A guide for selecting welding consumables

Type of steel	ASTM steel grade		SMAW
	Plate	Pipe / Tube	
Mn-Mo Mn-Mo-Ni	A302Gr.B, C, D A533Type A, B, C, D	-	**BL-96** **BL-106**
0.5Mo	A204Gr.A, B, C	A209Gr.T1 A335Gr.P1	**CM-A76**
1Cr-0.5Mo 1.25Cr-0.5Mo	A387Gr.12 Cl.1, Cl.2 A387Gr.11 Cl.1, Cl.2	A213Gr.T11,T12 A335Gr.P11,P12	**CM-A96** **CM-A96MB** **CM-A96MBD** **CM-B95** **CM-B98**
2.25Cr-1Mo	A387Gr.22 Cl.1, Cl.2	A213Gr.T22 A335Gr.P22	**CM-A106** **CM-A106N** **CM-A106ND** **CM-B105** **CM-B108**
2.25Cr-1Mo-V	A542Type D Cl.4a A832Gr.22V	-	**CM-A106H** **CM-A106HD**
Low C 2.25Cr-W-V-Nb	-	SA213Gr.T23 SA335Gr.P23	**CM-2CW**
9Cr-1Mo-V-Nb	A387Gr.91 Cl.2	A213Gr.T91 A335Gr.P91	**CM-95B91** **CM-96B91** **CM-9Cb**
9Cr-W-V-Nb 12Cr-W-V-Nb	-	A213Gr.T92 A335Gr.P92 A213Gr.T122 A335Gr.P122	**CR-12S**

	GMAW	GTAW	SAW
	MG-S56 MG-S63S	TG-S56 TG-S63S	PF-200/US-56B PF-200/US-63S
	MG-SM MG-S70SA1	TG-SM TG-S70SA1	MF-38/US-40 MF-38/US-49 MF-38/US-A4
	MG-S1CM MG-S80B2F	TG-S80B2 TG-S1CM TG-S1CML	G-80/US-B2 PF-200/US-511N PF-200D/US-511ND PF-200D/US-B2R
	MG-S2CM	TG-S90B3 TG-S2CM TG-S2CML	PF-200/US-521S PF-200D/US-521S
	-	TG-S2CMH	PF-500/US-521H
	MG-S2CW	TG-S2CW	MF-29A/US-2CW
	MG-S90B91 MG-S9Cb	TG-S90B91 TG-S9Cb	PF-200S/US-90B91 PF-90B91/US-90B91 PF-200S/US-9Cb
	MG-S12CRS	TG-S12CRS	PF-200S/US-12CRSD

Tips for better welding results

SMAW

(1) Remove scale, rust, oil, grease, water, and other dirt from welding grooves beforehand to prevent defects such as porosity and cracking in the weld metal.
(2) Use welding currents in the recommended range because the use of excessively high currents can cause imperfections such as poor X-ray soundness, much undercuts, much spatter, and hot cracking.
(3) Keep the arc length as short as possible to prevent porosity caused by nitrogen in the atmosphere. Limit the weaving width within two and a half times the diameter of the electrode. When striking an arc in the welding groove directly, use the backstep technique or strike an arc on a scrap plate before welding the groove to prevent blowholes in the arc starting bead.
(4) Use preheating and interpass temperatures in the recommended range as shown in Table 1 in order to prevent the occurrence of cold cracks.
(5) Use proper postweld heat treatment (PWHT) temperatures to ensure good mechanical properties of the weld. The use of an excessively high temperature can damage the weld causing inadequate tensile strength and impact value of the weld. In contrast, the use of an excessively low temperature can cause poor ductility and impact toughness of the weld in addition to inadequate stress relieving. The recommended ranges of PWHT temperatures are shown in Table 1. Hold weldments at PWHT temperatures for appropriate time according to the thickness of the base metal to ensure the quality of the weld.
(6) Control heat input in predetermined ranges because heat input can remarkably affect the crack resistibility and mechanical properties of the weld.

Table 1 Recommended temperatures

Type of steel	Preheating and interpass temperature (℃)	PWHT temperature (℃)
Mn-Mo-Ni	150-250	590-650
0.5Mo and 0.5Cr-0.5Mo	100-250	620-680
1Cr-0.5Mo and 1.25Cr-0.5Mo	150-300	650-700
2.25Cr-1Mo	200-350	680-730
5Cr-0.5Mo and 9Cr-1Mo	250-350	710-780
9Cr-1Mo-V-Nb	250-350	710-760*1 750-800*2
9~12Cr-W-V-Nb	250-350	720-760

*1: For CM-9Cb, MG-S9Cb, TG-S9Cb, and PF-200S/US-9Cb
*2: For CM-95B91, CM-96B91, TG-S90B91, and PF-90B91/US-90B91

GMAW

(1) Use DCEP polarity.
(2) Use an appropriate shielded gas flow rate as shown in Table 2 for recommendation.
(3) In spray arc welding with a shielding gas of Ar/O_2 or $Ar/5\text{-}20\%CO_2$ admixture, short circuiting noise may occur when the arc voltage is excessively low. In such a case, keep the arc length about 4-5 mm in order to prevent blowholes in the weld metal.
(4) Refer to (1), (4), (5), (6) of the tips for SMAW.

Table 2 Recommended shielding gas flow rate

Flow rate (liter/min)	Nozzle standoff (mm)	Max wind velocity (m/sec)
20-25	20	2

GTAW

(1) Use DCEN polarity.
(2) Use an appropriate shield gas flow rates as shown in Table 3.
(3) Use back-shielding to ensure good reverse bead appearance and prevent the occurrence of porosity in the weld metal for low-alloy steels containing Cr over 1.25%.
(4) Refer to (1), (4), (5), (6) of the tips for SMAW.

Table 3 Recommended shielding gas flow rate

Flow rate (liter/min)	Max. wind velocity (m/sec)
10-15	1

SAW

(1) Control flux supply at an appropriate flux-burden height. The flux-burden height can affect the appearance of beads and X-ray soundness. The most appropriate height varies depending on flux mesh size, shape of welding groove and other welding conditions; however, single electrode welding commonly use 25-35 mm while tandem welding generally use 30-45 mm.
(2) Use lower currents and slower speeds for root pass welding of thick plates to prevent cracking.
(3) Refer to (1), (4), (5), (6) of the tips for SMAW.

How to select the proper welding consumable for dissimilar metal joints

The structural components of high temperature service equipment such as power generation boiler use several types of steels; therefore, joining dissimilar steels is unavoidable at the interface of different service condition areas. When joining carbon steels and Cr-Mo steels, or when joining dissimilar Cr-Mo steels, a filler metal with a composition similar to the lower-alloy steel or with an intermediate composition is commonly used for butt joints.

For instance, carbon steel can readily be joined to 2.25Cr-1Mo steel by using either a carbon steel or a 1.25Cr-0.5Mo steel filler metal; however, carbon steel filler metals are usually selected except where carbon migration (the diffusion of carbon from lower-Cr metal to higher-Cr metal during PWHT and high temperature service) must be decreased. Likewise, 2.25Cr-1Mo steel can be joined to 9Cr-1Mo-V-Nb steel by using a 2.25Cr-1Mo filler metal.

In contrast, Cr-Mo steel and austenitic stainless steel are joined with a high Cr-Ni stainless (e.g. E309) or, where carbon migration and thermal stress are important factors, nickel alloy (e.g. ENiCrFe-1) filler metal. For a quick guide to recommended welding consumables for joining dissimilar metals, refer to Table 1.

Table 1 A quick guide for joining dissimilar metals [(1) (2)]

Base metal	Mild steel	0.5Mo	1.25Cr-0.5Mo	2.25Cr-1Mo	9Cr-1Mo-V-Nb
Type 304 stainless steel	・NC-39 (E309), NC-39L (E309L), TG-S309 (ER309), TG-S309L (ER309L) ・NI-C703D (ENiCrFe-3), NI-C70A (ENiCrFe-1), TG-S70NCb (ERNiCr-3)				
9Cr-1Mo-V-Nb	LB-52 (E7016) TG-S50 (ER70S-G)	CM-A76 (E7016-A1) TG-SM (ER80S-G)	CM-A96 (E8016-B2) TG-S1CM (ER80S-G)	CM-A106 (E9016-B3) TG-S2CM (ER90S-G)	
2.25Cr-1Mo	LB-52 (E7016) TG-S50 (ER70S-G)	CM-A76 (E7016-A1) TG-SM (ER80S-G)	CM-A96 (E8016-B2) TG-S1CM (ER80S-G)		
1.25Cr-0.5Mo	LB-52 (E7016) TG-S50 (ER70S-G)	CM-A76 (E7016-A1) TG-SM (ER80S-G)			
0.5Mo	LB-52 (E7016) TG-S50 (ER70S-G)				

Note: (1) This table guides to recommended filler metals matching the lower-alloy steels in various dissimilar metal joints, excepting for Type 304 steel. Other types of filler metals may be needed where a specific requirement is imposed.

Note: (2) Preheating and postweld heat treatment for dissimilar Cr-Mo steels should be sufficient to the higher-alloy steel; however, the PWHT temperature should be lower to avoid damage to the lower-alloy steel and minimize the carbon migration. Type 304 stainless steel should not be preheated or postweld heat-treated to avoid sensitization.

BL-96 TRUSTARC™

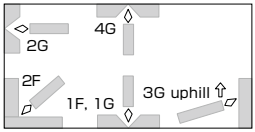
Stick electrode for Mn-Mo and Mn-Mo-Ni steel

Features: ▪ Applied for ASTM A533 Type A, B, C, D and equivalents

Classification: AWS A5.5 E9016-G

Redrying Conditions: 325~375℃x1h
Identification color: 1st Red, 2nd Green
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 85H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 120H, 430L
5.0	400	5	20	86	170W, 120H, 430L
6.0	450	5	20	137	170W, 120H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.12
Si	0.50	0.60
Mn	1.23	0.90~1.70
P	0.01	0.03
S	<0.01	0.03
Ni	0.40	0.20~1.00
Mo	0.58	0.35~0.65

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	-
6.0	240~300	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	590	531min.
TS (MPa)	670	621min.
El on 4d (%)	29	17min.
IV -20℃ (J)	80	-
PWHT (℃xh)	630x1	620±15x1

BL-106

TRUSTARC™

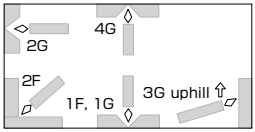
Stick electrode for Mn-Mo and Mn-Mo-Ni steel

Features: ▪ Applied for ASTM A533 Type A, B, C, D class 2 and equivalents

Classification: AWS A5.5 E10016-G

Redrying Conditions: 325~375℃x1h
Identification color: 1st White, 2nd Red
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 85H, 330L
3.2	350	5	20	30	170W, 120H, 380L
4.0	400	5	20	54	170W, 120H, 430L
5.0	400	5	20	84	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.10	0.12
Si	0.53	0.60
Mn	1.41	1.00~1.60
P	0.009	0.020
S	0.005	0.020
Ni	0.76	0.60~1.00
Mo	0.50	0.40~0.65

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	650	600min.
TS (MPa)	730	689min.
El on 4d (%)	24	16min.
IV -20℃ (J)	80	-
PWHT (℃xh)	620x2	620±15x1

CM-A76 TRUSTARC™

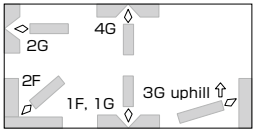
Stick electrode for 0.5%Mo steel

Features: ▪ Applied for ASTM A204 Gr. A, B, C and equivalents

Classification: AWS A5.5 E7016-A1

Redrying Conditions: 325~375℃x1h
Identification color: 1st Brown
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	170W, 120H, 330L
3.2	350	5	20	30	170W, 120H, 380L
4.0	400	5	20	55	170W, 120H, 430L
5.0	400	5	20	86	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.12
Si	0.53	0.60
Mn	0.79	0.90
P	0.01	0.03
S	<0.01	0.03
Mo	0.49	0.40~0.65

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~120
4.0	140~190	110~170
5.0	190~240	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	550	393min.
TS (MPa)	630	483min.
El on 4d (%)	29	22min.
IV 0℃ (J)	210	-
PWHT (℃xh)	620x1	620±15x1

CM-A96

TRUSTARC™

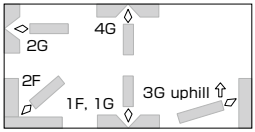
Stick electrode for 1~1.25%Cr-0.5%Mo steel

Features: ▪ Applied for ASTM A387 Gr.11, Gr.12 and equivalents

Classification: AWS A5.5 E8016-B2

Redrying Conditions: 325~375℃x1h
Identification color: 1st Silver, 2nd Black
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 85H, 330L
3.2	350	5	20	29	170W, 110H, 380L
4.0	400	5	20	53	170W, 115H, 430L
5.0	400	5	20	82	170W, 120H, 430L
6.0	400	5	20	122	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.05~0.12
Si	0.48	0.60
Mn	0.81	0.90
P	0.01	0.03
S	<0.01	0.03
Cr	1.31	1.00~1.50
Mo	0.55	0.40~0.65

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	80~120	75~110
4.0	125~175	100~160
5.0	185~235	-
6.0	240~300	-

All-weld mechanical properties

	Typical (AC)		Guaranty
Temp. (℃)	RT	450	RT
0.2%YS (MPa)	570	460	462min.
TS (MPa)	650	520	552min.
El on 4d (%)	26	21	19min.
IV 0℃ (J)	210	-	-
PWHT (℃xh)	690x1	690x1	690±15x1

Approvals

ABS	MG (AWS A5.5 E8016-B2)
LR	MG
DNV-GL	MG (VL1Cr0.5Mo), H10
BV	UP (E8016-B2)
NK	MG (AWS A5.5 E8016-B2)

CM-A96MB TRUSTARC™

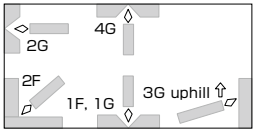
Stick electrode for 1~1.25%Cr-0.5%Mo steel

Features:
- Applied for ASTM A387 Gr.11, Gr.12 and equivalents
- Lower TS, higher IV and less sensitive to temper embrittlement

Classification: AWS A5.5 E8016-B2

Redrying Conditions: 325~375℃x1h
Identification color: 1st Silver, 2nd Silver grey
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 85H, 330L
3.2	350	5	20	30	170W, 110H, 380L
4.0	400	5	20	54	170W, 115H, 430L
5.0	400	5	20	84	170W, 110H, 430L
6.0	400	5	20	120	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.05~0.12
Si	0.48	0.60
Mn	0.78	0.90
P	0.01	0.03
S	<0.01	0.03
Cr	1.35	1.00~1.50
Mo	0.57	0.40~0.65

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	80~120	75~110
4.0	125~175	100~160
5.0	185~235	-
6.0	240~300	-

All-weld mechanical properties

	Typical		Guaranty
Temp. (℃)	RT	450	RT
0.2%YS (MPa)	490	360	462min.
TS (MPa)	590	450	552min.
El on 4d (%)	30	24	19min.
IV -18℃ (J)	200	-	-
PWHT (℃xh)	690x1	690x1	690±15x1

Approvals

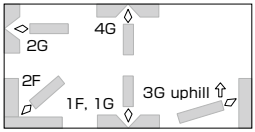
LR	MG
BV	UP (E8016-B2)

CM-A96MBD TRUSTARC™

Stick electrode for 1~1.25%Cr-0.5%Mo steel

Features:
- Applied for ASTM A387 Gr.11, Gr.12 and equivalents
- Lower TS, higher IV and less sensitive to temper embrittlement

Welding Positions:



Classification: AWS A5.5 E8016-B2

Redrying Conditions: 325~375℃x1h
Identification color: 1st Black, 2nd Silver grey
Polarity: DCEP

Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 85H, 330L
3.2	350	5	20	30	170W, 110H, 380L
4.0	400	5	20	54	170W, 115H, 430L
5.0	400	5	20	84	170W, 110H, 430L
6.0	400	5	20	120	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.05~0.12
Si	0.47	0.60
Mn	0.79	0.90
P	0.01	0.03
S	<0.01	0.03
Cr	1.31	1.00~1.50
Mo	0.57	0.40~0.65

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	80~120	75~110
4.0	125~175	100~160
5.0	185~235	-
6.0	240~300	-

All-weld mechanical properties

	Typical		Guaranty
Temp. (℃)	RT	450	RT
0.2%YS (MPa)	520	390	462min.
TS (MPa)	620	480	552min.
El on 4d (%)	27	19	19min.
IV -20℃ (J)	170	-	-
PWHT (℃xh)	690x1	690x1	690±15x1

CM-B95 TRUSTARC™

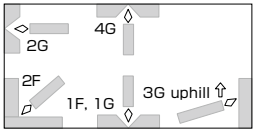
Stick electrode for 1~1.25%Cr-0.5%Mo steel

Features: ▪ Applied for ASTM A387 Gr.11, Gr.12 and equivalents

Classification: AWS A5.5 E7015-B2L

Redrying Conditions: 325~375℃x1h
Identification color: 1st Black, 2nd Yellow
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	170W, 120H, 330L
3.2	350, 400	5	20	31, 36	170W, 120H, 380L or 430L
4.0	400	5	20	55	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.02	0.05
Si	0.93	1.00
Mn	0.74	0.90
P	0.01	0.03
S	<0.01	0.03
Cr	1.20	1.00~1.50
Mo	0.52	0.40~0.65

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	70~100	60~90
3.2	110~140	100~130
4.0	150~180	120~160

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	470	393min.
TS (MPa)	580	518min.
El on 4d (%)	29	19min.
IV 0℃ (J)	80	-
PWHT (℃xh)	690x1	690±15x1

Approvals

LR	MG

CM-B98

TRUSTARC™

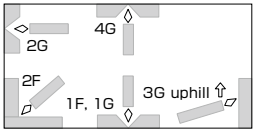
Stick electrode for 1~1.25%Cr-0.5%Mo steel

Features: ▪ Applied for ASTM A387 Gr.11, Gr.12 and equivalents

Classification: AWS A5.5 E8018-B2

Redrying Conditions: 325~375℃x1h
Identification color: 1st Black, 2nd Yellowish green
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	19	170W, 120H, 330L
3.2	400	5	20	38	170W, 120H, 430L
4.0	450	5	20	69	170W, 120H, 480L
5.0	450	5	20	106	170W, 120H, 480L
6.0	450	5	20	154	170W, 120H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.05~0.12
Si	0.73	0.80
Mn	0.78	0.90
P	0.01	0.03
S	<0.01	0.03
Cr	1.31	1.00~1.50
Mo	0.54	0.40~0.65

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	65~95	60~90
3.2	90~130	80~120
4.0	135~185	110~170
5.0	190~250	-
6.0	250~320	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	590	462min.
TS (MPa)	690	552min.
El on 4d (%)	26	19min.
IV 0℃ (J)	70	-
PWHT (℃xh)	690x1	690±15x1

Approvals

LR	MG

CM-A106

TRUSTARC™

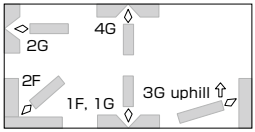
Stick electrode for 2.25%Cr-1%Mo steel

Features: ▪ Applied for ASTM A387 Gr.22 and equivalents

Classification: AWS A5.5 E9016-B3

Redrying Conditions: 325~375℃x1h
Identification color: 1st Silver, 2nd Brown
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 85H, 330L
3.2	350	5	20	30	170W, 110H, 380L
4.0	400	5	20	55	170W, 105H, 430L
5.0	400	5	20	85	170W, 120H, 430L
6.0	400	5	20	121	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.05~0.12
Si	0.44	0.60
Mn	0.63	0.90
P	0.01	0.03
S	<0.01	0.03
Cr	2.10	2.00~2.50
Mo	1.02	0.90~1.20

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	75~115
4.0	140~190	100~160
5.0	190~240	-
6.0	240~300	-

All-weld mechanical properties

	Typical (AC)		Guaranty
Temp. (℃)	RT	450	RT
0.2%YS (MPa)	630	520	531min.
TS (MPa)	730	580	621min.
El on 4d (%)	22	17	17min.
IV 0℃ (J)	120	-	-
PWHT (℃xh)	690x1	690x1	690±15x1

Approvals

ABS	MG (AWS A5.5 E9016-B3)
LR	MG
DNV-GL	MG (VL2Cr1Mo), H10
BV	UP (E9016-B3)
NK	MG (AWS A5.5 E9016-B3)

CM-A106N

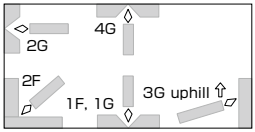
TRUSTARC™

Stick electrode for 2.25%Cr-1%Mo steel

Features:

- Applied for ASTM A387 Gr.22 and equivalents
- Lower tensile strength, higher impact value and less sensitive to temper embrittlement

Welding Positions:



Classification: AWS A5.5 E9016-B3

Redrying Conditions: 325~375℃x1h
Identification color: 1st Silver, 2nd White
Polarity: AC

Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	270W, 85H, 330L
3.2	350	5	20	31	170W, 115H, 380L
4.0	400	5	20	55	170W, 105H, 430L
5.0	400	5	20	86	170W, 115H, 430L
6.0	400	5	20	122	170W, 115H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.11	0.05~0.12
Si	0.38	0.60
Mn	0.76	0.90
P	<0.01	0.03
S	<0.01	0.03
Cr	2.25	2.00~2.50
Mo	1.02	0.90~1.20

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	75~115
4.0	140~190	100~160
5.0	190~240	-
6.0	240~300	-

All-weld mechanical properties

	Typical		Guaranty
Temp. (℃)	RT	450	RT
0.2%YS (MPa)	510	430	531min.
TS (MPa)	650	510	631min.
El on 4d (%)	28	20	17min.
IV -29℃ (J)	120	-	-
PWHT (℃xh)	690x8	690x8	690±15x1

Approvals

BV	UP (E9016-B3)

CM-A106ND TRUSTARC™

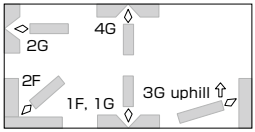
Stick electrode for 2.25%Cr-1%Mo steel

Features:
- Applied for ASTM A387 Gr.22 and equivalents
- Lower tensile strength, higher impact value and less sensitive to temper embrittlement

Classification: AWS A5.5 E9016-B3

Redrying Conditions: 325~375℃x1h
Identification color: 1st Black, 2nd White
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 105H, 430L
5.0	400	5	20	86	170W, 115H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.09	0.05~0.12
Si	0.24	0.60
Mn	0.67	0.90
P	<0.01	0.03
S	<0.01	0.03
Cr	2.21	2.00~2.50
Mo	1.02	0.90~1.20

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	75~115
4.0	140~190	100~160
5.0	190~240	-

All-weld mechanical properties

	Typical		Guaranty
Temp. (℃)	RT	450	RT
0.2%YS (MPa)	500	400	531min.
TS (MPa)	640	480	621min.
El on 4d (%)	26	19	17min.
IV -40℃ (J)	150	-	-
PWHT (℃xh)	690x8	690x8	690±15x1

CM-B105

TRUSTARC™

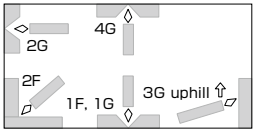
Stick electrode for 2.25%Cr-1%Mo steel

Features: ▪ Applied for ASTM A387 Gr.22 and equivalents

Classification: AWS A5.5 E8015-B3L

Redrying Conditions: 325~375℃x1h
Identification color: 1st Black, 2nd Blue
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	32	170W, 120H, 380L
4.0	400	5	20	56	170W, 120H, 430L
5.0	400	5	20	87	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.03	0.05
Si	0.90	1.00
Mn	0.79	0.90
P	0.01	0.03
S	<0.01	0.03
Cr	2.20	2.00~2.50
Mo	0.98	0.90~1.20

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	110~140	100~130
4.0	150~180	120~160
5.0	190~220	-

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	550	462min.
TS (MPa)	650	552min.
El on 4d (%)	25	17min.
IV 0℃ (J)	80	-
PWHT (℃xh)	690x1	690±15x1

CM-B108 TRUSTARC™

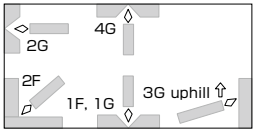
Stick electrode for 2.25%Cr-1%Mo steel

Features: ▪ Applied for ASTM A387 Gr.22 and equivalents

Classification: AWS A5.5 E9018-B3

Redrying Conditions: 325~375℃x1h
Identification color: 1st Black, 2nd Pink
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	19	170W, 120H, 330L
3.2	400	5	20	40	170W, 120H, 430L
4.0	450	5	20	69	170W, 120H, 480L
5.0	450	5	20	108	170W, 120H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.05~0.12
Si	0.72	0.80
Mn	0.72	0.90
P	0.01	0.03
S	0.01	0.03
Cr	2.23	2.00~2.50
Mo	0.97	0.90~1.20

