. +	High Cellulose Sodium Thin Friable Slag	Deep
E6011	F, V, OH, H	A.C. & D.C. +	High Cellulose Sodium Thin Friable Slag	Deep
E6012	F, V, OH, H	A.C & D.C. + or -	High Titania Sodium Dense Slag	Midium
E6013	F, V, OH, H	A.C & D.C. + or -	High Titania Potassium, Dense-Fluid Slag	Midium
E7014	F, V, OH, H	A.C & D.C. + or -	Low Iron Powder, Titania Self Removing Slag	Low
E7015	F, V, OH, H	D.C. +	Low Hydrogen Sodium Basic Slag Heavy & Friable	Midium
E7016	F, V, OH, H	A.C & D.C. +	Low Hydrogen Potassium Basic Slag Heavy & Friable	Midium
E7018	F, V, OH, H	A.C & D.C. +	Low Hydrogen Potassium Iron Powder	Midium
E7018M	F, V, OH, H	D.C. +	Low Hydrogen Iron Powder " Military Hydrogen Controlled "	Midium
E6019	F, V, OH, H	A.C. & D.C. + or -	Iron Oxide Titania Potassium Fluid Slag	Midium
E6020	F & H/V-FILLET	A.C. & D.C. + or -	High Iron Oxide Easily Removable Slag	Medium to Deep
E6022	F & H/V-FILLET	A.C. & D.C. -	High Iron Oxide " Single-Pass Welds Only "	Deep
E7024	F & H/V-FILLET	A.C. & D.C. + or -	Iron Powder, Titania " High Deposition Efficiency "	Midium
E6027	F & H/V-FILLET	A.C. & D.C. + or -	High Iron Oxide Iron Powder Heavy Honeycombed Slag	Midium
E7027	F & H/V-FILLET	A.C. & D.C. + or -	High Iron Oxide Iron Powder Heavy Honeycombed Slag	Midium
E7028	F & H/V-FILLET	A.C & D.C. +	Low Hydrogen Potassium, Iron Powder	Midium
E7048	F, V, OH, H V-DOWN	A.C & D.C. +	Low Hydrogen Potassium, Iron Powder	Midium

*** Legend to Abbreviations :**

F	=	Flat
V	=	Vertical
H	=	Horizontal
OH	=	Overhead
V-DOWN	=	Vertical-Down
H/V-FILLET	=	Horizontal-Vertical Fillet

AWS A5.5-96 Low Alloy Steel Covered Arc Welding Electrodes

Weld Metal No.	Min. Tensile Strength(psi)	Yield Strength (ksi)	Weld Metal No.	Min. Tensile Strength(psi)	Yield Strength (ksi)
7010-P1	70,000	60	100	100,000	87
70	70,000	57	10018M	100,000	88-100
70xx-B2L	75,000	57	110	110,000	97
80	80,000	67	11018M	110,000	98-110
80xx-C3	80,000	68-80	120	120,000	107
90	90,000	77	12018M	120,000	108-120
9018M	90,000	78-90	12018M1	120,000	108-120

80 = the first two digits indicate the minium required tensile strength in ksi.

ELECTRODE — E 8 0 1 8 - C 1

Classification Suffixes by Major Chemical Analysis(%)						
Type	C	Mn	Ni	Cr	Mo	V
Carbon-Molybdenum Steel Electrodes						
A1	0.12	0.50-1.00		0.40-0.65	0.40-0.65	
Chromium-Molybdenum Steel Electrodes						
B1	0.05-0.12	0.90		0.40-0.65	0.40-0.65	
B2	0.05-0.12	0.90		1.00-1.50	0.40-0.65	
B2L	0.05	0.90		1.00-1.50	0.40-0.65	
B3	0.05-0.12	0.90		2.00-2.50	0.90-1.20	
B4L	0.05	0.90		1.75-2.25	0.40-0.65	
B5	0.07-0.15	0.40-0.70		0.40-0.60	1.00-1.25	0.05
B6	0.05-0.10	1.00		4.00-6.00	0.45-0.65	
B6L	0.05	1.00		6.00-8.00	0.45-0.65	
B7	0.05-0.10	1.00		6.00-8.00	0.45-0.65	
B7L	0.05	1.00		6.00-8.00	0.45-0.65	
B8	0.05-0.10	1.00		8.00-10.50	0.85-1.20	
B8L	0.05	1.00		8.00-10.50	0.85-1.20	0.05
B9	0.08-0.13	1.25		8.00-10.50	0.85-1.20	0.15-0.30
Nickel Steel Electrodes						
C1	0.12	1.25	2.00-2.75			
C1L	0.05	1.25	2.00-2.75			
C2	0.12	1.25	3.00-3.75			
C2L	0.05	1.25	3.00-3.75			
C3	0.12	0.40-1.25	0.80-1.10	0.15	0.35	0.05
C3L	0.08	0.40-1.40	0.80-1.10	0.15	0.35	0.05
C4	0.1	1.25	1.10-2.00			
C5L	0.05	0.40-1.00	6.00-7.25			
Nickel-Molybdenum Steel Electrodes						
NM	0.10	0.80-1.25	0.80-1.10	0.1	0.40-0.65	0.02
Manganese-Molybdenum Steel Electrodes						
D1	0.12	1.00-1.75	0.90		0.25-0.45	
D2	0.15	1.65-2.00	0.90		0.25-0.45	
D3	0.12	1.00-1.80	0.90		0.40-0.65	
Pipeline Electrodes						
P1	0.20	1.20	1.00	0.30	0.50	0.10
G = General and M = Military						
G		1.00 min	0.50 min	0.30 min	0.20 min	0.10 min

The third digit = Welding Position

1 All Positional
2 Flat & H/V Fillets
4 Especially good Vertical-Down

8 = The Fourth digit indicates the flux type and Welding Current/ Polarity to besure.EG:Hydrogen Controlled Low Iron Powder A.C.&D.C. +, medium penetration See Table 3 for details.

AWS A5.5 Low Alloy Steel Covered Arc Welding Electrodes

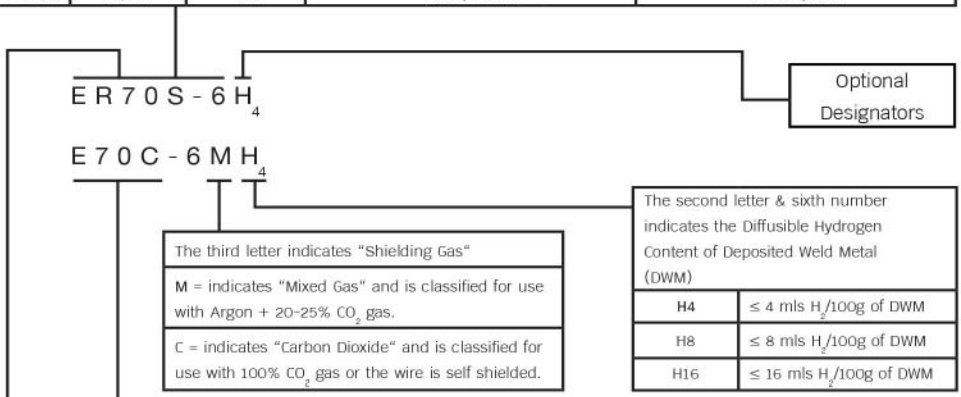
AWS A5.5 Electrode Classification Summary - Table 3

