

S-4301.I

Type : Ilmenite

Conformances

AWS A5.1/ ASME SFA5.1 E6019
 JIS Z3211 E4319
 EN ISO 2560-A E35 2 RA 1 2
 KR 3
 ABS 3

LR 3
 BV 3
 DNV 3
 GL 3
 NK KMW3

Applications

- General fabrication
- Shipbuilding

Features

- Suitable for butt and fillet welding of thin and medium-thick plates (up to 20mm)
- Good crack resistance, pitting resistance
- Good X-ray performance

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		√						
3.2 (1/8)	350 (14)		√						
4.0 (5/32)	400 (16)		√						
	450 (18)								
4.5 (11/64)	400 (16)		√						
	450 (18)								
5.0 (3/16)	400 (16)		√						
	450 (18)								
6.0 (15/64)	450 (18)		√						

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.10	0.37	0.021	0.014

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	382 (55,500)	437 (63,500)	31.2	0 (32) -20 (-4)	88 (65) 56 (42)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16) 450 (18)	400 (16)	400 (16) 450 (18)	450 (18)
F & HF	50-85A	80-130A	120-180A	145-200A	170-250A	240-310A
V-up, OH	45-70A	60-110A	110-150A	120-180A	130-200A	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-4303.V

Type : Lime-Titania

Conformances

JIS	Z3211 E4303
EN	ISO 2560-A E38 2 RA 1 2
KR	3
ABS	3
LR	3
BV	3
DNV	3
GL	3
NK	KMW3

Applications

- General fabrication
- Shipbuilding

Features

- Suitable for butt and fillet welding of thin plates
- Good at vertical down
- Good mechanical properties

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
2.6 (3/32)	350 (14)	5kg(11lbs)	20kg(44lbs)
3.2 (1/8)	350 (14)	✓	✓
4.0 (5/32)	400 (16)	✓	✓
5.0 (3/16)	400 (16)	✓	✓
6.0 (15/64)	450 (18)	✓	✓

Typical Chemical Composition of All-Weld Metal(%)

C	Si	Mn	P	S
0.06	0.15	0.47	0.021	0.012

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	433 (62,800)	470 (68,100)	33.6	0 (32) -20 (-4)	110 (81) 72 (53)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	65~100A	100~140A	140~190A	200~260A	250~330A
V-up, OH	50~90A	80~130A	110~170A	140~210A	-

S-4303.T

Type : Lime-Titania

Conformances

JIS Z3211 E4303

EN ISO 2560-A E38 0 RA 1 2

Applications

- General fabrication
- Automotive
- Machinery

Features

- Suitable for butt and fillet welding of thin plates
- Good striking properties and high welding efficiency
- Suitable for tack welding
- Good mechanical properties

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.16	0.48	0.019	0.014

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	436 (63,300)	489 (71,000)	28.9	0 (32)	98 (73)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	65~100A	100~140A	140~190A	200~250A	250~330A
V-up, OH	50~90A	80~130A	110~170A	140~210A	-

SMW

SAW

GMW

GTW

FCW

Non-FERROUS

APPENDIX

S-6010.D

Type : Cellulosic

Conformances

AWS A5.1/ ASME SFA5.1 E6010
 JIS Z3211 E4310
 EN ISO 2560-A E38 0 C 2 1
 KR 2
 ABS 2
 LR 2
 BV 2
 DNV 2
 GL 2
 NK KMW2
 CWB CSA W48 E4310

Applications

- Pipe line
- General fabrication

Features

- Standard in the pipe welding industry
- Deep penetration
- High ductility (root pass)

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF-PG) (PE)

Current

DC +

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	√	
3.2 (1/8)	350 (14)	√	
4.0 (5/32)	400 (16)	√	
5.0 (3/16)	400 (16)	√	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.10	0.17	0.42	0.015	0.017

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	447 (64,900)	517 (75,000)	32.3	-30 (-22)	62 (46)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	50~75A	75~125A	90~165A	140~220A
V-up, OH	50~75A	75~125A	90~165A	140~220A

S-6011.D

Type : Cellulosic

Conformances

AWS	A5.1/ ASME SFA5.1 E6011
JIS	Z3211 E4311
EN	ISO 2560-A E38 0 C 1 1
KR	2
ABS	2
LR	2
BV	2
DNV	2
GL	2
NK	KMW2

Applications

- Pipe line
- General fabrication
- Shipbuilding

Features

- Standard in the pipe welding industry
- Deep penetration
- High ductility (root pass)
- AC and DC welding

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF-PG) (PE)

Current

AC or DC +

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.11	0.16	0.51	0.015	0.012

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	468 (68,000)	558 (81,000)	29.7	-30 (-22)	51 (38)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	50~75A	75~125A	90~165A	140~220A
V-up, OH	50~75A	75~125A	90~165A	140~220A

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-6013.LF

Type : Rutile

Conformances

AWS A5.1/ ASME SFA5.1 E6013
 JIS Z3211 E4313
 EN ISO 2560-A E38 0 R 1 2
 KR 2
 ABS 2
 LR 2

BV 2
 DNV 2
 GL 2
 NK KMW2
 NAKS

Applications

- General fabrication

Features

- Suitable for butt and fillet welding of thin plates
- Good restriking
- Good bead appearance
- Easy to remove slag
- Smooth arc and low fume
- AC welding with low ocv

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓						
3.2 (1/8)	350 (14)		✓						
4.0 (5/32)	400 (16)		✓						
	450 (18)								
5.0 (3/16)	400 (16)		✓						
	450 (18)								
6.0 (15/64)	450 (18)		✓						

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.05	0.23	0.35	0.022	0.017

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	439 (63,700)	488 (70,900)	26.8	0 (32)	67 (50)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16) 450 (18)	400 (16) 450 (18)	450 (18)
F & HF	50-95A	80-130A	120-180A	160-230A	220-300A
V-up, OH	45-90A	60-120A	100-160A	120-220A	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-6013.V

Type : Rutile-Cellulosic

Conformances

AWS A5.1/ ASME SFA5.1 E6013
 JIS Z3211 E4313
 EN ISO 2560-A E38 0 RC 1 1
 KR 2
 ABS 2
 LR 2
 NK KMW2
 CWB CSA W48 E4313
 TÜV EN ISO 2560-A - E38 0 RC 1 1

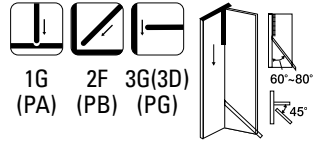
Applications

- General fabrication

Features

- Suitable for butt and fillet welding of thin plates
- Good at vertical down
- Good restriking
- Good bead appearance
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.09	0.32	0.48	0.017	0.012

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	460 (66,700)	550 (79,800)	27.5	0 (32)	65 (48)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	60~100A	100~140A	140~190A	190~240A
V-up, OH	45~90A	60~120A	100~160A	120~220A

S-6027.LF

Type : High recovery Rutile

Conformances

AWS A5.1/ ASME SFA5.1 E6027
 JIS Z3211 E4327
 EN ISO 2560-A E38 0 R 1 4
 KR 3
 ABS 3

LR 3,3G
 BV 3
 DNV 3
 GL 3
 NK KMW3

Applications

- General fabrication

Features

- High efficient fillet welding
- Low fume
- Good welding performance in manual and gravity welding

Welding Position



1G 2F
 (PA) (PB)

Current

AC or DC +

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
4.0 (5/32)	550 (22)		✓						
4.5 (11/64)	700 (28)		✓						
5.0 (3/16)	700 (28)		✓						
5.5 (7/32)	700 (28)		✓						
6.0 (15/64)	700 (28)		✓						
6.4 (1/4)	700 (28)		✓						
7.0 (9/32)	700 (28)		✓						

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.32	0.76	0.023	0.013

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	448 (65,100)	499 (72,500)	32.0	-30 (-22)	47 (35)

Typical Operating Procedures

Diameter mm (in)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)	5.5 (7/32)	6.0 (15/64)	6.4 (1/4)	7.0 (9/32)
Length mm (in)	550 (22)	550 (22) 700 (28)	700 (28)	700 (28)	700 (28)	700 (28)	700 (28)
F	140~180	170~210	180~230	210~250	240~290	260~310	280~330
GW	150~180	160~200	180~240	210~260	230~290	250~310	280~330

