FLUX CORED WIRES FOR **STAINLESS STEEL**

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HYUNDAI
WELDING

Stainless Steel

Hyundai Welding offers a productive alternative for the welding of stainless steels over SMAW / GMAW welding. Hyundai not only provides a full product portfolio in stainless cored wires, but also ensures high productivity and superb weldability. Whether you're in need of wires for austenitic stainless steel, dissimilar joints and buffer layers, or high temperature applications such as cryogenic LNG storage tanks, we've got you covered. This goes for both flat and horizontal welding, and all positional welding.

By using our flux cored wires for stainless steel, you benefit from :

· Superior productivity (deposition rate and welding speed) compared to SMAW / GMAW welding
· Reliable weld penetration and lower risk of weld defects
· Superb weld appearance and reduced cost and time for post weld cleaning

Types of Stainless Steel

Type	Main Chemical Composition (wt%)	AISI/ASTM	Product	Characteristics
Austenitic	18 Cr-8 Ni	304, 309, 316, 347, 310	SW-308L, 309L, 309MoL, 316L, 316LT, 347 Cored Supercored 308L, 309L, 309MoL, 316L SW-308HBF, 309HBF, 316HBF	· Non-Magnetic, most common type of stainless steel · High toughness and good corrosion resistance · Applied to shipbuilding, offshore, cryogenic LNG tanks etc.
Ferritic	18 Cr	409, 430, 436, 439	SF-409Ti SF-430 SF-430Nb SF-436 SC-439Ti Cored	· Magnetic, good heat resistance and corrosion resistance · Excellent high-speed sheet metal welding · Applied to automotive exhaust systems
Martensitic	13 Cr-C	410, 420, 429, 431, 440	SW-410 Cored SW-410NiMo Cored	· Magnetic · High strength, low ductility, and heat treatable · Applied to hardfacing of continuous casting rolls, valve seats, etc.
Duplex (Dual-Phase)	Cr-Ni-Mo-N	2205, 2304, 2507	SW-2209 Cored SW-2594 Cored	· A combination of austenitic and ferritic · Dual phase that is based on ferrite mixed with 50% of austenite for intergranular and stress corrosion cracking prevention

Grades of Stainless Steel

304 basic grade

- **310** **253MA S30815** — Incresing high temperature resistance
- **316** **317** **904L** **6Mo S31254** — increasing corrosion resistance
  - **316L** — Weld stabilized grades
- **304L** **321** — Weld stabilized grades
- **308L** **347** — Welding consumable grades

430 basic grade

- **444** — Higher corrosion resisting weldable grade.
- **409** **3CR12** — Utility grades with increasing toughness
- **430F** — Free machining grade

410 basic grade

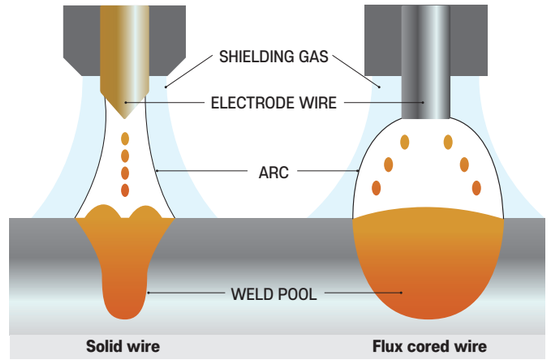
- **420** — Higher hardness grade
- **431** — Higher corrosion resistance and higher toughness grade
- **440A** **440B** **440C** — Increasing hardness after heat treatment
- **416** — Free machining grade

Austenitic Stainless Steel | **Ferritic Stainless Steel** | **Martensitic Stainless Steel**

Characteristics of Flux Cored Wires

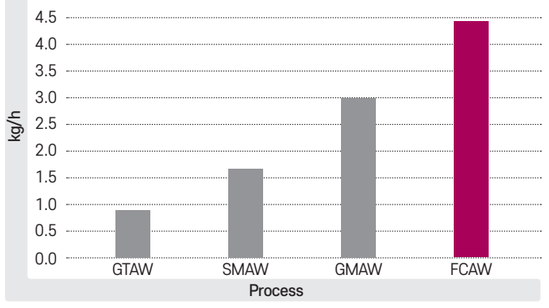
Flux Cored Wires (FCAW) offer easy handling and superb weldability. Though they generally cost more than solid wires (GMAW), they eventually make up for significant cost savings thanks to their high productivity and minimized post-weld work such as repair and cleaning.

As demonstrated in the graphic, the weld pool of FCAW is protected by the shielding gas. The slag that is formed covers both the surface of the bead as well as the reversed side of the root, making it very useful for outdoor one-sided welding.