Electrode Classification	Welding Position	Type of Current and Polarity	Tupe of Flux Covering and Slag Type or "Use"	Penetration
E70 Series, 70,000 psi (480 MPa)				
E7010-X	F,V,OH,H	D.C.+	High Cellulose Sodium	Deep
E7011-X	F,V,OH,H	A.C. & D.C.+	High Cellulose Potassium	Deep
E7015-X	F,V,OH,H	D.C.+	Low Hydrogen Sodium	Medium
E7016-X	F,V,OH,H	A.C. & D.C.+	Low Hydrogen Potassium	Medium
E7018-X	F,V,OH,H	A.C. & D.C.+	Iron Powder, Low Hydrogen	Medium
E7020-X	F & H/V FILLET	A.C. & D.C.+ or -	High Iron Oxide	Medium to Deep
E7027-X	F & H/V FILLET	A.C. & D.C.+ or -	High Iron Oxide, Iron Powder	Medium
E80 Series, 80,000 psi (550 MPa)				
E8010-X	F,V,OH,H	D.C.+	High Cellulose Sodium	Deep
E8011-G	F,V,OH,H	A.C. & D.C.+	High Cellulose Potassium	Deep
E8013-G	F,V,OH,H	A.C. & D.C.+ or -	High Titania Potassium	Medium
E8015-X	F,V,OH,H	D.C.+	Low Hydrogen Sodium	Medium
E8016-X	F,V,OH,H	A.C. & D.C.+	Low Hydrogen Potassium	Medium
E8018-X	F,V,OH,H	A.C. & D.C.+	Low Hydrogen, Iron Powder	Medium
E90 Series, 90,000 psi (620 MPa)				
E9010-G	F,V,OH,H	D.C.+	High Cellulose Sodium	Deep
E9011-G	F,V,OH,H	A.C. & D.C.+	High Cellulose Potassium	Deep
E9013-G	F,V,OH,H	A.C. & D.C.+ or -	High Titania Potassium	Medium
E9015-X	F,V,OH,H	D.C.+	Low Hydrogen Sodium	Medium
E9016-X	F,V,OH,H	A.C. & D.C.+	Low Hydrogen Potassium	Medium
E9018-X	F,V,OH,H	A.C. & D.C.+	Low Hydrogen, Iron Powder	Medium
E9018M	F,V,OH,H	D.C.+	Low Hydrogen, Iron Powder	Medium
E100 Series, 100,000 psi (690 MPa)				
E10010-G	F,V,OH,H	D.C.+	High Cellulose Sodium	Deep
E10011-G	F,V,OH,H	A.C. & D.C.+	High Cellulose Potassium	Deep
E10013-G	F,V,OH,H	A.C. & D.C.+ or -	High Titania Potassium	Medium
E10015-X	F,V,OH,H	D.C.+	Low Hydrogen Sodium	Medium
E10016-X	F,V,OH,H	A.C. & D.C.+	Low Hydrogen Potassium	Medium
E10018-X	F,V,OH,H	A.C. & D.C.+	Low Hydrogen, Iron Powder	Medium
E10018M	F,V,OH,H	D.C.+	Low Hydrogen, Iron Powder	Medium
E110 Series, 110,000 psi (760 MPa)				
E11010-G	F,V,OH,H	D.C.+	High Cellulose Sodium	Deep
E11011-G	F,V,OH,H	A.C. & D.C.+	High Cellulose Potassium	Deep
E11013-G	F,V,OH,H	A.C. & D.C.+ or -	High Titania Potassium	Medium
E11015-G	F,V,OH,H	D.C.+	Low Hydrogen Sodium	Medium
E11016-G	F,V,OH,H	A.C. & D.C.+	Low Hydrogen Potassium	Medium
E11018-G	F,V,OH,H	A.C. & D.C.+	Low Hydrogen, Iron Powder	Medium
E11018M	F,V,OH,H	D.C.+	Low Hydrogen, Iron Powder	Medium
E120 Series, 120,000 psi (830 MPa)				
E12010-G	F,V,OH,H	D.C.+	High Cellulose Sodium	Deep
E12011-G	F,V,OH,H	A.C. & D.C.+	High Cellulose Potassium	Deep
E12013-G	F,V,OH,H	A.C. & D.C.+ or -	High Titania Potassium	Medium
E12015-G	F,V,OH,H	D.C.+	Low Hydrogen Sodium	Medium
E12016-G	F,V,OH,H	A.C. & D.C.+	Low Hydrogen Potassium	Medium
E12018-G	F,V,OH,H	A.C. & D.C.+	Low Hydrogen, Iron Powder	Medium
E12016M	F,V,OH,H	A.C. & D.C.+	Low Hydrogen Potassium	Medium
E12018M1	F,V,OH,H	A.C. & D.C.+	Low Hydrogen, Iron Powder	Medium

Legend to Abbreviations: F = Flat, V = Verticle, H = Horizontal, OH = Ovwehead, H/V-FILLET = Horizontal-Vertical Fillet

AWS A5.18-1993 Carbon Steel Electrodes and Rods for Gas Shielded Arc Welding

As Welded Mechanical Properties (Minimum)						
AWS Class.	Tensil Strength Psi	MPa	Yield Strength Psi	MPa	% Elong.	Charpy-V-Notch (CVN) Impact Requirement
ER70S-2	70,000	480	58,000	400	22	20ft Lb @ -20°F (27J @ -29°C)
ER70S-3	70,000	480	58,000	400	22	20ft Lb @ 0°F (27J @ -18°C)
ER70S-4	70,000	480	58,000	400	22	Not Required
ER70S-5	70,000	480	58,000	400	22	Not Required
ER70S-6	**70,000**	**480**	**58,000**	**400**	22	**20ft Lb @ -20°F (27J @ -29°C)**
ER70S-7	70,000	480	58,000	400	22	20ft Lb @ 0°F (27J @ -18°C)
ER70S-G	70,000	480	58,000	400	22	As agreed between supplier & purchaser
E70C-3X	70,000	480	58,000	400	22	20ft Lb @ 0°F (27J @ -18°C)
E70C-6X	70,000	480	58,000	400	22	20ft Lb @ -20°F (27J @ -29°C)
E70C-G(X)	70,000	480	58,000	400	22	As agreed between supplier & purchaser
E70C-GS(X)	70,000	480	Not Specified			Not Required



E = Electrode, **R** = Rod, **S** = Solid Wire, **C** = Composite Metal Cored Wire, followed by a hyphen then a number or letter which defines the chemical composition of the wire.

Wire Classification	Carbon (C)	Manganese (Mn)	Silicon (Si)	Other Elements Allowable % Range
ER70S-2	0.07	0.90-1.40	0.40-0.70	0.05-0.15Ti/0.02-0.12Zr/0.05-0.15Al
ER70S-3	0.06-0.15	0.90-1.40	0.45-0.75	0.50Cu
ER70S-4	0.07-0.15	1.00-1.50	0.60-0.85	0.50Cu
ER70S-5	0.07-0.19	0.90-1.40	0.30-0.60	0.50Cu/0.50-0.90 Al
ER70S-6	**0.06-0.15**	**1.40-1.85**	**0.80-1.15**	**0.50Cu**
ER70S-7	0.07-0.15	1.50-2.00	0.50-0.80	0.50Cu
ER70S-G	G = General, composition is not specified and is agreed between the supplier and the customer.			
ER70C-3X	0.12	1.75	0.90	0.50Cu
ER70C-6X	**0.12**	**1.75**	**0.90**	**0.50Cu**
ER70C-G(X)	G = General, composition is not specified and is agreed between the supplier and the customer.			
ER70C-G(X)	G = General, Single Pass Only, composition is agreed between the supplier and the customer.			

Single values are maximum. X represents shielding gas indicators e.g. "C" indicates CO_2 shielding gas and "M" indicates mixed shielding gases in the Argon + 20-25%CO_2. (X) is optional for these classifications.

CONSUMABLES CLASSIFICATION TABLES

AWS A5.20-95 Carbon Steel Electrodes for Flux Cored Arc Welding

6 or 7 = the first digit indicates the minimun tensile strength in psi x 10,000.	
Weld Metal No:	Minimum Tensile Strength. "psi" (Mpa)
6	60,000 (415)
7	70,000 (480)

The second digit indicates the Welding Positions	
0	Flat & Horizontal
1	All Positional

ELECTRODE

E 7 1 T - 1 M J H_4

The second letter indicates the electrode is Flux Cored.

T = Tubular

Optional Designators

1 = the third digit group(1 to 14, or the letter/s G or GS) indicates the Welding Polarity to be used, Arc Transfer, Flix type and the No. of Weld Passes.
eg.1 = D.C.+, spray transfer, rutile type flux for multipass welding.

G = "General" Classification, and means that the electrode shield, polarity and impact peoperties are not specified.

S = "Single" Pass wlding only.

See Table 6 for details.

The second letter & sixth number indicates the diffusible hydrogen content of Deposited Weld Metal (DWM)

H_4	≤ 4 mls H_2/100g of DWM
H_8	≤ 8 mls H_2/100g of DWM
H_{16}	≤ 16 mls H_2/100g of DWM

J = the fourth letter indicates that the electrode meets thr following requirement of improved impact toughness, 20ft Lb @ -40 °F (27J @ -40 °C).
See table 5 for details.

M = the third letter indicates "Mixed Gas" and is classified for use with Argon + 20-25% CO_2.
If no 'M' is shown than the electrode is used with either CO_2 or the electrode is self shield.

AWS A5.20-95 Carbon Steel Electrodes for Flux Cored Arc Welding

As Welded Mechanical Properties - Table 5						
AWS Class.	Tensil Strength Psi	MPa	Yield Strength Psi	MPa	% Elong.	Charpy-V-Notch (CVN) Impact Requirement
T-1/1M	70	480	58	400	22	20ft Lb @ 0°F (27J @ -18°C)
T-2/2M	70	480	n.s.	n.s.	n.s.	not specified
T-3*	70	480	n.s.	n.s.	n.s.	not specified
T-4*	70	480	58	400	22	not specified
T-5/5M	70	480	58	400	22	20ft Lb @ -20°F (27J @ -29°C)
T-6*	70	480	58	400	22	20ft Lb @ -20°F (27J @ -29°C)
T-7*	70	480	58	400	22	not specified
T-8*	70	480	58	400	22	20ft Lb @ -20°F (27J @ -29°C)
T-9/9M	70	480	58	400	22	20ft Lb @ -20°F (27J @ -29°C)
T-10*	70	480	n.s.	n.s.	n.s.	not specified
T-11*	70	480	58	400	20	not specified
T-12/12M	70-90	480-620	58	400	22	not specified
T-13*	60	415	n.s.	n.s.	n.s.	not specified
T-13*	70	480	n.s.	n.s.	n.s.	not specified
T-14*	70	480	n.s.	n.s.	n.s.	not specified
T-G	60	415	48	330	22	not specified
T-G	70	480	58	400	22	not specified
T-GS	60	415	n.s.	n.s.	n.s.	not specified
T-GS	70	480	n.s.	n.s.	n.s.	not specified

The above designations may be classifield with the 'J' indicator provided the lower CVN Impact requirement of 20ft Lb @ -40oF (27J @ -40°C), are met for T-1/1M, T-5/5M, T-6, T-8, T-9/M and T-12/12M types.

CONSUMABLES CLASSIFICATION TABLES

AWS A5.20 Carbon Steel Electrodes for Flux Cored Arc Welding cont.

