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HYUNDAI WELDING

WIND TOWER WELDING SOLUTIONS

CONTENTS

HYUNDAI WELDING EXPERTISE ANSWERS THE NEED TO STEP UP WIND ENERGY

With the 2015 Paris agreement negotiated at its COP21 Climate Change Conference, the United Nations decided to curb global warming by a long-term worldwide reduction of greenhouse gas emissions. Since then, wind energy has taken off as one of the major sources of renewable energy, only to be accelerated by recent geopolitical conflicts. Falling production costs over recent years have made wind energy the cheapest source of renewable energy nowadays available on a large scale. And although the majority of installed wind energy is still land-based, offshore windfarms account for the majority of planned and newly installed capacity.

The welding of towers is an important step in the fabrication of wind turbines and efficient production has become a prerequisite for success in the fast-growing global market. The dominant welding method – submerged arc welding, often with multi-head equipment – requires welding consumables with a consistent performance in terms of weldability, weld metal quality and mechanical properties.

HYUNDAI WELDING offers a complete portfolio of superior quality welding consumables for wind towers, monopiles and transition pieces, as well as the experience to assist fabricators in applying them optimally. Fluxes and wires are supplied in moisture protective packaging, and can be ordered in bulk units for reduced downtime of submerged arc welding installations. We can help you fulfil new production challenges in terms of lower welding times and higher mechanical requirements.

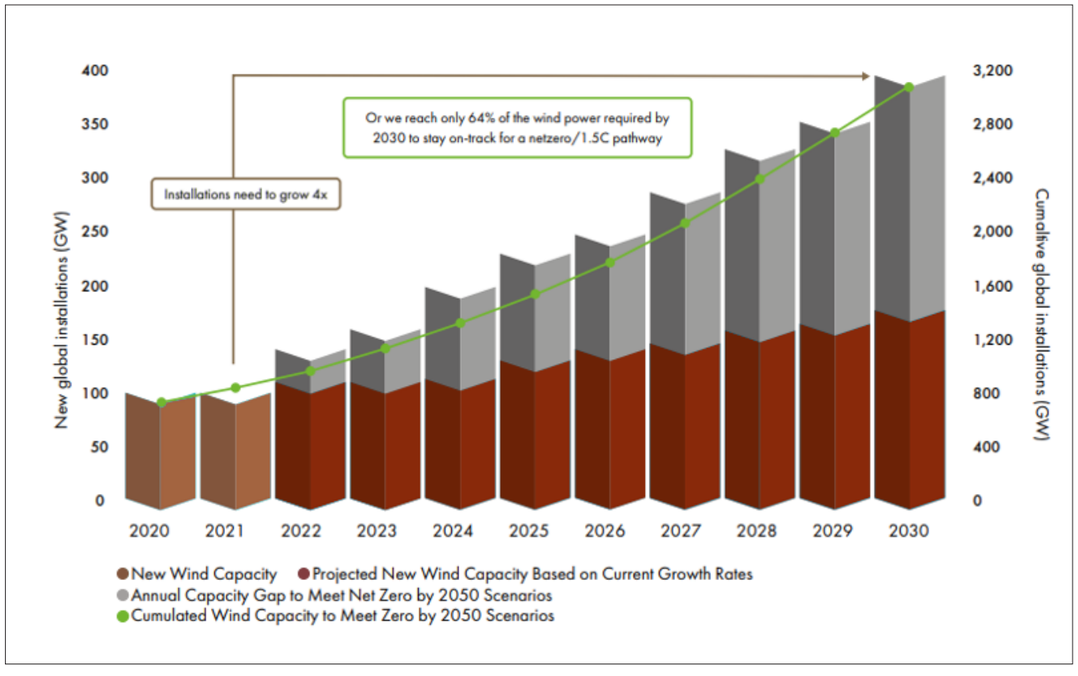
Welding consumables for the construction of supporting subsea structures - such as tripods, jackets, spars and tension legs - are available in our vast range of welding consumables, but are not presented in this catalogue. Please contact your HYUNDAI WELDING representative.