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	65~95	60~90
3.2	90~130	80~120
4.0	135~185	110~170
5.0	190~250	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	610	531min.
TS (MPa)	720	621min.
El on 4d (%)	23	17min.
IV 0℃ (J)	110	-
PWHT (℃xh)	690x1	690±15x1

CM-A106H

TRUSTARC™

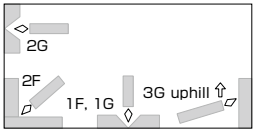
Stick electrode for 2.25%Cr-1%Mo-V steel

Features:
- Applied for ASTM A542 Type D Cl.4a and equivalents
- Excellent tensile strength at high temperatures and less sensitive to temper embrittlement

Classification: AWS A5.5 E9016-G

Redrying Conditions: 325~375℃x1h
Identification color: 1st Silver, 2nd Green
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	32	170W, 115H, 380L
4.0	400	5	20	56	170W, 110H, 430L
5.0	400	5	20	87	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.09	0.05~0.12
Si	0.28	0.20~0.50
Mn	0.87	0.50~1.30
P	0.01	0.03
S	<0.01	0.03
Cr	2.13	2.00~2.60
Mo	1.03	0.90~1.20
V	0.39	0.20~0.40
Nb	0.018	0.010~0.040

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill
3.2	90~130	75~115
4.0	140~190	100~160
5.0	190~240	-

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	620	531min.
TS (MPa)	730	621min.
El on 4d (%)	24	17min.
IV -18℃ (J)	140	-
PWHT (℃xh)	705℃×8h	705±15x8

CM-A106HD TRUSTARC™

Stick electrode for 2.25%Cr-1%Mo-V steel

Features:
- Applied for ASTM A542 Type D Cl.4a and equivalents
- Excellent tensile strength at high temperatures and less sensitive to temper embrittlement

Classification: AWS A5.5 E9016-G

Redrying Conditions: 325~375℃x1h
Identification color: 1st Silver, 2nd Green
Polarity: DCEP

Welding Positions:

Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	32	170W, 120H, 380L
4.0	400	5	20	56	170W, 110H, 430L
5.0	400	5	20	87	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.05~0.12
Si	0.24	0.20~0.50
Mn	0.87	0.50~1.30
P	<0.01	0.03
S	<0.01	0.03
Cr	2.34	2.00~2.60
Mo	1.01	0.90~1.20
V	0.30	0.20~0.40
Nb	0.018	0.010~0.040

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill
3.2	90~130	75~115
4.0	140~190	100~160
5.0	190~240	-

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	600	531min.
TS (MPa)	710	621min.
El on 4d (%)	21	17min.
IV -18℃ (J)	120	-
PWHT (℃xh)	705x8	705±15x8

CM-2CW

TRUSTARC™

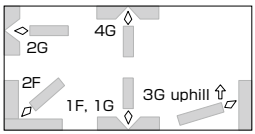
Stick electrode for low C-2.25%Cr-W-V-Nb steel

Features: ▪ Applied for ASTM A335 Gr. P23 and equivalents

Classification: AWS A5.5 E9016-G

Redrying Conditions: 325~375℃x1h
Identification color: 1st Orange, 2nd Green
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 85H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	57	170W, 120H, 430L
5.0	400	5	20	86	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.05	0.15
Si	0.36	0.60
Mn	0.82	0.10~1.60
P	0.007	0.020
S	0.004	0.010
Ni	0.04	0.01~1.20
Cr	2.25	1.90~2.60
Mo	0.08	0.05~0.85
Cu	0.02	0.40
W	1.45	1.00~2.00
V	0.22	0.15~0.30
Nb	0.02	0.01~0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	75~115	70~110
4.0	120~160	90~150
5.0	190~240	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	570	295min.
TS (MPa)	650	510min.
El on 4d (%)	20	17min.
IV 0℃ (J)	110	-
PWHT (℃xh)	715x2	715±15x2

Approvals

ABS	MG
LR	MG
NK	MG

CM-95B91 TRUSTARC™

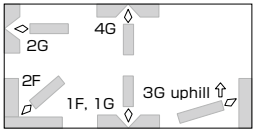
Stick electrode for 9%Cr-1%Mo-V-Nb steel

Features:
- Applied for ASTM A387 Gr.91 and equivalents
- Excellent creep rupture strength

Classification: AWS A5.5 E9015-B91

Redrying Conditions: 325~375℃x1h
Identification color: -
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.5/2.6	300	2	20	18	270W, 85H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	350, 400	5	20	48, 55	170W, 115H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.09	0.08~0.13
Si	0.23	0.30
Mn	0.71	1.20
P	0.01	0.01
S	<0.01	0.01
Ni	0.10	0.80
Co	0.42	-
Cr	8.4	8.0~10.5
Mo	0.99	0.85~1.20
Nb	0.06	0.02~0.10
V	0.21	0.15~0.30
Cu	0.03	-
Al	<0.01	0.04
N	0.03	0.02~0.07
Mn+Ni	0.81	1.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.5/2.6	55~90	50~80
3.2	75~115	70~110
4.0	120~160	90~150

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	590	531min.
TS (MPa)	730	621min.
El on 4d (%)	21	17min.
IV 20℃ (J)	70	-
PWHT (℃xh)	760x2	760±15x2

CM-96B91 TRUSTARC™

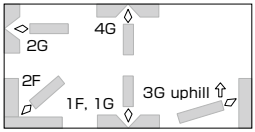
Stick electrode for 9%Cr-1%Mo-V-Nb steel

Features:
- Applied for ASTM A387 Gr.91 and equivalents
- Excellent creep rupture strength

Classification: AWS A5.5 E9016-B91

Redrying Conditions: 325~375℃x1h
Identification color: -
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	270W, 85H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 115H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.11	0.08~0.13
Si	0.25	0.30
Mn	0.78	1.20
P	0.01	0.01
S	<0.01	0.01
Ni	0.15	0.80
Co	0.41	-
Cr	8.5	8.0~10.5
Mo	0.97	0.85~1.20
Nb	0.04	0.02~0.10
V	0.23	0.15~0.30
Cu	0.02	0.25
Al	<0.01	0.04
N	0.04	0.02~0.07
Mn+Ni	0.93	1.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	75~115	70~110
4.0	120~160	90~150

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	620	531min.
TS (MPa)	760	621min.
El on 4d (%)	23	17min.
IV 20℃ (J)	40	-
PWHT (℃xh)	760x2	760±15x2

CM-9Cb TRUSTARC™

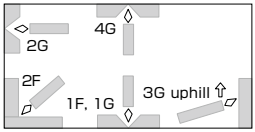
Stick electrode for 9%Cr-1%Mo-V-Nb steel

Features:
- Applied for ASTM A387 Gr.91 and equivalents
- Excellent creep rupture strength
- Good performance by AC current

Classification: AWS A5.5 E9016-G

Redrying Conditions: 325~375℃x1h
Identification color: 1st Yellow, 2nd Purple
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	270W, 85H, 330L
3.2	350	5	20	31	170W, 115H, 380L
4.0	400	5	20	55	170W, 105H, 430L
5.0	400	5	20	85	170W, 110H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.12
Si	0.39	0.60
Mn	1.51	2.00
P	0.01	0.03
S	<0.01	0.03
Ni	0.94	1.00
Cr	8.98	8.00~10.50
Mo	1.06	0.80~1.20
Nb	0.03	0.15
V	0.19	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	75~115	70~110
4.0	120~160	90~150
5.0	160~220	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	600	531min.
TS (MPa)	750	621min.
El on 4d (%)	25	17min.
IV 0℃ (J)	80	-
PWHT (℃xh)	750x5	740±15x1

Approvals

ABS	MG (AWS A5.5 E9016-G)
LR	MG
NK	MG

CR-12S TRUSTARC™

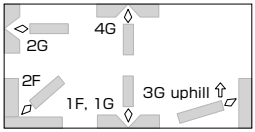
Stick electrode for 9~12%Cr-W-V-Nb steel

Features:
- Applied for ASTM A335 Gr. P92 and equivalents
- Excellent creep rupture strength

Classification: AWS A5.5 E9016-G

Redrying Conditions: 325~375℃x1h
Identification color: -
Polarity: DCEP, AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 110H, 430L
5.0	400	5	20	85	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical (DCEP)	Guaranty [a]
C	0.07	0.15
Si	0.38	0.60
Mn	0.94	0.50~1.50
P	0.01	0.03
S	<0.01	0.03
Ni	0.46	1.50
Co	1.57	0.50~1.80
Cr	9.52	8.60~13.00
Mo	0.21	0.50
V	0.30	0.50
Nb	0.030	0.080
W	1.56	1.30~2.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	75~115	70~110
4.0	120~160	90~150
5.0	160~220	-

All-weld mechanical properties

	Typical (DCEP)	Guaranty
0.2%YS (MPa)	650	531min.
TS (MPa)	700	621min.
El on 4d (%)	22	17min.
IV 0℃ (J)	40	-
PWHT (℃xh)	740x8	750±15x8

MG-S56 TRUSTARC™

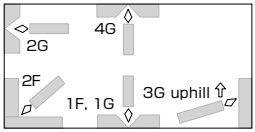
Solid wire for Mn-Mo & Mn-Mo-Ni steel

Features: ▪ Applied for ASTM A533 Type A, B, C, D and equivalents

Classification: AWS A5.28 ER80S-G

Shielding gas: Ar-5~20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	20kg
Volume mm	280W, 110H, 270L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.10
Si	0.41	0.30~0.90
Mn	1.50	1.00~1.60
P	0.004	0.020
S	0.007	0.020
Ni	0.92	0.50~1.00
Mo	0.35	0.20~0.60
Cu	0.16	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	240~300	130~190

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	540	469min.
TS (MPa)	620	552min.
El on 4d (%)	29	19min.
IV -20℃ (J)	190	-
PWHT (℃xh)	620x1	620±15x1
SG	Ar-20%CO_2	Ar-20%CO_2

MG-S63S TRUSTARC™

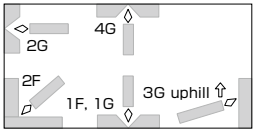
Solid wire for Mn-Mo & Mn-Mo-Ni steel

Features: ▪ Applied for ASTM A533 Type A, B, C, D class 2 and equivalents

Classification: AWS A5.28 ER90S-G

Shielding gas: Ar-5~20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	20kg
Volume mm	280W, 110H, 270L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.08	0.15
Si	0.48	0.70
Mn	1.76	1.50~2.10
P	0.007	0.015
S	0.002	0.015
Ni	1.02	0.80~1.40
Mo	0.46	0.40~0.65
Cu	0.12	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	240~300	130~190

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	570	-
TS (MPa)	650	621min.
El on 4d (%)	27	-
IV -12℃ (J)	150	-
PWHT (℃xh)	630x27	620±15x1
SG	Ar-20%CO_2	Ar-20%CO_2

MG-S70SA1 TRUSTARC™

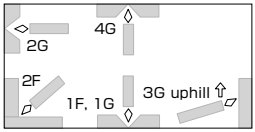
Solid wire for 0.5%Mo steel

Features: ▪ Applied for ASTM A204 Gr. A, B, C and equivalents

Classification: AWS A5.28 ER70S-A1

Shielding gas: Ar-2~5%O_2, Ar-5~20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum	
0.9	10kg	-	-	-
1.0	-	20kg	250kg	-
1.2	-	20kg	250kg	400kg
Volume mm	240W, 110H, 230L	280W, 110H, 270L	530ϕ, 820H	680ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.12
Si	0.51	0.30~0.70
Mn	0.99	1.30
P	0.009	0.025
S	0.012	0.025
Ni	0.03	0.20
Mo	0.49	0.40~0.65
Cu	0.16	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	240~300	130~190

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	450	400min.
TS (MPa)	530	515min.
El on 4d (%)	33	19min.
IV 0℃ (J)	190	-
PWHT (℃xh)	620x1	620±15x1
SG	Ar-2%O_2	Ar-2%O_2

MG-SM TRUSTARC™

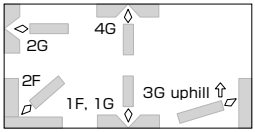
Solid wire for 0.5%Mo steel

Features: ▪ Applied for ASTM A204 Gr. A, B, C and equivalents

Classification: AWS A5.28 ER80S-G

Shielding gas: Ar-2~5%O_2, Ar-5~20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum		
0.9	10kg	20kg	-	-	-
1.0	10kg	20kg	-	-	-
1.2	10kg	20kg	100kg	250kg	400kg
Volume mm	240W, 110H, 230L	280W, 110H, 270L	530ϕ, 820H		680ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.53	0.30~0.70
Mn	1.03	0.60~1.30
P	0.006	0.025
S	0.008	0.025
Ni	0.02	0.20
Mo	0.54	0.40~0.65
Cu	0.17	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	240~300	130~190

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	520	480	469min.
TS (MPa)	610	580	552min.
El on 4d (%)	25	28	19min.
IV 0℃ (J)	100	160	-
PWHT (℃xh)	AW	620x1	AW
SG	Ar-20%CO_2	Ar-20%CO_2	Ar-20%CO_2

Approvals

ABS	MG (AWS A5.28 ER80S-G)
LR	MG

MG-S1CM TRUSTARC™

Solid wire for 1~1.25%Cr-0.5%Mo steel

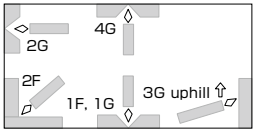
Features: ▪ Applied for ASTM A387 Gr.11, Gr.12 and equivalents

Classification: AWS A5.28 ER80S-G

Shielding gas: Ar-2~5%O_2, Ar-5~20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum		
0.8	10kg	-	-	-	-
0.9	10kg	-	-	-	-
1.0	10kg	20kg	-	-	-
1.2	10kg	20kg	250kg	300kg	400kg
1.4	10kg	-	-	-	-
1.6	-	20kg	-	-	400kg
Volume mm	240W, 110H, 230L	280W, 110H, 270L	530ϕ, 820H		680ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.55	0.30~0.90
Mn	1.05	0.80~1.50
P	0.007	0.025
S	0.008	0.025
Cr	1.38	1.00~1.60
Mo	0.56	0.40~0.65
Cu	0.26	0.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	240~300	130~190

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	550	570	469min.
TS (MPa)	640	680	552min.
El on 4d (%)	25	22	17min.
IV 0℃ (J)	190	70	-
PWHT (℃xh)	650x1	620x1	620±15x1
SG	Ar-2%O_2	Ar-20%CO_2	Ar-2%O_2

Approvals

ABS	MG
LR	MG
BV	UP (AWS A 5.28 ER80S-G)
NK	MG

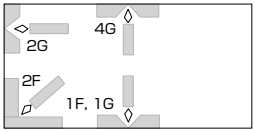
MG-S80B2F

TRUSTARC™

Solid wire for 1~1.25%Cr-0.5%Mo steel

Features:
- Applied for ASTM A387 Gr.11 and equivalents
- Suitable for 1 pass fillet welding in the panel fin tube fabrication
- Do not use for multi-pass welding

Welding Positions:



Classification: AWS A5.28 ER80S-B2

Shielding gas: Ar-2~5%O_2, Ar-5~20%CO_2 mixture
Polarity: DCEP

Packaging data

ϕ mm	Spool		Drum	
0.9	10kg	20kg	-	-
1.0	10kg	20kg	250kg	-
1.2	10kg	20kg	250kg	400kg
1.4	10kg	20kg	-	-
1.6	10kg	20kg	-	400kg
Volume mm	240W, 110H, 230L	280W, 110H, 270L	530ϕ, 820H	680ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.11	0.07~0.12
Si	0.50	0.40~0.70
Mn	0.67	0.47~0.70
P	0.004	0.025
S	0.004	0.025
Cr	1.40	1.20~1.50
Ni	0.01	0.20
Mo	0.55	0.40~0.65
Cu	0.15	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 4G
1.2	240~300	130~190

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	550	470min.
TS (MPa)	650	550min.
El on 4d (%)	28	19min.
IV -18℃ (J)	140	-
PWHT (℃xh)	620x1	620±15x1
SG	Ar-2%O_2	Ar-2%O_2

MG-S2CM TRUSTARC™

Solid wire for 2.25%Cr-1%Mo steel

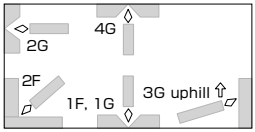
Features: ▪ Applied for ASTM A387 Gr.22 and equivalents

Classification: AWS A5.28 ER90S-G

Shielding gas: Ar-2~5%O_2, Ar-5~20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum		
0.9	10kg	-	-	-	-
1.0	10kg	-	-	-	-
1.2	10kg	20kg	100kg	250kg	400kg
1.4	-	20kg	-	250kg	-
1.6	-	20kg	-	-	400kg
Volume mm	240W, 110H, 230L	280W, 110H, 270L	530ϕ, 820H		680ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.56	0.30~0.90
Mn	1.03	0.75~1.40
P	0.005	0.025
S	0.008	0.025
Cr	2.35	2.10~2.70
Mo	1.11	0.90~1.20
Cu	0.17	0.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	240~300	130~190

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	580	430	538min.
TS (MPa)	680	570	621min.
El on 4d (%)	23	30	17min.
IV 0℃ (J)	190	140	-
PWHT (℃xh)	690x1	690x15	690±15x1
SG	Ar-2%O_2	Ar-20%CO_2	Ar-2%O_2

Approvals

LR	MG
NK	MG

MG-S2CW

TRUSTARC™

Solid wire for low C-2.25%Cr-W-V-Nb steel

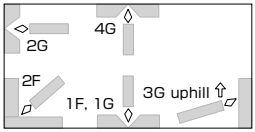
Features: ▪ Applied for ASTM A335 Gr. P23 and equivalents

Classification: AWS A5.28 ER90S-G

Shielding gas: Ar-5~20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum
1.0	10kg	-
1.2	10kg	250kg
Volume mm	240W, 110H, 230L	530ϕ, 820H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.12
Si	0.38	0.10~0.60
Mn	1.16	0.80~1.60
P	0.003	0.020
S	0.007	0.010
Ni	0.55	0.30~1.00
Cr	2.24	2.00~2.60
Mo	0.10	0.05~0.30
Cu	0.13	0.40
Nb	0.04	0.01~0.08
V	0.27	0.15~0.30
W	1.80	1.00~2.00

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	240~300	130~190

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	660	490min.
TS (MPa)	730	621min.
El on 4d (%)	19	15min.
IV 0℃ (J)	40	-
PWHT (℃xh)	715x2	715x2
SG	Ar-20%CO_2	Ar-20%CO_2

Approvals

LR	MG
NK	MG

MG-S90B91 TRUSTARC™

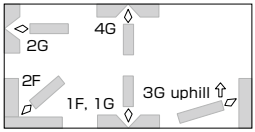
Solid wire for 9%Cr-1%Mo-V-Nb steel

Features:
- Applied for ASTM A387 Gr.91 and equivalents
- Excellent creep rapture strength

Classification: AWS A5.28 ER90S-B9

Shielding gas: Ar-2~5%O_2, Ar-5~20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	10kg	20kg
Volume mm	240W, 110H, 230L	280W, 110H, 270L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.07~0.13
Si	0.23	0.15~0.50
Mn	0.63	1.20
P	0.004	0.010
S	0.005	0.010
Ni	0.15	0.80
Co	0.41	-
Cr	8.38	8.00~10.50
Mo	0.98	0.85~1.20
Cu	0.01	0.20
Nb	0.06	0.02~0.10
V	0.18	0.15~0.30
N	0.04	0.03~0.07
Al	<0.01	0.04
Mn+Ni	0.78	1.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	260~320	140~200

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	590	414min.
TS (MPa)	730	621min.
El on 4d (%)	23	15min.
IV 0℃ (J)	30	-
PWHT (℃xh)	760x2	760±15x2
SG	Ar-5%CO_2	Ar-5%CO_2

MG-S9Cb

TRUSTARC™

Solid wire for 9%Cr-1%Mo-V-Nb steel

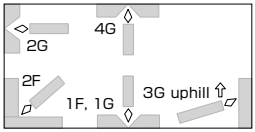
Features: ▪ Applied for ASTM A387 Gr.91 and equivalents

Classification: AWS A5.28 ER90S-G

Shielding gas: Ar-2~5%O_2, Ar-5~20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.0	10kg	-
1.2	10kg	20kg
Volume mm	240W, 110H, 230L	280W, 110H, 270L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.08	0.12
Si	0.32	0.10~0.60
Mn	1.54	1.20~1.90
P	0.005	0.020
S	0.007	0.020
Ni	0.45	0.20~1.00
Cr	8.79	8.00~10.50
Mo	0.86	0.80~1.20
Cu	0.09	0.35
Nb	0.02	0.01~0.10
V	0.17	0.15~0.50
N	0.02	0.01~0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	260~320	140~200

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	570	414min.
TS (MPa)	700	621min.
El on 4d (%)	27	15min.
IV 0℃ (J)	100	-
PWHT (℃xh)	740x8	745±15x1
SG	Ar-5%CO_2	Ar-5%CO_2

Approvals

ABS	MG (AWS A5.28 ER90S-G)
LR	MG
NK	MG

MG-S12CRS TRUSTARC™

Solid wire for 9~12%Cr-W-V-Nb steel

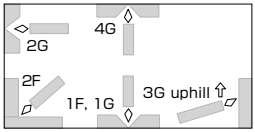
Features: ▪ Applied for ASTM A335 Gr. P92 and equivalents

Classification: AWS A5.28 ER90S-G

Shielding gas: Ar-2~5%O_2, Ar-5~20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	10kg	20kg
Volume mm	240W, 110H, 230L	280W, 110H, 270L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.12
Si	0.40	0.10~0.70
Mn	1.19	0.80~1.50
P	0.004	0.020
S	0.006	0.020
Ni	0.52	0.30~1.00
Cr	10.10	9.50~11.50
Mo	0.40	0.25~0.50
Cu	0.01	0.40
Nb	0.04	0.01~0.08
V	0.30	0.10~0.50
W	1.59	1.00~2.00
N	0.04	0.02~0.07
Co	1.59	1.00~1.70

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G, 3G uphill, 4G
1.2	260~320	140~200

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	590	531min.
TS (MPa)	720	621min.
El on 4d (%)	25	15min.
IV 20℃ (J)	70	-
PWHT (℃xh)	750x8	750±15x1
SG	Ar-5%CO_2	Ar-5%CO_2

TG-S56

TRUSTARC™

TIG wire and rod for Mn-Mo and Mn-Mo-Ni steel

Features: ▪ Applied for ASTM A533 Type A, B, C, D and equivalents

Classification: AWS A5.28 ER80S-G

Shielding Gas: Ar
Identification color: 1st Silver grey
Polarity: DCEN

Packaging data

	Tube		
ϕ mm	**kg**	**Length mm**	**g/piece**
1.2	5	1,000	9
1.6	5	1,000	16
2.0	5	1,000	25
2.4	5	1,000	35
Volume mm	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.12
Si	0.39	0.20~0.60
Mn	1.52	1.20~1.80
P	0.003	0.025
S	0.007	0.025
Ni	0.62	0.40~0.80
Mo	0.49	0.40~0.60
Cu	0.16	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	520	469min.
TS (MPa)	590	552min.
El on 4d (%)	31	19min.
IV -12℃ (J)	290	-
PWHT (℃xh)	620x1	620±15x1

TG-S63S TRUSTARC™

TIG wire and rod for Mn-Mo and Mn-Mo-Ni steel

Features: ▪ Applied for ASTM A533 Type A, B, C, D and equivalents

Classification: AWS A5.28 ER90S-G

Shielding Gas: Ar
Identification color: 1st Light green
Polarity: DCEN

Packaging data

	Tube		
ϕ mm	**kg**	**Length mm**	**g/piece**
1.6	5	1,000	16
2.0	5	1,000	25
2.4	5	1,000	35
3.2	5	1,000	63
Volume mm	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.15
Si	0.34	0.20~0.50
Mn	1.27	1.05~1.45
P	0.003	0.025
S	0.007	0.025
Ni	1.58	1.45~1.75
Cr	0.02	0.30
Mo	0.41	0.25~0.55
Cu	0.11	0.35
V	<0.01	0.05

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	570	530min.
TS (MPa)	660	621min.
El on 4d (%)	27	15min.
IV -12℃ (J)	260	-
PWHT (℃xh)	625x15	620x1

TG-S70SA1

TRUSTARC™

TIG wire and rod for 0.5%Mo steel

Features: ▪ Applied for ASTM A204 Gr. A, B, C and equivalents

Classification: AWS A5.28 ER70S-A1

Shielding Gas: Ar
Identification color: 1st Green
Polarity: DCEN

Packaging data

	Tube		
ϕ mm	**kg**	**Length mm**	**g/piece**
1.6	5	1,000	16
2.0	5	1,000	25
2.4	5	1,000	35
3.2	5	1,000	63
Volume mm	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.53	0.30~0.70
Mn	1.03	1.30
P	0.006	0.025
S	0.008	0.025
Ni	0.02	0.20
Mo	0.54	0.40~0.65
Cu	0.15	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	530	400min.
TS (MPa)	610	518min.
El on 4d (%)	32	19min.
IV 0℃ (J)	270	-
PWHT (℃xh)	620x1	620±15x1