AWS A5.20 Class.	Polarity	Arc Transfer Type	Slag Base	No.of Weld Passes	Discernible Features and Applications
T-1 and T-1M	DC +	Spray	Rutile	Multiple	Larger diameters (2mm [5/64"] & larger) are used for flat & H/V welding only. Very smooth / quiet are with low spatter loss, flat to slightly convex weld bead contour, full covering easy revoved slag, and high deposition rates.
T-2 and T-2M	DC +	Spray	Rutile	Single	Essentially the same as T-1 / T-1M types, but with higher manganese or silicon or both. Higher levels of deoidisers allow welding of heavily oxidised steels such as, rimmed, rusty and mill scaled steels. SINGLE pass only.
T-3*	DC +	Spray	Rutile Fluoride	Single	# High speed gasless welding in flat & H/V and 20 down inclined positions on sheet metal. Limited mech. props.
T-4*	DC +	Globular	Alumina Fluoride	Multiple	Very low Sulphur weld deposits (resistant to hot craking) & very high deposition rates, Bridging of poor fit-up joins.
T-5 and T-5M	DC +/-	Globular	Basic	Multiple	Larger diameters (>2mm) are used for flat & H/V velding. Good mechanical properties (eg. Impacts 27J @ -29°C/20ft Lb @ -20°F) Slightly convex weld bead contour, easy removed thin slag, resistant to hot & cold cracking.
T-6*	DC +	Spray	Rutile Basic	Multiple	Good low temperature impact properties (eg. 27J @ -29°C/20ft Lb @ -20°F) Excellent slag removal in deep groove joints. Good root run penetration. Flat & H/V only.
T-7*	DC -	Spray	Alumina Fluoride	Multiple	Dia. (>2mm) used for flat & H/V welding. High deposition-rates and very low sulphur weld metal resistant to cracking
T-8*	DC -	Spray	Alumina Fluoride	Multiple	Very good low temperature strength, notch toughness and crack resistance (eg.27J @ -29°C / 20ft Lb @ -20°F).
T-9 and T-9M	DC +	Spray	Rutile	Multiple	Essentially the same as T-1 / T-1M types, but deposit weld metal with improved impact properties (eg. 27J @ -29°C / 20ft Lb @ -20°F). To obtain X-Ray quality, joints are to be relatively clean and free of oil, excesive oxide & mil-scale.
T-10*	DC -	small droplet Globular	-	Single	High speed gasless welding in flat & H/V and 20 vertical inclined positions on larger thickness than the T-3 class.
T-11*	DC -	Spray	-	Multiple	General purpose wire for use on material less than 20mm (3/4) unless preheat & interpass temp's are maintained.
T-12 and T-12M	DC +	Spray	Rutile	Multiple	Essentially the same as T-1/T-1M types, but modified to increase impact properties and to meet lower manganese requirement of the ASME Boiler and Pressure Vessel code section IX, A-1 analysis group of 1.6% Mn.
T-13*	DC -	Short arc	-	Single	Root pass welding only on circumferential pipe welds.
T-14*	DC -	Spray	-	Single	# High speed all positional welding of sheet metal such as, galvanised, zinc and other coated steels < 6mm (1/4)
T-G	DC +/-	not specified	N.S.	Multiple	For electrodes not covered by any present classification. The wire must meet the chemical requirements to ensure a carbon steel deposit and the specified tensile strength.
T-GS	DC +/-	not specified	N.S.	Single	For single pass electrodes not covered by any present classification. The wire must meet the specified tensile strength requirements. No other requirements are specified.

* Self shielded wire types. # Suitable only for material thickness below 6mm (1/4")

AWS ASME SFA A5.17 Standard for submerged Arc Wire & Fluxes

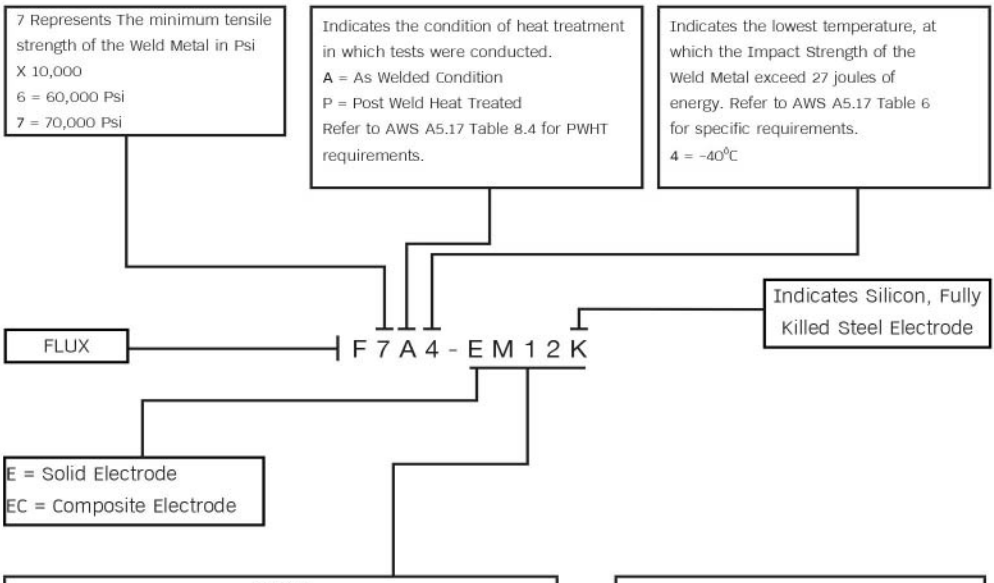


Table 1
Chemical Composition Requirements for Solid Electrodes

Electrode Classification	C	Mn	Si	S	P	Cu
Low Manganese Electrodes						
EL8	0.10	0.25-0.60	0.07	0.03	0.03	0.35
EL8K	0.10	0.25-0.60	0.1-0.25	0.03	0.03	0.35
EL12	0.04-0.14	0.26-0.60	0.10	0.03	0.03	0.35
Medium Manganese Electrodes						
EM12	0.06-0.15	0.8-1.25	0.1	0.03	0.03	0.35
EM12K	**0.05-0.15**	**0.8-1.25**	**0.1-0.35**	**0.03**	**0.03**	**0.35**
EM13K	0.05-0.16	0.9-1.4	0.35-0.75	0.03	0.03	0.35
EM14K	0.06-0.19	0.9-1.4	0.35-0.75	0.025	0.025	0.35
(Ti 0.03-0.17%)						
High Manganese Electrodes						
EH11K	0.07-0.15	1.4-1.85	0.8-1.15	0.03	0.03	0.35
EH12K	0.06-0.15	1.5-2.00	0.25-0.65	0.025	0.025	0.35
EH14	0.10-0.20	1.7-2.20	0.1	0.03	0.03	0.35

Table 6
Impact Test Requirements

Digit	Test Temp C	Minimum Average Energy Level (Joules)
Z	No Impact Requirements	
0	-18	27
2	-29	27
4	-40	27
5	-46	27
6	-51	27
8	-62	27

Material with electrode selection

Number	Base Material			P.Number	ASTM Specifacation			
					Pipe	Tube	Wrought Fitting	Forging
1	Carbon Steel		Carbon Steel	1	A 53 A106	A178 A179/192	A234 GR. WPA/B	A181 A105
2			Carbon Steel (LTCS-Impact test)		A333 Gr.1/6	A334 Gr.1/6	A420 WPL6	A350 LF 1/2
3	Low and intermediate alloy steels		C - 1/2Mo	3	A335 P1	A161 T1	A234 WPI	A182 F1
4			1/2Cr-1/2Mo		A335 P2	A213 T2	-	A182 F2
5			1Cr-1/2Mo	4	A335 P12	A213 T12	A234 WP12	A182 F12
6			1 1/4Cr-1/2Mo		A335 P11	A213 T11	A234 WP11	A182 F11
7			2 1/4Cr-1Mo	5	A335 P22	A213 T22	A234 WP22	A182 F22
8			5Cr-1/2Mo		A335 P5	A213 T5	A234 WP5	A182 F5
9			7Cr-1/2Mo		A335 P7	A213 T7	A234 WP7	A182 F7
10			9Cr-1Mo		A335 P9	A213 T9	A234 WP9	A182 F9
11	Stainless Steels	Martensinc & Ferrite	11Cr	6	-	A268 TP409	-	-
12			12Cr		-	A268 TP410	-	A182 F6
13			13Cr	7	-	A268 TP405	-	A182 F6
14			17Cr		-	A268 TP430	-	-
15		Austentic	18Cr-8Ni	8	A312 TP304	A213 TP304	A403 WP304	A182 F304
16			18Cr-8Ni Low C		A312 TP304L	A213 TP304L	A403 WP304L	A182 F304L
17			18Cr-8 Ni Hight C		A312 TP304H	A213 TP304H	A403 WP305H	A182 F304H
18			25Cr-12Ni		A312 TP308	-	A403 WP309	-
19			25Cr-20Ni		A312 TP310	A213 TP310	A403 WP310	A182 F310
20			18Cr-12Ni-2Mo		A312 TP316	A213 TP316	A403 WP316	A182 F316
21			18Cr-12Ni-2Mo		18Cr-12Ni-2Mo	A213 TP316L	A403 WP316L	A182 F316L
22			18Cr-12Ni-2Mo High C		18Cr-12Ni-2Mo High C	A213 TP316H	A403 WP316H	A182 FS16H
23			18Cr-12Ni-3M		A312 TP317	A213 TP317	A403 WP317	-
24			18Cr-10Ni-Ti		A312 TP321	A213 TP321	A403 WP321	A182 F321
25			18Cr-10Ni-Ti High C		A312 TP321H	A213 TP321H	A403 WP321H	A182 F321H
26			18Cr-10Ni-Cb		A312 TP347	A213 TP347	A403 WP347	A182 F347
27			18Cr-10Ni-Cb High C		A312 TP347H	A213 TP347H	A403 WP347H	A182 F347H
28			18Cr-10Ni-To		A312 TP348	A213 TP348	A403 WP348	A182 F348
29			18Cr-10Ni-To High C		A312 TP348H	A213 TP347H	-	-
30			25Cr-20Ni		-	A608 HK40	-	-
31			20Cr-28Ni-2Mo	-	B464	B468	B365 WP20CB	B472
32		PII	17Cr-4Ni-Ph	-	-	-	-	A564 TP630
33	Ni Steels		3 1/2 Ni	9	A333 Gr.3	A334 Gr.3	A420 WPL6	A350 LF3
34			9 Ni	11	A333 Gr.8	A334 Gr.8	A420 WPL8	A522
35	Non Ferous		Alluminium	21 31 34 35 41 42 43	B241	B210, B234	B361 WP3003	B247
36			Copper		B42	B75	-	-
37			70 Cu 30 Ni Cupr		B455 C715	B111 C715	-	-
38			Alluminium B		-	B111 C614	-	B150
39			Nickel		B161	B161, B163	B366 WPN	B160
40			Monel		B185	B165, B163	B366 WPNC	B164
41			Inconel		B167,8 B517	B516, B183	B366 WPNCI	B166
42			Hastelly B	44	B619	8522	B366 WPHB	-
43			Hastelloy C		-	-	B366 WPHC	-
44			Incoly	45	B407, B 514	8407, B515	B366 WPNIC	B408
45			Titanium	-	B337	B338	B363	B381
46			Zirconium	-	B658 R02	B523 R02	B853 R 02	B493 R C2