WIND ENERGY IS PIVOTAL FOR A SUSTAINABLE FUTURE

The transition to sustainable energy generation offers an excellent opportunity to counteract global warming while creating wealth and improved health for mankind. During the latest United Nations Climate Change Conference, COP26 in Glasgow, member states committed to further steps to accelerate the path to “Net Zero” fossil fuel emissions by 2050; the dawn of a new sustainable era in power generation. At the same time, this policy will reduce energy dependency and associated market disruptions with globally rocketing energy prices.

These targets can only be met by massive investments in renewable energy, with a pivotal role for wind power. Thousands of extra gigawatts of wind energy will be needed worldwide. After an initial boom in Europe, Latin America, Africa and the Middle East, the world’s dominant “wind markets” are today in China and The United States. Based on the growth forecast until 2030, however, newly installed capacity worldwide will be insufficient to keep on track with the net zero/ 1.5 degree pathway to 2050. A drastic increase in especially offshore wind power is inevitable, despite conventional political and economic policies.

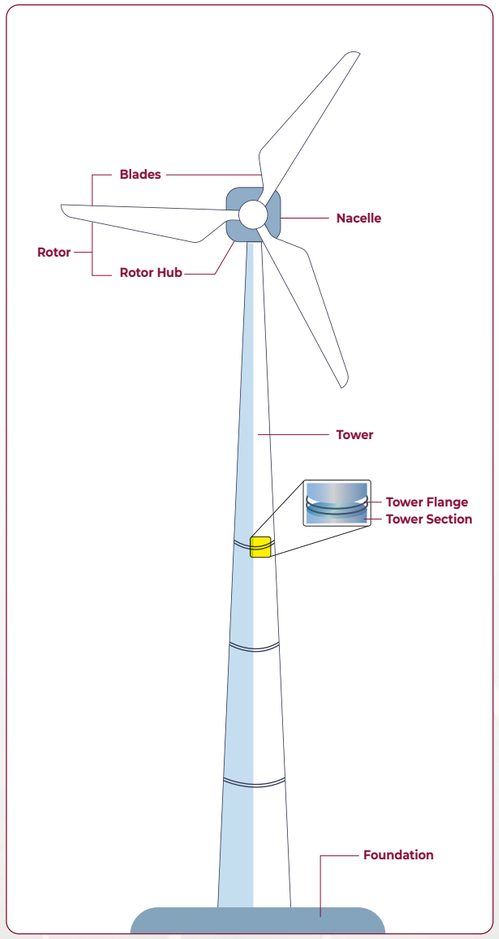
The trend in offshore wind farms is to increase the size of the turbines and to place them further away from the coast and in deeper water. Turbine sizes continue to grow with rotor diameters over 150m and turbine capacities averaging 7MW. Floating wind farms may very well be the economically feasible game changer needed to achieve the global wind energy targets.