S-7014.F

Type : High recovery Rutile

Conformances

AWS A5.1/ ASME SFA5.1 E7014
 EN ISO 2560-A E42 0 R 1 2
 KR 2, 2Y
 ABS 2Y
 LR 2, 2Y
 BV 2, 2Y
 DNV 2
 GL 2Y
 NK KMW52

Applications

- General fabrication

Features

- High welding speed
- Easy horizontal fillet and groove welding

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.30	0.66	0.022	0.015

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	449 (65,200)	510 (74,100)	30.9	0 (32)	83 (61)

Typical Operating Procedures

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	400 (16)	400 (16)	400 (16)	450 (18)
F	95~140	140~200	180~250	240~310

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7024.F

Type : High recovery Rutile

Conformances

AWS A5.1/ ASME SFA5.1 E7024
 JIS Z3211 E4924
 EN ISO 2560-A E42 0 RR 7 4
 ABS 2

LR 2, 2Y, 2YG
 DNV 2 (25 t)
 NK KMW2, KMW52
 CWB CSA W48 E4924

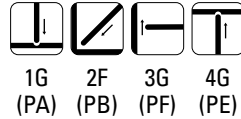
Applications

- Heavy steel fabrication
- Shipbuilding

Features

- Highly efficient fillet welding
- High welding speed
- Good bead appearance
- Easy to remove slag

Welding Position



Current

AC or DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
3.2 (1/8)	400 (16)		✓						
4.0 (5/32)	450 (18)		✓						
4.5 (11/64)	450 (18)		✓						
	700 (28)								
5.0 (3/16)	450 (18)		✓						
	700 (28)								
6.0 (15/64)	450 (18)		✓						
	700 (28)								

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.42	0.82	0.022	0.014

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	513 (74,400)	561 (81,400)	23.4	0 (32)	61 (45)

Typical Operating Procedures

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	400 (16)	450 (18)	450 (18) 700 (28)	450 (18) 700 (28)	450 (18) 700 (28)
F	100~150	140~200	180~230	200~250	260~300

S-7016.0

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016
 JIS Z3211 E4316
 EN ISO 2560-A E42 2 B 1 2
 KR 3H10, 3YH10
 ABS 3H10, 3Y
 LR 3, 3YH15
 DNV 3YH10
 NK KMW53HH
 NAKS

Applications

- Pipe line

Features

- Suitable for one side welding of pipe
- Stable arc
- Relatively low current

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.45	1.10	0.015	0.007

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	511 (74,200)	597 (86,700)	31.2	-30 (-22)	82 (61)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	400 (16)	400 (16)
F	60~90	90~130	130~190	180~240
FV-up, OH	50~80	80~120	110~180	150~210
Root pass	30~65	60~110	90~150	130~180

S-7016.M

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016
 JIS Z3211 E4316
 EN ISO 2560-A E42 2 B 1 2
 KR 3H10, 3YH10
 ABS 3H10, 3Y
 NK KMW53HH

Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good X-ray performance
- Good mechanical properties

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.64	1.18	0.018	0.009

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	539 (78,300)	617 (89,600)	26.5	-20 (-4)	73 (54)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~85	90~140	140~190	190~250	250~320
V-up, OH	50~80	80~130	110~170	160~210	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7016.H

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016
 JIS Z3211 E4916
 EN ISO 2560-A E42 2 B 1 2
 KR 3H10, 3YH10
 ABS 3H10, 3Y
 LR 3, 3YH15
 BV 3YHH
 DNV 3YH10
 GL 3YH10
 NK KMW53HH
 RS 3Y H10
 CWB CSA W48 E4916

Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good crack resistance and X-ray performance
- Good mechanical properties

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.62	1.22	0.017	0.011

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	560 (81,300)	620 (90,700)	28.5	-30 (-22)	80 (59)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55-85	90-130	130-180	180-240	250-310
V-up, OH	50-80	80-120	110-170	150-200	-

S-7016.HR

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016 H4R

JIS Z3211 E4916 H5

EN ISO 2560-A E42 3 B 1 2 H5

Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Extra low hydrogen electrode
- Good mechanical properties
- Vacuum sealed package available (HDM ≤ 4ml/100g)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.064	0.56	1.00	0.012	0.005

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	493 (71,500)	561 (81,400)	30.4	-30 (-22)	173 (128)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16) 450 (18)	400 (16) 450 (18)
F &HF	50-95A	90-140A	130-180A	180-240A
V-up, OH	50-95A	90-130A	120-160A	150-200A

S-7016.LF

Type : Basic

Conformances

AWS	A5.1/ ASME SFA5.1 E7016
JIS	Z3211 E4916
EN	ISO 2560-A E42 3 B 1 2
KR	3H10, 3Y H10
ABS	3H10, 3Y
LR	3, 3YH15
BV	3, 3YHH
DNV	3YH10
GL	3YH10
NK	KMW53HH

Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good crack resistance and X-ray performance
- Good mechanical properties
- Low fume

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.62	1.29	0.016	0.011

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	550 (79,900)	605 (87,800)	29.0	-30 (-22)	75 (56)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55-85	90-130	130-180	180-240	250-310
V-up, OH	50-80	80-130	110-170	150-200	-

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7016.G

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7016

JIS Z3211 E4916

EN ISO 2560-A E42 3 B 1 2

Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good crack resistance and X-ray performance
- Good mechanical properties

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.08	0.66	1.40	0.017	0.011

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	560 (81,300)	641 (93,100)	30.4	-30 (-22)	68 (50)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55-90	90-130	130-180	180-240	250-310
V-up, OH	50-80	85-120	110-170	150-200	-

S-7018.G

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7018
 JIS Z3211 E4918
 EN ISO 2560-A E42 3 B 1 2
 KR 3H10, 3Y H10
 ABS 3H10, 3Y
 LR 3, 3YH15
 BV 3YHH
 DNV 3YH10
 GL 3YH10
 NK KMW53HH
 NAKS

Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Suitable for butt and fillet welding of heavy structure
- Good crack resistance and X-ray performance
- Good mechanical properties
- Iron powder and low hydrogen type electrode (high efficiency)

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.50	1.20	0.017	0.011

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	504 (73,200)	572 (83,100)	29.8	-30 (-22)	111 (82)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	5.5 (7/32)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)	450 (18)
	-	400 (16)	450 (18)	450 (18)		
F	60-90	90-140	130-190	180-240	220-260	250-300
V-up, OH	50-80	80-120	120-170	150-200	-	-

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard / P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
5.5 (7/32)	450 (18)	✓	
6.0 (15/64)	450 (18)	✓	

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7018.GH

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7018
 JIS Z3211 E4918 H5
 EN ISO 2560-A E42 3 B 3 2 H5

CWB CSA W48 E4918

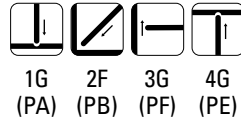
Applications

- Heavy steel fabrication
- Shipbuilding
- Pressure vessels

Features

- Low hydrogen electrode
- Iron powder and low hydrogen type electrode (high efficiency)
- Good mechanical properties
- Vacuum sealed package available (HDM ≤ 5ml/100g)

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	
6.0 (15/64)	450 (18)	✓		✓		✓		✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.42	1.21	0.018	0.006

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	488 (70,800)	566 (82,100)	27.4	-30 (-22)	126 (93)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14) -	350 (14) 400 (16)	400 (16) 450 (18)	400 (16) 450 (18)	450 (18)
F	60-90	90-140	130-190	180-240	250-300
V-up, OH	50-80	80-120	120-170	150-200	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7028.F

Type : High recovery Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7028

JIS Z3211 E4928

EN ISO 2560-A E42 2 B 7 4

KR 3Y

ABS 3, 3Y

LR 3, 3Y, 3YG

BV 3, 3Y

DNV 3 (25 t)

GL 3Y

NK KMW3, KMW53

Applications

- Heavy steel fabrication

Features

- Heavy iron powder type electrode
- High deposition rate
- Easy to remove slag

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
4.0 (5/32)	550 (22)		√						
4.5 (11/64)	550 (22)		√						
	700 (28)								
5.0 (3/16)	700 (28)		√						
5.5 (7/32)	700 (28)		√						
6.0 (15/64)	700 (28)		√						
6.4 (1/4)	700 (28)		√						
7.0 (9/32)	700 (28)		√						

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.07	0.29	1.08	0.027	0.015

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	478 (69,400)	546 (79,300)	32.0	-20 (-4)	63 (47)

Typical Operating Procedures

Diameter mm (in)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)	5.5 (7/32)	6.0 (15/64)	6.4 (1/4)	7.0 (9/32)
Length mm (in)	550 (22)	550 (22) 700 (28)	700 (28)	700 (28)	700 (28)	700 (28)	700 (28)
F	150-220	170-220	190-250	220-280	260-320	270-340	330-360