Material with electrode selection

Casting	Plate	AWS Specifications		Preheat Temp. C (min)	Postheat Temp. c	Hardness BHN Max.
		Covered Electrode		Bare Electrode		
		Preferred	Alternate			
A216	A285 A515	LKE-6010 ROOT LKE-7018 F&F	LKE-6013 E7015,E7028	ER70S-2,S-3,S-5 RG60,RG65	< 25.4 mm 10 > 25.4 mm 80	> 19 mm 595-650	200
A352 LCB/C	A516	LKE-7018-G	LKE-7018	ER70S-B1			
A217 WC1	-	LKE-7010-A1 LKE-7018-A1	E7015-A1	ER70S-B1	< 25.4 mm 11	> 19 mm 595-720	225
-	A387 Gr.2	E8018-B1	E8016-B1	-	>25.4 mm 81		
-	A387 Gr.12	E8016-B2	LKE-8018-B2	ER515	150	> 12.5 MM 705-745	225
A217 WC6	A387 Gr.11						
A217 WC9	A2387 Gr.22	E9015-B3	LEK-9018-B3	ER521	175	> 12.5 MM 705-760	241
A217 C6	A387 Gr.6	E602	E8018-B6	ER602		705-760	
-	A387 Gr.7	E7 Cr.7	-	ER7 Cr			
A217 C12	A387 Gr.9	E505	E8018-B8	ER505			
-	-	LKE-309	LKE-312	ER309	150 INTER pass<315	730-790	241
A217 CA15	A240 TP410	LKE-410	-	ER410			
A296 CA15	A240 TP405	LKE-309	LKE-NiCrFe-3	ER309	10	-	-
-	A240 TP430	E430	LKE-NiCrFe-3	LKT/LKM-430			
A351 CF8	A240 TP304	LKE-308	-	ER308	10	-	-
A351 CF3	A240 TP304L	LKE-308L	-	LKT/LKM-308L			
-	-	E16-6-2	LKE-308	ER16-8-2			
A351 CH20	A240 TP3095	LKE-309	LKE-310	ER309			
A351 CK20	A240 TP310S	LKE-310	-	LKT/LKM-310			
A351 CF 8M	A240 TP316	LKE-316	E15-8-2	ER316			
A351 CF 3M	A240 TP316L	LKE-316L	E308MoL	LKT/LKM-316L			
-	-	E16-8-2	LKE-316	ER16-18-2			
-	A240 TP317	E317	-	ER317			
-	A240 TP321	LKE-347	-	ER347			
-	-	E16-6-2	LKE-347	ER16-8-2			
A351 CF 8C	A240 TP347	LKE-347	-	ER347			
-	-	E16-8-2	LKE-347	ER16-8-2			
-	A240 TP348	EKE-347	-	ER348			
-	-	E16-8-2	LKE-347	ER16-8-2			
A351 HK40	-	E310H	-	ER310H			
A351 CN 7M	B463	E320	E320 LA	ER320			
A474 CB7Cu1	-	E630	-	ER630			
A352 LC3	A203 Gr. D/E	LKE-8018-C2	E8016-D2	-	95	> 19 mm 595-635	-
-	A353	LKE-NiCrFe-3	-	LKT/LKM-NiCr-3	10	> 19 MM 550-5855	-
-	B209	-	-	ER1100	10	10	-
-	B11	ECu	-	ERCu	10	10	-
B369 C964	B171	ECuNi	-	ERCuNi	10	10	-
B148	B169	E Cu Aj-A1	E Cu Aj-A2	ERCu Aj-A2	10	10	-
-	B162	ENi1	ENi-3	ERNi-3	10	10	-
-	B127	LKE-NiCu-7	ENiCu-3/-4	LKT/LKM-NiCCu-7	10	10	-
-	B168	LKE-NiCrFe-1	LKE-NiCrFe-3	ERNiCrFe-5	10	10	-
A296 N12M	B333	ENiMo-1	-	ERNiMo-1	10	10	-
A295 CU12M	B334	ENiMo-2	-	ERNiMo-2	Inter pass<95	10	-
-	B409	LKE-NiCrFe-2	-	LKT/LKM-NiCr-3		10	-
B367	B265	-	-	ERTi-2	10	10	-
-	B551 R 02	-	-	ER ZR 2	10	10	-

WELDING CONSUMABLES FOR CR-MO CREEP RESISTANT STEELS FOR POWER GENERATION APPLICATIONS

Alloy Type	ASTM (ASME) Steel Grade		
	Plate	Tube/Pipe	Cast/Forging
½Mo	A204Gr. A, B, C	A209 Gr. T1, T1a, T1b A250 Gr. T1, T1a, T1b A234 Gr. WP1 A335 Gr. P1	A182 Gr.F1 A336 Gr.F1
1¼Cr-½Mo (T/P11)	A387 Gr.11 Cl1, 2 A387 Gr.12 Cl1, 2	A199 Gr. T11 A200 Gr. T11 A213 Gr. T11, T12 A217 Gr. WC6, WC11 A234 Gr. WP11, WP12 A234 Gr. WP12Cl.1, 2 A250 Gr. T11, T12 A335 Gr. P11, P12	A182 Gr.F11Cl.1, 2, 3 A182 Gr.F12Cl.1, 2 A336 Gr.F11Cl.1, 2, 3 A336 Gr.F12
2¼Cr-1Mo (T/P22)	A387 Gr.22 Cl.1, 2	A199 Gr. T21, T22 A200 Gr. T21, T22 A213 Gr. T22 A217 WC9 A234 Gr. WP22 Cl.1, 3 A250 Gr. T22 A335 Gr. P22	A182 Gr. F22 Cl.1, 3 A336 Gr. F22 Cl.1, 4
1¼Cr-1Mo-¼V			A289 Gr. C24 A356 Gr. 9

Note : [a] Recommended shielding gases for solid wire MIG welding are Ar+1-3%O_2 or Ar+5-20%CO_2 mixed gas

[b] These are all-positional wires. Recommended shielding gases are Ar+20%CO_2 mixed gas or 100%CO_2

Metrode Welding Consumables				
SMAW	**GTAW**	**GMAW[a]**	**SAW: wire&flux**	**FCAW [b]**
LKE-7018-A1	ER70S-A1	ER70S-A1		
LKE-8018-B2	LKT-80B2 LKT-60	LKM-80B2 LKM-60	EB2 BS EN SA FB 1	LFC-811B2
LKE-9018-B3 E8018-B3	LKT-90B3 ER90S-G	ER90S-B3 ER90S-G	EB3 BS EN SA FB 1	LFC-911B3
BS EN ECrMoV1 B 20 DIN ECrMoV1 B 32 BS EN ECrMoV1 B 20				