In addition, the superior deposition rate and welder comfort of FCAW translate to increased productivity on site, as compared to SMAW or GMAW. Flux cored wires have more room for a welder to find the correct welding parameters, and the backhand (drag) technique of FCAW is less demanding than the forehand (push) technique of GMAW. The difference in deposition rate per process is shown in the graph below.

Deposition Rate



Item	Content
Process	GTAW, SMAW, GMAW, FCAW welding for stainless steel
Joint	Fillet
Position	PF/3G (vertical-up)
Welding time	1 min
Diameter	GTAW : 2.4mm (3/32in) SMAW : 3.2mm (1/8in) GMAW : 1.2mm (0.045in) FCAW : 1.2mm (0.045in)

Hyundai's Flux Cored Wires for Stainless Steel

For Flat and Horizontal Welding

Product	Specifications		Shielding Gas	Chemical Composition (Typical Values)												Mechanical Properties				Diameter mm(in)	Characteristics and Applications
	AWS A5.22/ SFA5.22	EN ISO 17633-A		C	Si	Mn	P	S	Cr	Ni	Mo	N	Fe	Nb		TS MPa (lbs/in2)	EL(%)	Temp °C (°F)	CVN J (ft·lbs)		
Austenitic Stainless Steel																					
SW-307NS Cored		T 18 8 Mn M M13/1	Ar + 2% O2, 100% Ar	0.072	0.61	7.35	0.019	0.008	18.3	8.6	0.10					610 (88,500)	43	-60 (-76)	71 (52)	1.2, 1.6 (0.045, 1/16)	· Metal-cored, bismuth-free · Joining and overlay applications on 13Mn steels · Welding of dissimilar steels (high Mn to carbon steel)
SW-309LNS Cored	A5.9 EC309L	T 23 12 L M M13/1	Ar + 2% O2, 100% Ar	0.025	0.53	1.80	0.016	0.005	24.0	13.0						590 (85,600)	45	-20 (-4)	60 (44)	1.0, 1.2, 1.6 (0.040, 0.045, 1/16)	· Metal-cored, bismuth-free · Non-slag type for automotive mufflers · Welding of dissimilar metals such as stainless and carbon alloy steels
Supercored 308L	E308LT0-1/-4	T 19 9 L R M21/C1 3	100% CO2	0.024	0.48	1.35	0.014	0.010	19.0	9.5						550 (79,750)	44	-60 (-76)	39 (28)	0.9, 1.0, 1.2, 1.4, 1.6 (0.035, 0.040, 0.045, 0.052,1/16)	· 18%Cr-8%Ni stainless steel
			80% Ar + 20% CO2	0.028	0.55	1.40	0.015	0.012	19.5	9.6						570 (82,650)	42	-60 (-76)	34 (25)		
Supercored 309L	E309LT0-1/-4	T 23 12 L R M21/C1 3	100% CO2	0.033	0.52	1.38	0.012	0.001	22.6	12.7						570 (82,650)	35	-60 (-76)	33 (24)	0.9, 1.0, 1.2, 1.6 (0.035, 0.040, 0.045, 1/16)	· 23.5%Cr-13%Ni stainless steels · Dissimilar welds between carbon, low alloy steels to stainless steels
			80% Ar + 20% CO2	0.035	0.58	1.45	0.015	0.007	23.2	12.9						580 (84,100)	34	-60 (-76)	34 (25)		
Supercored 309MoL	E309LMoT0-1/-4	T 23 12 2 L R M21/C1 3	100% CO2	0.033	0.50	1.23	0.010	0.003	22.0	12.4	2.3					680 (98,600)	35	-60 (-76)	32 (23)	0.9, 1.0, 1.2, 1.6 (0.035, 0.040, 0.045, 1/16)	· 22%Cr-12%Ni-2.5%Mo stainless steels · Dissimilar welds between carbon, low alloy steels to stainless steels
			80% Ar + 20% CO2	0.034	0.58	1.35	0.011	0.004	22.5	12.6	2.5					690 (100,161)	32	-60 (-76)	35 (25)		
Supercored 316L	E316LT0-1/-4	T 19 12 3 L R M21/C1 3	100% CO2	0.023	0.52	1.21	0.014	0.005	17.8	12.1	2.6					550 (79,750)	40	-60 (-76)	41 (30)	0.9, 1.0, 1.2, 1.6 (0.035, 0.040, 0.045, 1/16)	· 18%Cr-12%Ni-2%Mo stainless steels
			80% Ar + 20% CO2	0.024	0.58	1.38	0.013	0.006	18.1	12.2	2.7					560 (81,200)	39	-60 (-76)	40 (29)		
Ferritic Stainless Steel																					
SF-409Ti	A5.9 EC409	-	Ar + 2% O2, 100% Ar	0.03	0.50	0.55	0.012	0.010	12.5	0.8(Ti)						500 (72,600)	20			0.9, 1.0, 1.2, 1.4 (0.035, 0.040, 0.045, 0.052)	· Stainless steel type 409 · For automotive exhaust systems
SF-430	A5.9 EC430	-	Ar + 2% O2, 100% Ar	0.03	0.30	0.50	0.005	0.010	16.5	0.45(Ti)						500 (72,600)	40			1.2, 1.6 (0.045, 1/16)	· Stainless steel types 409 and 430 · For automotive exhaust systems
SF-430Nb	-	ISO 12072 G Z 17 L Nb	Ar + 2% O2, 100% Ar	0.03	0.40	0.17	0.010	0.010	16.5	0.40(Ti)				0.50		520 (75,400)	24			1.2 (0.045)	· Stainless steel types 409 and 430 · For automotive exhaust systems
SF-436	-	-	Ar + 2% O2, 100% Ar	0.03	0.60	0.40	0.008	0.006	16.8	0.45(Ti)	0.78					500 (72,600)	35			1.2, 1.4 (0.045, 0.052)	· Stainless steel types 409, 430 and 436 · For automotive exhaust systems
SC-439Ti Cored	A5.22 EC439	-	Ar + 2% O2, 100% Ar	0.03	0.30	0.60	0.005	0.010	18.5	0.60(Ti)						500 (72,600)	40			1.2 (0.045)	· Stainless steel types 409, 430, 436, 439 · For automotive exhaust systems