TG-SM

TRUSTARC™

TIG wire and rod for 0.5%Mo steel

Features: ▪ Applied for ASTM A204 Gr. A, B, C and equivalents

Classification: AWS A5.28 ER80S-G

Shielding Gas: Ar
Identification color: 1st Green
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	-	-	-
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	35
3.2	-	5	1,000	63
Volume mm	240W, 110H, 230L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.05~0.12
Si	0.53	0.30~0.70
Mn	1.03	1.30
P	0.006	0.025
S	0.008	0.025
Ni	0.02	0.20
Mo	0.54	0.40~0.65
Cu	0.15	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	500	469min.
TS (MPa)	580	552min.
El on 4d (%)	32	19min.
IV 0℃ (J)	280	-
PWHT (℃xh)	620x1	AW

Approvals

ABS	MG

TG-S80B2

TRUSTARC™

TIG wire and rod for 1.25%Cr-0.5%Mo steel

Features: ▪ Applied for ASTM A213 Gr.11 and equivalents

Classification: AWS A5.28 ER80S-B2

Shielding Gas: Ar
Identification color: 1st Silver
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	-	-	-
1.2	10	5	1,000	9
1.6	-	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	35
3.2	-	5	1,000	63
Volume mm	240W, 110H, 230L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.07~0.12
Si	0.52	0.40~0.70
Mn	0.60	0.40~0.70
P	0.004	0.025
S	0.007	0.025
Ni	0.03	0.20
Cr	1.35	1.20~1.50
Mo	0.52	0.40~0.65
Cu	0.15	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	490	469min.
TS (MPa)	630	552min.
El on 4d (%)	32	19min.
IV -20℃ (J)	250	-
PWHT (℃xh)	620x1	620±15x1

TG-S1CM TRUSTARC™

TIG wire and rod for 1.25%Cr-0.5%Mo steel

Features: ▪ Applied for ASTM A387 Gr.11, Gr.12 and equivalents

Classification: AWS A5.28 ER80S-G

Shielding Gas: Ar
Identification color: 1st Silver
Polarity: DCEN

Packaging data

	Spool			Coil	Tube		
ϕ mm	**kg**			**kg**	**kg**	**Length mm**	**g/piece**
0.8	1	5	10	-	-	-	-
1.0	-	5	10	-	-	-	-
1.2	-	-	10	-	5	1,000	9
1.6	-	-	10	-	5	1,000	16
2.0	-	-	-	-	5	1,000	25
2.4	-	-	-	-	5	1,000	35
3.2	-	-	-	25	5	1,000	63
Volume mm	280W, 110H, 280L/10pcs	240W, 110H, 230L		430W, 90H, 430L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.08	0.05~0.12
Si	0.52	0.30~0.70
Mn	1.06	0.80~1.20
P	0.006	0.025
S	0.007	0.025
Ni	0.02	0.20
Cr	1.40	1.00~1.50
Mo	0.55	0.40~0.65
Cu	0.20	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	630	469min.
TS (MPa)	740	552min.
El on 4d (%)	28	19min.
IV -20℃ (J)	210	-
PWHT (℃x h)	620x1	620±15x1

Approvals

ABS	MG (AWS A5.28 ER80S-G)
LR	MG
DNV-GL	VL1Cr0.5Mo, MG
BV	UP (AWS A5.28 ER80S-G)
NK	MG (AWS A5.28 ER80S-G)
KR	MG (AWS A5.28 ER80S-G)

TG-S1CML

TRUSTARC™

TIG wire and rod for 1.25%Cr-0.5%Mo steel

Features:
- Applied for ASTM A387 Gr.11, Gr.12 and equivalents
- Lower carbon content than TG-S1CM

Classification: AWS A5.28 ER80S-G

Shielding Gas: Ar
Identification color: 1st Blue
Polarity: DCEN

Packaging data

	Spool		Tube		
ϕ mm	**kg**		**kg**	**Length mm**	**g/piece**
0.8	10	-	-	-	-
1.0	10	20	-	-	-
1.2	10	20	-	-	-
1.6	-	-	5	1,000	16
2.0	-	-	5	1,000	25
2.4	-	-	5	1,000	35
3.2	-	-	5	1,000	63
Volume mm	240W, 110H, 230L	280W, 110H, 270L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.03	0.05
Si	0.47	0.20~0.70
Mn	1.07	0.80~1.30
P	0.004	0.025
S	0.010	0.025
Ni	0.02	0.20
Cr	1.40	1.00~1.50
Mo	0.51	0.40~0.65
Cu	0.12	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	480	469min.
TS (MPa)	580	552min.
El on 4d (%)	31	19min.
IV 0℃ (J)	300	-
PWHT (℃x h)	620x1	AW

TG-S90B3 TRUSTARC™

TIG wire and rod for 2.25%Cr-1%Mo steel

Features: ▪ Applied for ASTM A387 Gr.22 and equivalents

Classification: AWS A5.28 ER90S-B3

Shielding Gas: Ar
Identification color: 1st Brown
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	-	-	-
1.2	10	-	-	-
1.6	-	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	35
3.2	-	5	1,000	63
Volume mm	240W, 110H, 230L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.09	0.07~0.12
Si	0.64	0.40~0.70
Mn	0.60	0.40~0.70
P	0.004	0.025
S	0.006	0.025
Cr	2.39	2.30~2.70
Mo	1.08	0.90~1.20
Ni	0.06	0.20
Cu	0.15	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	600	538min.
TS (MPa)	730	621min.
El on 4d (%)	27	17min.
IV -20℃ (J)	240	-
PWHT (℃xh)	690x1	690±15x1

TG-S2CM

TRUSTARC™

TIG wire and rod for 2.25%Cr-1%Mo steel

Features: ▪ Applied for ASTM A387 Gr.22 and equivalents

Classification: AWS A5.28 ER90S-G

Shielding Gas: Ar
Identification color: 1st Brown
Polarity: DCEN

Packaging data

	Spool				Tube		
ϕ mm	**kg**				**kg**	**Length mm**	**g/piece**
0.8	1	5	10	-	-	-	-
1.0	-	-	10	-	-	-	-
1.2	-	-	10	20	5	1,000	9
1.6	-	-	10	-	5	1,000	16
2.0	-	-	-	-	5	1,000	25
2.4	-	-	-	-	5	1,000	35
3.2	-	-	-	-	5	1,000	63
Volume mm	280W, 110H, 280L/10pcs	240W, 110H, 230L		280W, 110H, 270L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.11	0.05~0.15
Si	0.36	0.60
Mn	0.70	0.50~1.20
P	0.005	0.025
S	0.008	0.025
Ni	0.04	0.20
Cr	2.29	2.10~2.50
Mo	1.07	0.90~1.20
Cu	0.15	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	610	538min.
TS (MPa)	720	621min.
El on 4d (%)	28	17min.
IV 0℃ (J)	250	-
PWHT (℃xh)	690x1	690±15x1

Approvals

ABS	MG
LR	MG
DNV-GL	VL2.25Cr1Mo, MG
BV	UP(AWS A5.28 ER90S-G)
NK	MG
KR	MG(AWS A5.28 ER90S-G)

TG-S2CML TRUSTARC™

TIG wire and rod for 2.25%Cr-1%Mo steel

Features:
- Applied for ASTM A387 Gr.22 and equivalents
- Lower carbon content than TG-S2CM

Classification: AWS A5.28 ER80S-G

Shielding Gas: Ar
Identification color: 1st Red
Polarity: DCEN

Packaging data

	Spool		Tube		
ϕ mm	**kg**		**kg**	**Length mm**	**g/piece**
1.0	10	20	-	-	-
1.2	10	20	5	1,000	-
1.6	10	-	5	1,000	16
2.0	-	-	5	1,000	25
2.4	-	-	5	1,000	35
Volume mm	240W, 110H, 230L	280W, 110H, 270L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.05
Si	0.50	0.30~0.80
Mn	1.09	0.80~1.40
P	0.005	0.025
S	0.010	0.025
Ni	0.02	0.20
Cr	2.34	2.10~2.70
Mo	1.10	0.90~1.20
Cu	0.16	0.40

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	520	469min.
TS (MPa)	630	552min.
El on 4d (%)	28	19min.
IV 0℃ (J)	250	-
PWHT (℃xh)	690x1	690±15x1

TG-S2CMH

TRUSTARC™

TIG wire and rod for 2.25%Cr-1%Mo-V steel

Features:
- Applied for ASTM A542 Type D Cl.4a and equivalents
- Excellent tensile strength at high temperatures and less sensitive to temper embrittlement

Classification: AWS A5.28 ER90S-G

Shielding Gas: Ar
Identification color: 1st Silver
Polarity: DCEN

Packaging data

	Spool		Tube		
ϕ mm	**kg**		**kg**	**Length mm**	**g/piece**
1.0	10	-	-	-	-
1.2	10	20	5	1,000	9
1.6	-	-	5	1,000	16
2.0	-	-	5	1,000	25
2.4	-	-	5	1,000	35
Volume mm	240W, 110H, 230L	280W, 110H, 270L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.05~0.15
Si	0.16	0.50
Mn	0.41	0.20~1.10
P	0.004	0.010
S	0.007	0.010
Ni	0.02	0.20
Cr	2.31	2.00~2.60
Mo	1.06	0.90~1.20
V	0.28	0.20~0.40
Nb	0.033	0.010~0.040
Cu	0.14	0.35

Note: [a] Single values are maximum.

All-weld Mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	620	-
TS (MPa)	730	621min.
El on 4d (%)	22	-
IV -18℃ (J)	300	-
PWHT (℃xh)	705x7	705±15x8

TG-S2CW TRUSTARC™

TIG wire and rod for low C-2.25%Cr-W-V-Nb steel

Features: ▪ Applied for ASTM A335 Gr. P23 and equivalents

Classification: AWS A5.28 ER80S-G

Shielding Gas: Ar
Identification color: 1st Blue white
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
0.8	10	-	-	-
1.0	10	-	-	-
1.2	10	-	-	-
2.0	-	5	1,000	25
2.4	-	5	1,000	35
Volume mm	240W, 110H, 230L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.42	0.10~0.60
Mn	0.46	0.20~1.00
P	0.006	0.020
S	0.008	0.010
Cr	2.30	2.00~2.60
Mo	0.47	0.40~0.65
Cu	0.17	0.40
Nb	0.03	0.01~0.08
V	0.32	0.15~0.40
W	1.19	1.00~2.00
Al	<0.01	0.03

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	470	400min.
TS (MPa)	580	520min.
El on 4d (%)	31	17min.
IV 0℃ (J)	210	-
PWHT (℃xh)	715x2	715±15x2

Approvals

ABS	MG
LR	MG
NK	MG

TG-S90B91

TRUSTARC™

TIG wire and rod for 9%Cr-1%Mo-V-Nb steel

Features:
- Applied for ASTM A387 Gr.91 and equivalents
- Excellent creep rupture strength

Classification: AWS A5.28 ER90S-B9

Shielding Gas: Ar
Identification color: 1st Purple Blue
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	-	-	-
1.2	10	-	-	-
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	35
3.2	-	5	1,000	63
Volume mm	240W, 110H, 230L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.07~0.13
Si	0.29	0.15~0.50
Mn	0.72	1.20
P	0.004	0.010
S	0.005	0.010
Cu	0.01	0.20
Cr	8.36	8.00~10.50
Mo	0.97	0.85~1.20
Ni	0.15	0.80
Co	0.41	-
V	0.18	0.15~0.30
Al	<0.01	0.04
Nb	0.06	0.02~0.10
N	0.04	0.03~0.07
Mn+Ni	0.87	1.50

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	620	414min.
TS (MPa)	750	621min.
El on 4d (%)	25	16min.
IV 0℃ (J)	150	-
PWHT (℃xh)	760x2	760±15x2

TG-S9Cb TRUSTARC™

TIG wire and rod for 9%Cr-1%Mo-V-Nb steel

Features:
- Applied for ASTM A387 Gr.91 and equivalents
- Excellent creep rupture strength

Classification: AWS A5.28 ER90S-G

Shielding Gas: Ar
Identification color: 1st Grey
Polarity: DCEN

Packaging data

	Spool		Tube		
ϕ mm	**kg**		**kg**	**Length mm**	**g/piece**
0.8	5	10	-	-	-
1.0	-	10	-	-	-
1.2	-	10	-	-	-
1.6	-	10	5	1,000	16
2.0	-	-	5	1,000	25
2.4	-	-	5	1,000	35
3.2	-	-	5	1,000	63
Volume mm	240W, 110H, 230L		40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.16	0.50
Mn	1.00	0.50~1.20
P	0.006	0.020
S	0.004	0.010
Ni	0.67	0.10~0.80
Cr	8.98	8.00~10.00
Mo	0.88	0.85~1.20
Nb	0.04	0.02~0.12
V	0.18	0.10~0.35
Cu	0.03	0.35
N	0.02	0.01~0.05

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	700	414min.
TS (MPa)	780	621min.
El on 4d (%)	24	16min.
IV 0℃ (J)	240	-
PWHT (℃xh)	740x8	745±15x1

Approvals

ABS	MG
LR	MG
NK	MG

TG-S12CRS

TRUSTARC™

TIG wire and rod for 9~12%Cr-W-V-Nb steel

Features:
- Applied for ASTM A335 Gr. P92 and equivalents
- Excellent creep rupture strength

Classification: AWS A5.28 ER90S-G

Shielding Gas: Ar
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	-	-	-
2.0	-	5	1,000	25
2.4	-	5	1,000	35
Volume mm	240W, 110H, 230L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.36	0.10~0.50
Mn	0.74	0.20~1.00
P	0.004	0.020
S	0.003	0.010
Ni	0.51	0.30~0.80
Cr	9.92	9.50~11.50
Mo	0.35	0.20~0.55
Cu	0.01	0.40
Nb	0.04	0.01~0.08
V	0.21	0.10~0.35
W	1.45	1.00~2.00
Co	1.01	0.80~1.20
N	0.04	0.02~0.07

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	670	531min.
TS (MPa)	790	621min.
El on 4d (%)	23	17min.
IV 0℃ (J)	40	-
PWHT (℃xh)	740x8	750±15

PF-200/US-56B TRUSTARC™

Flux and wire combination for Mn-Mo and Mn-Mo-Ni steel

Features: ▪ Applied for ASTM A533 Type A, B, C, D and equivalents

Classification: AWS A5.23 F9P4-EG-G

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: AC

Packaging data

Flux	Mesh	Can	
PF-200	48xD	20kg	
Volume mm		240W, 350H, 240L	
Wire	ϕ mm	Coil	
US-56B	3.2	25kg	-
	4.0	25kg	75kg
	4.8	25kg	75kg
Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.11	0.15
Si	0.17	0.35
Mn	1.59	1.40~2.20
P	0.003	0.018
S	0.001	0.018
Ni	0.86	0.70~1.20
Cr	0.03	0.20
Mo	0.48	0.40~0.70
Cu	0.06	0.30

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.08	0.12
Si	0.11	0.50
Mn	1.33	0.90~1.80
P	0.007	0.020
S	0.003	0.020
Ni	0.83	0.70~1.20
Mo	0.43	0.40~0.70
Cu	0.08	0.30

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	580	538min.
TS (MPa)	660	621~758
El on 4d (%)	31	17min.
IV -40℃ (J)	160	27min.
PWHT (℃xh)	620x1	620±15x1

PF-200/US-63S TRUSTARC™

Flux and wire combination for Mn-Mo and Mn-Mo-Ni steel

Features: ▪ Applied for ASTM A533 Type A, B, C, D Class 2 and equivalents

Classification: AWS A5.23 F10P2-EG-G

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: AC

Packaging data

Flux	Mesh	Can	
PF-200	48xD	20kg	
Volume mm		240W, 350H, 240L	
Wire	ϕ mm	Coil	
US-63S	3.2	25kg	-
	4.0	25kg	75kg
	4.8	25kg	75kg
Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.11	0.15
Si	0.14	0.40
Mn	1.70	1.30~2.20
P	0.006	0.020
S	0.004	0.020
Ni	1.47	1.00~1.75
Cr	0.16	0.40
Mo	0.47	0.30~0.80
Cu	0.08	0.30

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.08	0.16
Si	0.10	0.60
Mn	1.51	1.00~2.00
P	0.007	0.020
S	0.004	0.020
Ni	1.31	1.00~1.75
Mo	0.47	0.30~0.80
Cr	0.14	0.40

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	630	607min.
TS (MPa)	710	689~827
El on 4d (%)	24	16min.
IV (J)	-20℃:120	-29℃:27min.
PWHT (℃xh)	610x2	620±15x1

FAMILIARC™ MF-38/ TRUSTARC™ US-A4

Flux and wire combination for 0.5%Mo steel

Features: ▪ Applied for ASTM A204 Gr. A, B, C and equivalents

Classification: AWS A5.23 F8P6-EA4-A4, F8A4-EA4-A4

Type of flux: Fused
Redrying of flux: 150~350℃x1h
Polarity: AC

Packaging data

Flux	Mesh	Can	Wire	ϕ mm	Coil
MF-38	12x65	25kg	US-A4	3.2	25kg
	20x200	25kg		4.0	25kg
	20xD	25kg		4.8	25kg
Volume mm		240W, 350H, 240L	Volume mm		430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.09	0.05~0.15
Si	0.04	0.20
Mn	1.59	1.20~1.70
P	0.01	0.025
S	0.014	0.025
Ni	0.02	0.25
Cr	0.04	0.15
Mo	0.52	0.45~0.65
Cu	0.10	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.10	0.15
Si	0.39	0.80
Mn	1.35	1.60
P	0.013	0.030
S	0.013	0.030
Mo	0.52	0.40~0.65
Cu	0.11	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	510	469min.
TS (MPa)	600	552~689
El on 4d (%)	29	20min.
IV -51℃ (J)	40	27min.
PWHT (℃xh)	620x1	620±15x1

FAMILIARC™ MF-38/ TRUSTARC™ US-49

Flux and wire combination for 0.5%Mo steel

Features: ▪ Applied for ASTM A204 Gr. A, B, C and equivalents

Classification: AWS A5.23 F8P6-EG-A4, F8A4-EG-A4

Type of flux: Fused
Redrying of flux: 150~350℃x1h
Polarity: AC

Packaging data

Flux		Can
MF-38	12x65	25kg
	20x200	25kg
	20xD	25kg
Volume mm		240W, 350H, 240L

Wire	ϕ mm	Spool		Coil		
US-49	1.6	-	20kg	-	-	-
	2.0	10kg	-	-	-	-
	2.4	10kg	-	25kg	-	-
	3.2	-	-	25kg	76kg	-
	4.0	-	-	25kg	75kg	-
	4.8	-	-	25kg	75kg	150kg
	6.4	-	-	25kg	-	159kg
Volume mm		240W, 110H, 230L	280W, 110H, 270L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.07~0.12
Si	0.02	0.05
Mn	1.58	1.25~1.80
P	0.009	0.025
S	0.011	0.025
Mo	0.53	0.45~0.60
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.10	0.15
Si	0.37	0.80
Mn	1.35	1.60
P	0.014	0.030
S	0.014	0.030
Mo	0.53	0.40~0.65
Cu	0.09	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	510	469min.
TS (MPa)	590	552~689
El on 4d (%)	30	20min.
IV -51℃ (J)	50	27min.
PWHT (℃xh)	620x1	620±15x1

Approvals

ABS	3YM
LR	3YM
DNV-GL	ⅢYM
BV	A3YM
NK	KAW3Y46M H10
CCS	3YM

Note: Single electrode

FAMILIARC™ MF-38/ TRUSTARC™ US-40

Flux and wire combination for 0.5%Mo steel

Features: ▪ Applied for ASTM A204 Gr. A, B, C and equivalents

Classification: AWS A5.23 F8P6-EA3-A3, F9A6-EA3-A3

Type of flux: Fused
Redrying of flux: 150~350℃x1h
Polarity: AC

Packaging data

Flux		Can	
MF-38	12x65	25kg	
	20x200	25kg	
	20xD	25kg	
Volume mm		240W, 350H, 240L	
Wire	ϕ mm	Spool	Coil
US-40	2.4	20kg	25kg
	3.2	-	25kg
	4.0	-	25kg
	4.8	-	25kg
	6.4	-	25kg
Volume mm		300W, 110H, 300L	430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.14	0.05~0.17
Si	0.02	0.20
Mn	1.78	1.65~2.20
P	0.009	0.025
S	0.014	0.025
Mo	0.52	0.45~0.65
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.08	0.15
Si	0.34	0.80
Mn	1.58	2.10
P	0.017	0.030
S	0.009	0.030
Mo	0.45	0.40~0.65
Cu	0.12	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	560	469min.
TS (MPa)	630	552~689
El on 4d (%)	29	20min.
IV -51℃ (J)	58	27min.
PWHT (℃xh)	620x1	620±15x1

Approvals

NK	KAW3Y50M, H10

Note: Single electrode

PF-200/US-511N TRUSTARC™

Flux and wire combination for 1~1.25%Cr-0.5%Mo steel

Features:
- Applied for ASTM A387 Gr.11, Gr.12 and equivalents
- Excellent notch toughness

Classification: AWS A5.23 F8P2-EG-B2

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: AC

Packaging data

Flux		Can	
PF-200	10x48	20kg	
Volume mm		240W, 350H, 240L	
Wire	ϕ mm	Coil	
US-511N	3.2	25kg	-
	4.0	25kg	75kg
Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.09	0.15
Si	0.30	0.40
Mn	0.90	0.50~1.00
P	0.004	0.015
S	0.002	0.015
Ni	0.17	0.25
Cr	1.48	1.25~1.80
Mo	0.52	0.40~0.65
Cu	0.11	0.25

Note: [a] Single values are maximum.

Composition (weld metal mass %)

	Typical	Guaranty [a]
C	0.08	0.05~0.15
Si	0.20	0.80
Mn	0.88	1.20
P	0.007	0.030
S	0.002	0.030
Ni	0.15	0.25
Cr	1.39	1.00~1.50
Mo	0.55	0.40~0.65
Cu	0.11	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	510	469min.
TS (MPa)	620	552~689
El on 4d (%)	24	20min.
IV (J)	-20℃: 150	-29℃: 27min.
PWHT (℃xh)	690x1	690±15x1

Approvals

BV	UP (AWS A.23 F8P2-EG-B2)

PF-200D/US-511ND TRUSTARC™

Flux and wire combination for 1~1.25%Cr-0.5%Mo steel

Features: ▪ Applied for ASTM A387 Gr.11, Gr.12 and equivalents

Classification: AWS A5.23 F8P2-EG-B2

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: DCEP

Packaging data

Flux	Mesh	Can	Wire	ϕ mm	Coil
PF-200D	10x48	20kg	US-511ND	2.4	25kg
				3.2	25kg
				4.0	25kg
Volume mm		240W, 350H, 240L	Volume mm		430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.13	0.15
Si	0.11	0.40
Mn	0.88	0.50~1.00
P	0.005	0.015
S	0.001	0.015
Ni	0.15	0.25
Cr	1.49	1.25~1.80
Mo	0.56	0.40~0.65
Cu	0.12	0.25

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.08	0.05~0.15
Si	0.21	0.80
Mn	0.82	1.20
P	0.007	0.030
S	0.003	0.030
Ni	0.15	0.25
Cr	1.39	1.00~1.50
Mo	0.56	0.40~0.65
Cu	0.09	0.35

Note: [a] Single values are maximum.