WELDING CONSUMABLES FOR Cr-Mo CREEP RESISTANT STEEL FOR POWER GENERATION APPLICATION

Alloy Type	ASTM (ASME) Steel Grade		
	Plate	Tube/Pipe	Cast/Forging
2¼Cr-Mo-W-V-Nb (T/P23)		A213 Gr. T23 A335 Gr. P23	
5Cr-½Mo	A387 Gr. 5 Cl.1, 2	A199 Gr. T5 A213 Gr. T5, T5b, T5c A234 Gr. WP5 A335 Gr. P5, P5b, P5c	A182 Gr. F5, F5a A336 Gr. F5, F5a
9Cr-1Mo	A387 Gr. 9 Cl.1, 2	A199 Gr. T9 A213 Gr. T9 A234 Gr. WP9 A335 Gr. P9	A182 Gr. F9 A336 Gr. F9
9Cr-1Mo-V-Nb (T/P91)	A387 Gr. 9 1 Cl.2	A199 Gr. T91 A213 Gr. T91 A234 Gr. WP91 A335 Gr. P91	A182 Gr. F91 A336 Gr. F91 A369 FP91 A217 C 12A
9Cr-Mo-1W-V-Nb (E911)		X11CrMoWVNb 9 1 1	G-X12CrMoWVNbN 10 1 1
9Cr-Mo-2W-V-Nb (T/P92)	A387 Gr. 92	A213 Gr. T92 A335 Gr. P92	A182 Gr. F92 A369 FP92
12Cr-1Mo-W-V (X20)		Type 422 X20CrMoV 12 1	G-X22CrMoV 12 1
1Ni-0.4Mo (WB36)	A302Gr. C, D A533Gr.A-D, cl 1,2		A508 class 1, 1A, 2, 3
	DIN 15NiCuMoNb5 (WB36)		

Note : [a] Shielding gases for solid wire MIG welding: Ar+1-3%O_2 or Ar+5-20%CO_2 mix gas; metal cored wire: Ar+20%CO_2mix gas

[b] These are all-positional wires. Recommended shielding gases are Ar+20%CO_2 mixed gas or 100%CO_2

Metrode Welding Consumables				
SMAW	GTAW	GMAW[a]	SAW: wire&flux	FCAW [b]
E8015-B6	ER80S-B6	ER80S-B6		E81T1-B6
E8015-B8	ER80S-B8	ER80S-B8		E81T1-B8
E9015-B9 E9016-B9	ER90S-B9	ER90S-B9 ER90C-G	EB9 BS EN SA FB 255AC	E91T1-B9
			BS EN SA FB 255AC	
BS EN E CrMoWV 12 B	BS EN W CrMoWV 12 SI			
E9018-G	E90S-D2		BS EN S3NiMo BS EN SA FB 1	

Stainless Steel Welding-Filler Material Selection Chart

Base Metal Grade	442 446	430f 430 FSE	430 431	501 502	416 418 SE	403 405 410 420 414	321 348 347	317
201-202-301 302-302B-304 305-308	310 312 309	310 312 309	310 312 309	310 312 309	309 310 312	309 310 312	308	308
303 303SE	310 309 312	310 309 312	310 309 312	310 312 309	310 309 312	310 309 312	308	308
304L	310 309 312	310 309 312	310 309 312	310 312 309	310 309 312	310 309 312	308	308
309 309S	310 309 312	310 309 312	310 309 312	310 312 309	310 309 312	310 309 312	308	317 316 309
310 310S	310 309 312	310 309 312	310 309 312	310 312 309	310 309 312	310 309 312	309	317 316 309
314	310 312 309	310 312 309	310 312 309	310 312 309	310 312 309	310 312 309	309 310 308	309 310
316	310 309 312	310 309 312	310 309 312	310 312 309	309 310 312	309 310 312	308	316
316L	310 309 312	310 309 312	310 309 312	310 312 309	310 309 312	310 309 312	308	316 317 308
317	310 309 312	310 309 312	310 309 312	310 312 309	309 310 312	309 310 312	308	317
321 348 347	310 309 312	310 309 312	310 309 312	310 312 309	309 310 312	309 310 312	347 308	308 347
403-405 410-420 414	310 309 312	310 309 312	310 309 312	310 312 309	309 310	410* 309**	309 310	309 310
416 416SE	310 309	310 309	310 309	310	410*	410* 309** 310**	309 310	309 310 312
501 502	310	310	310	502* 310**	310	310	310 309	310 30

Remark : * Preheat

** No Preheat Necessary

REFERENCE

Stainless Steel Welding-Filler Material Selection Chart

316L	316	314	310 310S	309 309S	304L	303 303S	201 202 301 302 302B 304 305 308	MILD STEEL
308	308	308	308	308	308	308	308	312 310 309
308	308	308	308	308	308	312 308-15	308	312 310 309
308	308	308	308	308	308L	3088	308	312 310 309
316	316	309	309	308	308	308	308	309 310 312
316	316	310	310	309 310	309	309	309	310 309 312
309 310	309 310	310-15	310	309 310	309 310	309 310	309 310	310 309 312
316	316	309 310 316	310 309 316	310 309 316	309 316	309 316	309 316	309 310 312
316L	316	309 310 316	310 309 316	319 309	308 316	308 316	308 316	308 310 312
316 308	316 308	309 310 317	317 316 309	317 316 309	308 316 317	308 316 317	308 316 317	309 310 312
347 308	347 308	309 310 347	347 308	347 308	347 308L	347 308	347 308	309 310 312
309 310	309 310	310 309	310 309	309 310	309 310	309 310	309 310	309 310 312
309 310 312	309 310 312	309 310 312	310 309 312	309 310 312	309 310 312	309 310 312	309 310 312	309 310 312
310 30	310 30	310 30	310 30	310 30	310 30	310 30	310 30	310 312 309

Aluminum Welding Filler Material Selection Chart

Base Alloys	Filler Alloys	1060, 1070, 1080, 1350	1100	2014, 2036	2219	3003, ALCLAD 3003	3004	ALCLAD 3004	5005, 5050	5052, 5652
Characteristics		W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M
319.0, 333.0, 354.0, 355.0, C355.0, 380.0	2319 4043 4145	B A A A A A A A B A A A	B A A A A A A A B A A A	B A A A A A C C B C A A A B C B A A	B A A A A A C C B C A A A B C B A A	B B A A A A A A B A A A	B B A A A A A A B A A A	B B A A A A A A B A A A	B B A A A A A A B A A A	A A A A A A
413.0, 443.0 444.0, 356.0, A356.0, A357.0 359.0	4043 4145 A356.0 A357.0 5356	A A A A A A A A B B A	A A A A A A A A B B A	B B A A A A A A B A A	B B A A A A A A B A A	A A A A A A A A B B A	A A A A A A	A A A A A A	A A A A A A	A B A A A A B A B B A
7005, 7021, 7039, 7046, 7146, 710.0, 711.0	4043 4145 5183 5356 5554 5556 5654	A A C A A B A B A A B A A A A B A B A A	A A C A A B A B A A B A A A A B A B A A	B B A A A A A B A A	B B A A A A A B A A	A B C A A B A B A A B A A A A B A B A A	A D C B A B A B A A B B A A A C C A A A A B A B A A C C A A B	A D C B A B A B A A B B A A A C C A A A A B A B A A C C A A B	A B C B A B A B A A B A A A A C A A A A B A B A A C A A A A	B D C B A A A B A A A B A A A B C A A A A A A B A A B C A A A
6061, 6070	4043 4145 4643 (1) 5183 5356 5554 5556 5654	A A C A A A A D B A B A B A B A A A B A B A	A A C A A A A D B A B A B A B A A A B A B A	B B A A A A A B A A	B B A A A A A B A A	A B C A A A A D B A B A B A B A A A B A B A	A D C A A B C D B A B A B A B B A A B A B A	A D C A A B C D B A B A B A B B A A B A B A	A B C A A A B D B A B A B A B A A A B A B A	A D C A A B A B C B B B A C A C C A B A B B A B C B C C A B A
6005, 6063, 6101, 6151, 6201, 6351, 6951	4043 4145 4643 (1) 5183 5356 5554 5556 5654	A A C A A A A D B A B A B A B A A A B A B A	A A C A A A A D B A B A B A B A A A B A B A	B B A A A A A B A A	B B A A A A A B A A	A B C A A A A D B A B A B A B A A A B A B A	A D C A A B C D B A B A B A B B A A B A B A	A D C A A B C D B A B A B A B B A A B A B A	A B C A A A B D B A B A B A B A A A B A B A	A D C A A B A B C B B B A C A C C A B A B B A B C B C C A B A
5454	4043 5183 5356 5554 5556 5654	A B C C A B A B B A B A A B A C A A A A B A B B A	A B C C A B A B B A B A A B A C A A A A B A B B A			A B C C A B A B B A B A A B A C A A A A B A B B A	A D C C A B A B B A B A A B A C C A A A B A B B A	A D C C A B A B B A B A A B A C C A A A B A B B A	A B C C A B A B B A B A A B A C A A A A B A B B A	A D C C A A A A B A A B A B A C C A A A A A B B A B C A B B
511.0, 512.0, 513.0, 514.0, 535.0, 5154, 5254	4043 5183 5356 5554 5556 5654	A B C C B A B B A B A A B A C A A A A B A B B A C A A A B	A B C C B A B B A B A A B A C A A A A B A B B A C A A A B			A B C C B A B B A B A A B A C A A A A B A B B A C A A A B	A D C C B A B B A B A A B A C C A A A B A B B A C C A A B	A D C C B A B B A B A A B A C C A A A B A B B A C C A A B	A B C C B A B B A B A A B A C A A A A B A B B A C A A A B	A D C C A A B B B A B A B A C C A A A A A B B A B C A A A
5086, 5056	4043 5183 5356 5554 5556 5654	A B C B A A B A A A A A A A A A B A A	A B C B A A B A A A A A A A A A B A A			A B C B A A B A A A A A A A A A B A A	A C C B A A B A A A B A A A A A B A A	A C C B A A B A A A B A A A A A B A A	A B C B A A B A A A A A A A A A B A A	A A B A A A B A A A C C A A A A A B A A B C A A B
5083, 5456	4043 5183 5356 5554 5556 5654	A B C B A A B A A A A A A A A A B A A	A B C B A A B A A A A A A A A A B A A			A B C B A A B A A A A A A A A A B A A	A C C B A A B A A A B A A A A A B A A	A C C B A A B A A A B A A A A A B A A	A B C B A A B A A A A A A A A A B A A	A A B A A A B A A A C C A A A A A B A A B C A A B
5052, 5652	4043 5183 5356 5554 5556 5654	A B C A A B A B A B A A A B A B A	A B C A A B A B A B A A A B A B A			A B C A A B A B A B A A A B A B A	A B C A A B A B A B A A A B A B A	A C C A A B A B A B B A A B A B A	A B C A A B A B A B A A A B A B A	A D C B A A A B C B A B A C A C C A A A B A A B C B B C A B A
5005, 5050	1100 4043 4145 5183 5356 5556	C B A A A A A A C A A B A D B A C A B B C A B B C A B B	C B A A A A A A C A A B A D B A C A B B C A B B C A B B			C C A A A A A B C A A B B D B A C A B C B C A B C B C A B C B	A B C A A B A B A B A A A B A B A	A B C A A B A B B A B A A B A B A B B A	B A A A A A B D A A B A C B B A B B B A C B	1100 4043 4145 5183 5356 5556
ALCLAD 3004	1100 4043 4145 5183 5356 5554 5556	D B A A A A A A C A A B A D B A C A B C B C A B C B C A B C B	D B A A A A A A C A A B A D B A C A B C B C A B C B C A B C B			C C A A A A A B C A A B B D B A C A B C A C A B C A C A B C A	A D D A A B A C C A B B B C A C C A B A A B A C C A	A D D A A B A C C A B B B C A C C A B A A B A C C A	1100 4043 4145 5183 5356 5554 5556		
3004	1100 4043 4145 5183 5356 5554 5556	D B A A A A A A C A A B A D B A C A B B C A B B C A B B	D B A A A A A A C A A B A D B A C A B B C A B B C A B B			C C A A A A A B C A A B B D B A C B C A C A B C A C B C A	A D A A B A C C A B B B C A C C A B A A B A C C A	1100 4043 4145 5183 5356 5554 5556		
3003, ALCLAD 3003	1100 4043 4145	B B A A A A A A B A A A A C B A	B B A A A A A A B A A A A C B A	B A A A A A A B A A	B A A A A A A B A A	B B A A A A A A B A A A A C B A	1100 4043 4145			
2219	2319 4043 4145	B A A A A A A B A A	B A A A A A A B A A	B A A A A A B C B C A A B C B A	A A A A A A B C B C A A B C B A	2319 4043 4145				
2014, 2036	2319 4043 4145	B A A A A A A B A A	B A A A A A A B A A	C A A A A A B C B C A A B C B A	2319 4043 4145					
1100	1100 4043 5356	B B A A A A A A B A A	B B A A A A A A B A A	1100 4043 5356						
1060, 1070, 1080, 1350	1100 1188 4043	B B A A A B C C A A A A A A B A A	1100 1188 4043							