· All products are fully approved by most common societies. Please contact Hyundai Welding for more information on approvals.

Hyundai Welding offers a full range of consumables for stainless steel welding, that include SMAW, SAW, GMAW, GTAW, and FCAW. Please refer to our product catalog for more information. Flux cored wires, metal cored wires, and solid wires have a productivity advantage over coated electrodes since it is not necessary to stop welding to change electrodes.

For All-Position Welding

Product	Specifications		Shielding Gas	Chemical Composition (Typical Values)												Mechanical Properties				Diameter mm(in)	Characteristics and Applications
	AWS A5.22/ SFA5.22	EN ISO 17633-A		C	Si	Mn	P	S	Cr	Ni	Mo	N	Fe	Nb		TS MPa (lbs/in2)	EL(%)	Temp °C (°F)	CVN J (ft·lbs)		
Austenitic Stainless Steel (Bi-Free)																					
SW-307 Cored	-	T 18 8 Mn P M21/C1 2	100% CO2	0.037	0.79	5.15	0.012	0.007	17.8	9.2	0.10					595 (86,275)	47.2	-60 (-76)	67 (49)	1.2, 1.4, 1.6 (0.045, 0.052, 1/16)	· Joining and overlay applications on 13Mn steels · Welding of dissimilar steels (high Mn to carbon steel)
			80% Ar + 20% CO2	0.047	0.88	5.74	0.012	0.008	17.9	8.9	0.10					602 (87,290)	46.6	-60 (-76)	62 (45)		
SW-308L Cored	E308LT1-1/-4	T 19 9 L P M21/C1 2	100% CO2	0.025	0.62	1.31	0.015	0.010	18.7	10.2						567 (82,215)	48.4	-60 (-76)	53 (39)	1.0, 1.2, 1.4, 1.6 (0.040, 0.045, 0.052, 1/16)	· 18%Cr-8%Ni stainless steel
			80% Ar + 20% CO2	0.023	0.70	1.42	0.015	0.010	18.9	10.0						573 (83,085)	46.5	-60 (-76)	54 (39)		
SW-308LT	E308LT1-1/-4	T 19 9 L P M21/C1 2	100% CO2	0.019	0.65	1.35	0.012	0.009	18.5	9.8						570 (82,742)	47.5	-196 (-321)	34 (25)	1.2 (0.045)	· 18% Cr-8%Ni stainless steels · Cryogenic service such as LNG storage tank
			80% Ar + 20% CO2	0.020	0.71	1.40	0.012	0.009	18.8	9.9						576 (83,613)	47.0	-196 (-321)	36 (25)		
SW-309L Cored	E309LT1-1/-4	T 23 12 L P M21/C1 2	100% CO2	0.027	0.74	1.27	0.021	0.006	23.4	13.0						540 (78,300)	41	-60 (-76)	46 (33)	0.9, 1.0, 1.2, 1.4, 1.6 (0.035, 0.040, 0.045, 0.052, 1/16)	· 23.5%Cr-13%Ni stainless steels · Dissimilar welds between carbon, low alloy steels to stainless steels
			80% Ar + 20% CO2	0.026	0.86	1.43	0.021	0.006	23.5	12.8						580 (84,100)	39	-60 (-76)	40 (29)		
SW-309MoL Cored	E309LMoT1-1/-4	T 23 12 2 L P M21/C1 2	100% CO2	0.031	0.64	1.39	0.021	0.010	22.2	12.4	2.37					693 (100,485)	32.4	-60 (-76)	44 (32)	1.2, 1.4, 1.6 (0.045, 0.052, 1/16)	· 22%Cr-12%Ni-2.5%Mo stainless steels · Dissimilar welds between carbon, low alloy steels to stainless steels
			80% Ar + 20% CO2	0.035	0.75	1.35	0.021	0.015	22.3	12.5	2.20					661 (95,845)	29.6	-60 (-76)	42 (31)		