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7048.V

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7048
 JIS Z3211 E4948
 EN ISO 2560-A E42 3 B 3 5
 KR 3H10, 3YH10
 ABS 3H10, 3Y
 LR 3, 3YH15
 BV 3, 3YHH
 DNV 3YH10
 GL 3YH10
 NK KMW53HH

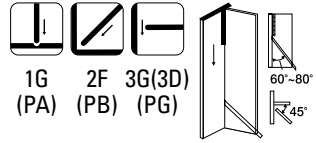
Applications

- Heavy steel fabrication
- Automotive
- Machinery

Features

- Suitable for tack welding
- Good at vertical down
- Good restriking
- Good bead appearance
- Easy to remove slag

Welding Position



Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.54	1.05	0.011	0.009

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	473 (68,700)	564 (81,900)	30.8	-30 (-22)	68 (50)

Typical Operating Procedures

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	4.5 (11/64)	5.0 (3/16)
Length mm (in)	400 (16)	450 (18)	450 (18)	450 (18)
F, V-down	100~160	140~210	180~240	220~270

S-8016.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-G
 JIS Z3211 E5516
 EN ISO 2560-A E46 3 1Ni B 1 2
 ABS AWS A5.5 E8016-G

Applications

- Heavy steel fabrication
- Shipbuilding
- Offshore structure

Features

- Good bead appearance
- Good crack resistance
- Good X-ray performance
- Good mechanical properties

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.08	0.34	1.44	0.011	0.009	0.94

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	519 (75,400)	613 (89,000)	28.8	-20 (-4) -30 (-22)	160 (119) 141 (104)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~180	180~240	250~310
V-up, OH	50~80	85~120	110~170	150~200	-

SMW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8018.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-G

JIS Z3211 E5518

EN ISO 2560-A E46 2 1Ni B 3 2

Applications

- Heavy steel fabrication
- Shipbuilding
- Offshore structure

Features

- Good bead appearance
- Good crack resistance
- Good X-ray performance
- Good mechanical properties
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.07	0.61	1.29	0.016	0.012	0.83

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	542 (78,700)	622 (90,300)	30.2	0 (32) -20 (-4)	147 (109) 103 (76)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60-90	90-140	130-190	180-240	250-300
V-up, OH	50-80	80-120	120-170	150-200	-

S-9016.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9016-G
 JIS Z3211 E5716
 EN ISO 2560-A E50 2 B 1 2
 ABS AWS A5.5 E9016-G

Applications

- Heavy steel fabrication
- Shipbuilding
- Offshore structure

Features

- Good bead appearance
- Good crack resistance
- Good X-ray performance
- Good mechanical properties

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.06	0.52	1.09	0.016	0.010	0.56	0.23

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	570 (82,800)	655 (95,100)	27.2	0 (32) -20 (-4)	125 (93) 78 (58)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~180	180~240	250~310
V-up, OH	50~80	85~120	110~170	150~200	-

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-10016.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E10016-G
 JIS Z3211 E6916-N4CM1 U
 EN 757 E55 0 B 1 2
 ABS AWS A5.5 E10016-G

Applications

- Heavy steel fabrication
- Pressure vessels
- Power plant

Features

- Good crack resistance
- Good X-ray performance
- Good mechanical properties

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.07	0.69	1.41	0.013	0.012	1.49	0.12

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	710 (103,130)	762 (110,680)	24.0	0 (32)	110 (81)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55-90	90-130	130-180	170-240	250-310
V-up, OH	50-80	85-120	110-170	150-200	-

S-11016.G

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E11016-G
 EN 757 E62 2 Mn2NiMo B 1 2
 ABS AWS A5.5 E11016-G

Applications

- Heavy steel fabrication
- Pressure vessels
- Power plant

Features

- Good crack resistance
- Good mechanical properties

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.07	0.45	1.56	0.017	0.013	0.20	2.25	0.40

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	760 (110,300)	790 (114,600)	24.0	-20 (-4)	130 (96)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~130	130~180	180~240	250~310
V-up, OH	50~80	85~120	110~170	150~200	-

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-9018.M

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9018-M

EN 757 E50 4 B 4 2

ABS AWS A5.5 E9018-M

Applications

- Heavy steel fabrication
- Pressure vessels

Features

- Good crack resistance
- Good X-ray performance
- Good impact value at -50°C
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Mo
0.05	0.46	1.21	0.017	0.011	1.47	0.22

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	585 (85,000)	646 (93,800)	27.6	-50 (-58)	89 (66)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	70~100	90~140	130~190	180~240	250~300
V-up, OH	60~80	80~120	120~170	150~200	-

S-11018.M

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E11018-M

EN 757 E62 4 B 4 2

ABS AWS A5.5 E11018-M

Applications

- Low alloy high tensile steels

Features

- Iron powder and low hydrogen type electrode (high efficiency)
- Good crack resistance
- Good X-ray performance
- Good impact value at -50°C

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.07	0.48	1.62	0.023	0.012	0.21	2.04	0.35

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	722 (104,900)	796 (115,600)	21.6	-50 (-58)	50 (37)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7018.W

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7018-W1

JIS Z3214 DA5026G

EN ISO 2560-A E42 2 B 3 2

Applications

- High tensile weathering steel

Features

- Suitable for off- and on-shore construction
- High resistance to corrosion caused by seawater or combinations of oil, gas and seawater
- Contains Cu, Ni and Cr (All-weld metal)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Cu
0.05	0.56	0.62	0.015	0.013	0.24	0.23	0.37

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	505 (73,300)	573 (83,200)	31.3	-20 (-4)	100 (74)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~140	130~190	180~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

S-8018.W

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-W2

JIS Z3214 DA5826W

EN ISO 2560-A E50 2 B 3 2

Applications

- High tensile weathering steel

Features

- Suitable for off- and on-shore construction
- High resistance to corrosion caused by seawater or combinations of oil, gas and seawater
- Contains Cu, Ni and Cr (All-weld metal)

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Cu
0.06	0.54	0.95	0.014	0.011	0.56	0.57	0.38

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	604 (87,700)	648 (94,100)	27.4	-20 (-4)	117 (87)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~140	130~190	180~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7018.1

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7018-1
 JIS Z3211 E4918
 EN ISO 2560-A E42 4 B 3 2
 ABS 3H10, 3Y
 BV 3Y HH
 LR 3, 3Y H15
 DNV 3Y H10
 GL 3Y H10
 RINA 3Y H10

Applications

- Heavy steel fabrication
- Low temperature strength steel
- Offshore structure

Features

- Suitable for butt and fillet welding of thin and medium-thick plates (up to 20mm)
- Iron powder and low hydrogen type electrode (high efficiency)
- Good impact value at -45°C

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard / P.V.C	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.25	1.25	0.017	0.012

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
AW	480 (69,700)	550 (79,800)	30.2	-45 (-49)	94 (70)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	60~90	90~140	130~190	180~240	250~300
V-up, OH	50~80	80~120	120~170	150~200	-

S-7018.1H

Type : Basic

Conformances

AWS A5.1/ ASME SFA5.1 E7018-1 H4R
 JIS Z3211 E4918 H5
 EN ISO 2560-A E42 4 B 3 2 H5
 ABS 4Y H5
 LR 4Y H5

BV 4Y HHH
 DNV 4YH5
 GL 4YH5
 CWB CSA W48 E4918-1

Applications

- Heavy steel fabrication
- Low temperature strength steel
- Offshore structure

Features

- Extra low hydrogen electrode
- Good impact value at -45°C
- Vacuum sealed package available (HDM ≤ 4ml/100g)

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S
0.06	0.25	1.35	0.014	0.005

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	493 (71,500)	566 (82,100)	30.8	-45 (-49)	152 (112)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	450 (18)	450 (18)
F	60-90	90-140	130-190	180-240
V-up, OH	50-80	80-120	120-170	150-200

S-76LTH

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7016-G

JIS Z3211 E4916-N1 AP L

EN ISO 2560-A E42 6 Z B H5

ABS 5Y, 5Y400 H5

DNV 5Y40H5

NV4-4L

Applications

- Low temperature strength steel
- Offshore structure
- LPG, LNG storage tank

Features

- Low hydrogen electrode (HDM \leq 5ml/100g)
- Good impact value at -60°C
- CTOD properties at -40°C (-40°F) temperature

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Ti	B
0.08	0.35	1.35	0.013	0.004	0.45	0.018	0.0015