Aluminum Welding Filler Material Selection Chart

5083, 5456	5086, 5056	511.0, 512.0, 513.0, 514.0, 535.0, 5154, 5254	5454	6005, 6063, 6101, 6151, 6201, 6351, 6951	6061, 6070	7005, 7021, 7039, 7046, 7146, 710.0, 711.0	413.0, 443.0, 444.0, 356.0, A356.0, A357.0 359.0	319.0, 333.0, 354.0, 355.0, C355.0, 380.0	
W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M	W S D C T M
A A A A A	A A A A A	A A A A A	A A A A A A	B B A A A A A A B A A A	B B A A A A A A B A A A	B B A A A A A A B A A A	B B A A A A A A B A A A	B A A A A A A B B B A A	2319 4043 4145
A B B A A A A A A A	A B B A A A A A A A	A B B A A A A A B A	A B B A A A A A A B A	A B A A A A A A B B A	A B A A A A A A B B A	A B B A A A A A A A B	A B A A A A A A B B A B A A A A A A A A A A A A	4043 4145 A356.0 A357.0 5356	
				A D C B A	A D C B A	B D C B A	4043 4145 5183 5356 5554 5556 5654		
A A B A A A B A A A A A B A A	A A B A A A B A A A A A B A A	A A B A A A B A A A B C A A A A A B A A B C A A A	A A B A A A B A A A B C A A A A A A B A A B C A A A	A A B A A A B A A A B C A A A A A A B A A B C A A A	A A B A A A B A A A B C A A A A A A B A A B C A A A	A A B A A A B A A A B C A A A A A A B A A B C A A A			
A D C A A A B A A A B A A A B C A A A A A B A A B C A A B	A D C A A A B A A A B A A A B C A A A A A B A A B C A A B	A D C A B A B C B B B A C A C C A B B B A B C B C C A B A	A D C B A B A B C A B B A C A C C A A A A B A B C A C C A B B	A C B A A A C B A A B A A C A B B A C A C B A B B A B A A C A C B A B B	A C B A A A C B A A B A A C B B B A C A C B A B B B B A A C B C B A B B	4043 4145 4643 (1) 5183 5356 5554 5556 5654			
A B C A A A B A A A A A A A B A A A A A A B A A B A A A B	A B C A A A B A A A A A A A B A A A A A A B A A B A A A B	A B C A B A B C A B A A C A B A B C A B A B C A C A A B B	A B C B A B A B C A B A A C A C A A A A A B A B C A C A A B B	A C B A A A C B A A B A A C A B A A C A C B A B B A B A A C A C B A B B	4043 4145 4643 (1) 5183 5356 5554 5556 5654				
A A B B A A B A B A B C A A A A A B B A	A A B B A A B A B A B C A A A A A B B A	A A B B A A B A B A B C A A A A A B B A B C A A B	A A B B A A B A B A B C A A A A A A B B A B C A B B	4043 5183 5356 5554 5556 5654					
A A B A A A B A A A B C A A A A A B A A B C A A B	A A B A A A B A A A B C A A A A A B A A B C A A B	A A B B B A B A B A B C A A B A A B B A B C A A A	4043 5183 5356 5554 5556 5654						
A A B A A A B A A A A A B A A	A A B A A A B A A A A A B A A	4043 5183 5356 5554 5556 5654							
A(2)B A A A A A A A A B A A	4043 5183 5356 5554 5556 5654								
4043 5183 5356 5554 5556 5654									

How to Use

1. Select base alloys to be joined (one from the side blue column, the other from the top blue row).
2. Find the block where the column and row intersect.
3. This block contains horizontal rows of letters (A, B, C or D) representative of the alloy directly across from them in the filler alloy box at the end of each row. The letters in each line give the A-to-D rating of the characteristics listed at the top of each column – W, S, D, C, T and M (see Legend at right for explanation of each letter).
4. Analyze the weld characteristics afforded by each filler alloy. You will find that you can "trade off" one characteristic for another until you find the filler that best meets your needs.

Example

When joining base alloys 3003 and 1100, find the intersecting block. Now, note that filler alloy 1100 provides excellent ductility (D), corrosion resistance (C), performance at elevated temperatures (T) and color match after anodizing (M), with good ease of welding (W) and strength (S). However, if ease of welding and shear strength are UTMOST in importance, and ductility and color match can be sacrificed slightly, filler alloy 4043 can be used advantageously.

Aluminum Filler Alloy Chart

Symbol	Characteristics
W	Ease of welding (relative freedom from weld cracking).
S	Strength of welded joint (as-welded condition). (Rating applies particularly to fillet welds. All rods & electrodes rated will develope presently specified minimum strengths for butt welds).
D	Ductility. (Rating is based upon the free bend elongation of the weld).
C	Corrosion resistance in continuous or alternate immersion in fresh or salt water.
T	Recommended for service at sustained temperatures above 150 F (65.5 C). °
M	Color match after anodizing.
A, B, C & D are relative ratings in decreasing order of merit. The ratings have relative meaning only within a given block.	

NOTE: Combinations having no rating are not usually recommended. Ratings do not apply to these alloys when heat treated after welding.

(1) 4643 is a heat-treatable filler alloy and gives higher strength in thick 6xxx series weldments after postweld solution heat treatment and aging.

(2) An "A" rating for alloy 5083 to 5083. No rating for alloy 5456 to 5456.

4047 can be used in lieu of 4043 for thin section sheet due to the lower melting point of 4047.