SW-316L Cored	E316LT1-1/-4	T 19 12 3 L P M21/C1 2	100% CO2	0.025	0.90	1.25	0.013	0.008	17.4	11.8	2.63					550 (79,750)	45.6	-60 (-76)	45 (33)	0.9, 1.0, 1.2, 1.4, 1.6 (0.035, 0.040, 0.045, 0.052, 1/16)	· 18%Cr-12%Ni-2%Mo stainless steels
			80% Ar + 20% CO2	0.026	0.92	1.38	0.013	0.008	17.5	11.7	2.65					555 (80,475)	42.4	-60 (-76)	40 (30)		
SW-316LT	E316LT1-1/-4	-	100% CO2	0.020	0.69	1.45	0.016	0.008	17.4	12.2	2.20					535 (77,575)	47	-196 (-321)	32 (23)	1.2 (0.045)	· 18% Cr-12%Ni-2%Mo stainless steels · Cryogenic service such as LNG storage tank
			80% Ar + 20% CO2	0.018	0.77	1.51	0.015	0.009	17.2	12.2	2.20					542 (78,590)	46	-196 (-321)	33 (24)		
SW-317L Cored	E317LT1-1/-4	-	100% CO2	0.029	0.61	1.41	0.022	0.007	18.3	12.7	3.35					585 (84,825)	36.8	-60 (-76)	32 (23)	0.9, 1.0, 1.2, 1.6 (0.035, 0.040, 0.045, 1/16)	· 316, 317 type stainless steels · Non bismuth-free
			80% Ar + 20% CO2	0.028	0.67	1.55	0.022	0.007	18.5	12.9	3.38					595 (86,275)	35.4	-60 (-76)	31 (22)		
SW-347 Cored	E347T1-1/-4	T 19 9 Nb P M21/C1 2	100% CO2	0.053	0.64	1.20	0.014	0.008	18.7	10.1				0.56		640 (92,800)	40.8	-60 (-76)	53 (39)	0.9, 1.0, 1.2, 1.4, 1.6 (0.035, 0.040, 0.045, 0.052, 1/16)	· 347 and 321 type stainless steels · Stainless steel boilers and gas turbine
			80% Ar + 20% CO2	0.053	0.70	1.15	0.014	0.008	18.8	10.1				0.60		648 (93,960)	40.6	-60 (-76)	52 (38)		
SW-308HBF	E308HT1-1/-4	ISO 17633-B TS 308H-F M21/C1 1	100% CO2	0.053	0.58	1.09	0.014	0.009	18.8	10.1						580 (84,100)	41.0	-60 (-76)	52 (38)	0.9, 1.0, 1.2, 1.4, 1.6 (0.035, 0.040, 0.045, 0.052, 1/16)	· Welding of 18%Cr-8%Ni stainless steels for high temperature service
			80% Ar + 20% CO2	0.050	0.63	1.00	0.019	0.008	19.1	10.2						585 (84,825)	42.0	-60 (-76)	53 (39)		
SW-309HBF	E309HT1-1/-4	ISO 17633-B TS 309H-F M21/C1 1	100% CO2	0.063	0.72	1.42	0.014	0.009	22.8	12.7						570 (82,650)	40.0	-60 (-76)	50 (39)	0.9, 1.0, 1.2, 1.4, 1.6 (0.035, 0.040, 0.045, 0.052, 1/16)	· Welding of dissimilar metals such as stainless steel and carbon steel or stainless steel and low alloy
			80% Ar + 20% CO2	0.060	0.78	1.49	0.015	0.008	23.0	12.9						574 (83,230)	42.6	-60 (-76)	54 (39)		
SW-316HBF	E316HT1-1/-4	ISO 17633-B TS 316H-F M21/C1 1	100% CO2	0.057	0.72	1.57	0.015	0.010	18.0	11.9	2.59					577 (83,665)	41.8	-60 (-76)	60 (44)	0.9, 1.0, 1.2, 1.4, 1.6 (0.035, 0.040, 0.045, 0.052, 1/16)	· Welding of 18%Cr-12%Ni-2% Mo stainless steels for high temperature service
			80% Ar + 20% CO2	0.058	0.77	1.62	0.016	0.010	18.2	12.3	2.62					580 (84,193)	41.9	-60 (-76)	58 (42)		
Martensitic Stainless Steel																					
SW-410 Cored	E410T1-1/-4	-	100% CO2	0.053	0.57	0.51	0.010	0.003	12.5	0.4						600 (87,000)	23.0	0 (32)	14 (10)	1.2, 1.4, 1.6 (0.045, 0.052, 1/16)	· 410, 410S, 405 stainless steels · Welding of ASTM CA6NM castings · Weld metal of martensite stainless steel