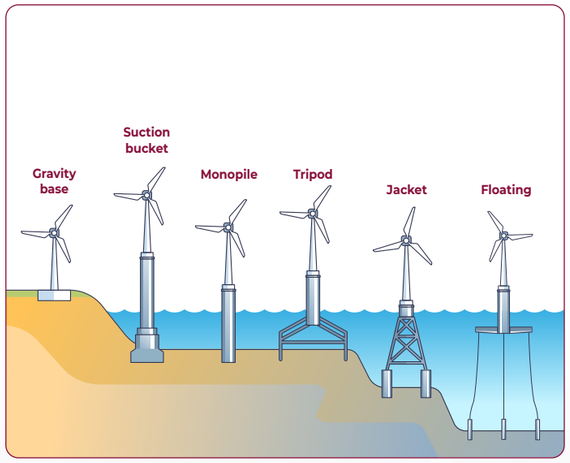


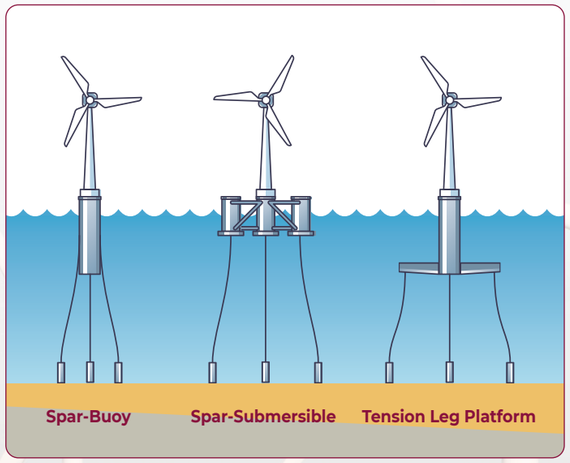
Source: GWEC Market Intelligence; IEA Net Zero by 2050 Roadmap (2021).

INDUSTRY INFORMATION

STRUCTURE OF ONSHORE & OFFSHORE WIND TOWERS

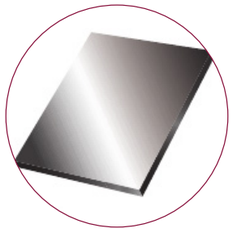


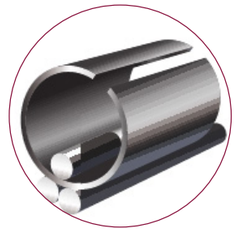


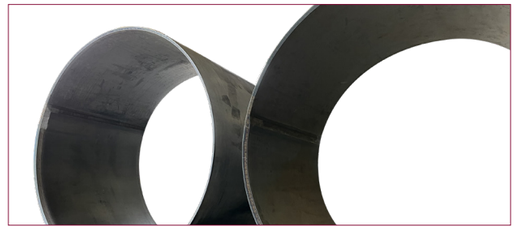


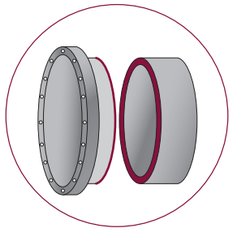
Floating offshore wind turbines are turbines mounted on a floating structure for use in water depths where fixed-foundation farms are not feasible. They provide an economic solution for the limited availability of shallow waters in several developed countries. Located far from the coast, they are less in the way of fishing zones and shipping lanes, while taking full advantage of strong and steady winds to add gigawatts of capacity.

WIND TOWER FABRICATION PROCESS

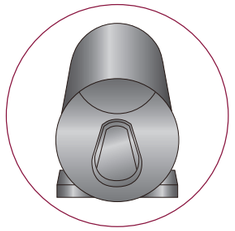

1. Cutting

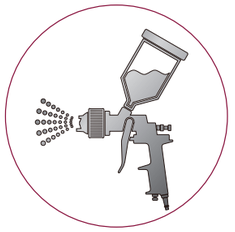

2. Rolling


3. Longitudinal Welding


4. Flange Welding


5.Circumferential Welding


6. Door Frame Welding


7. Blasting & Painting

Wind towers and associated cylindrical structures like monopiles and transition pieces are thick-walled constructions built-up from segments. For making these segments (cans), plates are cut to the desired size, bent and tack-welded. Cans are individually closed with longitudinal welds over the full length and connected to form a tower section by circumferential welds. Flanges at the section ends to enable on-site erection of the wind tower are also attached by circumferential welds. The majority of joints in wind tower fabrication involve circumferential welding. An associated task is the welding of door frames, mostly performed with mechanized flux- or metal-cored arc welding.

Productivity is crucial in wind tower fabrication. Therefore submerged arc welding stations are often equipped with productive SAW heads such as twin arc, tandem arc or tandem twin arc. Narrow gap welding is applied as a method to drastically reduce the weld volume, utilizing a special flat welding head (sword) and single wire or tandem wire heads.