Common Welding Conversion Data

Electrode Sizes		Pack Weights		Pack Weights		Lengths	
Imperial Unit	Metric Unit	Imperial Unit	Metric Unit	Imperial Unit	Metric Unit	Imperial Unit	Metric Unit
.025"	0.6mm	1lb	.45kg	1kg	2.20lb	2"	50.8mm
.030"	0.8mm	2lb	.91kg	2.5kg	5.50lb	4"	101.6mm
.035"	0.9mm	5lb	2.27kg	5kg	11.02lb	6"	152.4mm
.040"	1.0mm	10lb	4.54kg	10kg	22.05lb	8"	203.4mm
.045"	1.2mm	16lb	7.26kg	15kg	33.07lb	10"	254mm
.052"	1.3mm	20lb	9.07kg	17kg	37.48lb	12"	304.8mm
1/16"	1.6mm	25lb	11.34kg	25kg	55.11lb	14"	355.6mm
5/64"	2.0mm	30lb	13.61kg	30kg	66.14lb	15"	381mm
3/32"	2.4mm	33lb	14.97kg	50kg	110.23lb	16"	406.4mm
7/64"	2.8mm	40lb	18.14kg	60kg	132.27lb	17"	431.8mm
.120"	3.0mm	45lb	21.77kg	70kg	154.32lb	18"	457.2mm
1/8"	3.2mm	50lb	22.68kg	100kg	220.46lb	20"	508mm
5/32"	4.0mm	250lb	113.40kg	250kg	551.15lb	22"	558.8mm
3/16"	4.8mm	400lb	181.44kg	300kg	661.37lb	26"	660.4mm
7/32"	5.6mm	500lb	226.80kg	500kg	1102.29lb	30"	762mm
1/4"	6.4mm	600lb	272.16kg	810kg	1785.71lb	36"	914.4mm
5/16"	8.0mm	700lb	317.52kg	918kg	2023.81lb	39"	990.6mm
3/8"	9.5mm	1000lb	453.60kg	1000kg	2204.58lb	40"	1016mm

Imperial to Metric	Metric to Imperial	Imperial to Metric	Metric to Imperial
Length		**Weight & Gas Flow**	
inch x 25.4 = mm	mm x 0.0394 = inch	oz x 28.349 = grams	grams x 0.035 = oz
inch x 2.54 = cm	cm x 0.94 = inch	stones x 6.350 = kg	kg x 0.157 = stones
feet x 0.3048 = metre	metre x 3.281 = feet	lb x 0.4536 = kg	kg x 2.2045 = lb
mile x 1.609 = km	km x 0.621 = miles	cft/hr x 0.4719 = L/min	L/min x 2.119 = cft/hr
Energy & Speec		**Pressure & stress**	
ft.lb x 1.35582 = joules	joules x 0.73756 = ft.lb	psi x 6.895 = kPa	kPa x 0.14504 = psi
ft/min x 0.305 = m/min	m/min x 3.281 = ft/min	psi x 0.006895 = Mpa	Mpa x 145.04 = psi
in/sec x 2.54 = cm/sec	cm/sec x 0.394 = in/sec	psi x 0.006895 = N/mm^2	N/mm^2 x 145.04 = psi
in/min x 0.423 = mm/sec	mm/sec x 0.394 = in/min	psi x 0.0703 = kg/cm^2	kg/cm^2 x 14.223 = psi
in/min x 0.0254 = m/min	m/min x 393.78 = in/min	ksi x 6.895 = Mpa	Mpa x 0.14504 = ksi
Deposition Rate		**Heat Input = Joules (Volts x Amps x 60 ÷ WFS)**	
lb/hr x 0.4536 = kg/hr	kg/hr x 2.2045 = lb/hr	J/inch x 39.37 = J/metre	J/metre x .0254 = J/inch

HARDNESS CONVERSION TABLE

Tensile Strength		Brinell hardness		Vickers hardness	Rockwell hardness	
N/mm²	kp/mm² (kgf/mm²)	d(mm)	HB	HV	HRB	HRC
200	20.4	7.32	60	63		
220	22.4	7.04	66	69		
240	24.5	6.82	71	75		
260	26.5	6.56	78	82		
280	28.6	6.35	84	88	45	
300	30.6	6.19	89	94	51	
320	32.6	6.01	95	100	56	
340	34.7	5.83	102	107	60	
360	36.7	5.7	107	113	63.5	
380	38.7	5.57	113	119	66	
400	40.8	5.44	119	125	69	
420	42.8	5.32	125	132	72	
440	44.9	5.2	131	138	74	
460	46.9	5.11	136	143	76.5	
480	48.9	5	143	150	78.5	
500	51	4.9	149	157	81	
510	52	4.86	152	160	81.5	
520	53	4.81	155	163	82.5	
530	54	4.78	157	165	83	
540	55.1	4.74	160	168	84.5	
550	56.1	4.7	163	172	85.5	
560	57.1	4.66	166	175	86	
570	58.1	4.62	169	178	86.5	
580	59.1	4.58	172	181		
590	60.2	4.54	175	184	88	
600	61.2	4.51	178	187	89	
610	62.2	4.47	181	190	89.5	
620	63.2	4.44	184	193	90	
630	64.2	4.4	187	197	91	
640	65.3	4.37	190	200	91.5	
650	66.3	4.34	193	203	92	
660	67.3	4.32	195	205	92.5	
670	68.3	4.29	198	208	93	
680	69.3	4.25	201	212		
690	70.4	4.22	204	215	94	
700	71.4	4.19	208	219		
710	72.4	4.16	211	222	95.5	

HARDNESS CONVERSION TABLE

Tensile Strength		Brinell hardness		Vickers hardness	Rockwell hardness	
N/mm^2	kp/mm^2 (kgf/mm^2)	d(mm)	HB	HV	HRB	HRC
720	73.4	4.13	214	225	96	
730	74.4	4.11	216	228		
740	75.5	4.08	219	230	96.5	
750	76.5	4.07	221	233	97	
760	77.5	4.03	225	237	97.5	
770	78.5	4.01	228	240	98	
780	79.5	3.98	231	243		21
790	80.6	3.95	235	247	99	
800	81.6	3.93	238	250	99.5	22
810	82.6	3.91	240	253		
820	83.6	3.89	242	255		23
830	84.6	3.87	245	258		
840	85.7	3.84	249	262		
850	86.7	3.82	252	265		
860	87.7	3.8	255	268		25
870	88.7	3.77	258	272		26
880	89.7	3.76	261	275		
890	90.8	3.74	264	278		
900	91.8	3.72	266	280		27
920	93.8	3.68	273	287		28
940	95.9	3.64	278	293		29
960	97.9	3.61	284	299		
980	99.9	3.57	290	305		
1000	102	3.53	296	311		
1020	104	3.50	301	317		32
1040	106.1	3.47	307	323		
1060	108.1	3.44	314	330		
1080	110.1	3.41	319	336		34
1100	112.2	3.38	325	342		
1120	114.2	3.35	332	349		
1140	116.2	3.32	337	355		36
1160	118.3	3.29	343	361		
1180	120.3	3.26	349	367		

°F	°C	°F	°C	°F	°C	°F	°C
-459.4	-273	40	4.4	170	76.7	740	393.3
-440	-262	42	5.6	172	77.8	760	404.4
-430	-257	44	6.7	174	78.9	780	415.6
-420	-251	46	7.8	176	80.0	800	426.7
-410	-246	48	8.9	178	81.1	820	437.8
-400	-240	50	10.9	180	82.2	840	448.9
-390	-234	52	11.1	182	83.3	860	460
-380	-229	54	12.2	184	84.4	880	471.1
-370	-223	56	13.3	186	85.6	900	182.2
-360	-218	58	14.4	188	86.7	920	193.3
-350	-212	60	15.6	190	87.8	940	504.4
-340	-207	62	16.7	192	88.9	960	515.6
-330	-201	64	17.8	194	90.0	980	527
-320	-196	66	18.9	196	91.1	1000	538
-310	-190	68	20.0	198	92.2	1020	549
-300	-184	70	21.1	200	93.3	1040	560
-290	-179	72	22.2	202	94.4	1060	571
-280	-173	74	23.3	204	95.6	1080	582
-270	-168	76	24.4	206	96.7	1100	593
-260	-162	78	25.6	208	97.8	1120	604
-250	-157	80	26.7	210	98.9	1140	616
-240	-151	82	27.8	212	100.0	1160	627
-230	-146	84	28.9	214	101.0	1180	638
-220	-140	86	30.0	216	102.2	1200	649
-210	-134	88	31.1	218	103.3	1220	660
-200	-129	90	32.2	220	104.4	1240	671
-190	-123	92	33.3	230	110.0	1260	682
-180	-118	94	34.4	240	115.6	1280	693
-170	-112	96	35.6	250	121.1	1300	704
-160	-107	98	36.7	260	126.7	1320	716
-150	-101	100	37.8	270	132.2	1340	727
-140	-93	102	38.9	280	137.8	1360	738
-130	-90	104	40.0	290	143.3	1380	749
-120	-84	106	41.1	300	148.9	1400	760
-110	-79	108	42.2	310	154.4	1420	771
-100	-73	110	43.3	320	160.0	1440	782
-90	-68	113	44.4	330	165.6	1460	793
-80	-62	114	45.6	340	171.1	1480	804
-70	-57	116	46.7	350	176.1	1500	816
-60	-51	118	47.8	360	182.2	1520	827
-50	-45.6	120	48.9	370	187.8	1540	838
-40	-40.0	122	50.0	380	193.3	1560	849
-30	-34.4	124	51.1	390	198.9	1580	860
-20	-28.9	126	52.2	400	204.4	1600	871
-10	-23.3	128	53.3	410	210.0	1620	882
0	-17.8	130	54.4	420	215.6	1640	893
2	-16.7	132	55.6	430	221.1	1660	904
4	-15.6	134	56.7	440	226.7	1680	916
6	-14.4	136	57.8	450	232.2	1700	927
8	-13.3	138	58.9	460	237.8	1720	938
10	-12.2	140	60.0	470	243.3	1740	949
12	-11.1	142	61.1	480	248.9	1760	960
14	-10.0	144	62.2	490	254.4	1780	971
16	-8.9	146	63.3	500	260.0	1800	982
18	-7.8	148	64.4	520	271.1	1820	993
20	-6.7	150	65.6	540	282.2	1840	1004
22	-5.6	152	66.7	560	293.3	1860	1016
24	-4.4	154	67.8	580	304.4	1880	1027
26	-3.3	156	68.9	600	315.6	1900	1038
28	-2.2	158	10.0	620	326.7	1920	1049
30	-1.1	160	71.1	640	337.8	1940	1060
32	0	162	72.2	660	348.9	1960	1071
34	1.1	164	73.3	680	360.0	1980	1082
36	2.2	166	74.4	700	371.1	2000	1093
38	3.3	168	75.6	720	382.2	0	