			80% Ar + 20% CO2	0.058	0.60	0.55	0.006	0.004	12.6	0.5						610 (88,500)	22.5	0 (32)	13 (9)		
SW-410 NiMo Cored	E410NiMoT1-1/-4	T 13 4 P M21/C1 2	100% CO2	0.032	0.74	0.43	0.008	0.008	11.8	4.4	0.50					890 (129,050)	17.0	0 (32)	35 (25)	1.2, 1.6 (0.045, 1/16)	· Martensite stainless steels (ASTM CA6NM) · Hardfacing of continuous casting rolls, valve seat, etc.
			80% Ar + 20% CO2	0.038	0.78	0.50	0.009	0.007	12.1	4.5	0.53					900 (130,500)	16.0	0 (32)	30 (22)		
Duplex Stainless Steel																					
SW-2209 Cored	E2209T1-1/-4	T 22 9 3 N L M21/C1 2	100% CO2	0.028	0.37	0.84	0.012	0.006	22.4	8.7	3.60	0.13				817 (120,350)	28.8	-20 (-4) -50 (-58)	45 (33) 35 (25)	1.2 (0.045)	· Duplex stainless steel (NAS 329J3L, UNS S31803)
			80% Ar + 20% CO2	0.030	0.45	0.91	0.012	0.008	23.1	8.8	3.70	0.12				828 (121,800)	26.0	-20 (-4) -50 (-58)	44 (32) 34 (25)		
SW-2594 Cored	E2594T1-1/-4	T 25 9 4 N L P M21/C1 2	100% CO2	0.023	0.42	0.74	0.013	0.002	25.5	9.2	3.74	0.24				896 (129,920)	24.2	-20 (-4)	27 (19) 20 (14)	1.2 (0.045)	· Super Duplex stainless steel (NAS 329J4L, UNS S32750)
			80% Ar + 20% CO2	0.029	0.52	0.75	0.012	0.001	25.7	9.1	3.78	0.23				891 (129,195)	26.0	-20 (-4)	37 (27) 30 (22)		
Nickel-base Alloys																					
SW-625	A5.34 ENiCrMo3T1-1/-4	-	100% CO2	0.017	0.37	0.15	0.002	0.002	21.0	Bal	9.2		1.4	3.6(Nb+Ta)		755 (109,597)	42.8	-196 (-321)	55 (41)	1.2 (0.045)	· Joining nickel-chromium-molybdenum alloys · Applied to LNG storage tanks, desulfurizations, and heat exchangers
			80% Ar + 20% CO2	0.019	0.42	0.19	0.003	0.002	21.2	Bal	9.5		1.2	3.7(Nb+Ta)		767 (111,338)	40.0	-196 (-321)	57 (42)		
SW-82H	A5.34 ENiGT1-1/-4	-	100% CO2	0.014	0.45	3.21	0.002	0.002	18.1	Bal	10.8		3.7			725 (105.242)	45.6	-196 (-321)	74 (54)	1.2 (0.045)	· Modified inconel FCAW for 9% Ni steel · Applied to LNG Fuel Tanks (Type C), for vertical upward welding (3G, PF)
			80% Ar + 20% CO2	0.016	0.46	3.35	0.002	0.002	18.6	Bal	10.9		2.7			750 (108,871)	40.8	-196 (-321)	71 (52)		
SW-82 Cored	A5.34 ENiCr3T1-1/-4	-	100% CO2	0.044	0.21	3.1	0.002	0.003	19.9	Bal		0.2(Ti)	2.2	2.4		665 (96,532)	42.8	-196 (-321)	100 (74)	1.2 (0.045)	· Dissimilar welding (stainless steel, heat resisting steel)
			80% Ar + 20% CO2	0.047	0.24	3.3	0.002	0.006	20.6	Bal		0.3(Ti)	2.3	2.5		670 (97,258)	42.0	-196 (-321)	95 (70)		
SW-182 Cored	A5.34 ENiCrFe3T1-1/-4	-	100% CO2	0.029	0.30	6.40	0.005	0.001	16.2	Bal		0.1(Ti)	8.3	1.9		611 (88,693)	44.0	-196 (-321)	105 (77)	1.2 (0.045)	· Cladding of reactor vessels , Welding of 3~7%Nickel steel for LNG Tanks · Dissimilar welding(stainless steel, heat resisting steel)
			80% Ar + 20% CO2	0.032	0.35	6.51	0.003	0.002	16.5	Bal		0.1(Ti)	8.5	2.0		640 (92,903)	37.0	-196 (-321)	100 (74)		