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	540 (78,400)	590 (85,600)	30.0	-46 (-51) -60 (-76)	190 (137) 100 (72)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	450 (18)	450 (18)
F	60~90	90~140	130~190	180~240
V-up, OH	50~80	80~120	120~170	150~200

S-78LTH

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7018-G

EN ISO 2560-A E46 5 1Ni B 3 2 H5

Applications

- Low temperature strength steel
- Offshore structure
- LPG, LNG storage tank

Features

- Low-Hydrogen electrode
- Iron powder and low hydrogen type electrode (high efficiency)
- Good impact value at -60°C
- Vacuum sealed package available (HDM ≤ 5ml/100g)

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC or DC +

Redrying Conditions

350~400°C (662~752°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni	Ti	B
0.06	0.23	1.25	0.015	0.004	0.73	0.023	0.003

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	525 (76,100)	600 (87,000)	32	-45 (-51) -60 (-76)	165 (121) 113 (83)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	450 (18)	450 (18)
F	60~90	90~140	130~190	180~240
V-up, OH	50~80	80~120	120~170	150~200

S-7016.LS

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7016-G H4R
 JIS Z3211 E4916-N1 AP L
 EN ISO 2560-A E46 6 1Ni B 1 2
 KR 3H10, 3YH10 (-60°C ≥34 J)
 ABS 3H10, 3Y (-60°C ≥34 J)

LR 5Y40H15
 BV 3, 3YHH (-60°C ≥34 J)
 DNV 5YH10

Applications

- Low temperature strength steel
- Offshore structure
- LPG, LNG storage tank

Features

- Extra low hydrogen electrode
- Good impact value at -60°C
- CTOD properties at -10°C (14°F) temperature
- Vacuum sealed package available (HDM ≤ 4ml/100g)

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.30	0.98	0.013	0.008	0.80

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)
AW	538 (78,100)	589 (85,500)	30.0	-45 (-49) -60 (-76)	95 (70) 73 (54)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55-85	90-130	130-180	180-240	250-310
V-up, OH	50-80	80-115	110-170	150-200	-

S-8016.C1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-C1

JIS Z3211 E5516-N5 AP L

EN ISO 2560-A E46 5 2Ni B 1 2

Applications

- Low temperature strength steel (2.5% Ni)
- Offshore structure

Features

- Good impact value at -60°C

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.52	1.03	0.012	0.006	2.38

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
AW	515 (74,800)	592 (86,000)	32.0	-60 (-76)	116 (86)	605 (1121°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8016.C2

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-C2

JIS Z3211 E5516-N7 AP L

EN ISO 2560-A E46 6 3Ni B 1 2

Applications

- Low temperature strength steel (3.5% Ni)
- Offshore structure

Features

- Good impact value at -60~-75°C

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.50	0.90	0.011	0.006	3.20

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
AW	530 (77,000)	630 (91,000)	30.0	-75 (-103)	60 (44)	605 (1121°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55-90	90-130	130-190	190-240	250-300
V-up, OH	50-80	80-120	120-170	-	-

S-8016.C3

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-C3

JIS Z3211 E5516-N2

EN ISO 2560-A E46 4 1Ni B 1 2

Applications

- Low temperature strength steel (1% Ni)
- Offshore structure

Features

- Good impact value at -40°C

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.06	0.54	1.12	0.015	0.006	0.96

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	540 (78,400)	620 (90,000)	26.0	-40 (-40)	80 (59)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8018.C1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-C1

JIS Z3211 E5518-N5 AP L

EN ISO 2560-A E46 5 1Ni B 3 2

Applications

- Low temperature strength steel (2.5% Ni)
- Offshore structure

Features

- Good impact value at -60°C
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.08	0.66	0.70	0.011	0.009	2.40

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
AW	518 (75,200)	593 (86,100)	30.2	-60 (-76)	78 (58)	605 (1121°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	400 (16)	400 (16)	450 (18)
F	90~130	130~180	190~240	250~300
V-up, OH	80~120	120~170	-	-

S-8018.C3

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-C3

JIS Z3211 E5518-N2

EN ISO 2560-A E46 4 1Ni B 3 2

Applications

- Low temperature strength steel (1% Ni)
- Offshore structure

Features

- Good impact value at -40°C
- Iron powder and low hydrogen type electrode (high efficiency)

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC or DC +

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Ni
0.07	0.59	1.00	0.020	0.009	0.94

Typical Mechanical Properties of All-Weld Metal

Condition	YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
AW	540 (78,400)	619 (89,900)	30.8	-40 (-40)	76 (56)

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F	55~90	90~130	130~190	190~240	250~300
V-up, OH	50~80	80~120	120~170	-	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7010.A1

Type : Cellulesic

Conformances

AWS A5.5/ ASME SFA5.5 E7010-A1
 EN ISO 2560-A - E42 0 Mo C 1 5
 ABS AWS A5.5 E7010-A1
 LR 2Y

Applications

- Low alloy steel (0.5% Mo)
- Pipe line

Features

- Good X-ray performance
- Good mechanical properties

Welding Position



5G Up/Down
(PF-PG)

Current

DC ±

Redrying Conditions

70~100°C (158~212°F) X 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.09	0.12	0.32	0.015	0.015	0.61

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
552 (80,000)	575 (83,400)	28.4	620°C(1148°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	55~80A	80~120A	120~160A	160~210A
V-up, OH	50~70A	70~110A	110~150A	-

S-7016.A1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7016-A1

JIS Z3223 E4916-1M3

EN 1599 - E Mo B 1 2

Applications

- Low alloy steel (0.5% Mo)
- Pressure vessels

Features

- Good mechanical properties
- Good bead appearance

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.07	0.50	0.80	0.012	0.008	0.60

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
560 (81,000)	650 (94,000)	28.0	620°C(1148°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55-90A	90-130A	130-190A	190-240A	250-300A
V-up, OH	50-80A	80-120A	120-170A	-	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-7018.A1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E7018-A1

JIS Z3223 E4918-1M3

EN 1599 - E Mo B 3 2

Applications

- Low alloy steel (0.5% Mo)
- Pressure vessels

Features

- Good mechanical properties
- Good bead appearance
- Iron powder type electrode (high efficiency)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Mo
0.07	0.77	0.88	0.018	0.010	0.52

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
477 (69,300)	617 (89,600)	32.8	620°C(1148°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90A	90~130A	130~190A	190~240A	250~300A
V-up, OH	50~80A	80~120A	120~170A	-	-

S-8016.B1

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B1

EN 1599 - E CrMo0.5 B 1 2

Applications

- Low alloy steel (0.5%Cr-0.5%Mo)
- Pressure vessels
- Power plant

Features

- Good crack resistance

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.05	0.57	0.85	0.012	0.005	0.51	0.51

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
505 (73,300)	589 (85,500)	31.0	690°C(1274°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55-90A	90-130A	130-190A	190-240A	250-300A
V-up, OH	50-80A	80-120A	120-170A	-	-

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8016.B2

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B2

JIS Z3223 E5516-1CM

EN 1599 - E CrMo1 B 1 2

ABS A5.5 E8016-B2

Applications

- Low alloy steel (1.25%Cr-0.5%Mo)
- Pressure vessels
- Power plant

Features

- Maximum service temperature at 550°C (1022°F)
- Good mechanical properties
- Good creep resistance

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.07	0.51	0.66	0.012	0.008	1.22	0.54

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
537 (78,000)	622 (90,300)	29.8	690°C(1274°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90A	90~130A	130~190A	190~240A	250~300A
V-up, OH	50~80A	80~120A	120~170A	-	-

S-8018.B2

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-B2
 JIS Z3223 E5518-1CM
 EN 1599 - E CrMo1 B 3 2
 ABS A5.5 E8018-B2

Applications

- Low alloy steel (1.25%Cr-0.5%Mo)

Features

- Iron powder and low hydrogen type electrode (high efficiency)
- Good mechanical properties
- Good creep resistance

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X
 0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.08	0.32	0.75	0.012	0.005	1.20	0.50

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
563 (82,000)	641 (93,000)	27.6	690°C(1274°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90A	90~130A	130~190A	190~240A	250~300A
V-up, OH	50~80A	80~120A	120~170A	-	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-8018.B2R

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8018-B2

JIS Z3223 E5518-1CM

EN 1599 - ECrMo1 B 3 2 H5

Applications

- Low alloy steel (1.25%Cr-0.5%Mo)

Features

- Relevant elements P, Sn, As and Sb controlled (X-Factor ≤ 15 ppm)
- Low-Hydrogen electrode (HDM ≤ 5 ml/100g)
- Iron powder type electrode (high efficiency)
- Good impact value at low temperature