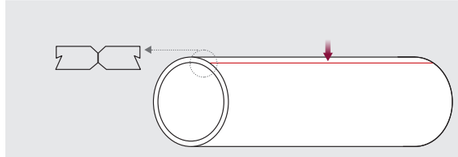
These challenging welding applications, along with the ever growing requirements of the wind energy industry on plate thickness and material grades, place tough demands on the weldability of welding consumables and the quality of the weld metal. HYUNDAI WELDING has been involved in wind tower fabrication from the early days and our welding consumables are developed in co-operation with the industry to excel in wind tower applications.

WELDING APPLICATIONS FOR WIND TOWERS

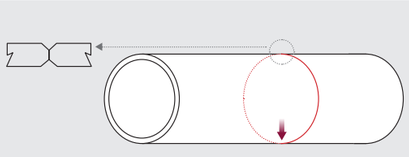
LONGITUDINAL, CIRCUMFERENTIAL AND FLANGE WELDING

◎ Welding consumables for S355, S420, S460 steel

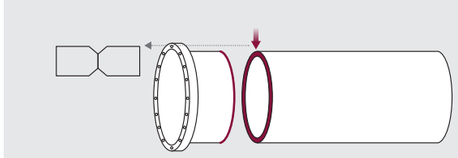
Steel grade	Temperature	Material Types for Wind Towers	SAW Flux & wire combination	FCAW
S355	Normal	S355JR / S355J0 / S355J2 S355K2 / S355N / S355M S355G2 / S355G5	S-717 / M-12K	Supercored 71 SC-71LHM Cored SC-420MC
	Low	S355NL / S355ML S355G3 / S355G6 / S355G7 S355G8 / S355G9 / S355G10	S-800WT / M-12K, Superflux 800T / M-12K, Superflux 55ULT / H-14, Superflux 787 / H-12K	Supercored 81-K2 Supercored 81MAG
S420	Normal	S420N, S420M	S-717 / M-12K	Supercored 71 SC-71LHM Cored SC-420MC
	Low	S420NL, S420ML S420G1, S420G2	S-800WT / M-12K, Superflux 800T / M-12K, Superflux 55ULT / H-14, Superflux 787 / H-12K	Supercored 81-K2 Supercored 81MAG
S460	Normal	S450JO, S460N, S460M	Superflux 787 / Ni-5 Superflux 55ULT / A-G	Supercored 81-K2 Supercored 81MAG
	Low	S460NL, S460ML S460G1, S460G2		



Longitudinal Welding



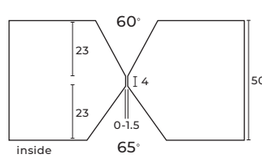
Circumferential Welding

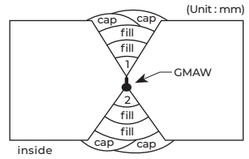


Flange Welding

The following are actual PQR (Procedure Qualification Record) results from our clients using tandem welding. Results may vary depending on welding conditions.

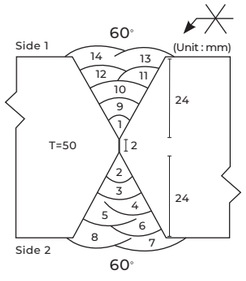
Higher thickness available upon request.