Weld Mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	490	469min.
TS (MPa)	610	552~689
El on 4d (%)	27	20min.
IV (J)	-20℃: 150	-29℃: 27min.
PWHT (℃xh)	690x1	690±15x1

FAMILIARC™ G-80/ TRUSTARC™ US-B2

Flux and wire combination for 1~1.25%Cr-0.5%Mo steel

Features:
- Applied for ASTM A387 Gr.11, Gr.12 and equivalents
- Suitable for 1 pass fillet welding in the panel fin tube fabrication

Classification: AWS A5.23 F7PZ-EB2-B2

Type of flux: Fused
Redrying of flux: 150~350℃x1h
Polarity: DCEP

Packaging data

Flux	Mesh	Can
G-80	12x65	25kg
	12x200	25kg
	20x200	25kg
	32x200	25kg
	20xD	25kg
Volume mm		240W, 350H, 240L

Wire	ϕ mm	Spool		Coil			Drum
US-B2	1.6	10kg	20kg	-	-	-	400kg
	2.0	10kg	-	25kg	-	-	-
	2.4	10kg	-	25kg	-	150kg	-
	3.2	-	-	25kg	75kg	150kg	-
	4.0	-	-	25kg	75kg	150kg	-
	4.8	-	-	25kg	75kg	150kg	-
Volume mm		240W, 110H, 230L	280W, 110H, 270L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	600ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.11	0.07~0.15
Si	0.13	0.05~0.30
Mn	0.57	0.45~1.00
P	0.007	0.025
S	0.006	0.025
Cr	1.49	1.00~1.75
Mo	0.53	0.45~0.65
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.05~0.15
Si	0.45	0.80
Mn	0.83	1.20
P	0.009	0.030
S	0.005	0.030
Cr	1.29	1.00~1.50
Mo	0.54	0.40~0.65
Cu	0.12	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	430	400min.
TS (MPa)	550	483~655
El on 4d (%)	27	22min.
IV 20℃ (J)	40	-
PWHT (℃xh)	690x1	690±15x1

PF-200D/US-B2R TRUSTARC™

Flux and wire combination for 1~1.25%Cr-0.5%Mo steel

Features:
- Applied for ASTM A387 Gr.11 and equivalents
- Satisfied the impurity elements index (X-factor≦15) for Oil reactors

Classification: AWS A5.23 F8P2-EB2R-B2R

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: DCEP

Packaging data

Flux	Mesh	Can	Wire	ϕ mm	Coil	
PF-200D	10x48	20kg	US-B2R	2.4	25kg	-
				3.2	25kg	-
				4.0	25kg	75kg
Volume mm		240W, 350H, 240L	Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.14	0.07~0.15
Si	0.10	0.05~0.30
Mn	0.86	0.45~1.00
P	0.004	0.010
S	0.004	0.010
Cr	1.47	1.00~1.75
Mo	0.56	0.45~0.65
Cu	0.12	0.15
As	0.003	0.005
Sn	0.001	0.005
Sb	0.001	0.005

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.10	0.05~0.15
Si	0.21	0.80
Mn	0.86	1.20
P	0.007	0.010
S	0.002	0.010
Cr	1.44	1.00~1.50
Mo	0.55	0.40~0.65
Cu	0.10	0.15
As	0.003	0.005
Sn	<0.001	0.005
Sb	<0.001	0.005

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	500	469min.
TS (MPa)	610	552~689
El on 4d (%)	27	20min.
IV -29℃ (J)	140	27min.
PWHT (℃xh)	698x1	690±15x1

PF-200/US-521S TRUSTARC™

Flux and wire combination for 2.25%Cr-1%Mo steel

Features:
- Applied for ASTM A387 Gr.22 and equivalents
- Excellent notch toughness

Classification: AWS A5.23 F9P2-EG-B3

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: AC

Packaging data

Flux		Can		
PF-200	10x48	20kg		
Volume mm		240W, 350H, 240L		
Wire	ϕ mm	Coil		
US-521S	3.2	25kg	-	150kg
	4.0	25kg	75kg	150kg
Volume mm		430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.16	0.08~0.18
Si	0.13	0.25
Mn	0.93	0.80~1.20
P	0.003	0.012
S	0.002	0.012
Ni	0.14	0.25
Cr	2.45	2.20~2.70
Mo	1.00	0.90~1.20
Cu	0.12	0.30

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.12	0.05~0.15
Si	0.10	0.80
Mn	0.82	1.20
P	0.008	0.030
S	0.001	0.030
Ni	0.13	0.25
Cr	2.34	2.00~2.50
Mo	1.04	0.90~1.20
Cu	0.12	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	470	538min.
TS (MPa)	610	621~758
El on 4d (%)	27	17min.
IV -29℃ (J)	150	27min.
PWHT (℃xh)	690x8	690±15x1

Approvals

BV	UP (AWS A.23 F9P2-EG-B3)

PF-200D/US-521S TRUSTARC™

Flux and wire combination for 2.25%Cr-1%Mo steel

Features:
- Applied for ASTM A387 Gr.22 and equivalents
- Excellent notch tonghness

Classification: AWS A5.23 F9P2-EG-B3

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: DCEP

Packaging data

Flux		Can		
PF-200D	10x48	20kg		
Volume mm		240W, 350H, 240L		
Wire	ϕ mm	Coil		
US-521S	3.2	25kg	-	150kg
	4.0	25kg	75kg	150kg
Volume mm		430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.16	0.08~0.18
Si	0.13	0.25
Mn	0.93	0.80~1.20
P	0.003	0.012
S	0.002	0.012
Ni	0.14	0.25
Cr	2.45	2.20~2.70
Mo	1.00	0.90~1.20
Cu	0.12	0.30

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.09	0.05~0.15
Si	0.16	0.80
Mn	0.81	1.20
P	0.006	0.030
S	0.003	0.030
Ni	0.13	0.25
Cr	2.41	2.00~2.50
Mo	1.07	0.90~1.20
Cu	0.13	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	510	538min.
TS (MPa)	620	621~758
El on 4d (%)	26	17min.
IV -29℃ (J)	160	27min.
PWHT (℃xh)	690x6	690±15x1

PF-500/US-521H TRUSTARC™

Flux and wire combination for 2.25%Cr-1%Mo-V steel

Features:
- Applied for ASTM A542 Type D Cl.4a and equivalents
- Excellent tensile strength at high temperatures and good creep rupture strength

Classification: AWS A5.23 F9P2-EG-G

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: AC

Packaging data

Flux		Can		
PF-500	10x48	20kg		
Volume mm		240W, 350H, 240L		
Wire	ϕ mm	Coil		
US-521H	2.4	25kg	-	-
	3.2	25kg	-	-
	4.0	25kg	75kg	150kg
Volume mm		430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L

Composition (wire mass%)

	Typical	Guaranty[a]
C	0.16	0.18
Si	0.21	0.30
Mn	1.19	0.30~1.50
P	0.002	0.010
S	0.001	0.010
Ni	<0.01	0.20
Cr	2.13	2.00~2.65
Mo	0.99	0.90~1.20
V	0.36	0.25~0.45
Nb	0.019	0.010~0.040
Cu	0.10	0.30

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty[a]
C	0.12	0.05~0.15
Si	0.15	0.05~0.35
Mn	1.14	0.50~1.30
P	0.003	0.010
S	0.001	0.010
Ni	<0.01	0.20
Cr	2.04	2.00~2.60
Mo	0.99	0.90~1.20
V	0.33	0.20~0.40
Nb	0.015	0.010~0.040
Cu	0.09	-

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	620	530min.
TS (MPa)	720	620min.
El on 4d (%)	23	16min.
IV -18℃ (J)	150	-
PWHT (℃xh)	705℃×8h	705±15x8

MF-29A/US-2CW TRUSTARC™

Flux and wire combination for low C-2.25%Cr-W-V-Nb steel

Features: ▪ Applied for ASTM A335 Gr.23 and equivalents

Classification: AWS -

Type of flux: Fused
Polarity: DCEP

Packaging data

Flux	Mesh	Can	
MF-29A	48xD	25kg	
Volume mm		240W, 350H, 240L	
Wire	**ϕ mm**	**Spool**	**Coil**
US-2CW	1.6	20kg	-
	2.4	-	25kg
	3.2	-	25kg
	4.0	-	25kg
Volume mm		300W, 110H, 300L	430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.15
Si	0.13	0.60
Mn	1.15	0.10~1.60
P	0.004	0.020
S	0.004	0.010
Cu	0.11	0.40
Cr	2.26	1.90~2.60
Mo	0.12	0.05~0.85
W	1.75	1.00~2.00
V	0.24	0.15~0.30
Nb	0.026	0.040

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.15
Si	0.25	0.60
Mn	1.15	0.10~1.60
P	0.006	0.020
S	0.002	0.010
Cu	0.13	0.40
Cr	2.12	1.90~2.60
Mo	0.12	0.05~0.85
W	1.69	1.00~2.00
V	0.22	0.15~0.30
Nb	0.016	0.040

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	520	300min.
TS (MPa)	620	510min.
El on 4d (%)	27	17min.
IV 20℃ (J)	100	-
PWHT (℃xh)	715x2	715x2

PF-200S/US-90B91 TRUSTARC™

Flux and wire combination for 9%Cr-1%Mo-V-Nb steel

Features:
- Applied for ASTM A387 Gr.91 and equivalents
- Excellent creep rupture strength

Classification: AWS A5.23 F9PZ-EB91-B91

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: AC

Packaging data

Flux	Mesh	Can
PF-200S	10x48	20kg
Volume mm		240W, 350H, 240L
Wire	**ϕ mm**	**Coil**
US-90B91	2.4 3.2	25kg 25kg
Volume mm		430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.11	0.07~0.13
Si	0.29	0.50
Mn	0.51	1.00
P	0.005	0.015
S	0.004	0.015
Cu	<0.01	0.10
Ni	0.14	1.00
Cr	8.95	8.5~10.5
Mo	1.00	0.85~1.15
V	0.19	0.15~0.25
Al	<0.002	0.04
Nb	0.06	0.02~0.10
N	0.04	0.03~0.07
Mn+Ni	0.65	1.40
Co	0.39	-

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.09	0.08~0.13
Si	0.25	0.80
Mn	0.66	1.20
P	0.005	0.010
S	0.005	0.010
Cu	0.01	0.25
Ni	0.12	0.80
Cr	9.01	8.0~10.5
Mo	1.01	0.85~1.20
V	0.19	0.15~0.25
Al	<0.01	0.04
Nb	0.05	0.02~0.10
N	0.04	0.02~0.07
Mn+Ni	0.78	1.40
Co	0.36	-

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	600	538min.
TS (MPa)	730	621~758
El on 4d (%)	23	17min.
PWHT (℃xh)	760x2	760±15x2

PF-90B91/US-90B91 TRUSTARC™

Flux and wire combination for 9%Cr-1%Mo-V-Nb steel

Features:
- Applied for ASTM A387 Gr.91 and equivalents
- Excellent creep rupture strength

Classification: AWS A5.23 F9PZ-EB91-B91

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: DCEP

Packaging data

Flux	Mesh	Can
PF-90B91	10x48	20kg
Volume mm		240W, 350H, 240L
Wire	**ϕ mm**	**Coil**
US-90B91	2.4 3.2	25kg 25kg
Volume mm		430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.11	0.07~0.13
Si	0.29	0.50
Mn	0.51	1.00
P	0.005	0.015
S	0.004	0.015
Cu	<0.01	0.10
Ni	0.14	1.00
Cr	8.95	8.5~10.5
Mo	1.00	0.85~1.15
V	0.19	0.15~0.25
Al	<0.002	0.04
Nb	0.06	0.02~0.10
N	0.04	0.03~0.07
Mn+Ni	0.65	1.40
Co	0.39	-

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.08	0.08~0.13
Si	0.26	0.80
Mn	0.72	1.20
P	0.005	0.010
S	0.005	0.010
Cu	0.01	0.25
Ni	0.12	0.80
Cr	8.93	8.0~10.5
Mo	1.01	0.85~1.20
V	0.18	0.15~0.25
Al	0.01	0.04
Nb	0.05	0.02~0.10
N	0.04	0.02~0.07
Mn+Ni	0.84	1.40
Co	0.36	-

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	590	538min.
TS (MPa)	730	621~758
El on 4d (%)	25	17min.
PWHT (℃xh)	760x2	760±15x2

PF-200S/US-9Cb

TRUSTARC™

Flux and wire combination for 9%Cr-1%Mo-V-Nb steel

Features:
- Suitable for multi-pass butt welding of 9%Cr-1%Mo-V-Nb steel
- Excellent creep rupture strength

Classification: AWS A5.23 F10PZ-EG-G

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: AC

Packaging data

Flux	Mesh	Can	
PF-200S	10x48	20kg	
Volume mm		240W, 350H, 240L	
Wire	ϕ mm	Spool	Coil
US-9Cb	1.2	20kg	-
	1.6	20kg	-
	2.4	-	25kg
	3.2	-	25kg
	4.0	-	25kg
Volume mm		300W, 110H, 300L	430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.08	0.14
Si	0.13	0.30
Mn	1.73	2.00
P	0.005	0.020
S	0.003	0.020
Ni	0.57	1.00
Cr	8.81	8.00~10.50
Mo	0.90	0.80~1.20
Nb	0.05	0.10
V	0.23	0.50
Cu	0.02	0.15

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.12	0.60
Mn	1.58	2.00
P	0.008	0.025
S	0.004	0.025
Ni	0.55	1.00
Cr	8.31	8.00~10.50
Mo	0.88	0.80~1.20
Nb	0.03	0.15
V	0.21	0.50

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	580	607min.
TS (MPa)	710	690~827
El on 4d (%)	24	16min.
IV 0℃ (J)	68	-
PWHT (℃xh)	740x8	745±15x1

PF-200S/US-12CRSD TRUSTARC™

Flux and wire combination for 9~12%Cr-W-V-Nb steel

Features: ▪ Applied for ASTM A335 Gr. P92 and equivalents

Classification: AWS -

Type of flux: Bonded
Redrying of flux: 200~300℃x1h
Polarity: DCEP

Packaging data

Flux	Mesh	Can	
PF-200S	10x48	20kg	
Volume mm		240W, 350H, 240L	
Wire	ϕ mm	Spool	Coil
US-12CRSD	1.2	20kg	-
	1.6	20kg	-
	2.4	-	25kg
Volume mm		300W, 110H, 300L	430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.15
Si	0.35	0.50
Mn	0.74	1.00
P	0.004	0.020
S	0.003	0.010
Cu	0.01	1.30
Ni	0.51	0.80
Cr	9.92	9.50~12.00
Mo	0.35	0.10~0.70
W	1.45	1.00~2.00
V	0.21	0.05~0.35
Nb	0.035	0.01~0.10
Co	1.01	0.80~1.20

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.15
Si	0.24	0.60
Mn	0.88	1.50
P	0.008	0.010
S	0.004	0.010
Cu	0.02	0.80
Ni	0.52	1.50
Cr	9.48	8.60~13.00
Mo	0.32	0.10~0.70
W	1.36	1.00~2.00
V	0.20	0.35
Nb	0.030	0.080
Co	0.98	0.50~1.80
N	0.04	0.10

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	650	440min.
TS (MPa)	780	621min.
El on 4d (%)	23	17min.
IV 20℃ (J)	30	-
PWHT (℃xh)	745x8	750±15x1

For Stainless Steel

Welding Consumables for

SMAW

FCAW

GMAW

GTAW

A guide for selecting welding consumables (Product names)

Steel type	Key note for application	SMAW
304	▪ General	**NC-38**
304L	▪ Cryogenic temperature	**NC-38LT**
	▪ Low carbon 0.04% max.	**NC-38L**
	▪ High temperature service and solution treatment	**NC-38L**
	▪ Low Cr (Ⅵ) in fume	-
304H	▪ High temperature	**NC-38H**
Dissimilar metals	▪ General	**NC-39, NC-39L** **NC-39MoL** **NC-32**
	▪ Solution treatment	-
	▪ Low Cr (Ⅵ) in fume	-
316	▪ General	**NC-36**
316L	▪ Cryogenic temperature	**NC-36LT**
	▪ Low carbon (0.04% max.)	**NC-36L**
	▪ Solution treatment	**NC-36L**
	▪ Low Cr (Ⅵ) in fume	-
316H	▪ High temperature	-
316L Mod.	▪ Urea (Low ferrite content)	**NC-316MF**
317L	▪ Low carbon (0.04% max.)	**NC-317L**
347	▪ General	**NC-37**
	▪ Low carbon	**NC-37L**
	▪ High temperature	**NC-37**
321	▪ General	**NC-37**
	▪ High temperature	**NC-37**
310S	▪ General	**NC-30**
Duplex	▪ Normal duplex	**NC-2209**
	▪ Super duplex	**NC-2594**
	▪ Lean duplex	-
410	▪ General	**CR-40**
405, 409	▪ Overlaying in cladding	**CR-40Cb**
-	▪ Low carbon martensite	-
409,430,436,410L	▪ Car exhaust system	-

	FCAW	GMAW	GTAW
	DW-308, DW-308LP	MG-S308	TG-S308
	DW-308LT	-	TG-S308L
	DW-308L DW-308LP	MG-S308LS	TG-S308L TG-X308L
	DW-308LH	-	-
	DW-308L-XR DW-308LP-XR	-	-
	DW-308H	-	-
	DW-309, DW-309L DW-309MoL, DW-309LP DW-309MoLP, DW-312	MG-S309 MG-S309LS	TG-S309, TG-S309L TG-S309MoL TG-X309L
	DW-309LH	-	-
	DW-309L-XR DW-309LP-XR	-	-
	DW-316LP	-	TG-S316
	DW-316LT	-	TG-S316L
	DW-316L, DW-316LP	MG-S316LS	TG-S316L, TG-X316L
	DW-316LH	-	-
	DW-316L-XR DW-316LP-XR	-	-
	DW-316H	-	-
	-	-	NO4051 TG-S310MF
	DW-317L, DW-317LP	-	TG-S317L
	DW-347	-	TG-S347, TG-X347
	-	-	TG-S347L
	-	-	TG-S347
	DW-347	-	TG-S347
	-	-	TG-S347
	DW-310	-	TG-S310
	DW-2209, DW-329AP	-	TG-S2209
	DW-2594	-	TG-S2594
	DW-2307	-	-
	-	MG-S410	TG-S410
	DW-410Cb	-	TG-S410Cb
	MX-A410NiMo	-	-
	MX-A430M	-	-

Tips for better welding results

SMAW

(1) Use proper welding currents because the use of an excessive current causes overheating electrodes and thereby welding usability and weld metal mechanical properties can be deteriorated.
(2) Keep the arc as short as possible.
(3) Control the weaving width of electrode within two and a half times the diameter of the electrode.

FCAW

1. Features:
(1) DW stainless flux-cored wires are cost-effective wires because of high welding efficiency with the deposition rate 2-4 times as high as those of stick electrodes as shown in Fig. 1 and deposition efficiency of about 90%.
(2) DW stainless wires offer a wider range of current and voltage in comparison with solid wire as shown in Fig. 2, which facilitates easier application for both semi-automatic and automatic welding.
(3) DW stainless series has excellent usability and weldability with stable arc, low spatter, good slag removal, smooth bead appearance, and high X-ray soundness.

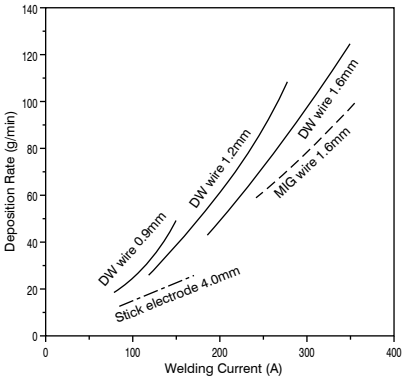


Fig. 1 Deposition rate as per welding current

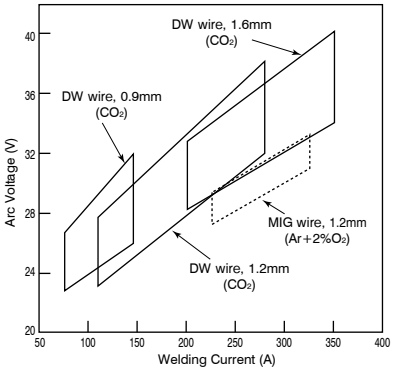


Fig. 2 Proper ranges of welding current and arc voltage

2. Notes on usage

(1) Welding power source:
Use a DC power source with constant voltage and the polarity DCEP. Inverter-type welding power sources can also be used. When the use of a certain pulsed arc power source causes much spatter, use the wire with ordinary currents, turning off the pulse switch.

(2) Shielding gas:
Use CO_2 for shielding gas for general applications. Ar-CO_2 mixtures with 20-50% CO_2 can also be used, but compared with CO_2, porosity (pit and blowhole) is apt to occur. The proper flow rate of shielding gas is 20-25 litter/min.

(3) Wire extension:
Keep the wire extension at about 15 mm for 0.9-mm wire and 15-20 mm for 1.2- and 1.6-mm wire. The use of a shorter wire extension may cause pit and worm-tracking porosity. The wire extension in welding with an Ar-CO_2 mixture should be 5 mm longer than in use of CO_2.

(4) Protection against wind:
When wind velocity at the vicinity of an arc is more than 1 m/sec., blowhole is apt to occur, and dissolution of nitrogen into the weld metal may deteriorate slag removal and decrease the ferrite content of the weld metal, thereby causing hot cracking. To prevent these problems, use an adequate shielding gas flow rate and a windscreen.

(5) Welding fumes:
Flux-cored wires generate much more welding fumes in terms of the amount of fumes at unit time in comparison with that of stick electrodes. To protect welders from harmful welding fumes, be sure to use a local ventilator and an appropriate respirator.

(6) Storage of wire:
Once a DW stainless wire picked up moisture, it cannot be dried at high temperatures, unlike stick electrodes. If a DW wire was left in a wire feeder in a high-temperature high-humidity atmosphere in summer season, a wet environment in rainy season or a dewfall environment at night in winter season, the use of it may cause pit and worm-tracking porosity due to moisture pick up. Once a wire was unpacked, the wire should be kept in an area of low humidity, taking appropriate preventive measures against dewfall water and dust.

3. Applications

(1) Butt welding:
Applicable plate thicknesses are 2 mm or larger with a 1.2mm wire and 5 mm or larger with a 1.6mm wire in flat position. P-series wires enable to weld thin plates with 3-4 mm thickness in vertical position. One-side welding can be applied for similar-shape grooves in flat, horizontal and vertical positions by using a backing material of FB-B3 (T size). In this case, the root opening should be about 3-4 mm to obtain good reverse beads.

(2) Horizontal fillet welding:
Proper welding speeds are approximately 30-70 cm/min in horizontal fillet welding. With a 309 type wire, dissimilar-metal welding of stainless steel to carbon steel can be done in the same welding condition as used for welding stainless steels. However to secure the ferrite content of weld metal, welding currents should be 200A or lower and welding speeds should be 40 cm/mm or slower with a 1.2mm wire.

(3) Overlaying and joining of clad steels:
The 1st layer of overlaying onto carbon steel should be welded with a 309 (or 309MoL) type wire by the half lapping method. In case where the dilution by the base metal is excessive, the ferrite content of the weld metal decreases and thereby hot cracking may occur. Therefore, it is important to use appropriate welding conditions to control the dilution particularly for the first layer. In order to obtain the proper dilution ratio, welding currents should be 200A or lower and welding speeds should be 20-40 cm/min with a 1.2mm wire. With a 1.6mm wire, use welding currents in the 200-250 range and welding speeds in the 20-30 cm/min range. Refer to Fig. 3.

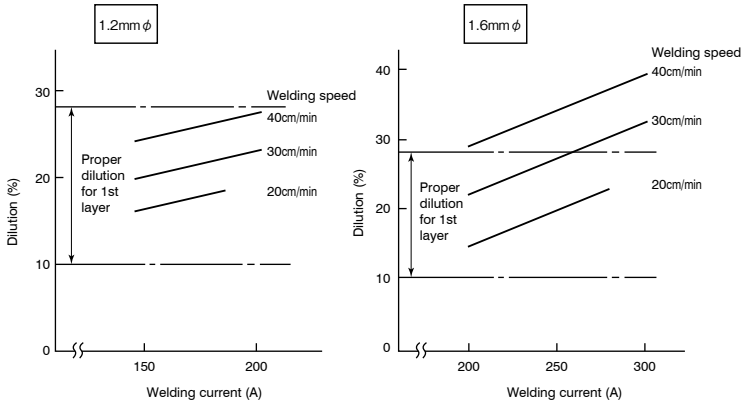


Fig. 3 Dilution ratios as per welding currents

GMAW

(1) Polarity:
DCEP is suitable.
(2) Shielding gas:
98% Ar-2%O_2 mixture is recommended for general applications. Proper gas flow rates range in 20-25 l/min. Ar-CO_2 mixture is not suitable for low carbon stainless steel (Type 304L) because the carbon content of deposited metal increases.
(3) Arc length:
GMAW of stainless steel generally uses the spray arc transfer mode due to lower spatter generation. Adjust arc voltage so that arc length becomes 4-6 mm. When arc length is excessively short, blowholes are apt to occur. Inversely, when arc length is excessively long, the wetting of deposited metal on the base metal becomes poor.
(4) Protection against wind:
GMAW is likely to be influenced by wind and thereby blowholes may occur. Use a windscreen to protect the arcing area against wind when the wind velocity near the arc is 0.5m/sec or more.
(5) Pulsed arc welding:
In pulsed arc welding, a stable spray arc can be obtained even with low welding currents. Pulsed arc is suitable for overlaying, welding of thin plates and vertical welding.