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC \pm

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)			✓		✓		✓	
3.2 (1/8)	350 (14)			✓		✓		✓	
4.0 (5/32)	400 (16)			✓		✓		✓	
5.0 (3/16)	400 (16)			✓		✓		✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Sn	As	Sb	X-factor(ppm)
0.069	0.57	0.82	0.007	0.010	1.32	0.58	0.0050	0.0020	0.0010	10.4

$$X\text{-factor} = (10P + 5Sb + 4Sn + As)/100 \leq 15 \text{ (ppm)}$$

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)	Heat Treatment
608 (88,200)	684 (99,200)	25.4	0 (32) -20 (-4)	144 (106) 62 (46)	690°C(1274°F) X 1hr. S.R
606 (87,900)	661 (95,900)	27.2	0 (32) -20 (-4)	143 (106) 91 (67)	690°C(1274°F) X 2hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55-90A	90-130A	130-190A	190-240A
V-up, OH	50-80A	80-120A	120-180A	-

S-9016.B3

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9016-B3

JIS Z3223 E6216-2C1M

EN 1599 - ECrMo2 B 1 2

Applications

- Low alloy steel (2.25%Cr-1%Mo)
- Pressure vessels
- Power plant

Features

- Maximum service temperature at 600°C (1112°F)
- Good mechanical properties
- Good creep resistance

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.07	0.57	0.82	0.022	0.012	2.32	1.07

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
554 (80,500)	663 (96,300)	25.6	690°C(1274°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90A	90~130A	130~190A	190~240A	250~300A
V-up, OH	50~80A	80~120A	120~170A	-	-

S-9018.B3

Type : Basic

Conformances

AWS	A5.5/ ASME SFA5.5 E9018-B3
JIS	Z3223 E6218-2C1M
EN	1599 - ECrMo2 B 3 2
KR	AWS A5.5 E9018-B3
ABS	AWS A5.5 E9018-B3
LR	AWS A5.5 E9018-B3
DNV	H10

Applications

- Low alloy steel (2.25%Cr-1%Mo)

Features

- Maximum service temperature at 600°C (1112°F)
- Good mechanical properties
- Good creep resistance
- Iron powder low hydrogen type electrode (high efficiency)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X
0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.08	0.64	0.83	0.020	0.011	2.11	1.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
570 (82,800)	677 (98,300)	24.2	690°C(1274°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55-90A	90-130A	130-190A	190-240A	250-300A
V-up, OH	50-80A	80-120A	120-170A	-	-

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-9018.B3R

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9018-B3

JIS Z3223 E6218-2C1M

EN 1599 - ECrMo2 B 3 2 H5

Applications

- Low alloy steel (2.25%Cr-1%Mo)

Features

- Relevant elements P, Sn, As and Sb controlled (X-Factor ≤ 15 ppm)
- Low-Hydrogen electrode (HDM ≤ 5 ml/100g)
- Iron powder type electrode (high efficiency)
- Good impact value at low temperature

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC \pm

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)			✓		✓		✓	
3.2 (1/8)	350 (14)			✓		✓		✓	
4.0 (5/32)	400 (16)			✓		✓		✓	
5.0 (3/16)	400 (16)			✓		✓		✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo	Sn	As	Sb	X-factor(ppm)
0.072	0.62	0.79	0.009	0.010	2.22	0.97	0.0060	0.0020	0.0070	13.1

$$X\text{-factor} = (10P + 5Sb + 4Sn + As)/100 \leq 15 \text{ (ppm)}$$

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
632 (91,700)	721 (104,600)	23.8	0 (32) -20 (-4)	121 (89) 81 (60)	690°C(1274°F) X 1hr. S.R
606 (87,900)	703 (102,000)	25.2	0 (32) -20 (-4)	132 (97) 105 (77)	690°C(1274°F) X 2hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55-90A	90-130A	130-190A	190-240A
V-up, OH	50-80A	80-120A	120-180A	-

S-8016.B5

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B5

EN 1599 - ECrMo5 B 1 2

Applications

- Low alloy steel (0.5%Cr-1%Mo)

Features

- Good mechanical properties

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.10	0.48	0.59	0.019	0.009	0.51	1.0

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Heat Treatment
555 (80,600)	663 (96,300)	27.8	690°C(1274°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90A	90~130A	130~190A	190~240A	250~300A
V-up, OH	50~80A	80~120A	120~170A	-	-

S-8016.B6

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E8016-B6

JIS Z3223 DT2516

EN 1599 - ECrMo5 B 1 2

Applications

- Low alloy steel (5%Cr-0.5%Mo)

Features

- Low hydrogen type electrode
- Good creep resistance at high temperature
- Good crack resistance

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	350 (14)	✓		✓		✓		✓	
	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.06	0.57	0.85	0.005	0.004	5.45	0.02	0.51

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Heat Treatment
570 (82,700)	670 (97,200)	22	0 (32)	136 (100)	740°C(1364°F) X 1hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)
F	50-90	80-120	120-160	160-210
V-up, OH	50-80	70-110	90-130	-

S-9015.B9

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9015-B9

JIS Z3223 E6215-9C1MV

EN 1599 - ECrMo91 B 4 2 H5

Applications

- Heat resistant steel (9%Cr-1%Mo)

Features

- Good creep resistance at high temperature
- Maximum service temperature at 650°C (1202°F)
- Low-Hydrogen electrode (HDM ≤5ml/100g)
- Good performance with DCEP

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	√		√		√		√	
3.2 (1/8)	350 (14)	√		√		√		√	
4.0 (5/32)	350 (14)	√		√		√		√	
	400 (16)	√		√		√		√	
5.0 (3/16)	400 (16)	√		√		√		√	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	V	Nb	N
0.10	0.24	0.90	0.008	0.006	9.25	0.50	0.99	0.25	0.023	0.043

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)	Heat Treatment
604 (87,600)	746 (108,200)	22.2	20 (68)	71 (52)	760°C(1400°F) X 2hr. S.R
684 (99,200)	733 (106,300)	25.2	20 (68)	85 (63)	760°C(1400°F) X 4hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)		5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55~90A	90~130A	130~190A	130~190A	190~240A
V-up, OH	50~80A	80~120A	120~180A	120~180A	-

S-9016.B9

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9016-B9 H4

JIS Z3223 E6216-9C1MV

EN 1599 - ECrMo91 B 3 2 H5

Applications

- Heat resistant steel (9%Cr-1%Mo)

Features

- Good creep resistance at high temperature
- Maximum service temperature at 650°C (1202°F)
- Low-Hydrogen electrode (HDM ≤5ml/100g)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC, DC ±

Redrying Conditions

300~350°C (572~662°F) X

0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	√		√		√		√	
3.2 (1/8)	350 (14)	√		√		√		√	
4.0 (5/32)	350 (14)	√		√		√		√	
	400 (16)	√		√		√		√	
5.0 (3/16)	400 (16)	√		√		√		√	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	V	Nb	N
0.10	0.24	1.00	0.009	0.006	9.07	0.45	1.00	0.22	0.036	0.035

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Heat Treatment
660 (95,700)	762 (110,500)	24.8	20 (68)	71 (52)	760°C(1400°F) X 2hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)		5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	80-110A	110-150A	150-200A	150-200A	190-240A
V-up, OH	70-100A	100-140A	140-200A	140-200A	-

S-9015(6).B92

Type : Basic

Conformances

AWS A5.5/ ASME SFA5.5 E9015(6)-G
(E9015(6)-B9 mod.)