· All products are fully approved by most common societies. Please contact Hyundai Welding for more information on approvals.

Application of Austenitic Stainless Cored Wires

1) Chemical and Petrochemical Plants

Stainless steel is the ideal material choice for a wide range of chemical and petrochemical plant applications. Its strength and resistance to corrosion are incomparable. A stainless steel filter and seamless pipe combination is a mainstay of modern fluid systems. Chemical plants deal with acids and oxidizers, which can damage many materials. Stainless provides the best overall resistance to a wide range of chemicals, and its shapes are smooth and robust enough to handle virtually any type of cleaning process. Hyundai's Supercored series for flat and horizontal welding is used for overlay on carbon steel, and the all-positional SW Cored series is used for welding types 347H, 321, 304, or duplex 2205 and 2207.

Part or Base metal	Product
Overlay on Carbon Steel	Supercored 308L, 309L, 309MoL, 316L
STS 347H, 321	SW-347 Cored
STS 304	SW-308 Cored
2205 (Duplex)	SW-2209 Cored
2207 (Super Duplex)	SW-2594 Cored

2) Seawater Desalination

Seawater has the potential to become one of our main sources of fresh water. Seawater desalination requires a material that can resist the aggressive corrosion caused by seawater and brine. The optimal method is to use stainless steel, which ensures low maintenance costs, durability, and high recyclability. Approximately 80% of stainless steels are recycled at the end of their life, which make it an economical choice in the long run. Austenitic STS 316L is the predominant material used to make the components of a desalination plant. High performance stainless steels, including LDX 2101 lean duplex and 2205 duplex grades, are being more widely used due to their resistance to stress corrosion cracking (SCC). SW-2209 Cored can be used to weld both of these grades.

Part or Base metal	Product
STS 316L	SW-316L Cored
LDX 2101 (Lean Duplex) 2205 (Duplex)	SW-2209 Cored
254SMo	SW-625 Cored
904L	SW-625 Cored

3) Power Plants

In today's world, renewable energy is of particular importance due to climate change and scarcity of fossil fuels. Power generation plants help generate this energy, and they are located in extreme environments such as coastal areas or underseas. The amazing corrosion resistance of stainless steel is a necessity when dealing with these harsh environments. Stainless steel's chromium forms a surface film that protects the metal from corroding, and it also has the ability to transfer heat. This is why it is found in heat exchangers and pressure tubes. The most commonly used alloy is 304L, applied to blocks and accumulator tanks. 309L and 316L are used in steam separators, and 2205 and 254SMo are used in seawater cooling condensers and storage tanks for nuclear waste.

Part or Base metal	Product
STS 304L	SW-308L Cored
STS 309L	SW-309L Cored
STS 316L	SW-316L Cored
LDX 2101 (Lean Duplex)	SW-2209 Cored
2207 (Super Duplex)	SW-2594 Cored
254SMo	SW-625 Cored

4) Shipbuilding and Offshore

Stainless steel has a critical advantage in the shipbuilding and offshore industry, which is high resistance to corrosion. Since it contains at least 12% chromium, a stable oxide film is formed on the surface of the metal. This film protects steel against oxidation in extreme environments. Types 304L and 316L are widely used for cryogenic service and LNG tankers. All-positional SW-308LT and SW-316LT have good impact value at cryogenic temperatures of up to -196°C (-321° F). Duplex 2205 and super duplex 2207 are used in welding parts for LNG-FPSO (Liquefied Natural Gas-Floating Production Storage and Offloading) structures, or oil rigs. SW-2209 Cored and SW-2594 Cored have you covered for these applications.