Conversion Table for Elements

Symbol	Element	Symbol	Element	Symbol	Element
H	Hydrogen	Mo	Molybdenum	Ge	Germanium
Li	Lithium	W	Tungsten	Pb	Lead
Na	Sodium	Nm	Manganese	N	Nitrogen
K	Potassium	Tc	Technetium	Pb	Phosphorus
Cs	Cesium	ReFe	Rhenium	As	Arsenic
Fr	Francium	Fe	Iron	Sb	Antimony
Be	Beryllium	Co	Cobal	Bi	Bisnuth
Mg	Magnesium	Rh	Rhodium	S	Sulphur
Ca	Calcium	Ni	Nickel	O	Oxygen
Sr	Strontium	Pt	Platinum	F	Fluorine
Ba	Barium	Cu	Copper	CI	Chlorine
Ra	Radium	Ag	Silver	Br	Bromine
Sc	Scandium	Au	Aurum	I	Iodine
Y	Yttrium	Zn	Zinc	At	Astatine
Ti	Titanium	Cd	Cadnium	He	Helium
Zr	Zirconium	Hg	Mercury	Ar	Argon
V	Vanadium	B	Boron	Sn	Tin
Nb	Niobium	AI	Aluminum	Se	Selenium
Ta	Tantalum	C	Carbon		
Cr	Chromium	Si	Silicon		

VERIFICATION OF CONFORMITY

S/N: 007484

No.: **ICR/VC/HM240146**

Name and address of Applicant	DongGuan Linkweld Welding Technology Co.,Ltd Room 2304, Building 1, People's Financial Building, No111, Guantai Road, Nancheng Section, Dongguan City, Guangdong Province, China
Name and address of manufacturer:	DongGuan Linkweld Welding Technology Co.,Ltd Room 2304, Building 1, People's Financial Building, No111, Guantai Road, Nancheng Section, Dongguan City, Guangdong Province, China
Product name:	Welding comsumables
Product types:	LKE-6010, LKE-6011, LKE-6013, LKE-7016, LKE-7018, LKE-7018-1, LKE-7018-1 H4, LKE-E8016-G, LKE-E9016-G, LKE-E10018-G, LKE-E11018-G, LKE-E12018-G, LKE-7010-A1, LKE-7018-A1, LKE-8018-B2, LKE-9018-B3, LKE-8016-B6, LKE-8016-B8, LKE-9016-B9, LKE-8018-G, LKE-8018-C1, LKE-8018-C2, LKE-8018-C3, LKE-7018-W1, LKE-8018-W2, LKE-307-16, LKE-308-16, LKE-308L-16, LKE-309-16, LKE-309L-16, LKE-309MOL-16, LKE-310-16, LKE-312-16, LKE-316-16, LKE-316L-16, LKE-317L-16, LKE-318-16, LKE-347-16, LKE-410-16, LKE-2209-16, LKE-NiFe-Cl, LKE-Ni-Cl, LKE-NiFe-1, LKE-NiFe-2, LKE-NiFe-3, LKE-NiCrMo-3, LKE-NiCrMo-4, LKE-NiCrMo-6, LKE-NiCu-7, LW-40G, LW-50G, LW-65G, LW-80G, LW-95G, LW-110G, LKE-GOUTING, LKT-56, LKM-56, LKT-50, LKM-50, LKT-60, LKM-60, LKT-80B2, LKT-90B3, LKT-308L, LKM-308L, LKT-308LSi, LKM-308LSi, LKT-309L, LKM-309L, LKT-309LSi, LKM-309LSi, LKT-310, LKM-310, LKT-312, LKM-312, LKT-316L, LKM-316L, LKT-316LSi, LKM-316LSi, LKT-430, LKM-430, LKT-2209, LKM-2209, LKT-NiCrMo-3, LKM-NiCrMo-3, LKT-NiCrMo-4, LKM-NiCrMo-4, LKT-NiCr-3, LKM-NiCr-3, LKT-NiCu-7, LKM-NiCu-7, LKT-4043, LKM-4043, LKT-5356, LKM-5356, LKT-Cu, LKM-Cu, LKT-CuSi, LKM-CuSi, LFC-70, LFC-77, LFC-701, LFC-711, LFC-711M, LFC-711Ni, LFC-715, LFC-704, LFC-707, LFC-811A1, LFC-811B2, LFC-911B3, LFC-811Ni1, LFC-811Ni2, LFC-911Ni2, LFC-811K2, LFC-811W2, LFC-308H, LFC-308L, LFC-309L, LFC-309LMO, LFC-316L, LFC-347L, LFC-2209, LSF38 X LSW-EM12K, LSF56 X LSW-EM12K, LSF56 X LSW-EH14, LSF30 X LSW-308/308L, LSF30 X LSW-309/309L, LSF30 X LSW-316/316L
Product trademark:	n/a

Verification was carried within following scope:

Information on the Declaration of Conformity:

Result:	**Legislation:**	**Standard:**
✓	CPR	EN 13479:2017

The assessment process has been carried out in accordance with individual rules and conditions agreed with the applicant. Evaluation has been carried out in accordance with:

Test report:	ZBB07240105105
Tests conducted by:	DongGuan Linkweld Welding Technology Co.,Ltd
Issue date:	15.01.2024
Expiration date:	14.01.2029

Remarks:

- VoC was issued on voluntary basis and does not imply meeting all essential requirements listed in Declaration of Conformity.

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CEO, ICR Co., Ltd.

Edition: 5.1.0.B of 01.03.2023

VERIFICATION OF CONFORMITY

S/N: 008181

No.: **ICR/VC/HM2403114**

Name and address of Applicant	DONGGUAN LINKWELD WELDING TECHNOLOGY CO.,LTD Room 2304, Building 1, People's Financial Building, No111, Guantai Road, Nancheng Section, Dongguan City, Guangdong Province, China
Name and address of manufacturer:	DONGGUAN LINKWELD WELDING TECHNOLOGY CO.,LTD Room 2304, Building 1, People's Financial Building, No111, Guantai Road, Nancheng Section, Dongguan City, Guangdong Province, China
Product name:	WELDING CONSUMABLES
Product types:	see page 2/2
Product trademark:	n/a

Verification was carried within following scope:

Information on the Declaration of Conformity:

Result:	**Legislation:**	**Standard:**
✓	CPR [(EU) 305/2011]	EN 13479:2017 EN ISO 17632:2015 EN ISO 17633:2018

The assessment process has been carried out in accordance with individual rules and conditions agreed with the applicant.
Evaluation has been carried out in accordance with:

Test report:	ZBB07240326107
Tests conducted by:	DONGGUAN LINKWELD WELDING TECHNOLOGY CO.,LTD
Issue date:	27.03.2024
Expiration date:	26.03.2029

Remarks:

- VoC was issued on voluntary basis and does not imply meeting all essential requirements listed in Declaration of Conformity.
- For introducing this product on European market may be needed EC/EU-type examination conducted by appropriate Notified Body.

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Edition: 5.1.1.B of 06.03.2024

verification проверка verificación verification проверка verificación verification

VERIFICATION OF CONFORMITY

S/N: 008181

No.: **ICR/VC/HM2403114**

Product name: WELDING CONSUMABLES

Product types: LSW-EM12K, LSF40xLSW-EA2, LSW-EB2, LSW-EB3, LSW-EB6, LSW-EB8, LSW-EB91, LSW-EG-G, LSW-308H, LSW-317L, LSW-347, LSW-2209, LSW-NiCrMo-3, LSW-NiCrMo-4, LSW-NiCrMo-10, LFC-2594, LFC-309H, LFC-310, LFC-312, LFC-316H, LFC-318, LKE-11018-H4, LKE-11018-M, LKE-2594, LKE-308H, LKE-308L-15, LKE-309H, LKE-316H, LKE-316L-15, LKE-6013-VD, LKE-6019, LKE-7018-H4, LKE-7018-H4R, LKE-8018-B2, LKE-NiCrMo-10, LKE-8018-B8, LKE-8018-G, LKE-9015-B91H4, LKE-9015-B92H4, LKE-9018-B9, LKE-9018-G, LKE-NiCrMo-10, LKM-2594, LKM-5183, LKM-NiCrMo-10, LKT-2594, LKT-5183, LKT-NiCrMo-10, LSF-39 x LSW-EM12K, LSF-121T x LSW-EM12K, LSF-121T x EG-F3, LSF-330 x LSW-308H, LSF-330 x LSW-317L, LSF-340 x LSW-347, LSF-330 x LSW-2209, LSF-600x LSW-NiCrMo-3, LSF-600 x LSW-NiCrMo-4, LSF-600 x LSW-NiCrMo-10, LSF-40x LSW-EB2, LSF-40x LSW-EB3, LSF-40x LSW-EB6, LSF-40x LSW-EB8, LSF-40x LSW-EB91, LSF-68x LSW-EG-G, LKT308H, LKM308H

Remarks:

- VoC was issued on voluntary basis and does not imply meeting all essential requirements listed in Declaration of Conformity.
- For introducing this product on European market may be needed EC/EU-type examination conducted by appropriate Notified Body.

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Edition: 5.1.1.B of 06.03.2024

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