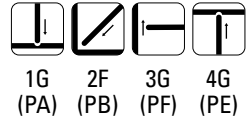
Applications

- Heat resistant steel (9%Cr-1%Mo-1.5%W)

Features

- Designed to weld equivalent 'type 92' 9CrMoW steels
- Low-Hydrogen electrode (HDM \leq 5ml/100g)
- Maximum service temperature at 650°C (1202°F)
- Good creep resistance at high temperature
- S-9015.B92 (DC \pm only)

Welding Position



Current

AC, DC \pm

Redrying Conditions

300~350°C (572~662°F) X
0.5~1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)	✓		✓		✓		✓	
3.2 (1/8)	350 (14)	✓		✓		✓		✓	
4.0 (5/32)	350 (14)	✓		✓		✓		✓	
	400 (16)	✓		✓		✓		✓	
5.0 (3/16)	400 (16)	✓		✓		✓		✓	

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo	V	Nb	N	W
0.08	0.24	0.60	0.006	0.004	9.18	0.45	0.40	0.25	0.050	0.045	1.45

Typical Mechanical Properties of All-Weld Metal

YS MPa(lbs/in ²)	TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft-lbs)	Heat Treatment
670 (97,200)	779 (113,000)	20.2	20 (68)	23 (17)	760°C(1400°F) X 2hr. S.R

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)		5.0 (3/16)
Length mm (in)	350 (14)	350 (14)	350 (14)	400 (16)	400 (16)
F & HF	55-90A	90-130A	130-190A	130-190A	190-240A
V-up, OH	50-80A	80-120A	120-180A	120-180A	-

S-240A.R

Type : Rutile

Conformances

JIS Z3251 DF2A-250-R

Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Light abrasive resistance, impact resistance
- Good cutting properties
- Stable arc
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



1G 2F 3G
(PA) (PB) (PF)

Current

AC or DC ±

Redrying Conditions

100°C (212°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
0.10	0.37	0.49	0.017	0.009	0.89

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	240
-	-	650°C(1202°F) Tempering	200
-	-	900°C(1652°F), O.Q	330

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	50-85A	80-130A	130-180A	180-240A	210-280A
V-up, OH	45-70A	70-120A	120-160A	-	-

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-350A.R

Type : Rutile

Conformances

JIS Z3251 DF2A-350-R

Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Medium abrasive resistance, impact resistance
- Machining / Quenching possible
- Easy to remove slag
- Good bead appearance

Welding Position



1G 2F 3G
(PA) (PB) (PF)

Current

AC or DC ±

Redrying Conditions

100°C (212°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
2.6 (3/32)	350 (14)	5kg(11lbs)	20kg(44lbs)
3.2 (1/8)	350 (14)	✓	✓
4.0 (5/32)	400 (16)	✓	✓
5.0 (3/16)	400 (16)	✓	✓
6.0 (15/64)	450 (18)	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
0.10	0.50	1.00	0.010	0.007	2.40

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp. °C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	370
-	-	650°C(1202°F) Tempering	280
-	-	850°C(1562°F), O.Q	430

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90A	90~140A	140~190A	190~240A	220~300A
V-up, OH	50~80A	80~130A	110~160A	-	-

S-260A.B

Type : Basic

Conformances

JIS Z3251 DF2A-300-B

Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Light abrasive resistance, impact resistance
- Good cutting properties
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



1G 2F 3G
(PA) (PB) (PF)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
0.15	0.68	2.15	0.015	0.007	0.05

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	260
-	-	650°C(1202°F) Tempering	240
-	-	900°C(1652°F), O.Q	380

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55-90A	90-140A	140-190A	190-240A	220-300A
V-up, OH	50-80A	80-130A	110-160A	-	-

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-350B.B

Type : Basic

Conformances

JIS Z3251 DF2A-400-B

Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Medium abrasive resistance, impact resistance
- Machining possible
- Low spatter
- Good bead appearance
- Hardness increased by quenching after machining

Welding Position



1G 2F 3G
(PA) (PB) (PF)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
2.6 (3/32)	350 (14)	5kg(11lbs)	20kg(44lbs)
3.2 (1/8)	350 (14)	✓	✓
4.0 (5/32)	400 (16)	✓	✓
5.0 (3/16)	400 (16)	✓	✓
6.0 (15/64)	450 (18)	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
0.26	0.82	1.44	0.015	0.009	1.88

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp. °C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	390
-	-	650°C(1202°F) Tempering	280
-	-	850°C(1562°F), O.Q	470

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55~90A	90~140A	140~190A	190~240A	220~300A
V-up, OH	50~80A	80~130A	110~160A	-	-

S-450B.B

Type : Basic

Conformances

JIS Z3251 DF2A-450-B

Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Mixed metal structure of austenite and martensite
- Under-lay with low hydrogen type carbon steel electrode
- Preheat at more than 150°C(302°F)

Welding Position



1G 2F 3G
(PA) (PB) (PF)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.30	1.06	0.56	0.019	0.01	1.64	0.63

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	420
300 (572)	-	-	380
-	-	650°C(1202°F) 6hr.F.C	410
-	-	625°C(1157°F) 6hr.F.C	330

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55-90A	90-140A	140-190A	190-240A	220-300A
V-up, OH	50-80A	80-130A	110-160A	-	-

SWAW

SAW

GMWAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-500B.B

Type : Basic

Conformances

JIS Z3251 DF2B-500-B

Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Under-lay with low hydrogen type carbon steel electrode
- Preheat at more than 150°C(302°F)
- Machining difficult

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.41	0.75	1.73	0.018	0.007	1.60	0.86

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	520
300 (572)	-	-	480

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55-90A	90-140A	140-190A	190-240A	220-300A

S-600B.B

Type : Basic

Conformances

JIS Z3251 DF2B-600-B

Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Under-lay with low hydrogen type carbon steel electrode
- Preheat at more than 150°C(302°F)
- Suitable for soil abrasion
- Martensite structure (All-weld metal)

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.52	1.10	1.61	0.022	0.009	3.90	1.34

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	540
300 (572)	-	-	500
600 (1112)	-	-	450

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55-90A	90-140A	140-190A	190-240A	220-300A

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

S-700B.B

Type : Basic

Conformances

JIS Z3251 DF3C-600-B

Applications

- Hardfacing of rollers, gears, crane wheels and abrasive parts

Features

- Preheat at more than 150°C(302°F)
- Postheat at about 600°C(1112°F), if possible
- Martensite structure (All-weld metal)
- Machining impossible (As welded)
- Mostly suitable for soil abrasion

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.56	1.26	1.67	0.029	0.011	4.06	1.84

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp.°C(°F)	Postheat	Heat Treatment	Hardness (HB)
150 (302)	-	-	610
300 (572)	-	-	580

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	55-90A	90-140A	140-190A	190-240A	220-300A

S-711

Type : Basic

Conformances

JIS Z3251 DFCrA-600-BR

Applications

- Mills to crush clinker in cement industry
- Screws in oil industry

Features

- Good wear resistance
- Austenite structure containing Cr-Carbide
- Machining impossible (As welded)
- Preheat at more than 150°C(302°F)

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	Standard	
		packet 5kg(11lbs)	carton 20kg(44lbs)
2.6 (3/32)	350 (14)		
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)		

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr
3.47	0.90	1.11	0.018	0.014	33.87

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp. °C(°F)	Postheat	Heat Treatment	Hardness (HB)
≥300 (572)	-	-	610

Typical Operating Procedures

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	350 (14)	400 (16)	400 (16)
F & HF	90~140A	140~190A	190~240A

SWAW

SAW

GM/AW

GT/AW

FC/AW

Non-FERROUS

APPENDIX

S-13MN.B

Type : Basic

Conformances

JIS Z3251 DFMA-250-B

Applications

- Light impact abrasion, crusher hammers, jaws, rolls and buckets

Features

- High impact resistance
- Good resistance to abrasion
- Mostly suitable for soil abrasion
- Cutting properties impossible
- Easy to remove slag

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard	
		packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)
2.6 (3/32)	350 (14)		
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Mo
0.38	0.06	14.5	0.030	0.003	1.16	1.57

Typical Mechanical Properties of All-Weld Metal

Preheat & Interpass Temp. °C(°F)	Postheat	Heat Treatment	Hardness (HB)
RT	-	-	220
	-	After work hardening	480

Typical Operating Procedures

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)	6.0 (15/64)
Length mm (in)	350 (14)	400 (16)	400 (16)	450 (18)
F & HF	90~140A	140~190A	190~240A	220~300A

S-308.16N

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E308-16
 JIS Z3221 ES308-16
 EN ISO 3581-A-E 19 9 R
 KR RD308
 ABS AWS A5.4 E308-16
 DNV 308

Applications

- Stainless steel (18%Cr-8%Ni)

Features

- Good resistance to corrosion and oxidizing environments
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.03	0.66	0.87	0.026	0.014	19.2	10.2

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
562 (81,600)	47.8

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

S-308H.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E308H-16

Applications

- Stainless steel (ASTM 304H, 304)

Features

- Good creep resistance
- Service temperature up to 700°C(1292°F)
- Easy to remove slag
- Low spatter
- Good bead appearance

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.05	0.65	0.90	0.03	0.02	18.9	9.9

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
590 (85,500)	40.0

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-308L.16N[17]