Base metal	Standard	Sub Group No.	Thickness
S355NL	EN 10025-3	1.2	50T

Pass	Process	Filler metal		Polarity	Current (A)	Voltage (V)	Speed CPM (IPM)	Heat input kJ/cm (kJ/in)
		Product	Diameter mm (in)					
Root	GMAW	SM-70	1.2 (.045)	DCEP	200-250	25-29	40-50 (15.8-19.7)	4.8-8.7 (12.2-22.1)
1	SAW	Superflux 55ULT / H-14	4.0 x 2 (5/32 x 2)	DCEP/AC	650-750	27-29	58-68 (22.8-26.8)	29.7-43.6 (75.4-110.7)
Fill	SAW	Superflux 55ULT / H-14	4.0 x 2 (5/32 x 2)	DCEP/AC	600-700	27-29	58-68 (22.8-26.8)	28-40.7 (71.1-103.4)
Cap	SAW	Superflux 55ULT / H-14	4.0 x 2 (5/32 x 2)	DCEP/AC	600-700	27-29	58-68 (22.8-26.8)	28-40.7 (71.1-103.4)
2	SAW	Superflux 55ULT / H-14	4.0 x 2 (5/32 x 2)	DCEP/AC	750-850	27-29	58-68 (22.8-26.8)	32.9-48.4 (83.6-122.9)
Fill	SAW	Superflux 55ULT / H-14	4.0 x 2 (5/32 x 2)	DCEP/AC	600-700	27-29	58-68 (22.8-26.8)	28-40.7 (71.1-103.4)
Cap	SAW	Superflux 55ULT / H-14	4.0 x 2 (5/32 x 2)	DCEP/AC	600-700	27-29	58-68 (22.8-26.8)	28-40.7 (71.1-103.4)



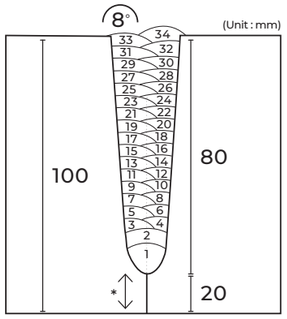
Base metal	Material specification	Joint type	Thickness
S420ML	EN 10025-4	Butt welding	50T

Pass	Process	Filler metal		Polarity	Current (A)	Voltage (V)	Speed CPM (IPM)	Heat input kJ/cm (kJ/in)
		Product	Diameter mm (in)					
1	FCAW	Supercored 81-K2	1.4 (.052)	DCEP	200-220	26-27	10-15 (3.9-5.9)	Max 15 (38.1)
2	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
3	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
4	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
5	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
6	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
7	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
8	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
9	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
10	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
11	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
12	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
13	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)
14	SAW	S-800WT / M-12K	4.0 (5/32)	DCEP	700-750	27-31	40-50 (15.7-19.7)	22.7-34.9 (57.7-88.6)

WELDING APPLICATIONS FOR WIND TOWERS

LONGITUDINAL, CIRCUMFERENTIAL AND FLANGES WELDING

Narrow gap solution



Base metal : S460G2 + M Z35

* Back-gouged and welded.

Layer	Current (A)	Voltage (V)	Speed CPM (IPM)	Heat Input kJ/cm (kJ/in)
1	DC+ 500-600	28-30	40-50 (15.7-19.7)	18.5-21.6 (47-54.9)
2	DC+ 600-650 AC 550-600	30-32 32-34	60-70 (23.6-27.6)	30.5-41.2 (77.5-104.6)
3~4	DC+ 550-600	28-30	40-50 (15.7-19.7)	18.5-21.6 (47-54.9)
5~34	DC+ 600-650 AC 550-600	30-32 32-34	60-70 (23.6-27.6)	30.5-41.2 (77.5-104.6)

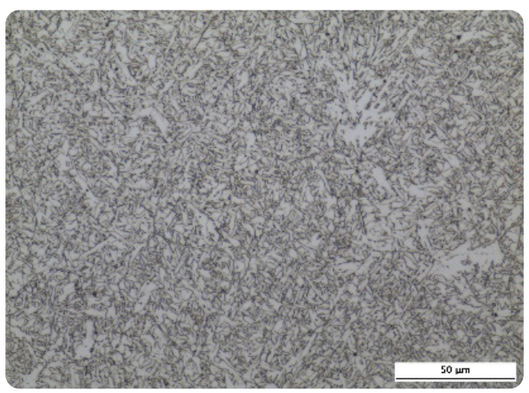
Mechanical Properties for Superflux 787 / Ni-5