GTAW

(1) Polarity:
DCEN is suitable.
(2) Shielding gas:
Argon gas is mainly used for shielding. Suitable flow rates of shielding gas are in the range of 7-15 l/min. at 100-200A of welding current and 12-20 l/min. at 200-300A in manual GTAW.
(3) Torch:
Two types of GTAW torches are available. One has a gas lens, another has no gas lens. A torch with a gas lens provides better shielding effect preventing the weld bead from oxidation since the gas lens can provide a regular gas flow.
(4) Tungsten electrode extension:
Proper tungsten electrode extensions are generally in the range of 4-5 mm. In the case where shielding effect tends to be lower as in welding corner joint, tungsten extension is recommended to be 2-3 mm. In welding of deep groove joints, tungsten extension should be longer as 5-6 mm.
(5) Arc length:
Proper arc lengths are in the range of 1-3 mm. When it is excessively long, the shielding effect becomes poor.
(6) One-side welding without backing materials:
In the case of one-side welding without backing materials, adopt back shielding in order to prevent oxidization of the penetration bead. However, with a flux-cored filler rod for GTAW, sound penetration bead can be obtained without back shielding.
(7) Fully austenitic type filler wires:
With a fully austenitic type filler wire (e.g., TG-S310, 310MF), use lower welding currents and welding speeds to prevent hot cracking.

Ferrite content measuring methods for austenitic stainless steel weld metal

Method	Principles of measuring ferrite content
Structure Diagram:	Calculating Ni equivalent and Cr equivalent of the chemical composition of a test specimen and reading the crossing point of the two equivalents in a structure diagram. Three structure diagrams are available: Schaeffler diagram, DeLong diagram and WRC diagram. See Figs. 1, 2 and 3.
Ferrite Indicator:	Comparing the magnetic attraction between a standard ferrite percent insert and a test specimen
Ferrite Scope:	Measuring a change of magnetic induction affected by the ferrite content of a test specimen
Magne Gage:	Measuring the pull off force necessary to detach a standard permanent magnet from a test specimen
Point Counting:	Calculating the area percentage of ferrite in the microstructure of a test specimen, by using a optical microscope

Fig. 1 Schaeffler Diagram

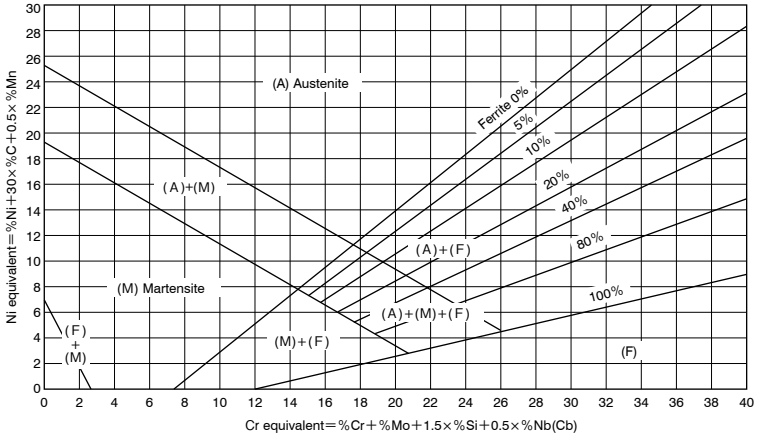


Fig. 2 DeLong Diagram

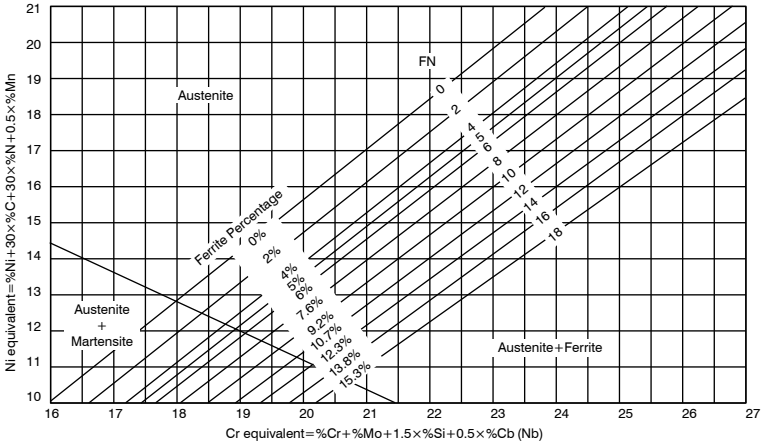
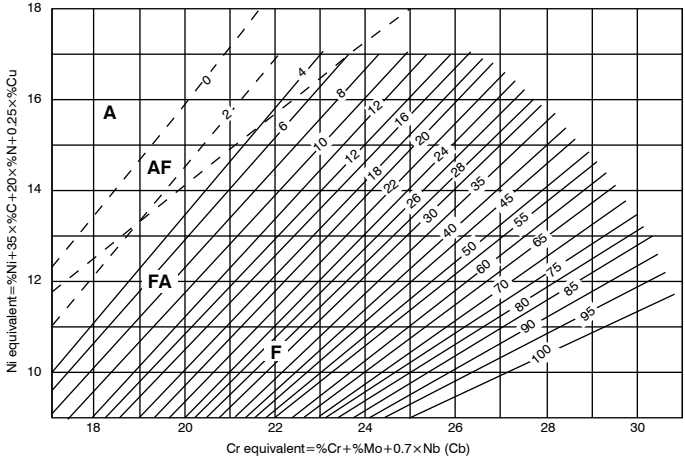


Fig. 3 WRC Diagram



A, AF, FA, F stand for solidification modes
A : Austenitic single phase (γ)
AF : Primary phase (γ) + Eutectic Ferrite (δ)
FA : Primary phase (δ) + Peritectic / Eutectic phase (γ)
F : δ Single phase Solidification

NC-38 PREMIARC™

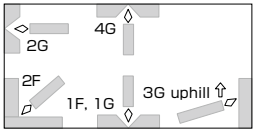
Stick electrode

Features: ▪ Applicable for 304 type steel

Classification: AWS A5.4 E308-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Yellow
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	250	2	20	11	300W, 125H, 280L
2.6	300	2	20	20	300W, 95H, 330L
3.2	350	5	20	36	175W, 115H, 380L
4.0	350	5	20	55	175W, 115H, 380L
5.0	350	5	20	82	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.08
Si	0.37	1.00
Mn	1.5	0.5~2.5
P	0.03	0.04
S	<0.01	0.03
Ni	9.4	9.0~11.0
Cr	20.0	18.0~21.0
Mo	0.16	0.75
Cu	0.08	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.0	50~75	45~65
2.6	75~95	70~90
3.2	85~120	80~115
4.0	110~160	90~140
5.0	150~200	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	410	-
TS (MPa)	600	552min.
El on 4d (%)	46	30min.
IV 0℃ (J)	74	-

Approvals

ABS	MG (AWS A5.4 E308-16)
DNV-GL	VL308
NK [a)]	KD308

Note: [a)] AC

NC-38H PREMIARC™

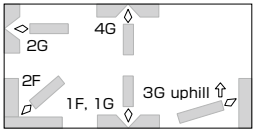
Stick electrode

Features:
- Applicable for 304 type steel for high temperature
- Excellent mechanical properties at high temperatures

Classification: AWS A5.4 E308H-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Yellow
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	20	300W, 100H, 330L
3.2	350	5	20	36	175W, 125H, 380L
4.0	350	5	20	54	175W, 125H, 380L
5.0	350	5	20	80	175W, 130H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.04~0.08
Si	0.45	1.00
Mn	1.95	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	9.5	9.0~11.0
Cr	19.5	18.0~21.0
Mo	0.05	0.75
Cu	0.07	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	45~80
3.2	70~115	65~110
4.0	95~145	85~135
5.0	135~180	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	403	-
TS (MPa)	572	552min.
El on 4d (%)	48	30min.
IV 0℃ (J)	79	-

NC-38L PREMIARC™

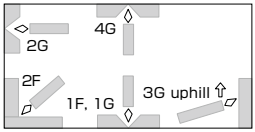
Stick electrode

Features: ▪ Applicable for 304L type steel

Classification: AWS A5.4 E308L-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Red
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	250	2	20	11	300W, 125H, 280L
2.6	300	2	20	20	300W, 100H, 330L
3.2	350	5	20	36	175W, 115H, 380L
4.0	350	5	20	55	175W, 130H, 380L
5.0	350	5	20	82	175W, 130H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.38	1.00
Mn	1.5	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	9.6	9.0~11.0
Cr	20.3	18.0~21.0
Mo	0.14	0.75
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.0	50~75	45~65
2.6	75~95	70~90
3.2	85~120	80~115
4.0	110~160	90~140
5.0	150~200	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	410	-
TS (MPa)	580	518min.
El on 4d (%)	48	30min.
IV 0℃ (J)	78	-

Approvals

LR	304L m (CHEM)
BV	UP (E308L-16)
DNV-GL	VL308L
NK	KD308L

NC-38LT PREMIARC™

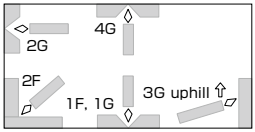
Stick electrode

Features: ▪ Suitable for 18%Cr-8%Ni steel for cryogenic temperature service

Classification: AWS A5.4 E308L-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Red, 2nd Yellow
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	300W, 100H, 330L
3.2	350	5	20	33	175W, 115H, 380L
4.0	350	5	20	51	175W, 130H, 380L
5.0	350	5	20	79	175W, 130H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.46	1.00
Mn	2.2	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	10.3	9.0~11.0
Cr	18.8	18.0~21.0
Mo	0.05	0.75
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	45~80
3.2	70~115	65~110
4.0	95~145	85~130
5.0	135~180	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	370	-
TS (MPa)	540	518min.
El on 4d (%)	51	35min.
IV -196℃ (J)	52	34min.

Approvals

ABS	MG (AWS 5.4 E308L-16)
LR	304L m (CRYO)
DNV-GL	VL308L, MG
BV	308L BT
NK [a)]	KD308

Note: [a)] AC

NC-39 PREMIARC™

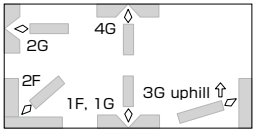
Stick electrode

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.4 E309-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Black, 2nd White
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	250	2	20	11	300W, 125H, 280L
2.6	300	2	20	20	300W, 100H, 330L
3.2	350	5	20	36	175W, 115H, 380L
4.0	350	5	20	55	175W, 115H, 380L
5.0	350	5	20	82	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.15
Si	0.40	1.00
Mn	1.0	0.5~2.5
P	0.03	0.04
S	<0.01	0.03
Ni	13.4	12.0~14.0
Cr	23.9	22.0~25.0
Mo	0.21	0.75
Cu	0.12	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.0	50~75	45~65
2.6	75~95	70~90
3.2	85~120	80~115
4.0	110~160	90~140
5.0	150~200	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	410	-
TS (MPa)	590	552min.
El on 4d (%)	39	30min.
IV 0℃ (J)	62	-

Approvals

ABS	MG (AWS 5.4 E309-16)
LR	SS/CMn m (CHEM)
DNV-GL	VL309, MG
BV	UP (E309-16)
NK [a)]	KD309
CCS	AS2-B

Note: [a)] AC

NC-39L PREMIARC™

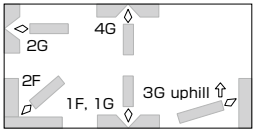
Stick electrode

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.4 E309L-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Yellow green, 2nd Blue white
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	250	2	20	11	300W, 125H, 280L
2.6	300	2	20	20	300W, 95H, 330L
3.2	350	5	20	36	175W, 125H, 380L
4.0	350	5	20	55	175W, 115H, 380L
5.0	350	5	20	82	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.04	0.04
Si	0.42	1.00
Mn	1.6	0.5~2.5
P	0.03	0.04
S	<0.01	0.03
Ni	13.3	12.0~14.0
Cr	23.8	22.0~25.0
Mo	0.18	0.75
Cu	0.09	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.0	50~75	45~65
2.6	75~95	70~90
3.2	85~120	80~115
4.0	110~160	90~140
5.0	150~200	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	410	-
TS (MPa)	560	518min.
El on 4d (%)	42	30min.
IV 0℃ (J)	67	-

Approvals

ABS	MG (AWS 5.4 E309L-16)
LR	SS/CMn m (CHEM)
DNV-GL	VL309L, MG
BV	UP (E309L-16)
NK	KD309L

NC-39MoL PREMIARC™

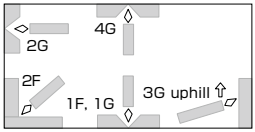
Stick electrode

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.4 E309LMo-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Silver, 2nd Blue
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	19	300W, 95H, 330L
3.2	350	5	20	33	175W, 135H, 380L
4.0	350	5	20	54	175W, 130H, 380L
5.0	350	5	20	85	175W, 130H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.51	1.00
Mn	1.3	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.9	12.0~14.0
Cr	23.5	22.0~25.0
Mo	2.1	2.0~3.0
Cu	0.07	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	45~80
3.2	70~115	65~110
4.0	95~145	85~135
5.0	135~180	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	450	-
TS (MPa)	630	518min.
El on 4d (%)	41	30min.
IV 0℃ (J)	65	-

Approvals

ABS	MG
NK	KD309Mo

NC-32 PREMIARC™

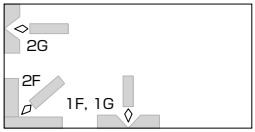
Stick electrode

Features: ▪ Suitable for dissimilar joint between carbon steel and stainless steel rich in carbon or nickel.

Classification: AWS A5.4 E312-16

Redrying Conditions: 150~250℃x0.5-1h
Identification color: 1st Green, 2nd Red
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	300	2	20	27	300W, 110H, 330L
4.0	350	5	20	49	175W, 120H, 380L
5.0	350	5	20	76	175W, 120H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.13	0.15
Si	0.62	1.00
Mn	1.2	0.5~2.5
P	0.01	0.04
S	<0.01	0.03
Ni	9.6	8.0~10.5
Cr	28.2	28.0~32.0
Mo	0.01	0.75
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G
3.2	70~115
4.0	95~145
5.0	135~180

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	624	-
TS (MPa)	785	655min.
El on 4d (%)	20	22min.

NC-36 PREMIARC™

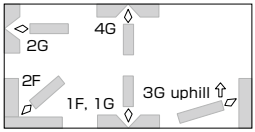
Stick electrode

Features: ▪ Applicable for 316 type steel

Classification: AWS A5.4 E316-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st White
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	250	2	20	11	300W, 130H, 280L
2.6	300	2	20	20	300W, 100H, 330L
3.2	350	5	20	36	175W, 115H, 380L
4.0	350	5	20	55	175W, 115H, 380L
5.0	350	5	20	82	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.04	0.08
Si	0.35	1.00
Mn	1.5	0.5~2.5
P	0.03	0.04
S	<0.01	0.03
Ni	12.0	11.0~14.0
Cr	19.2	17.0~20.0
Mo	2.2	2.0~3.0
Cu	0.10	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.0	50~75	45~65
2.6	75~95	70~90
3.2	85~120	80~115
4.0	110~160	90~140
5.0	150~200	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	410	-
TS (MPa)	570	518min.
El on 4d (%)	46	30min.
IV 0℃ (J)	80	-

Approvals

NK	KD316

NC-36L PREMIARC™

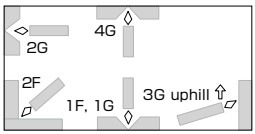
Stick electrode

Features: ▪ Applicable for 316L type steel

Classification: AWS A5.4 E316L-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Green
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	250	2	20	11	300W, 130H, 280L
2.6	300	2	20	20	300W, 100H, 330L
3.2	350	5	20	36	175W, 110H, 380L
4.0	350	5	20	55	175W, 115H, 380L
5.0	350	5	20	82	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.36	1.00
Mn	1.5	0.5~2.5
P	0.03	0.04
S	<0.01	0.03
Ni	12.0	11.0~14.0
Cr	19.4	17.0~20.0
Mo	2.2	2.0~3.0
Cu	0.11	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.0	50~75	45~65
2.6	75~95	70~90
3.2	85~120	80~115
4.0	110~160	90~140
5.0	150~200	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	420	-
TS (MPa)	580	483min.
El on 4d (%)	45	30min.
IV 0℃ (J)	83	-

Approvals

ABS	MG (AWS 5.4 E316L-16)
LR	316L m (CHEM)
DNV-GL	VL316L, MG
BV	UP (E316L-16)
NK [a)]	KD316L

Note: [a)] AC

NC-36LT PREMIARC™

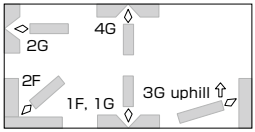
Stick electrode

Features: ▪ Suitable for 18%Cr-12%Ni-2%Mo steel for cryogenic temperature service

Classification: AWS A5.4 E316L-16

Redrying Conditions: 150~200℃x 0.5~1h
Identification color: 1st Green
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	19	300W, 100H, 330L
3.2	350	5	20	34	175W, 110H, 380L
4.0	350	5	20	51	175W, 115H, 380L
5.0	350	5	20	78	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.59	1.00
Mn	2.0	0.5~2.5
P	0.03	0.04
S	<0.01	0.03
Ni	13.1	11.0~14.0
Cr	18.0	17.0~20.0
Mo	2.2	2.0~3.0
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	45~80
3.2	70~115	65~110
4.0	95~145	85~130
5.0	135~180	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	390	-
TS (MPa)	530	483min.
El on 4d (%)	44	30min.
IV -196℃ (J)	40	27min.

NC-317L PREMIARC™

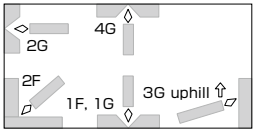
Stick electrode

Features: ▪ Suitable for low carbon 19%Cr-13%Ni-3%Mo steel

Classification: AWS A5.4 E317L-16

Redrying Conditions: 150~200℃x 0.5~1h
Identification color: 1st Sorrel, 2nd Orange
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	19	300W, 100H, 330L
3.2	350	5	20	34	175W, 110H, 380L
4.0	350	5	20	51	175W, 115H, 380L
5.0	350	5	20	79	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.55	1.00
Mn	1.2	0.5~2.5
P	0.03	0.04
S	<0.01	0.03
Ni	13.3	12.0~14.0
Cr	19.7	18.0~21.0
Mo	3.7	3.0~4.0
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	45~80
3.2	70~115	65~110
4.0	95~145	85~135
5.0	135~180	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	440	-
TS (MPa)	600	518min.
El on 4d (%)	39	30min.

NC-37 PREMIARC™

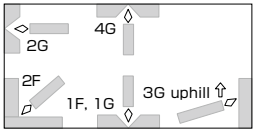
Stick electrode

Features: ▪ Suitable for 18%Cr-8%Ni-Nb steel

Classification: AWS A5.4 E347-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Blue, 2nd Blue
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	250	2	20	15	300W, 100H, 280L
3.2	300	2	20	28	300W, 95H, 330L
4.0	350	5	20	50	175W, 120H, 380L
5.0	350	5	20	77	175W, 120H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.08
Si	0.55	1.00
Mn	1.5	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	10.1	9.0~11.0
Cr	19.6	18.0~21.0
Mo	0.04	0.75
Cu	0.04	0.75
Nb+Ta	0.67	8xC%~1.00

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	45~80
3.2	70~115	65~110
4.0	95~145	85~135
5.0	135~180	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	470	-
TS (MPa)	670	518min.
El on 4d (%)	34	30min.

NC-37L PREMIARC™

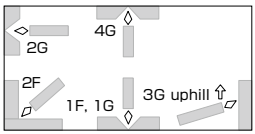
Stick electrode

Features: ▪ Suitable for 18%Cr-8%Ni-Nb steel

Classification: AWS A5.4 E347-16

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Blue, 2nd Green
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	300W, 100H, 330L
3.2	350	5	20	33	175W, 110H, 380L
4.0	350	5	20	51	175W, 115H, 380L
5.0	350	5	20	79	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.04	0.08
Si	0.58	1.00
Mn	2.3	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	9.7	9.0~11.0
Cr	19.1	18.0~21.0
Nb	0.59	8xC%~1.00

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	45~80
3.2	70~115	65~110
4.0	95~145	85~135
5.0	135~180	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	420	-
TS (MPa)	600	518min.
El on 4d (%)	45	30min.

CR-40Cb PREMIARC™

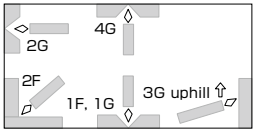
Stick electrode

Features:
- Suitable for 13%Cr stainless steels such as 403, 410 and 405 type.
- Preheat: 100~250℃

Classification: AWS A5.4 E409Nb-16

Redrying Conditions: 300~350℃x0.5~1h
Identification color: 1st Purple, 2nd Orange
Polarity: AC, DCEP

Welding Positions:



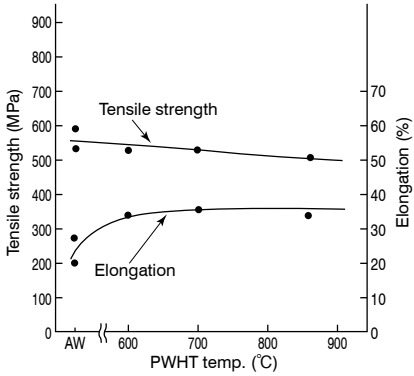
Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	300W, 100H, 330L
3.2	350	5	20	31	175W, 120H, 380L
4.0	400	5	20	53	175W, 120H, 430L
5.0	400	5	20	82	175W, 120H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.09	0.12
Si	0.40	1.00
Mn	0.3	1.0
P	0.02	0.04
S	<0.01	0.03
Ni	0.1	0.6
Cr	12.9	11.0~14.0
Mo	0.05	0.75
Cu	0.03	0.75
Nb+Ta	0.81	0.50~1.50

Note: [a] Single values are maximum.



Mechanical properties vs. PWHT temp.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	270	-
TS (MPa)	500	450min.
El on 4d (%)	35	20min.
PWHT (℃xh)	850x2	

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	60~85	50~80
3.2	80~115	65~105
4.0	100~145	95~140
5.0	140~180	-

CR-40 PREMIARC™

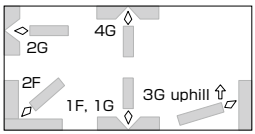
Stick electrode

Features:
- Suitable for 13%Cr stainless steels such as 403 and 410 types.
- Preheat: 200~400℃

Classification: AWS A5.4 E410-16

Redrying Conditions: 300~350℃x0.5~1h
Identification color: 1st Purple
Polarity: AC, DCEP

Welding Positions:



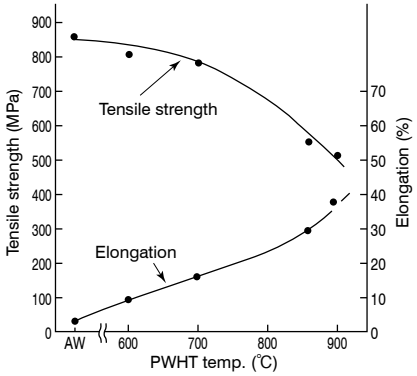
Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	300W, 100H, 330L
3.2	350	5	20	30	175W, 120H, 380L
4.0	400	5	20	54	175W, 120H, 430L
5.0	400	5	20	83	175W, 120H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.12
Si	0.47	0.90
Mn	0.3	1.0
P	0.02	0.04
S	0.01	0.03
Ni	0.1	0.7
Cr	12.8	11.0~13.5
Mo	0.04	0.75
Cu	0.02	0.75

Note: [a] Single values are maximum.



Mechanical properties vs. PWHT temp.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	290	-
TS (MPa)	510	450min.
El on 4d (%)	33	20min.
PWHT (℃xh)	850x2	

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	45~80
3.2	70~115	65~110
4.0	95~145	85~135
5.0	135~180	-

NC-2209 PREMIARC™

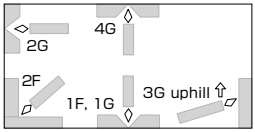
Stick electrode

Features: ▪ Suitable for normal duplex stainless steel (S32205, S31803, etc.)

Classification: AWS A5.4 E2209-16

Redrying Conditions: 250~350℃x1~2h
Identification color: -
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	20	300W, 95H, 330L
3.2	350	5	20	35	175W, 135H, 380L
4.0	350	5	20	53	175W, 130H, 380L
5.0	350	5	20	79	175W, 130H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.47	1.00
Mn	1.1	0.5~2.0
P	0.02	0.04
S	<0.01	0.03
Ni	9.0	8.5~10.5
Cr	23.2	21.5~23.5
Mo	3.2	2.5~3.5
N	0.17	0.08~0.20
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	75~95	70~90
3.2	85~120	80~115
4.0	110~160	90~140
5.0	150~200	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	667	-
TS (MPa)	845	690min.
El on 4d (%)	30	20min.
IV -50℃ (J)	72	-

NC-2594 PREMIARC™

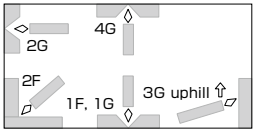
Stick electrode

Features: ▪ Suitable for super duplex stainless steel (S32750, S32760, etc.)