Type : Rutile, Rutile-acid



Conformances

AWS A5.4/ ASME SFA5.4 E308L-16
 JIS Z3221 ES308L-16 / EN ISO 3581-A-E 19 9 L R
 EN ISO 3581-A-E 19 9 L R
 AWS A5.4 / ASME SFA5.4 E308L-17
 JIS Z3221 ES308L-17 / EN ISO 3581 E 19 9 L R
 KR RD308L
 ABS AWS A5.4 E308L-16
 AWS A5.4 E308L-17
 LR 304L

DNV 308L
 NK KD308L
 BV 308L
 CWB CSA W48 E308L-16
 TÜV EN ISO 3581-A - E 19 9 L R
 CE
 DB DIN EN ISO 3581-A-E 199 L R
 CCS 304L

Applications

- Stainless steel (low carbon 18%Cr-8%Ni)

Features

- Good resistance to corrosion and oxidizing environments
- Easy to remove slag
- Good bead appearance
- High moisture resistance (17 type)

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	2.5kg(11lbs)	10kg(22lbs)
2.0 (5/64)	300 (12)								✓
2.6 (3/32)	300 (12)								✓
3.2 (1/8)	350 (14)								✓
4.0 (5/32)	350 (14)								✓
5.0 (3/16)	350 (14)								✓

SMAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

Typical Chemical Composition of All-Weld Metal (%)

Product name	C	Si	Mn	P	S	Cr	Ni
S-308L.16N	0.02	0.67	0.87	0.028	0.018	19.2	10.0
S-308L.17	0.02	0.63	0.98	0.028	0.017	19.0	9.9

Typical Mechanical Properties of All-Weld Metal

Product name	TS MPa(lbs/in ²)	EL (%)
S-308L.16N	561 (81,500)	44.0
S-308L.17	570 (82,800)	49.0

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-308Mo.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E308Mo-16

JIS Z3221 ES308Mo-16

EN ISO 3581-A-E 20 10 3

Applications

- Stainless steel (ASTM CF8M)

Features

- Easy to remove slag
- Smooth welding
- Low spatter

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.03	0.65	0.77	0.032	0.017	18.5	9.7	2.3

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
621 (90,200)	42.3

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-308LT.16

Type : Basic

Conformances

AWS A5.4/ ASME SFA5.4 E308L-16
 JIS Z3221 ES308L-16
 EN ISO 3581-A-E 19 9 L R
 ABS AWS A5.4 E308L-16 (-196°C)

Applications

- Stainless steel (308L)
- LPG, LNG storage tank

Features

- Good impact value up to -196°C
- Easy to remove slag
- Low spatter

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.035	0.77	1.74	0.023	0.012	19.2	9.9

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
576 (83,500)	49.8	-196 (-321)	36 (27)

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-309.16N

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E309-16
 JIS Z3221 ES309-16
 EN ISO 3581-A-E 23 12 R
 KR RD309
 ABS AWS A5.4 E309-16
 DNV 309
 LR SS/CMn

Applications

- Welding of dissimilar steels

Features

- Good resistance to heat and corrosion
- Easy to remove slag
- Low spatter

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.03	0.79	1.10	0.025	0.016	23.4	12.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
579 (84,100)	38.6

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-309L.16[17]

Type : Rutile, Rutile-acid



Conformances

AWS A5.4/ ASME SFA5.4 E309L-16
 JIS Z3221 ES309L-16 / EN ISO 3581-A-E 23 12 L R
 AWS A5.4/ ASME SFA5.4 E309L-17
 JIS Z3221 ES309L-17 / EN ISO 3581-A-E 23 12 L R
 KR RD309L
 ABS AWS A5.4 E309L-16
 AWS A5.4 E309L-17
 LR SS/CMn
 BV UP

DNV 309L
 NK KD309L
 GL 4332
 CWB CSA W48 E309L-16
 TÜV EN ISO 3581-A - E 23 12 L R
 CE
 DB DIN EN ISO 3581-A-E 23 12 L R
 CCS 309L

Applications

- Welding of dissimilar steels
- Buffer layer for build-up

Features

- Good resistance to heat and corrosion
- Good crack resistance
- Easy to remove slag
- High moisture resistance (17 type)

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	2.5kg(11lbs)	10kg(22lbs)
2.0 (5/64)	300 (12)								✓
2.6 (3/32)	300 (12)								✓
3.2 (1/8)	350 (14)								✓
4.0 (5/32)	350 (14)								✓
5.0 (3/16)	350 (14)								✓

Typical Chemical Composition of All-Weld Metal (%)

Product name	C	Si	Mn	P	S	Cr	Ni
S-309L.16	0.02	0.76	1.21	0.028	0.018	22.9	12.7
S-309L.17	0.02	0.63	1.15	0.028	0.017	23.1	12.8

Typical Mechanical Properties of All-Weld Metal

Product name	TS MPa(lbs/in ²)	EL (%)
S-309L.16N	563 (81,800)	43.0
S-309L.17	570 (82,800)	43.0

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-309Mo.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E309Mo-16
 JIS Z3221 ES309Mo-16
 EN ISO 3581-A-E 23 12 2 R
 ABS AWS A5.4 E309Mo-16

Applications

- Welding of dissimilar steels (root pass)

Features

- Good resistance to heat and crack
- Easy to remove slag
- Good bead appearance

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.03	0.77	1.21	0.026	0.015	23.3	12.6	2.4

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
662 (96,100)	35.7

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-309MoL.16

Type : Rutile



Conformances

AWS A5.4/ ASME SFA5.4 E309LMo-16
 JIS Z3221 ES309LMo-16
 EN ISO 3581-A-E 23 12 2 L R
 DNV 309MoL (-20°C)
 TÜV EN ISO 3581-A - E 23 12 2 L R
 CE
 DB EN ISO 3581-A-E 23 12 2 L R

Applications

- Welding of dissimilar steels
- Welding of low carbon 22%Cr-12%Ni-2.5%Mo stainless steel

Features

- Good resistance to heat and crack
- Easy to remove slag
- Good bead appearance

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
2.6 (3/32)	350 (14)	2.5kg(5.5lbs)	10kg(22lbs)
3.2 (1/8)	350 (14)	✓	✓
4.0 (5/32)	400 (16)	✓	✓
5.0 (3/16)	400 (16)	✓	✓
6.0 (15/64)	450 (18)	✓	✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.02	0.72	1.30	0.027	0.013	23.3	12.7	2.4

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
690 (99,000)	33.8

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-310.15

Type : Basic(Lime)

Conformances

AWS A5.4/ ASME SFA5.4 E310-15

JIS Z3221 ES310-15

EN ISO 3581-A-E 25 20 B

Applications

- Welding of 13%Cr or clad part of 18%Cr-8%Ni steel

Features

- Basic type electrode
- Good mechanical properties
- Martensite structure (All-weld metal)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.10	0.60	1.90	0.018	0.013	26.5	20.6

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
610 (88,400)	35.0

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-310.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E310-16

JIS Z3221 ES310-16

EN ISO 3581-A-E 25 20 R

Applications

- Stainless steel (25%Cr-20%Ni)

Features

- Good heat resistance
- Good mechanical properties
- Martensite structure (All-weld metal)
- Easy to remove slag

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.10	0.60	1.90	0.018	0.013	26.5	20.6

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
610 (88,400)	35.0

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

S-312.16

Type : Basic

Conformances

AWS A5.4/ ASME SFA5.4 E312-16

JIS Z3221 ES312-16

EN ISO 3581-A-E 299 R

Applications

- Welding of dissimilar steels
- Buffer layer for build-up

Features

- Good crack resistance
- Excellent buffer effect against stress
- Easy to remove slag

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni
0.11	0.49	1.41	0.021	0.013	29.5	9.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
803 (116,600)	22.0

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-316.16N

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E316-16
 JIS Z3221 ES316-16
 EN ISO 3581-A-E 19 12 3 R
 KR RD316
 ABS AWS A5.4 E316-16
 BV UP (E316-16, -20°C)
 DNV 316

Applications

- Stainless steel (18%Cr-12%Ni-2%Mo)

Features

- Good resistance to corrosion and oxidizing environments
- Good heat resistance
- asy to remove slag
- Low spatter

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.03	0.77	0.9	0.03	0.029	18.7	12.3	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
572 (83,100)	40.8

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-316L.16N[17]

Type : Rutile, Rutile-acid



Conformances

AWS A5.4/ ASME SFA5.4 E316L-16

JIS Z3221 ES316L-16 / EN ISO 3581-A-E 19 12 3 L R

AWS A5.4/ ASME SFA5.4 E316L-17

JIS Z3221 ES316L-17 / EN ISO 3581-A-E 19 12 3 L R

KR RD316L

ABS AWS A5.4 E316L-16

AWS A5.4 E316L-17

LR 316L

BV UP (E316L-16, -20°C)