Location	CVN Impact Test (Joule)				
	Temp°C (°F)	X1	X2	X3	Av.
Face weld	-60 (-76)	110	111	112	111

Location	Tension Test			
	Test size	YS(Mpa)	TS(Mpa)	EL(%)
Face weld	Ø12.5	547 (79,300)	649 (94,100)	24.8

Location	Hardness (Hv10)		
	X1	X2	X3
WM, Face -2mm	222	224	219
WM, Face -50mm	209	209	216

Optical Micrograph of Weld Sample



Magnification 500X

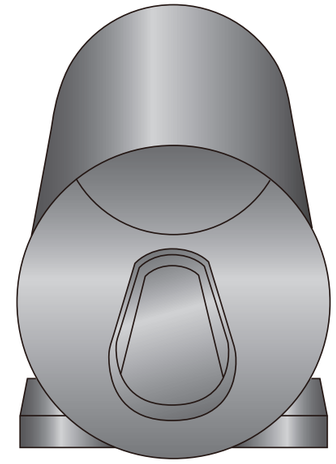
Optical micrograph is taken from a reheated part of the cross section reveals a fine microstructure of finely dispersed ferrite- a structure with optimal low-temperature toughness.

DOOR FRAME WELDING

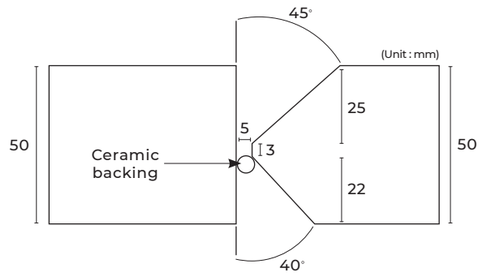
Each wind tower has a door in the lowest section of the tower to allow entrance for maintenance service. The door frame is an integral part of the tower and needs to fulfil the same strength and toughness requirements as are valid for the section. Welds need to be flawless with a smooth transfer to the base material. The curvature of door hole and frame require consumables with all-positional capabilities, often applied in mechanized welding.

HYUNDAI WELDING's all-positional rutile cored wires (Supercored 71 and Supercored 81-K2 with 100%CO2 shielding gas / SC-71LHM Cored, SC-420MC and Supercored 81MAG with mixed gas). feature:

- A smooth, stable arc with low spatter
- A fast-freezing slag for high productivity in positional welding
- A dependable deep weld penetration
- Easy slag removal and a nice weld appearance



These multi-purpose wires are designed for a wide range of applicable welding currents and are suited for productive welding of root passes on ceramic weld metal support. Supercored 81 is alloyed with 1.5%Ni for excellent low-temperature CVN weld metal toughness.



Process	DC+		Speed CPM (IPM)	Heat input kJ/cm (kJ/in)
	Current (A)	Voltage (V)		
1~2	200~220	26~28	10~15 (3.9~5.9)	Max 15.0 (38.1)
Fill, Cap	280~300	30~32	10~15 (3.9~5.9)	Max 15.0 (38.1)