Classification: AWS A5.4 E2594-16

Redrying Conditions: 250~350℃x1~2h
Identification color: -
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	20	300W, 95H, 330L
3.2	350	5	20	35	175W, 135H, 380L
4.0	350	5	20	53	175W, 130H, 380L
5.0	350	5	20	79	175W, 130H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.55	1.00
Mn	0.7	0.5~2.0
P	0.02	0.04
S	<0.01	0.03
Ni	9.3	8.0~10.5
Cr	25.4	24.0~27.0
Mo	3.9	3.5~4.5
N	0.24	0.20~0.30
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	75~95	70~90
3.2	85~120	80~115
4.0	110~160	90~140
5.0	150~200	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	750	-
TS (MPa)	935	759min.
El on 4d (%)	28	15min.
IV -50℃ (J)	40	-

Approvals

DNV-GL	MG

NC-316MF PREMIARC™

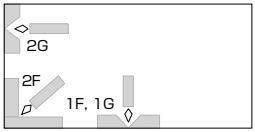
Stick electrode

Features:
- Suitable for urea plant in cryogenic temperature service
- Lime titania type

Classification: AWS -

Redrying Conditions: 150~200℃x0.5~1h
Identification color: 1st Green, 2nd Pink
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	300W, 120H, 330L
3.2	300	5	20	29	300W, 110H, 330L
4.0	350	5	20	55	175W, 120H, 380L
5.0	350	5	20	83	175W, 120H, 380L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.03	0.04
Si	0.31	0.90
Mn	5.09	4.00~7.00
P	0.013	0.030
S	0.002	0.020
Ni	17.06	15.00~18.00
Cr	17.97	17.00~19.50
Mo	2.80	2.20~3.00

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G
2.6	50~85
3.2	70~115
4.0	95~145
5.0	135~180

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	370	-
TS (MPa)	520	480min.
El on 4d (%)	44	25min.
IV -257℃ (J)	70	-

DW-308H PREMIARC™

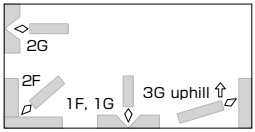
Flux cored wire

Features:
- Suitable for 18%Cr-8%Ni steel for high temperature service
- Bi-free type

Classification: AWS A5.22 E308HT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.05	0.04~0.08
Si	0.5	1.0
Mn	1.2	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	9.6	9.0~11.0
Cr	19.0	18.0~21.0
Mo	0.02	0.75
Cu	0.03	0.75
Bi	<0.0005	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill
1.2	130~270	150~220	130~180

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	370	-
TS (MPa)	560	552min.
El on 4d (%)	48	30min.
IV 0℃ (J)	71	-

Approvals

CWB	E308HT1-1, E308HT1-4

DW-308L PREMIARC™

Flux cored wire

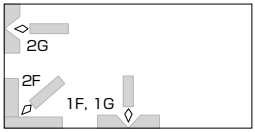
Features: ▪ Applied for 304L type steel

Classification: AWS A5.22 E308LT0-1/4

Shielding gas: CO_2 or Ar-CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
0.9	5kg	12.5kg
1.2	-	12.5kg
1.6	-	12.5kg
Volume mm	235W, 110H, 230L	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.6	1.0
Mn	1.5	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	10.0	9.0~11.0
Cr	19.5	18.0~21.0
Mo	0.02	0.75
Cu	0.03	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
0.9	80~150	90~130
1.2	130~270	150~220
1.6	190~320	220~270

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	370	-
TS (MPa)	550	518min.
El on 4d (%)	42	30min.
IV 0℃ (J)	41	-

Approvals

ABS	MG
LR	304L S (CHEM & CRYO)
DNV-GL	VL308L, MG (CO_2) VL308L (Ar-CO_2)
NK	KW308LG (C)
CWB	E308LT0-1, E308LT0-4

Note: CO_2, except in CWB/DNV-GL

DW-308LT PREMIARC™

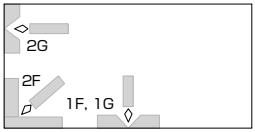
Flux cored wire

Features: ▪ Suitable for 18%Cr-8%Ni steel for low temperature service

Classification: AWS A5.22 E308LT0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.3	1.0
Mn	2.2	0.5~2.5
P	0.02	0.04
S	0.01	0.03
Ni	10.3	9.0~11.0
Cr	18.6	18.0~21.0
Mo	0.01	0.75
Cu	0.05	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	130~270	150~220

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	380	-
TS (MPa)	530	518min.
El on 4d (%)	51	30min.
IV -196℃ (J)	39	27min.

DW-308LH PREMIARC™

Flux cored wire

Features:
- Suitable for 18%Cr-8%Ni steel with high temperature heat treatment such as solution treatment
- Bi-free type

Classification: AWS A5.22 E308LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:

Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.4	1.0
Mn	1.3	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	10.2	9.0~11.0
Cr	18.7	18.0~21.0
Mo	0.02	0.75
Cu	0.02	0.75
Bi	<0.0005	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill
1.2	130~270	150~220	130~180

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	360	-
TS (MPa)	540	518min.
El on 4d (%)	52	30min.
IV 0℃ (J)	76	-

DW-308LP PREMIARC™

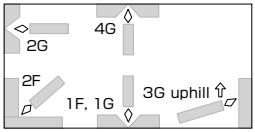
Flux cored wire

Features: ▪ Applicable for 304 and 304L type steel

Classification: AWS A5.22 E308LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.02	0.04
Si	0.8	1.0
Mn	1.1	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	9.9	9.0~11.0
Cr	20.3	18.0~21.0
Mo	0.02	0.75
Cu	0.03	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	380	-
TS (MPa)	550	518min.
El on 4d (%)	45	30min.
IV 0℃ (J)	57	-

Approvals

ABS	MG (AWS A5.22 E308LT1-1)
LR	304L S (CHEM & CRYO)
DNV-GL	VL308L, MG
BV	308L BT
NK	KW308LG (C)
KR	RW308LG (C)
CWB	E308LT1-1, E308LT1-4

Note: CO_2, except in CWB

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~270	150~220	130~220	150~200

DW-308 PREMIARC™

Flux cored wire

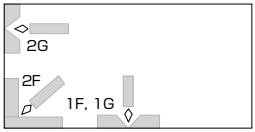
Features: ▪ Applicable for 304 type steel

Classification: AWS A5.22 E308T0-1/4

Shielding gas: CO_2 or Ar-CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
0.9	5kg	12.5kg
1.2	-	12.5kg
1.6	-	12.5kg
Volume mm	235W, 110H, 230L	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.05	0.08
Si	0.6	1.0
Mn	1.5	0.5~2.5
P	0.02	0.04
S	0.01	0.03
Ni	9.7	9.0~11.0
Cr	19.7	18.0~21.0
Mo	0.02	0.75
Cu	0.03	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
0.9	80~150	90~130
1.2	130~270	150~220
1.6	190~320	220~270

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	390	-
TS (MPa)	570	552min.
El on 4d (%)	41	30min.
IV 0℃ (J)	39	-

Approvals

ABS	MG (A5.22 E308T0-1)
NK	KW308G (C)

Note: CO_2

DW-308L-XR PREMIARC™

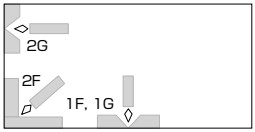
Flux cored wire

Features:
- Applied for 304L type stainless steel
- Low Cr (Ⅵ) stainless steel flux cored wire

Classification: AWS A5.22 E308LT0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (wire mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.7	1.0
Mn	1.3	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	9.5	9.0~11.0
Cr	19.4	18.0~21.0
Mo	0.01	0.75
Cu	0.02	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	130~270	150~220

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	396	-
TS (MPa)	583	518min.
El on 4d (%)	42	30min.

Approvals

CWB	E308LT0-1, E308LT0-4

DW-308LP-XR PREMIARC™

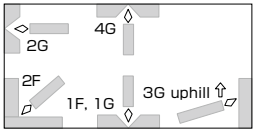
Flux cored wire

Features:
- Applied for 304L type stainless steel
- Low Cr (Ⅵ) stainless steel flux cored wire

Classification: AWS A5.22 E308LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (wire mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.8	1.0
Mn	1.8	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	10.4	9.0~11.0
Cr	19.5	18.0~21.0
Mo	0.02	0.75
Cu	0.04	0.75

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	386	-
TS (MPa)	551	518min.
El on 4d (%)	42	30min.

Approvals

ABS*	MG (AWS A5.22 E308LT1-4)
CWB	E308LT1-1, E308LT1-4

Note: *Ar-25%CO_2

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~270	150~220	130~220	150~200

DW-309MoL PREMIARC™

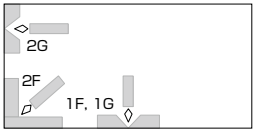
Flux cored wire

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.22 E309LMoT0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
1.6	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.7	1.0
Mn	1.4	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.3	12.0~16.0
Cr	23.2	21.0~25.0
Mo	2.4	2.0~3.0
Cu	0.07	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	130~270	150~220
1.6	190~320	220~270

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	540	-
TS (MPa)	720	518min.
El on 4d (%)	30	25min.

Approvals

ABS	MG
LR	SS/CMn S (CHEM)
DNV-GL	VL309MoL (CO_2/Ar-CO_2)
BV	UP
NK	KW309MoLG (C) KW309MoLG (C)-YP315M-TS550M

Note: CO_2, except in DNV-GL

DW-309MoLP PREMIARC™

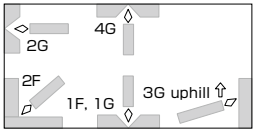
Flux cored wire

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.22 E309LMoT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.4	1.0
Mn	0.6	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.4	12.0~16.0
Cr	22.3	21.0~25.0
Mo	2.3	2.0~3.0
Cu	0.04	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	540	-
TS (MPa)	699	518min.
El on 4d (%)	30	25min.

Approvals

NK	KW309MoLG (C), KW309MoLG (C)- YP315M-TS550M

Note: CO_2

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~270	150~220	130~220	150~200

DW-309L PREMIARC™

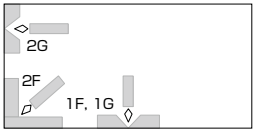
Flux cored wire

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.22 E309LT0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum	
0.9	5kg	12.5kg	-	-
1.2	-	12.5kg	150kg	-
1.6	-	12.5kg	-	200kg
Volume mm	235W, 110H, 230L	295W, 110H, 295L	530ϕ, 820H	680ϕ, 770H

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.6	1.0
Mn	1.2	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.4	12.0~14.0
Cr	23.8	22.0~25.0
Mo	0.03	0.75
Cu	0.02	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
0.9	80~150	90~130
1.2	130~270	150~220
1.6	190~320	220~270

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	450	-
TS (MPa)	580	518min.
El on 4d (%)	33	30min.

Approvals

ABS	MG
LR	SS/CMn S (CHEM) (CO_2) SS/CMn S (CHEM), Dup/CMnS (CHEM) (Ar-CO_2)
DNV-GL	VL309L
BV	UP
NK	KW309LG (C)
CWB	E309LT0-1, E309LT0-4

Note: CO_2, except in LR/CWB

DW-309LH PREMIARC™

Flux cored wire

Features:
- Suitable for dissimilar metal joint of solution heat treatment and underlaying on ferritic steels for overlaying stainless steel weld metals
- Bi-free type

Classification: AWS A5.22 E309LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:

Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.4	1.0
Mn	1.2	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.6	12.0~14.0
Cr	23.1	22.0~25.0
Mo	0.02	0.75
Cu	0.02	0.75
Bi	<0.0005	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill
1.2	130~270	150~220	130~180

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	380	-
TS (MPa)	590	518min.
El on 4d (%)	36	30min.

DW-309LP PREMIARC™

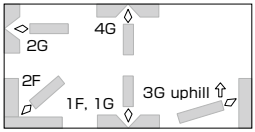
Flux cored wire

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.22 E309LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.02	0.04
Si	0.8	1.0
Mn	0.8	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.4	12.0~14.0
Cr	23.2	22.0~25.0
Mo	0.02	0.75
Cu	0.02	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	430	-
TS (MPa)	570	518min.
El on 4d (%)	38	30min.

Approvals

	CO_2	Ar-CO_2
ABS	MG (AWS A5.22 E309LT1-1)	MG (AWS A5.22 E309LT1-4)
LR	SS/CMn S (CHEM & CRYO), Dup/CMnS (CHEM)	SS/CMn S (CHEM)
DNV-GL	VL309L	VL309L
BV	309L, UP	-
NK	KW309LG (C)	-
KR	RW309LG (C)	-
CCS	309L, UP	-
CWB	E309LT1-1	E309LT1-4

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~270	150~220	130~220	150~200

DW-309 PREMIARC™

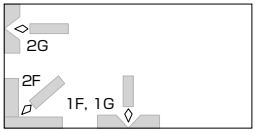
Flux cored wire

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.22 E309T0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum
1.2	12.5kg	200kg
1.6	12.5kg	-
Volume mm	295W, 110H, 295L	680ϕ, 770H

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.10
Si	0.7	1.0
Mn	1.2	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.3	12.0~14.0
Cr	24.0	22.0~25.0
Mo	0.02	0.75
Cu	0.03	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	130~270	150~220
1.6	190~320	220~270

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	450	-
TS (MPa)	590	552min.
El on 4d (%)	32	30min.
IV 0℃ (J)	33	-

Approvals

LR	SS/CMn S (CHEM)

Note: CO_2

DW-309L-XR PREMIARC™

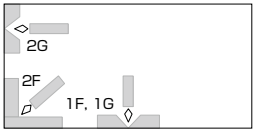
Flux cored wire

Features:
- Suitable for dissimilar-metal joint and underlaying on ferritic steels
- Low Cr (Ⅵ) stainless steel flux cored wire

Classification: AWS A5.22 E309LT0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (wire mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.8	1.0
Mn	1.1	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.4	12.0~14.0
Cr	24.1	22.0~25.0
Mo	0.03	0.75
Cu	0.03	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	130~270	150~220

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	454	-
TS (MPa)	608	518min.
El on 4d (%)	32	30min.

Approvals

CWB	E309LT0-1, E309LT0-4

DW-309LP-XR PREMIARC™

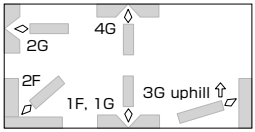
Flux cored wire

Features:
- Suitable for dissimilar-metal joint and underlaying on ferritic steels
- Low Cr (Ⅵ) stainless steel flux cored wire

Classification: AWS A5.22 E309LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (wire mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.7	1.0
Mn	1.0	0.5~2.5
P	0.01	0.04
S	<0.01	0.03
Ni	12.3	12.0~14.0
Cr	24.2	22.0~25.0
Mo	0.02	0.75
Cu	0.01	0.75

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	430	-
TS (MPa)	562	518min.
El on 4d (%)	37	30min.

Approvals

ABS*	MG (AWS A5.22 E309LT1-4)
CWB	E309LT1-1, E309LT1-4

Note: *Ar-25%CO_2

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~270	150~220	130~220	150~200

DW-310 PREMIARC™

Flux cored wire

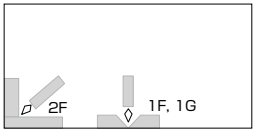
Features: ▪ Suitable for 25%Cr-20%Ni steel

Classification: AWS A5.22 E310T0-1/4

Shielding gas: CO_2 or Ar-CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.18	0.20
Si	0.4	1.0
Mn	2.0	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	20.6	20.0~22.5
Cr	25.3	25.0~28.0
Mo	0.03	0.75
Cu	0.03	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
1.2	130~220

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	420	-
TS (MPa)	620	552min.
El on 4d (%)	33	30min.
IV 0℃ (J)	68	-

Approvals

CWB	E310T0-1, E310T0-4

DW-312 PREMIARC™

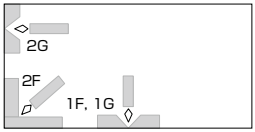
Flux cored wire

Features:
- Suitable for dissimilar-metal joint and underlaying on ferritic steels for overlaying stainless steel weld metals

Classification: AWS A5.22 E312T0-1

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.11	0.15
Si	0.5	1.0
Mn	1.6	0.5~2.5
P	0.02	0.04
S	0.01	0.03
Ni	10.2	8.0~10.5
Cr	28.4	28.0~32.0
Mo	0.02	0.75
Cu	0.02	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	130~270	150~220

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	600	-
TS (MPa)	720	655min.
El on 4d (%)	23	22min.

Approvals

CWB	E312T0-1

FCAW

DW-316L PREMIARC™

Flux cored wire

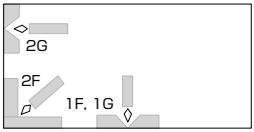
Features: ▪ Applicable for 316L type steel

Classification: AWS A5.22 E316LT0-1/4

Shielding gas: CO_2 or Ar-CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum
0.9	5kg	12.5kg	-
1.2	-	12.5kg	150kg
1.6	-	12.5kg	-
Volume mm	235W, 110H, 230L	295W, 110H, 295L	530ϕ, 820H

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.02	0.04
Si	0.6	1.0
Mn	1.3	0.5~2.5
P	0.02	0.04
S	0.01	0.03
Ni	12.0	11.0~14.0
Cr	18.9	17.0~20.0
Mo	2.5	2.0~3.0
Cu	0.06	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
0.9	80~150	90~130
1.2	130~270	150~220
1.6	190~320	220~270

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	380	-
TS (MPa)	540	483min.
El on 4d (%)	41	30min.
IV 0℃ (J)	44	-

Approvals

	CO_2	Ar-CO_2
ABS	MG	-
LR	316L S (CHEM)	
DNV-GL	VL316L	
BV	UP	-
NK	KW316LG (C)	-
CWB	E316LT0-1	E316LT0-4

DW-316LT

PREMIARC™

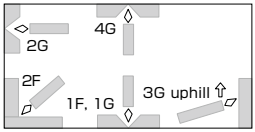
Flux cored wire

Features: ▪ Suitable for 18%Cr-12%Ni-2%Mo steel for low temperature service

Classification: AWS A5.22 E316LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.02	0.04
Si	0.4	1.0
Mn	1.2	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.0	11.0~14.0
Cr	17.4	17.0~20.0
Mo	2.2	2.0~3.0
Cu	0.06	0.75

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	398	-
TS (MPa)	528	483min.
El on 4d (%)	44	30min.
IV -196℃ (J)	36	27min.

Approvals

ABS	MG (AWS A5.22 E316LT1-1)
LR	316LS (CHEM & CRYO)
DNV-GL	VL316L, MG
BV	316LBT
NK	KW316LG (C)
KR	RW316LG (C)

Note: CO_2

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~220	150~220	130~180	160~200

DW-316LH PREMIARC™

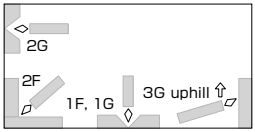
Flux cored wire

Features:
- Suitable for 18%Cr-12%Ni-2%Mo steel with high temperature heat treatment such as solution treatment
- Bi-free type

Classification: AWS A5.22 E316LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.02	0.04
Si	0.4	1.0
Mn	1.1	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	11.9	11.0~14.0
Cr	18.5	17.0~20.0
Mo	2.4	2.0~3.0
Cu	0.02	0.75
Bi	<0.0005	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill
1.2	130~270	150~220	130~180

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	390	-
TS (MPa)	540	483min.
El on 4d (%)	44	30min.
IV 0℃ (J)	66	-

DW-316LP PREMIARC™

Flux cored wire

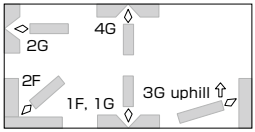
Features: ▪ Applicable for 316 and 316L type steel

Classification: AWS A5.22 E316LT1-1/4

Shielding gas: CO_2 or Ar-CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.02	0.04
Si	0.8	1.0
Mn	1.3	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.3	11.0~14.0
Cr	18.1	17.0~20.0
Mo	2.8	2.0~3.0
Cu	0.08	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	370	-
TS (MPa)	540	483min.
El on 4d (%)	43	30min.
IV 0℃ (J)	54	-

Approvals

	CO_2	Ar-CO_2
LR	-	316L S (CHEM)
DNV-GL	VL316L	
BV	316L	-
NK	KW316LG (C)	-
CWB	E316LT1-1	E316LT1-4

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~270	150~220	130~220	150~200

DW-316H PREMIARC™

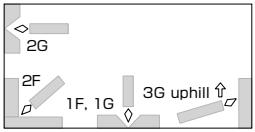
Flux cored wire

Features:
- Suitable for 18%Cr-12%Ni-2%Mo steel for high temperature service
- Bi-free type

Classification: AWS A5.22 E316T1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.05	0.08
Si	0.4	1.0
Mn	1.1	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	11.6	11.0~14.0
Cr	18.2	17.0~20.0
Mo	2.4	2.0~3.0
Cu	0.05	0.75
Bi	<0.0005	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill
1.2	130~270	150~220	130~180

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	390	-
TS (MPa)	570	518min.
El on 4d (%)	41	30min.
IV 0℃ (J)	68	-

DW-316L-XR PREMIARC™

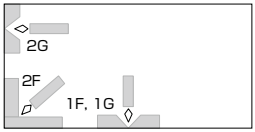
Flux cored wire

Features:
- Applicable for 316L type stainless steel
- Low Cr (Ⅵ) stainless steel flux cored wire

Classification: AWS A5.22 E316LT0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (wire mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.7	1.0
Mn	1.3	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.0	11.0~14.0
Cr	18.9	17.0~20.0
Mo	2.4	2.0~3.0
Cu	0.03	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	130~270	150~220

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	400	-
TS (MPa)	548	483min.
El on 4d (%)	42	30min.

Approvals

CWB	E316LT0-1, E316LT0-4

DW-316LP-XR PREMIARC™

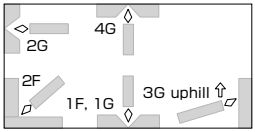
Flux cored wire

Features:
- Applicable for 316L type stainless steel
- Low Cr (Ⅵ) stainless steel flux cored wire

Classification: AWS A5.22 E316LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (wire mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.8	1.0
Mn	1.2	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.5	11.0~14.0
Cr	19.0	17.0~20.0
Mo	2.8	2.0~3.0
Cu	0.05	0.75

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	429	-
TS (MPa)	566	483min.
El on 4d (%)	41	30min.

Approvals

ABS*	MG (AWS A5.22 E316LT1-4)
CWB	E316LT1-1, E316LT1-4

Note: *Ar-25%CO_2

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~270	150~220	130~220	150~200

DW-317L PREMIARC™

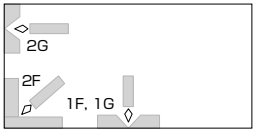
Flux cored wire

Features: ▪ Suitable for 18%Cr-12%Ni-2%Mo-N and 19%Cr-13%Ni-3%Mo steel

Classification: AWS A5.22 E317LT0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.4	1.0
Mn	1.0	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.8	12.0~14.0
Cr	18.9	18.0~21.0
Mo	3.1	3.0~4.0
Cu	0.04	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	130~270	150~220

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	380	-
TS (MPa)	590	518min.
El on 4d (%)	37	20min.
IV 0℃ (J)	43	-

Approvals

LR	MG
DNV-GL	VL317L
BV	UP
NK	KW317LG (C)
CWB	E317LT0-1, E317LT0-4

Note: CO_2, except in CWB

DW-317LP PREMIARC™

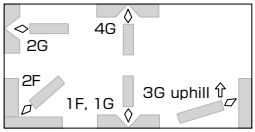
Flux cored wire

Features: ▪ Suitable for 18%Cr-12%Ni-2%Mo-N and 19%Cr-13%Ni-3%Mo stainless steel

Classification: AWS A5.22 E317LT1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.6	1.0
Mn	1.3	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	13.8	12.0~14.0
Cr	18.6	18.0~21.0
Mo	3.3	3.0~4.0
Cu	0.09	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	435	-
TS (MPa)	582	518min.
El on 4d (%)	37	20min.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~270	150~220	130~220	150~200

DW-347 PREMIARC™

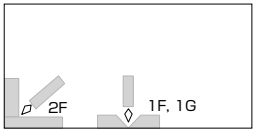
Flux cored wire

Features: ▪ Suitable for 18%Cr-8%Ni-Nb and18%Cr-8%Ni-Ti steel

Classification: AWS A5.22 E347T0-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
1.6	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.02	0.08
Si	0.3	1.0
Mn	1.5	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	10.5	9.0~11.0
Cr	18.6	18.0~21.0
Mo	0.01	0.75
Cu	0.04	0.75
Nb+Ta	0.59	8xC~1.0
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
1.2	130~270
1.6	180~300

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	390	-
TS (MPa)	550	518min.
El on 4d (%)	43	30min.
IV 0℃ (J)	49	-

Approvals

CWB	E347T0-1, E347T0-4

DW-2209 PREMIARC™

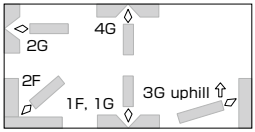
Flux cored wire

Features: ▪ Suitable for normal duplex stainless steel (S32205, S31803, etc.)