DNV 316L

NK KD316L

CWB CSA W48 E316L-16

TÜV EN ISO 3581-A - E 19 12 3 L R

CE

DB EN ISO 3581-A-E 19 12 3 L R

CCS 316L

Applications

- Stainless steel (low carbon 18%Cr-12%Ni-2%Mo)

Features

- Good resistance to corrosion and oxidizing environments
- Good heat resistance
- Easy to remove slag
- High moisture resistance (17 type)

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	Standard		Vacuum				P.V.C	
		packet	carton	packet	carton	packet	carton	packet	carton
mm (in)	mm (in)	5kg(11lbs)	20kg(44lbs)	1.5kg(3.3lbs)	15kg(3.3lbs)	5kg(11lbs)	20kg(44lbs)	2.5kg(11lbs)	10kg(22lbs)
2.0 (5/64)	300 (12)								✓
2.6 (3/32)	300 (12)								✓
3.2 (1/8)	350 (14)								✓
4.0 (5/32)	350 (14)								✓
5.0 (3/16)	350 (14)								✓

Typical Chemical Composition of All-Weld Metal (%)

Product name	C	Si	Mn	Cr	Ni	Mo
S-316L.16N	0.02	0.75	1.10	18.5	12.7	2.5
S-316L.17	0.02	0.73	1.33	23.1	12.8	2.5

Typical Mechanical Properties of All-Weld Metal

Product name	TS MPa(lbs/in ²)	EL (%)
S-316L.16N	557 (80,900)	45.2
S-316L.17	560 (81,300)	48.0

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-316LT.16

Type : Basic

Conformances

AWS A5.4/ ASME SFA5.4 E316L-16
 JIS Z3221 ES316L-16
 EN ISO 3581-A-E 19 12 3 L R
 ABS AWS A5.4 E316L-16 (-196°C)

Applications

- Stainless steel (18%Cr-12%Ni-2%Mo)
- LPG, LNG storage tank

Features

- Good impact value up to -196°C
- Good resistance to inter-crystalline corrosion
- Easy to remove slag
- Low spatter

Welding Position



1G 2F 3G 4G
 (PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.035	0.55	1.59	0.021	0.016	18.5	13.5	2.5

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
538 (78,000)	34.4	-196 (-321)	36 (27)

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-317.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E317-16

JIS Z3221 ES317-16

Applications

- Stainless steel (317L)

Features

- Good resistance to nitroxide and sulfide
- Good heat resistance
- Easy to remove slag

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Mo
0.02	0.63	1.05	0.029	0.018	18.3	12.6	3.2

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
558 (85,400)	38.4

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMW

SAW

GMW

GTAW

FCW

Non-FERROUS

APPENDIX

S-347.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E347-16

JIS Z3221 ES347-16

EN ISO 3581-A-E 199 Nb R

Applications

- Stainless steel (321, 347)

Features

- Contains stabilizing element(Nb)
- High temperature strength
- Suitable for welding of boiler and gas turbine
- Easy to remove slag

Welding Position



1G 2F 3G 4G
(PA) (PB) (PF) (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Cr	Ni	Nb
0.02	0.75	0.82	0.027	0.014	18.5	9.8	0.35

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)
603 (87,600)	42.4

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-2209.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E2209-16

JIS Z3221 ES2209-16

EN ISO 3581-A-E 22 9 3 N L

Applications

- Welding of duplex stainless steel (SAF2205, UNS S31803)

Features

- Ferritic/austenitic structure (All-weld metal)
- Service temperature up to 250°C
- High resistance to pitting, intergranular and stress corrosion
- PREN 35
- Easy to remove slag
- Good bead appearance

Welding Position



1G (PA) 2F (PB) 3G (PF) 4G (PE)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	Cr	Ni	Mo	N
0.029	0.78	1.03	23.1	9.2	3.1	0.12

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.lbs)
830 (120,400)	28.0	-20(-4) -50(-58)	50 (37) 45 (33)

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25-55A	50-85A	70-115A	95-145A	135-180A
V-up, OH	20-50A	45-80A	65-110A	85-135A	-

SMAW

SAW

GM/AMW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-2594.16

Type : Rutile

Conformances

AWS A5.4/ ASME SFA5.4 E2594-16

EN ISO 3581-A-E 25 9 4 N L

Applications

- Welding of super duplex stainless steel (UNS S32750, S32760)

Features

- Service temperature up to 250°C
- High resistance to Pitting corrosion and embrittlement
- PREN 41
- Easy to remove slag
- Good bead appearance

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter mm (in)	Length mm (in)	P.V.C	
		packet 2.5kg(5.5lbs)	carton 10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	Cr	Ni	Mo	N
0.019	0.58	0.53	25.17	8.9	3.9	0.22

Typical Mechanical Properties of All-Weld Metal

TS MPa(lbs/in ²)	EL (%)	Temp °C(°F)	CVN-Impact Value J (ft.-lbs)
830 (120,400)	28.0	-20(-4) -50(-58)	35 (25) 30 (22)

Typical Operating Procedures

Diameter mm (in)	2.0 (5/64)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	300 (12)	350 (14)	350 (14)	350 (14)
F & HF	25~55A	50~85A	70~115A	95~145A	135~180A
V-up, OH	20~50A	45~80A	65~110A	85~135A	-

S-NCI

Type : Basic

Conformances

AWS A5.15/ ASME SFA5.15 ENi-CI

JIS Z3252 DFCNi

EN ISO 1071 - E C Ni-CI 1

Applications

- Repairing and joining of cast iron

Features

- Graphite coated electrode
- Preheat at 150°C (302°F)

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1 hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Fe	Ni
1.38	0.79	0.36	0.004	0.003	0.58	98.3

Typical Mechanical Properties of All-Weld Metal

Hardness (HRB)
77.6

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)
Length mm (in)	300 (12)	350 (14)	350 (14)
F	55-80	80-130	110-160

SWAW

SAW

GMAW

GTAW

FCAW

Non-FERROUS

APPENDIX

S-NFC

Type : Basic

Conformances

AWS A5.15/ ASME SFA5.15 ENiFe-CI

JIS Z3252 DFCNiFe

EN ISO 1071 - E C NiFe-CI 1

Applications

- Welding of normal grades of cast iron

Features

- Good crack resistance
- Preheat at 100~200°C (212~392°F)
- Easy to remove slag

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)		✓
3.2 (1/8)	350 (14)		✓
4.0 (5/32)	400 (16)		✓
5.0 (3/16)	400 (16)		✓
6.0 (15/64)	450 (18)		✓

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Fe	Ni
1.17	0.80	1.2	0.010	0.003	54.0	Bal

Typical Mechanical Properties of All-Weld Metal

Hardness (HRB)
90

Typical Operating Procedures

Diameter mm (in)	3.2 (1/8)	4.0 (5/32)
Length mm (in)	350 (14)	350 (14)
F	80~130	110~160

S-FCF

Type : Basic

Conformances

AWS A5.15/ ASME SFA5.15 ESt

JIS Z3252 DFCFe

EN ISO 1071 - E Z 1

Applications

- Repairing of cast iron

Features

- Machining impossible (As welded)
- Easy to remove slag
- Preheat at 200~350°C (392~662°F)
- Stable arc and good bead appearance

Welding Position



1G 2F
(PA) (PB)

Current

AC or DC ±

Redrying Conditions

350°C (662°F) X 1hr

Diameter / Packaging

Diameter	Length	P.V.C	
		packet	carton
mm (in)	mm (in)	2.5kg(5.5lbs)	10kg(22lbs)
2.6 (3/32)	350 (14)	✓	
3.2 (1/8)	350 (14)	✓	
4.0 (5/32)	400 (16)	✓	
5.0 (3/16)	400 (16)	✓	
6.0 (15/64)	450 (18)	✓	

Typical Chemical Composition of All-Weld Metal (%)

C	Si	Mn	P	S	Fe
2.47	0.41	0.45	0.024	0.024	99.6

Typical Mechanical Properties of All-Weld Metal

Hardness (HRB)

450-510

Typical Operating Procedures

Diameter mm (in)	2.6 (3/32)	3.2 (1/8)	4.0 (5/32)	5.0 (3/16)
Length mm (in)	300 (12)	350 (14)	350 (14)	400 (16)
F	55-80	80-130	110-160	150-200

SMAW

SAW

GMW

GTAW

FCAW

Non-FERROUS

APPENDIX