Part or Base metal	Product
STS 304L (Cryogenic)	SW-308LT
STS 316L (Cryogenic)	SW-316LT
904L	SW-625 Cored
2205 (Duplex)	SW-2209 Cored
2207 (Super Duplex)	SW-2594 Cored

5) Food & Beverage Industry

In the food and beverage industry, tanks with high strength and corrosion resistance are required for storage. Duplex stainless steel offers a number of economical benefits, allowing for thinner gauges for lighter structure and smoother surfaces for easy washing. Lean duplex LDX 2101 and duplex 2304 are most commonly used in this industry. Duplex is used for a variety of tank fabrication, such as tanks for wine storage, beer kegs, sugar syrup, and palm oil. It is advisable to use cored wires for stainless steel depending on the type of duplex and its pitting resistance equivalent number (PREN). Stainless type 304L is primarily used to weld beer kegs.

Part or Base metal	Product
STS 304L	SW-308L Cored
STS 316L	SW-316L Cored
LDX 2101 (Lean Duplex) 2205, 2304 (Duplex)	SW-2209 Cored
2507 (Super Duplex)	SW-2594 Cored
254SMo	SW-625 Cored

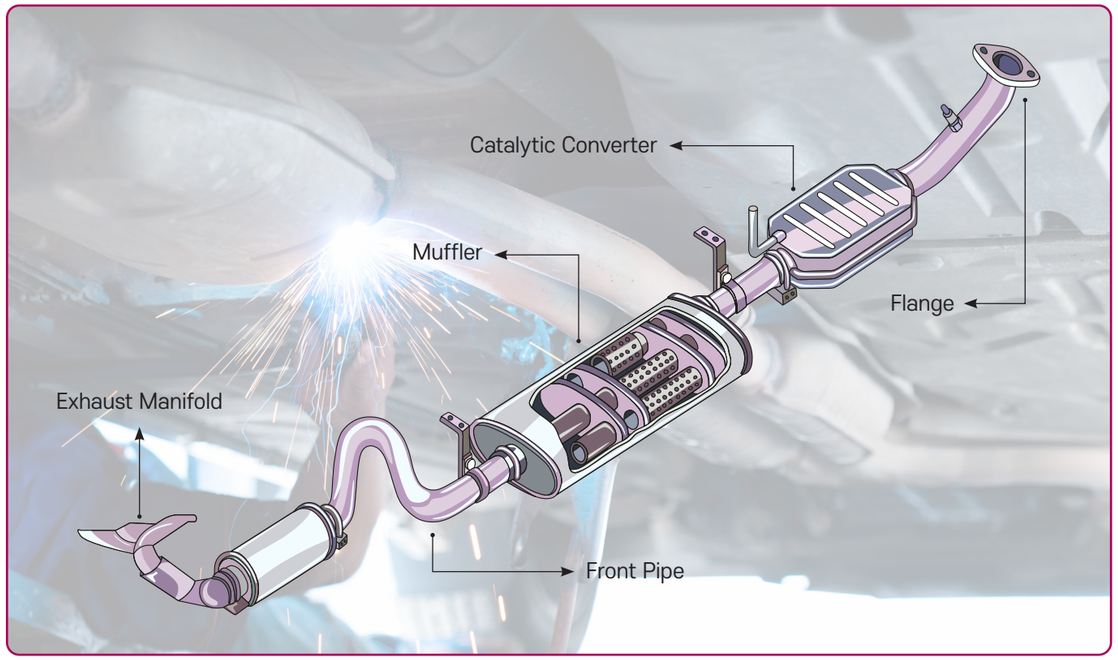
6) Pulp & Paper Industry

While the pulp and paper industry continues to evolve and refine its processes, one thing remains constant: the importance of stainless steel parts and equipment. Despite having reduced waste production and optimized techniques, the industry still uses highly corrosive chemicals. Ensuring that piping, heat exchangers, and structural elements can withstand constant exposure to these chemicals is critical. Stainless steel provides a solution to these problems, with its advantages in corrosion resistance and thermal characteristics. Types 304, 304L, 316, and 316L are frequently used in bleach towers, cooking optimizers, and water recirculation/purification systems. Lean duplex LDX 2101 is used to weld white liquor tanks.

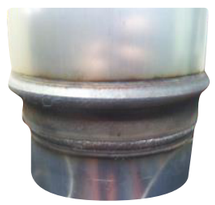
Part or Base metal	Product
STS 304	SW-308 Cored
STS 304L	SW-308L Cored
STS 316	SW-316 Cored
STS 316L	SW-316L Cored
LDX 2101 (Lean Duplex)	SW-2209 Cored

Application of Ferritic Stainless Cored Wires

Automotive Industry



Flux cored wires for ferritic stainless steel are widely used for welding automotive exhaust systems in cars. Hyundai's cored wires for the automotive industry are specifically designed to weld manifolds, mufflers, converters, and other components. These metal-cored wires excel in the welding of tubing to these other components, particularly where there are gaps. The hot end of exhaust systems include the exhaust manifold, front pipe, and catalytic converter, and the cold end consists of the center pipe, muffler, and tail pipe. The material used in mufflers differs by manufacturer, so the cored wire should be used according to the components' type of stainless steel. Austenitic wire SW-309LNS Cored is used for welding of dissimilar steels, from stainless to carbon alloy steel. The remaining ferritic wires are all used for type 400 series group of stainless steels, such as types 409, 430, 436, and 439. Hyundai's wires for automobiles naturally have a long history, as its Motor Group is a global leader in the automotive industry.