Classification: AWS A5.22 E2209T1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.5	1.0
Mn	0.7	0.5~2.0
P	0.02	0.04
S	<0.01	0.03
Ni	9.4	7.5~10.0
Cr	23.0	21.0~24.0
Mo	3.3	2.5~4.0
Cu	0.03	0.75
N	0.14	0.08~0.20

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	630	-
TS (MPa)	815	690min.
El on 4d (%)	28	20min.
IV -40℃ (J)	60	-

Approvals

LR	S31803S (CHEM)
CWB	E2209T1-1, E2209T1-4

Note: Ar-CO_2

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~250	150~220	130~180	160~200

DW-329AP PREMIARC™

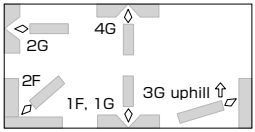
Flux cored wire

Features: ▪ Suitable for normal duplex stainless steel (S32205, S31803, etc)

Classification: AWS A5.22 E2209T1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (wire mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.61	1.0
Mn	0.74	0.5~2.0
P	0.02	0.04
S	0.01	0.03
Ni	9.10	7.5~10.0
Cr	22.70	21.0~24.0
Mo	3.30	2.5~4.0
Cu	0.02	0.75
N	0.13	0.08~0.20

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	639	-
TS (MPa)	820	690min.
El on 4d (%)	28	20min.
IV -20℃ (J)	46	-

Approvals

	CO_2	Ar-CO_2
ABS	MG (AWS A5.22 E2209T1-1)	MG (AWS A5.22 E2209T1-4)
LR	S31803S (CHEM), Dup/CMnS(CHEM)	S31803S (CHEM)
DNV-GL	MG (Duplex)	MG (Duplex)
BV	SA2205	SA2205
NK	KW2209G (C)	KW2209G (M21)
CCS	2205	2205

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
1.2	130~250	150~220	130~220	160~190

DW-2307 PREMIARC™

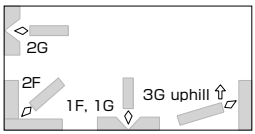
Flux cored wire

Features: ▪ Suitable for lean duplex stainless steel of S32101, S32304, S82122

Classification: AWS A5.22 E2307T1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.02	0.04
Si	0.6	1.0
Mn	1.4	2.0
P	0.02	0.03
S	<0.01	0.02
Ni	8.3	6.5~10.0
Cr	24.6	22.5~25.5
Mo	0.05	0.8
Cu	0.03	0.50
N	0.13	0.10~0.20
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill
1.2	130~250	150~220	130~180

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	590	-
TS (MPa)	754	690min.
El on 4d (%)	29	20min.
IV 0℃ (J)	52	-

DW-2594 PREMIARC™

Flux cored wire

Features: ▪ Suitable for super duplex stainless steel (S32750, S32760, etc.)

Classification: AWS A5.22 E2594T1-1/4

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:

Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.03	0.04
Si	0.5	1.0
Mn	1.2	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	9.5	8.0~10.5
Cr	25.5	24.0~27.0
Mo	3.8	2.5~4.5
Cu	<0.1	1.5
W	<0.1	1.0
N	0.22	0.20~0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill
1.2	130~250	150~220	130~180

All-weld mechanical properties

	Typical (Ar-CO_2)	Guaranty
0.2%YS (MPa)	714	-
TS (MPa)	896	759min.
El on 4d (%)	28	15min.
IV -40℃ (J)	38	-

Approvals

ABS	MG
LR	S32750S (CHEM), Dup/CMnS (CHEM)
DNV-GL	MG (AWS A5.22 E2594T1-1)
BV	UP
NK	MG
CWB	E2594T1-1, E2594T1-4

Note: CO_2, except in CWB

DW-410Cb PREMIARC™

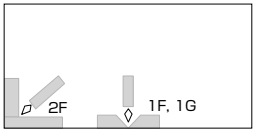
Flux cored wire

Features:
- Suitable for 13%Cr martensitic stainless steel such as 403 and 410 types and 13%Cr ferritic stainless steels such as 405 type

Classification: AWS A5.22 E409NbT0-1

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.05	0.10
Si	0.5	1.0
Mn	0.7	1.2
P	0.03	0.04
S	<0.01	0.03
Ni	0.1	0.6
Cr	12.6	10.5~13.5
Mo	<0.1	0.5
Cu	<0.1	0.5
Nb+Ta	0.64	8xC~1.5
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
1.2	130~270

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	282	-
TS (MPa)	515	449min.
El on 4d (%)	30	15min.
IV (J)	-	-
PWHT (℃xh)	775x2	760~790x2

MX-A410NiMo PREMIARC™

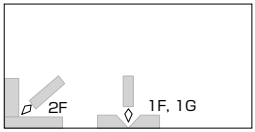
Flux cored wire

Features:
- Suitable for 13%Cr-Ni steel
- Preheat (100℃) must be done depending on thickness of base metal

Classification: AWS A5.22 EC410NiMo

Shielding gas: Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	295W, 110H, 295L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.02	0.06
Si	0.3	0.5
Mn	0.5	0.6
P	0.02	0.03
S	0.01	0.03
Ni	4.2	4.0~5.0
Cr	12.0	11.0~12.5
Mo	0.5	0.4~0.7
Cu	0.03	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
1.2	180~320

All-weld mechanical properties

	Typical
0.2%YS (MPa)	870
TS (MPa)	920
El on 4d (%)	20
IV 0℃ (J)	64
PWHT (℃xh)	600x1

MX-A430M PREMIARC™

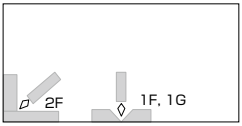
Flux cored wire

Features:
- Suitable for 13~17% Cr ferritic stainless steels
- Applied for thin plate in short circuiting welding
- Only use for single pass

Classification: AWS -

Shielding gas: Ar-CO_2 or Ar-O_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum	
1.2	20kg	200kg	250kg
Volume mm	295W, 110H, 295L	530ϕ, 820H	

Composition (all-weld metal mass%)

	Typical (Ar-CO_2)	Guaranty [a]
C	0.05	0.10
Si	0.4	0.9
Mn	0.1	1.0
P	0.01	0.04
S	0.02	0.03
Ni	0.1	0.6
Cr	17.0	15.0~18.5
Nb	0.7	1.0

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
1.2	100~250

All-weld mechanical properties

	Typical (Ar-CO_2)
0.2%YS (MPa)	390
TS (MPa)	540
El on 4d (%)	26
PWHT	AW

TG-X filler rods for one-side TIG welding

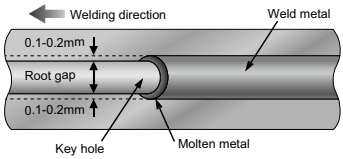
Tips for using TG-X filler rods

In order to secure a sound back bead with TG-X filler rod, it is essential to follow specific techniques.

(1) Proper root gap for sufficient penetration

Groove shape	Single V (70°) with 1.0mm shoulder		
Wall thickness (mm)	4	6	10 min.
Root gap (mm)	2.0	2.5	3.0

(2) Keyhole forming
By forming a key hole during welding, a sufficient amount of molten slag will flow to the back side of the groove and cover the back side of the bead.

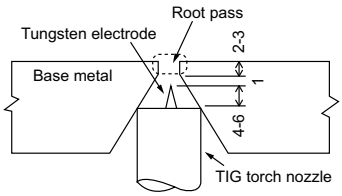


(3) Higher feeding speed of TG-X filler rod
The feeding speed of TG-X filler rod differs slightly from that of conventional solid TIG filler rod. It has to be fed at a high pace and little by little, with attention paid to not feeding too much at one time.

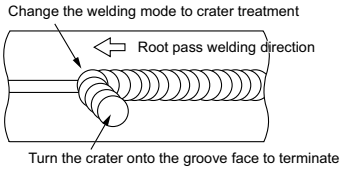
(4) Proper welding current and short arc length

Wall thickness (mm)	3-5	6-9	10 min.
Current (A)	80-90	90-105	90-110

It is recommended to keep the nozzle in contact with the groove fusion faces with an appropriate extension of the tungsten (W) electrode.



(5) Crater treatment to avoid crater cracking
Turn the crater onto the groove face to prevent crater cracking as well as shrinkage cavities in the crater.



(6) Bead connection
It is also important to maintain the bead connection properly to prevent oxidation in the penetration bead and to obtain a normal penetration bead contour.

Maintain solid slag both on the crater and the back bead when re-starting an arc to join a preceding bead. The re-arcing point should be placed back from the edge of the crater by about 10 mm.

In 5G position welding, terminate the succeeding bead onto the crater of the preceding bead in the uphill position to control molten slag and thereby to help create the keyhole.

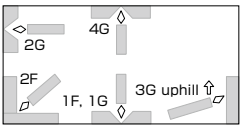
TG-X308L PREMIARC™

Flux cored filler rod

Features:

- Applicable for 304 and 304L type steels
- Suitable for root pass in one-side welding without back shielding
- In order to avoid defects, TG-X filler rod must be moved quickly at short pitch, unlike TIG filler rod

Welding Positions:



Classification: AWS A5.22 R308LT1-5

Shielding gas: Ar
Identification color: Red
Polarity: DCEN

Packaging data

	Tube			
ϕ mm	**kg**	**Length mm**	**g/piece**	**Volume mm**
2.2	5	1,000	26	42W, 35H, 1015L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.02	0.03
Si	0.7	1.2
Mn	1.4	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	10.3	9.0~11.0
Cr	19.6	18.0~21.0
Mo	0.02	0.75
Cu	0.04	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters

thickness mm	3~5	6~9	Over 10
current A	80~90	90~105	90~110

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	450	-
TS (MPa)	620	518min.
El on 4d (%)	47	30min.
IV -196℃ (J)	60	-

TG-X309L

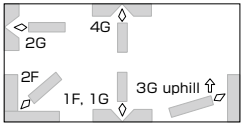
PREMIARC™

Flux cored filler rod

Features:

- Applicable for dissimilar-metal joint of stainless steels and ferritic steels
- Suitable for root pass in one-side welding without back shielding
- In order to avoid defects, TG-X filler rod must be moved quickly at short pitch, unlike TIG filler rod

Welding Positions:



Classification: AWS A5.22 R309LT1-5

Shielding gas: Ar
Identification color: Yellow green
Polarity: DCEN

Packaging data

	Tube			
ϕ mm	**kg**	**Length mm**	**g/piece**	**Volume mm**
2.2	5	1,000	26	42W, 35H, 1015L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.02	0.03
Si	0.8	1.2
Mn	1.4	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.1	12.0~14.0
Cr	23.7	22.0~25.0
Mo	0.02	0.75
Cu	0.04	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters

thickness mm	3~5	6~9	Over 10
current A	80~90	90~105	90~110

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	530	-
TS (MPa)	680	518min.
El on 4d (%)	32	30min.

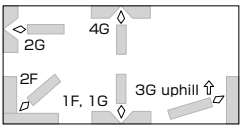
TG-X316L PREMIARC™

Flux cored filler rod

Features:

- Applicable for 316 and 316L type steels
- Suitable for root pass in one-side TIG welding without back shielding
- In order to avoid defects, TG-X filler rod must be moved quickly at short pitch, unlike TIG filler rod

Welding Positions:



Classification: AWS A5.22 R316LT1-5

Shielding gas: Ar
Identification color: Green
Polarity: DCEN

Packaging data

	Tube			
ϕ mm	**kg**	**Length mm**	**g/piece**	**Volume mm**
2.2	5	1,000	26	42W, 35H, 1015L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.02	0.03
Si	0.7	1.2
Mn	1.4	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	12.0	11.0~14.0
Cr	18.4	17.0~20.0
Mo	2.2	2.0~3.0
Cu	0.05	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters

thickness mm	3~5	6~9	Over 10
current A	80~90	90~105	90~110

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	440	-
TS (MPa)	600	483min.
El on 4d (%)	38	30min.
IV 0℃ (J)	110	-

Approvals

NK	MG

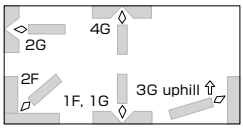
TG-X347 PREMIARC™

Flux cored filler rod

Features:

- Applicable for 347 and 321 type steels
- Suitable for root pass in one-side TIG welding without back shielding
- In order to avoid defects, TG-X filler rod must be moved quickly at short pitch, unlike TIG filler rod

Welding Positions:



Classification: AWS A5.22 R347T1-5

Shielding gas: Ar
Identification color: Blue
Polarity: DCEN

Packaging data

	Tube			
ϕ mm	**kg**	**Length mm**	**g/piece**	**Volume mm**
2.2	5	1,000	26	42W, 35H, 1015L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.02	0.08
Si	0.8	1.2
Mn	1.4	0.5~2.5
P	0.02	0.04
S	<0.01	0.03
Ni	10.2	9.0~11.0
Cr	18.9	18.0~21.0
Nb+Ta	0.60	8xC%~1.0
Mo	0.01	0.75
Cu	0.03	0.75
Bi	>0.002	-

Note: [a] Single values are maximum.

Welding parameters

thickness mm	3~5	6~9	Over 10
current A	80~90	90~105	90~110

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	460	-
TS (MPa)	630	518min.
El on 4d (%)	48	30min.
IV 0℃ (J)	130	-

MG-S308 PREMIARC™

Solid wire

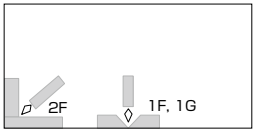
Features: ▪ Suitable for 18%Cr-8%Ni steel

Classification: AWS A5.9 ER308

Shielding gas: Ar-2%O_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum	
0.8	10kg	-	-	-
0.9	-	20kg	-	-
1.0	-	20kg	200kg	-
1.2	-	20kg	-	250kg
Volume mm	240W, 110H, 240L	285W, 110H, 285L	530ϕ, 820H	

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.08
Si	0.43	0.30~0.65
Mn	1.7	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	9.7	9.0~11.0
Cr	19.9	19.5~22.0
Mo	0.08	0.75
Cu	0.11	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
0.8	50~150
0.9	70~200
1.0	80~250
1.2	100~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	410
TS (MPa)	600
El on 4d (%)	40
IV -196℃ (J)	49

MG-S308LS PREMIARC™

Solid wire

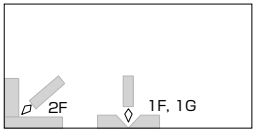
Features: ▪ Suitable for low carbon 18%Cr-8%Ni steel

Classification: AWS A5.9 ER308LSi

Shielding gas: Ar-2%O_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
0.8	10kg	-
0.9	10kg	-
1.0	10kg	20kg
1.2	10kg	20kg
Volume mm	240W, 110H, 240L	285W, 110H, 285L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.02	0.03
Si	0.79	0.65~1.00
Mn	1.9	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	9.9	9.0~11.0
Cr	19.8	19.5~22.0
Mo	0.04	0.75
Cu	0.04	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
0.8	50~150
0.9	70~200
1.0	80~250
1.2	100~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	400
TS (MPa)	580
El on 4d (%)	42
IV -196℃ (J)	59

MG-S309 PREMIARC™

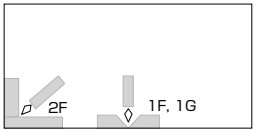
Solid wire

Features:
- Suitable for dissimilar-metal joint and underlaying on ferritic steels for overlaying stainless steel weld metals

Classification: AWS A5.9 ER309

Shielding gas: Ar-2%O_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
0.9	10kg	-
1.0	10kg	20kg
1.2	10kg	20kg
Volume mm	240W, 110H, 240L	285W, 110H, 285L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.46	0.30~0.65
Mn	2.0	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	13.7	12.0~14.0
Cr	23.3	23.0~25.0
Mo	0.03	0.75
Cu	0.03	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
0.9	70~200
1.0	80~250
1.2	100~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	430
TS (MPa)	610
El on 4d (%)	39

MG-S309LS PREMIARC™

Solid wire

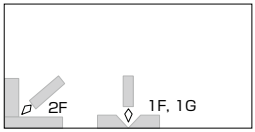
Features:
- Suitable for dissimilar-metal joint and underlaying on ferritic steels for overlaying stainless steel weld metals

Classification: AWS A5.9 ER309LSi

Shielding gas: Ar-2%O_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	10kg	20kg
Volume mm	240W, 110H, 240L	285W, 110H, 285L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.02	0.03
Si	0.84	0.65~1.00
Mn	1.8	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	13.3	12.0~14.0
Cr	23.6	23.0~25.0
Mo	0.03	0.75
Cu	0.03	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
1.2	100~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	410
TS (MPa)	570
El on 4d (%)	40
IV 0℃ (J)	88

MG-S316LS PREMIARC™

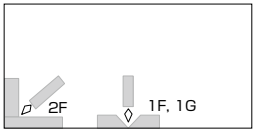
Solid wire

Features: ▪ Suitable for low carbon 18%Cr-12%Ni-2%Mo steel

Classification: AWS A5.9 ER316LSi

Shielding gas: Ar-2%O_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.0	10kg	-
1.2	10kg	20kg
Volume mm	240W, 110H, 240L	285W, 110H, 285L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.02	0.03
Si	0.79	0.65~1.00
Mn	2.0	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	12.2	11.0~14.0
Cr	19.3	18.0~20.0
Mo	2.4	2.0~3.0
Cu	0.12	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
1.0	80~250
1.2	100~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	380
TS (MPa)	550
El on 4d (%)	41
IV -196℃ (J)	39

TG-S308

PREMIARC™

Filler rod and wire

Features: ▪ Suitable for 18%Cr-8%Ni steel

Classification: AWS A5.9 ER308

Shielding gas: Ar
Identification color: 1st Yellow
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
0.8	-	5	1,000	4
1.0	-	5	1,000	6
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.05	0.08
Si	0.38	0.30~0.65
Mn	1.5	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	9.5	9.0~11.0
Cr	19.9	19.5~22.0
Mo	0.11	0.75
Cu	0.12	0.75

Note: [a] Single values are maximum.

Welding parameters

ϕ mm	Current A
0.8	50~80
1.0	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	410
TS (MPa)	580
El on 4d (%)	42
IV 0℃ (J)	150

Approvals

ABS	MG (AWS A5.9 ER308)
DNV-GL	VL308
NK	KY308

TG-S308L PREMIARC™

Filler rod and wire

Features: ▪ Suitable for low carbon 18%Cr-8%Ni steel

Classification: AWS A5.9 ER308L

Shielding gas: Ar
Identification color: 1st Red
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	kg	kg	Length mm	g/piece
0.8	10	5	1,000	4
1.0	10	5	1,000	6
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.01	0.03
Si	0.37	0.30~0.65
Mn	1.8	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	10.1	9.0~11.0
Cr	19.8	19.5~22.0
Mo	0.07	0.75
Cu	0.08	0.75

Note: [a] Single values are maximum.

Welding parameters

ϕ mm	Current A
0.8	50~80
1.0	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	420
TS (MPa)	590
El on 4d (%)	45
IV -196℃ (J)	78

Approvals

ABS	MG (AWS A5.9 ER308L)
LR	304L m (CHEM & CRYO)
DNV-GL	VL308L, MG
BV	308LBT
NK	KY308L

TG-S309

PREMIARC™

Filler rod and wire

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.9 ER309

Shielding gas: Ar
Identification color: 1st Black
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	5	1,000	6
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.47	0.30~0.65
Mn	1.6	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	13.6	12.0~14.0
Cr	23.1	23.0~25.0
Mo	0.10	0.75
Cu	0.12	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.0	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	410
TS (MPa)	580
El on 4d (%)	39
IV 0℃ (J)	150

Approvals

DNV-GL	VL309
NK	KY309

TG-S309L PREMIARC™

Filler rod and wire

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.9 ER309L

Shielding gas: Ar
Identification color: 1st Yellow green
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
0.9	10	-	-	-
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.01	0.03
Si	0.42	0.30~0.65
Mn	1.7	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	13.5	12.0~14.0
Cr	23.3	23.0~25.0
Mo	0.04	0.75
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
0.9	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	410
TS (MPa)	570
El on 4d (%)	38
IV 0℃ (J)	110

Approvals

LR	SS/CMn m (CHEM & CRYO), Dup/CMn m (CHEM)
NK	KY309L

TG-S309MoL PREMIARC™

Filler rod and wire

Features: ▪ Suitable for dissimilar-metal joint and underlaying on ferritic steels

Classification: AWS A5.9 ER309LMo

Shielding gas: Ar
Identification color: 1st Silver, 2nd Red
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.2	10	5	1,000	9
1.6	-	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.02	0.03
Si	0.43	0.30~0.65
Mn	2.1	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	13.6	12.0~14.0
Cr	23.5	23.0~25.0
Mo	2.2	2.0~3.0
Cu	0.05	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	440
TS (MPa)	590
El on 4d (%)	36

Approvals

NK	KY309Mo

TG-S310

PREMIARC™

Filler rod and wire

Features: ▪ Suitable for 25%Cr-20%Ni steel

Classification: AWS A5.9 ER310

Shielding gas: Ar
Identification color: 1st Gold
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	-	-	-
1.6	-	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.11	0.08~0.15
Si	0.49	0.30~0.65
Mn	1.8	1.0~2.5
P	0.01	0.03
S	<0.01	0.03
Ni	21.2	20.0~22.5
Cr	26.7	25.0~28.0
Mo	0.02	0.75
Cu	0.02	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.0	50~80
1.6	100~200
2.0	100~200
2.4	150~250

All-weld mechanical properties

	Typical
0.2%YS (MPa)	450
TS (MPa)	610
El on 4d (%)	39
IV 0℃ (J)	110

TG-S316

PREMIARC™

Filler rod and wire

Features: ▪ Suitable for 18%Cr-12%Ni-2%Mo steel

Classification: AWS A5.9 ER316

Shielding gas: Ar
Identification color: 1st White
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	5	1,000	6
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.04	0.08
Si	0.47	0.30~0.65
Mn	1.5	1.0~2.5
P	0.03	0.03
S	<0.01	0.03
Ni	12.0	11.0~14.0
Cr	19.1	18.0~20.0
Mo	2.1	2.0~3.0
Cu	0.26	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.0	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	390
TS (MPa)	570
El on 4d (%)	42
IV 0℃ (J)	110

TG-S316L PREMIARC™

Filler rod and wire

Features: ▪ Suitable for low carbon 18%Cr-12%Ni-2%Mo steel

Classification: AWS A5.9 ER316L

Shielding gas: Ar
Identification color: 1st Green
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
0.8	10	5	1,000	4
1.0	10	5	1,000	6
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.01	0.03
Si	0.40	0.30~0.65
Mn	1.7	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	12.0	11.0~14.0
Cr	18.7	18.0~20.0
Mo	2.2	2.0~3.0
Cu	0.11	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
0.8	50~80
1.0	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	390
TS (MPa)	550
El on 4d (%)	43
IV -196℃ (J)	49

Approvals

ABS	MG (AWS A5.9 ER316L)
LR	316LS (CHEM & CRYO)
DNV-GL	VL316L, MG
BV	316LBT
NK	KY316L

TG-S317L PREMIARC™

Filler rod and wire

Features: ▪ Suitable for low carbon 18%Cr-12%Ni-2%Mo-N and low carbon 19%Cr-13%Ni-3%Mo steel

Classification: AWS A5.9 ER317L

Shielding gas: Ar
Identification color: 1st Sorrel
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.01	0.03
Si	0.43	0.30~0.65
Mn	1.8	1.0~2.5
P	0.02	0.03
S	<0.01	0.03
Ni	13.1	13.0~15.0
Cr	18.8	18.5~20.5
Mo	3.4	3.0~4.0
Cu	0.04	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	410
TS (MPa)	570
El on 4d (%)	39
IV 0℃ (J)	98

TG-S347 PREMIARC™

Filler rod and wire

Features: ▪ Suitable for 18%Cr-8%Ni-Nb and 18%Cr-8%Ni-Ti steel

Classification: AWS A5.9 ER347

Shielding gas: Ar
Identification color: 1st Blue
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	-	-	-
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.05	0.08
Si	0.40	0.30~0.65
Mn	2.1	1.0~2.5
P	0.02	0.03
S	0.01	0.03
Ni	10.0	9.0~11.0
Cr	19.3	19.0~21.5
Mo	0.07	0.75
Cu	0.07	0.75
Nb	0.6	10xC~1.0

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.0	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	460
TS (MPa)	630
El on 4d (%)	38
IV 0℃ (J)	88

Approvals

NK	KY347

TG-S410 PREMIARC™

Filler rod and wire

Features: ▪ Suitable for 13%Cr stainless steel

Classification: AWS A5.9 ER410

Shielding gas: Ar
Identification color: 1st Purple
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.2	10	-	-	-
1.6	-	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.10	0.12
Si	0.3	0.5
Mn	0.5	0.6
P	0.01	0.03
S	0.01	0.03
Ni	0.4	0.6
Cr	12.8	11.5~13.5
Mo	0.50	0.75
Cu	<0.01	0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250

All-weld mechanical properties

	Typical
0.2%YS (MPa)	520
TS (MPa)	660
El on 4d (%)	25
PWHT (℃xh)	760x1, FC

TG-S2209

PREMIARC™

Filler rod and wire

Features: ▪ Suitable for normal duplex stainless steel (S32205, S31803, etc.)