Applications	Product
· Welding of dissimilar metals (Stainless and carbon alloy steel)	SW-309LNS Cored (Austenitic)
· Type 409 Stainless	SF-409Ti
· Type 409 and 430 Stainless	SF-430
· Type 409 and 430 Stainless · Applied to exhaust manifolds at high temperature	SF-430Nb
· Type 409, 430, 436 Stainless	SF-436
· Type 409, 430, 436, 439 Stainless	SC-439Ti Cored

Duplex Stainless Steel

Duplex Stainless Steels have a two-phase microstructure consisting of grains of ferritic and austenitic stainless steel. This prevents the structure from intergranular corrosion and Stress Corrosion Cracking (SCC).

The duplex structure gives this family of stainless steels a combination of attractive properties such as strength, ductility, and corrosion resistance. Duplex stainless steels also show very good stress corrosion cracking (SCC) resistance, which can be a problem for standard austenitics such as Types 304 and 316 under certain circumstances (chlorides, humidity, and elevated temperature).

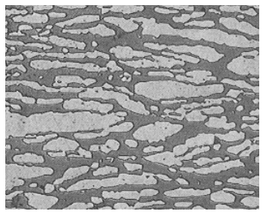
Merits of Ferritic Grades + **Merits of Austenitic Grades**

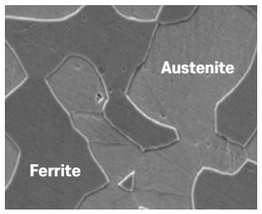
Strength,
Stress Corrosion Cracking(SCC) Resistance

Toughness,
Corrosion resistance

Duplex Stainless Steels offer the merits of both ferritic and austenitic grades.

Microstructure of Duplex Stainless Steel

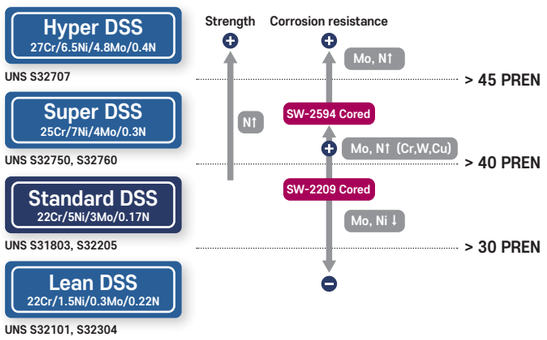




As demonstrated in the graphic, duplex stainless steel has a dual-phase microstructure consisting of both ferritic and austenitic grains. The most stable of microstructures is when the phase balance is equal; approximately 50% ferrite and 50% austenite.

In comparison with austenitic stainless steel, duplex stainless steel has a larger thermal conductivity and stress corrosion cracking (SCC) resistance, but has a higher nitrogen (N) content and larger microstructure transformation at the heat affected zone (HAZ). In this heat affected zone, the austenitic grains dissolve into the ferritic phase and then precipitate during the cooling process, creating a dual microstructure.

Application of Duplex Stainless Cored Wires



PREN = Cr + 3.3*Mo + 16*N
Pitting resistance equivalent number (PREN) formula

Duplex stainless cored wires are a common choice for pipelines and pressure vessels in the petrochemical industry, as well as pipework systems, such as risers and manifolds in the oil and gas industry.

Hyundai Welding offers all-positional cored wires for both duplex (NAS 329J3L, UNS S31803) and super duplex (NAS 329J4L, UNS S32750) stainless steel. They are called SW-2209 Cored (E2209T1-1/-4) and SW-2594 Cored (E2594T1-1/-4), and their properties are illustrated in the graphic below.

The pitting resistance equivalent number (PREN) is a predictive measurement of a stainless steel's resistance to localized pitting corrosion based on its chemical composition. The higher the PREN value, the more resistant the stainless steel is to pitting corrosion by chloride.

Both lean and standard duplex stainless steel offer great opportunities in many industries because of their improved corrosion resistance properties and higher mechanical strength.

Super duplex offers greater corrosion endurance and strength but is more difficult to process. Hyper duplex is used when higher mechanical and corrosion performances are necessary such as oil, gas, offshore, and petrochemical applications.

E-book

FLUX CORED WIRES FOR **STAINLESS STEEL**

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