Classification: AWS A5.9 ER2209

Shielding gas: Ar or Ar-2%N_2
Identification color: 1st Red, 2nd Green
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.2	10	5	1,000	9
1.6	-	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.01	0.03
Si	0.38	0.90
Mn	1.49	0.50~2.00
P	0.02	0.03
S	<0.01	0.03
Ni	8.6	7.5~9.5
Cr	23.0	21.5~23.5
Mo	3.3	2.5~3.5
Cu	0.05	0.75
N	0.15	0.08~0.20

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	615
TS (MPa)	814
El on 4d (%)	38
IV -50℃ (J)	150

TG-S2594 PREMIARC™

Filler rod and wire

Features: ▪ Suitable for super duplex stainless steel (S32750, S32760, etc.)

Classification: AWS A5.9 ER2594

Shielding gas: Ar or Ar-2%N_2
Identification color: 1st Red, 2nd Blue
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.2	10	5	1,000	9
1.6	-	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.01	0.03
Si	0.4	1.0
Mn	0.6	2.5
P	0.02	0.03
S	<0.01	0.02
Ni	9.2	8.0~10.5
Cr	24.8	24.0~27.0
Mo	3.8	2.5~4.5
Cu	0.1	1.5
N	0.26	0.20~0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical (Ar-2%N_2)
0.2%YS (MPa)	646
TS (MPa)	859
El on 4d (%)	38
IV -50℃ (J)	171

Approvals

ABS	MG (AWS A5.9 ER2594)
LR	S32750m (CHEM)
DNV-GL	MG (Super duplex)
BV	UP (AWS A5.9 ER2594)
NK	MG
CCS	2750

TG-S310MF

PREMIARC™

Filler rod and wire

Features: ▪ Suitable for 25%Cr-22%Ni-2%Mo steel of urea plant

Classification: AWS -

Shielding gas: Ar
Identification color: -
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
0.8	-	5	1,000	4
1.2	10	5	1,000	9
1.6	-	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.009	0.020
Si	0.03	0.50
Mn	4.87	3.00~5.50
P	0.005	0.030
S	0.002	0.020
Ni	22.52	21.00~23.00
Cr	25.33	24.00~26.00
Mo	2.27	1.90~2.70
N	0.13	0.20

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
0.8	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250

All-weld mechanical properties

	Typical
0.2%YS (MPa)	480
TS (MPa)	630
El on 4d (%)	40

TG-S410Cb

PREMIARC™

Filler rod and wire

Features: ▪ Suitable for 13%Cr and 13%Cr-Al steel

Classification: AWS -

Shielding gas: Ar
Identification color: 1st Purple
Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
3.2	-	5	1,000	64
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.09	0.12
Si	0.41	0.50
Mn	0.46	0.60
P	0.007	0.030
S	0.002	0.030
Ni	0.07	0.60
Cr	11.93	11.50~13.50
Mo	0.01	0.75
Cu	0.01	0.75
Nb	0.89	0.70~1.10

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250
3.2	200~300

All-weld mechanical properties

	Typical
0.2%YS (MPa)	270
TS (MPa)	540
El on 4d (%)	23
IV 20℃ (J)	39

N04051 PREMIARC™

Filler rod and wire

Features: ▪ Suitable for modified 316 stainless steel of urea plant

Classification: AWS -

Shielding gas: Ar

Identification color: -

Polarity: DCEN

Packaging data

	Spool	Tube		
ϕ mm	**kg**	**kg**	**Length mm**	**g/piece**
1.0	10	5	1,000	6
1.2	10	5	1,000	9
1.6	10	5	1,000	16
2.0	-	5	1,000	25
2.4	-	5	1,000	36
Volume mm	240W, 110H, 240L	40W, 35H, 1015L		

Composition (rod and wire mass%)

	Typical	Guaranty [a]
C	0.005	0.045
Si	0.16	1.00
Mn	6.10	4.00~7.00
P	0.011	0.030
S	0.004	0.020
Ni	16.29	14.00~18.00
Cr	18.24	17.00~19.50
Mo	2.56	2.20~3.00
N	0.01	0.20

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	
1.0	50~80
1.2	50~100
1.6	100~200
2.0	100~200
2.4	150~250

All-weld mechanical properties

	Typical
0.2%YS (MPa)	360
TS (MPa)	490
El on 4d (%)	41
IV -257℃ (J)	99

PF-S1D/US-2209 PREMIARC™

Flux and wire combination for duplex stainless

Features: ▪ Suitable for normal duplex stainless steel (S32205, S31803, etc)

Classification: Wire: AWS A5.9 ER2209

Type of flux: Bonded

Redrying of flux: 200~300℃ × 1h

Packaging data

Flux	Mesh	Can		
PF-S1D	12×65	20kg		
Volume mm		240W, 350H, 240L		
Wire	**ϕ mm**	**Spool**		**Coil**
US-2209	1.2	-	15kg	-
	1.6	10kg	15kg	-
	2.4	10kg	15kg	25kg
Volume mm		240W, 110H, 240L	285W, 110H, 285L	430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.02	0.03
Si	0.36	0.90
Mn	1.42	0.50~2.00
P	0.01	0.03
S	<0.01	0.03
Ni	8.9	7.5~9.5
Cr	23.3	21.5~23.5
Mo	3.3	2.5~3.5
Cu	0.16	0.75
N	0.15	0.08~0.20

Note: [a] Single values are maximum.

Composition (all weld metal mass%)

	Typical
C	0.02
Si	0.30
Mn	1.66
P	0.02
S	<0.01
Ni	9.0
Cr	23.1
Mo	3.3
Cu	0.16
N	0.14

All-weld mechanical properties

	Typical
0.2%YS (MPa)	618
TS (MPa)	798
El on 4d (%)	29
IV -40℃ (J)	61

Approvals

LR	S31803T, S31803M (CHEM)
DNV-GL	MG
BV	2205TM
CCS	2205

For Hardfacing

Welding Consumables for

SMAW

FCAW

GMAW

A guide for selecting welding consumables

Weld metal microstructure and main alloying elements determine the performances of welding consumables for hardfacing as summarized in Table 1.

Table 1 Welding consumables and their characteristics

Weld metal microstructure and alloying formula		Hv	Features
Pearlite		200-400	▪ Good crack resistance ▪ Good machinability
Martensite		350-800	▪ Good wear resistance
13%Cr stainless steel type		350-500	▪ Good resistance to oxidation, heat and corrosion ▪ Good wear resistance
Semi-Austenite		500-700	▪ High toughness and good wear resistance
High Mn Austenite	13%Mn	150-500	▪ High toughness and good impact wear resistance ▪ High work hardenability
	16%Mn-16%Cr	200-400	▪ High hardness at high temperatures ▪ High toughness
High Cr-Fe		600-800	▪ Excellent erosion resistance ▪ Good resistance to corrosion and heat
Tungsten carbide type		800-1200	▪ Excellent resistance to heavy abrasion

Note (1) MTM: Metal-to-metal wear, ABR: Abrasion, HTW: High temp. wear, CAV: Cavitation, COR; Corrosion wear, HRT: Heat resistance, IMP: Impact wear
◎: Excellent resistance, ○:Good resistance, △: Slightly inferior, ×: Inferior,
-: Not used for general applications

Material to be introduced here, is for hardfacing. Please do not use the joint welding.

	Type of wear [1]							SMAW	FCAW	GMAW
	MTM	ABR	HTW	CAV	COR	HRT	IMP			
	○	△	×	-	-	×	○	HF-240 HF-260 HF-330 HF-350	DW-H250 DW-H350	MG-250 MG-350
	○	○	△	-	×	△	△	HF-450 HF-500 HF-600 HF-650 HF-700 HF-800K	DW-H450 DW-H600 DW-H700 DW-H800	-
	○	△	○	○	○	○	△	HF-13	-	-
	○	○	△	△	△	△	△	HF-12	-	-
	×	○	×	△	×	×	◎	HF-11	DW-H11	-
	○	△	○	○	○	○	○	HF-16	DW-H16	-
	△	◎	◎	×	○	○	×	HF-30	-	-
	×	◎	×	×	×	×	×	HF-950	-	-

Tips for better welding results

Common

Important points in hardfacing are to obtain sufficient hardness and to minimize cracking. In order to achieve them, proper selection of welding consumables and proper welding procedures mentioned below are necessary.

1) Preparation of base metal:
Rust, oil and soil attached on the base metal may cause blowholes. Cracks in the base metal may cause cracking of the weld metal; therefore, they must be removed completely beforehand.

2) Preheat and interpass temperature:
In order to minimize cracking, control of preheat and interpass temperature is a key technique. Table 1 shows a rule of thumb for proper preheat and interpass temperatures in relation to the carbon equivalent of the base metal. In practice, size of work, type of welding consumable and method of hardfacing should be taken into consideration to determine the most appropriate temperatures.

Table 1 A rule of thumb for preheat and interpass temperature in relation to base metal carbon equivalents

Type of steel	Carbon equivalent (1)	Preheat and interpass temperature (℃)
Carbon steel and Low alloy steel	Less than 0.3 0.3-0.4 0.4-0.5 0.5-0.6 0.6-0.7 0.7-0.8 Over 0.8	100 max. 100 min. 150 min. 200 min. 250 min. 300 min. 350 min.
High-Mn steel (13%Mn steel)		Use no preheat and cool each weld pass with water
Austenitic stainless steel		Use no preheat and control the interpass temperature 150℃ or lower
High alloy steel (e.g., High-Cr steel)		400 min.

Note (1) Carbon equivalent = C + Mn/6 + Si/24 + Cr/5 + Mo/4 + Ni/15

3) Post heating:
Heating the weldment at 300-350°C for 10-30 minutes just after welding was finished is effective to prevent cold cracking. Control the temperature carefully, or the hardness of the weld will be decreased by excessive heating.

4) Postweld heat treatment:
Postweld heat treatment (PWHT) at 550-750°C is effective to prevent cold cracking and distortion in service, and to improve properties of the welds. It is important to set the PWHT conditions taking into account that the hardness of the weld is normally decreased by PWHT.

5) Underlaying:
Underlaying is effective to prevent cracking in welds where low-alloy steel having high hardenability is hardfaced or where high-hardness weld metal is deposited on carbon steel. For underlaying, mild steel type welding consumables or austenitic stainless steel type welding consumables should be used.

6) Penetration:
In hardfacing, the properties of the weld metal will considerably be affected by welding penetration into the base metal, because the chemical composition of the welding consumable is generally very different from those of the base metal. In order to use sufficiently the desired properties of the welding consumable, welding penetration must be controlled by using an appropriate welding procedure, for instance, multi-layer welding.

7) Welding distortion:
Intermittent and symmetrical welding sequences are effective to minimize welding distortion. Restraint of the work is also effective to minimize welding distortion.

SMAW

1) Control the arc length as short as possible.
2) Use the backstep method for arc starting to prevent blowholes.
3) Control the weaving width less than 3-4 times the diameter of a stick electrode.
4) Re-dry stick electrodes before use.

FCAW, GMAW

1) Control shielding gas flow rates within 20-25 l/mm for general applications. Note that poor shielding due to low flow rates and wind can cause blowholes and pits in the weld metal.
2) Refer to proper currents for individual wire sizes as shown in Table 2.

Table 2 Proper welding currents

Type of wire	Diameter (mm)	Polarity	Welding current (A)
DW-H series	1.2	DCEP	120-360
	1.6	DCEP	200-420
MG series	1.2	DCEP	120-320
	1.6	DCEP	200-420

Product names	Typical use & Redrying condition	Nominal hardness	Pol.	WP	Composition C
HF-240	▪ Gears and wheels ▪ 70~100℃x0.5~1h	Hv 240	AC DCEP	1F 1G 3G uphill 4G	Ty 0.09
HF-260	▪ Shafts, crane wheels and couplings ▪ 300~350℃x0.5~1h	Hv 260	AC DCEP	1F 1G 3G uphill 4G	Ty 0.17
HF-330	▪ Keys and clutch lugs ▪ 70~100℃x0.5~1h	Hv 330	AC DCEP	1F 1G 3G uphill 4G	Ty 0.10
HF-350	▪ Upper rollers and sprockets of bulldozers ▪ 300~350℃x0.5~1h	Hv 350	AC DCEP	1F 1G 3G uphill 4G	Ty 0.25

Note: Welding tests are as per Kobe Steel's Standard. Ty: Typical (polarity: AC)

Identification color

Product names	1st	2nd
HF-240	Red	White
HF-260	Red	Green
HF-330	Red	Purple
HF-350	Orange	Green

(overlay weld metal mass%)			Weld metal hardness		
Si	Mn	Cr	PWHT	Hv	Pre. H & IPT ℃
0.58	0.58	0.81	AW	240	150min.
			900℃, OQ	350	
0.69	1.81	-	AW	271	150min.
			900℃, OQ	395	
0.69	0.86	2.29	AW	340	150min.
			-	-	
0.49	1.38	1.16	AW	366	150min.
			850℃, OQ	510	

Packaging data

ϕ mm	2.6	3.2	4.0	5.0	6.0
HF-240	-	350	400	400	450
HF-260	300	350	400	400	450
HF-330	-	350	400	400	450
HF-350	300	350	400	400	450
carton mm	270W, 90H, 330L	170W, 120H, 380L	170W, 120H, 430L	170W, 120H, 430L	170W, 110H, 480L

Product names	Typical use & Redrying condition	Nominal hardness	Pol.	WP	Composition C
HF-450	▪ Idlers, rollers and truck links of bulldozers ▪ 300~350℃x0.5~1h	Hv 450	AC DCEP	1F 1G	Ty 0.20
HF-500	▪ Idlers and truck links of bulldozers ▪ 300~350℃x0.5~1h	Hv 500	AC DCEP	1F 1G	Ty 0.45
HF-600	▪ Lower rollers and bucket edges ▪ 300~350℃x0.5~1h	Hv 600	AC DCEP	1F 1G	Ty 0.48
HF-650	▪ Tamping dies and mixer blades ▪ 300~350℃x0.5~1h	Hv 650	AC DCEP	1F 1G	Ty 0.67

Note: Welding tests are as per Kobe Steel's Standard. Ty: Typical (polarity: AC)

Identification color

Product names	1st	2nd
HF-450	Red	Pink
HF-500	Orange	Blue white
HF-600	Red	Red
HF-650	Red	Orange

(overlay weld metal mass%)						Weld metal hardness		
Si	Mn	Cr	Mo	V	W	PWHT (°Cxh)	Hv	Pre. H & IPT ℃
1.30	0.31	2.54	0.60	0.23	-	AW	456	150min.
						550x6	443	
1.37	0.91	-	0.98	0.28	-	AW	517	150min.
0.77	2.58	2.50	-	-	-	AW	595	200min.
0.90	0.87	4.91	1.17	0.55	1.42	AW	634	200min.
						600x1, AC	580	

Packaging data

ϕ mm	2.6	3.2	4.0	5.0	6.0
HF-450	-	-	400	400	450
HF-500	-	350	400	400	450
HF-600	300	350	400	400	450
HF-650	300	350	400	400	450
carton mm	270W, 100H, 330L	170W, 130H, 380L	170W, 120H, 430L	170W, 125H, 430L	170W, 115H, 480L

Product names	Typical use & Redrying condition	Nominal hardness	Pol.	WP	Composition	
						C
HF-700	▪ Cutter knives and casings ▪ 300~350℃x0.5~1h	Hv 700	AC DCEP	1F 1G	Ty	0.62
HF-800K	▪ Cutter knives and casings ▪ 300~350℃x0.5~1h	Hv 800	AC DCEP	1F 1G	Ty	0.80
HF-950	▪ Shovel teeth and cutter knives ▪ 150~200℃x0.5~1h	Hv 950	AC DCEP	1F 1G	Ty	3.5

Note: Welding tests are as per Kobe Steel's Standard. Ty: Typical (polarity: AC)

Identification color

Product names	1st	2nd
HF-700	Orange	Orange
HF-800K	Orange	Yellow
HF-950	Orange	-

(overlay weld metal mass%)						Weld metal hardness		
Si	Mn	Cr	Mo	W	B	PWHT (°Cxh)	Hv	Pre. H & IPT ℃
0.80	0.78	5.12	2.21	-	-	AW	654	200min.
						600x1, AC	485	
1.65	1.24	3.82	-	2.42	0.29	AW	736	200min.
						600x1, AC	535	
0.1	2.6	-	-	26	-	AW	930	300min.

Packaging data

ϕ mm	3.2	4.0	5.0	6.0
HF-700	-	400	400	450
HF-800K	350	400	400	450
HF-950	-	400	400	-
carton mm	170W, 120H, 380L	170W, 115H, 430L	170W, 120H, 430L	170W, 120H, 480L

Product names	Typical use & Redrying condition	Nominal hardness	Pol.	WP	Composition C
HF-11	▪ Crusher hammers and crusher jaws ▪ 150~200℃x0.5~1h	Hv 250	AC DCEP	1F 1G	Ty 0.82
HF-12	▪ Ripper teeth, impellers and breakers ▪ 300~350℃x0.5~1h	Hv 500	AC DCEP	1F 1G	Ty 0.72
HF-13	▪ Valve seats and agitator propellers ▪ 300~350℃x0.5~1h	Hv 450	AC DCEP	1F 1G	Ty 0.13
HF-16	▪ Hot shears and hot dies ▪ 150~200℃x0.5~1h	Hv 300	AC DCEP	1F 1G	Ty 0.71
HF-30	▪ Crusher rotors and liners ▪ 300~350℃x0.5~1h	Hv 700	AC DCEP	1F 1G	Ty 5.00

Note: Welding tests are as per Kobe Steel's Standard. Ty: Typical (polarity: AC)

Identification color

Product names	1st	2nd
HF-11	Red	Black
HF-12	Red	Brown
HF-13	Red	Blue white
HF-16	Orange	Brown
HF-30	Red	Silver

(overlay weld metal mass%)						Weld metal hardness	
Si	Mn	Cr	Mo	V	Ni	PWHT (°Cxh)	Hv
0.39	13.88	-	-	-	-	AW	266
0.89	1.17	7.30	1.12	-	-	AW	532
						500x2	630
0.50	0.74	12.97	0.97	-	0.99	AW	420
						750x1	260
0.48	14.59	15.33	1.85	0.42	2.20	AW	306
0.42	1.23	30.5	-	-	-	AW	770

Packaging data

ϕ mm	2.6	3.2	4.0	5.0	6.0
HF-11	-	350	400	400	450
HF-12	300	350	400	400	450
HF-13	-	350	400	400	-
HF-16	-	300	350	350	-
HF-30	-	-	400	450	-
carton mm	270W, 100H, 330L	170W, 125H, 380L or 330L	170W, 120H, 430L or 380L	170W, 120H, 430L or 380L	170W, 110H, 480L

Product names	Typical use	Nominal hardness	SG	WP
DW-H250	▪ Metal-to-metal wear parts and underlaying for hardfacing and repair	Hv 250	CO_2	1F 1G 2F
DW-H350	▪ Metal-to-metal wear and light abrasion parts	Hv 350	CO_2	1F 1G 2F
DW-H450	▪ Metal-to-metal wear and abrasion parts	Hv 450	CO_2	1F 1G 2F
DW-H600	▪ Abrasion parts	Hv 600	CO_2	1F 1G 2F
DW-H700	▪ Abrasion parts	Hv 700	CO_2	1F 1G 2F
DW-H800	▪ Heavy abrasion parts ▪ Metal type flux cored wire	Hv 800	CO_2	1F 1G 2F

Note: Polarity: DCEP, Welding tests are as per Kobe Steel's Standard. Ty: Typical

Packaging data

ϕ mm	DW-H250	DW-H350	DW-H450	DW-H600	DW-H700	DW-H800
1.2	20kg	20kg	20kg	20kg	20kg	20kg
1.6	20kg	20kg	20kg	20kg	20kg	20kg
Volume mm	300W, 110H, 300L					

	Composition (overlay weld metal mass%)								Weld metal hardness		
	C	Si	Mn	Cr	Mo	V	W	B	PWHT (℃xh)	Hv	Pre. H & IPT ℃
Ty	0.09	0.49	1.30	1.02	0.40	-	-	-	AW	269	150min.
									600x2	270	
Ty	0.13	0.64	1.70	0.48	0.53	-	-	-	AW	370	150min.
									600x2	297	
Ty	0.15	0.57	1.40	3.70	0.47	0.25	-	-	AW	431	150min.
									600x2	384	
Ty	0.45	0.48	0.97	4.31	0.51	-	-	-	AW	574	200min.
									600x2	398	
Ty	0.57	0.73	1.05	5.40	1.01	0.54	1.21	-	AW	673	250min.
									600x2	605	
Ty	1.10	0.68	1.83	4.22	-	-	2.26	0.54	AW	772	250min.
									600x2	612	

Product names	Typical use	Nominal hardness	SG	WP
DW-H11	▪ Abrasion accompanied by heavy impact parts and repair welding of 13%-Mn cast steel ▪ Metal type flux cored wire	Hv 250	Ar-CO_2	1F 1G 2F
DW-H16	▪ High temperature wear, impact wear and cavitation parts such as hot shear bytes, hot saws, and hydraulic power water turbines ▪ Metal type flux cored wire	Hv 300	Ar-CO_2	1F 1G 2F

Note: Polarity: DCEP, Welding tests are as per Kobe Steel's Standard. Ty: Typical

Packaging data

ϕ mm	DW-H11	DW-H16
1.2	-	12.5kg
1.6	12.5kg	-
Volume mm	300W, 110H, 300L	

	Composition (overlay weld metal mass%)							Weld metal hardness		
	C	Si	Mn	Cr	Mo	V	B	PWHT	Hv	Pre. H & IPT ℃
Ty	0.84	0.68	14.17	-	-	-	-	AW	233	-
Ty	0.60	0.51	16.76	16.21	1.49	0.49	-	AW	278	150min.

For Cast Iron

Welding Consumables for

SMAW

A guide for selecting welding consumables

Table 1 shows stick electrodes for shielded metal arc welding of cast irons in conjunction with weldability, usability, color matching, and machinability.

Table 1 Welding consumables for cast irons (1)

Product names	Preheat temperature (℃)	Wettability with base metal	Color matching with base metal	Joint efficiency	X-ray soundness	Machinability of weld metal	Machinability of HAZ
CI-A1	100-300	○	△	◎	○	◎	◎
CI-A2	150-350	◎	△	◎	○	◎	○
CI-A3	350-400	◎	◎	○	○	△	△

Note (1) ◎: Good, ○: Better, △: Inferior

Tips for better welding results

1) Preparation for base metal:

(1) When cast irons have impregnated oil, the base metal must be heated at 400°C to burn off the oil before welding. Other contaminants should also be removed off before welding.
(2) To repair a defect, it must be removed completely by machining or grinding (arc air gouging is not suitable for cast irons) before welding. The welding groove should have a round bottom for better fusion. Where a crack defect seems to be propagated by machining or grinding, make stop-holes at both ends of the crack.

2) Welding procedure:

(1) The most appropriate preheating temperature depends on the size and thickness of the work; however, Table 1 can be a rule of thumb.
(2) Stringer welding with the maximum bead length of about 50 mm is recommended to prevent overheat, distortion and cracking.
(3) Peening is needed to minimize residual stresses. Just after one bead was laid, it must be peened with a hammer to the extent that the ripple of the bead disappears.
(4) Comparatively small conical groove should be welded in the spiral sequence from the bottom of the groove to the surface of the base metal. Backstep, symmetrical or intermittent sequence is recommended for a long welding line to prevent cracking. The buttering method, in which the surface of the groove is cladded first and the filling passes are laid later, is recommended for a deep groove.

Product names	Typical use & Redrying condition	AWS Class.	Pol.	WP		C	Si
CI-A1	▪ Repairing and joining various kinds of cast irons ▪ 70~100℃x0.5~1h	A5.15 ENi-CI	AC DCEP	F	Ty	1.0	0.1
					Gt[a]	2.0	4.0
CI-A2	▪ Repairing and joining various kinds of cast irons ▪ 70~100℃x0.5~1h	A5.15 ENiFe-CI	AC DCEP	F	Ty	1.1	0.3
					Gt[a]	2.0	4.0
CI-A3	▪ Repairing and joining various kinds of cast irons ▪ 300~350℃x0.5~1h	-	AC DCEP	F	Ty	0.04	0.50
					Gt[a]	0.15	1.00

Note: [a] Single values are maximum. Ty: Typical (polarity: AC), Gt: Guaranty

Identification color

Product names	1st	2nd
CI-A1	Gold	Red
CI-A2	Gold	Pink
CI-A3	Black	Orange