CONSUMABLE INFORMATION GUIDE

TYPICAL MECHANICAL PROPERTIES AND CHEMICAL COMPOSITION (%) OF ALL-WELD METAL

Process	Product Name	AWS	EN ISO	Typical Chemical Composition of All-Weld Metal(%)								Typical Mechanical Properties of All-Weld Metal				
				C	Si	Mn		P	S	Ni	Mo	YS MPa(lbs/in²)	TS MPa(lbs/in²)	EL (%)	Impact ISO-V °C (°F)	Impact ISO-V J (ft·lbs)
SAW	S-717 / M-12K	A5.17 F7A(P)6-EM12K	ISO 14174-S A AB 1 / 14171-A-S42 4 AB S2Si	0.08	0.34	1.47		0.025	0.018	-		510 (74,000)	580 (84,100)	28	-51 (-60)	60 (44)
	Superflux 800T / M-12K	A5.17 F7A8-EM12K	ISO 14174-S A FB 1 / 14171-A- S42 5 FB S2Si	0.09	0.35	1.40		0.023	0.006	-		530 (76,700)	550 (79,800)	29	-62 (-80)	100 (74)
	S-800WT / M-12K	A5.17 F7A8-EM12K	ISO 14174-S A FB 1 / 14171-A- S42 5 FB S2Si	0.09	0.20	1.45		0.020	0.010	-		520 (75,400)	570 (82,700)	29	-62 (-80)	130 (95)
	Superflux 55ULT / H-14	A5.17 F7A(P)8-EH14	ISO 14174-S A FB 1 / 14171-A-S 46 6 FB S4	0.09	0.25	1.40		0.019	0.012	-		510 (74,000)	570 (82,700)	30	-62 (-80)	110 (81)
	Superflux 55ULT / A-G	A5.23 F8A(P)8-EG	ISO 14174-S A FB 1 / 14171-A-S 46 6 FB S4	0.09	0.30	1.50		0.019	0.012	-		540 (78,300)	600 (87,000)	30	-62 (-80)	110 (81)
	Superflux 787 / H-12K	A5.17 F7A(P)8-EH12K	ISO 14174 S A FB1 / 14171 –A-S 42 6 FB S3Si	0.09	0.30	1.50		0.018	0.010	-		540 (78,300)	580 (84,100)	31	-62 (-80)	101 (75)
	Superflux 787 / Ni-5	A5.23 F8A(P)8-ENi5-Ni1	ISO 14174 S A FB 1 14171 –A-S 46 6 FB S3Ni1Mo0.2	0.06	0.30	1.40		0.015	0.003	0.80	0.20	590 (85,600)	620 (90,000)	21	-62 (-80)	80 (59)
FCAW	Supercored 71 **	A5.36 E71T1-C1A0-CS1	ISO 17632-A-T 42 2 P C1 1	0.03	0.051	1.26		0.010	0.011	-	-	545 (79,100)	572 (83,100)	>28	20 (-4)	70 (52)
	Supercored 81-K2 **	A5.36 E81T1-C1A8-K2 H4	ISO 17632-A-T46 6 1.5Ni P C 1 H5	0.03	0.35	1.25		0.011	0.012	0.95	-	570 (82,700)	640 (92,900)	>25	-30 (-22)	90 (66)
	SC-71LHM Cored *	A5.20 E71T-1C/-9C/9C-J	ISO 17632-A-T 46 3 P M21 1 H5	0.05	0.50	1.20		0.012	0.015	-	-	580 (84,200)	600 (87,100)	28.0	-30 (-22)	80 (59)
	SC-420MC */**	A5.20 E71T-1C H4/-1M H8	ISO 17632-A-T 42 2 P C1 1 H5 /ISO 17632-A-T 42 2 P M21 1 H5	0.05	0.40	1.25		0.010	0.005	-	-	585 (84,825)	640 (92,820)	26.0	-20 (-4)	105 (77)
	Supercored 81MAG *	A5.29 E81T1-Ni1M H4	ISO 17632-A-T 46 6 1Ni P M21 2 H5	0.05	0.28	1.20		0.008	0.012	0.93	-	550 (79,900)	590 (85,700)	26.0	-60 (-76)	60 (44)

*** With M21 Shielding Gas** **** With C1 Shielding Gas**

SUBARC FLUX SELECTION TABLE

Name of SAW Flux	Available wire combinations	EN ISO SAW Flux Classification	Basicity index	Single wire	Twin Wire	Tandem Wire	Tandem Twin Wire		Narrow Gap	Low diffusible hydrogen HD < 5mL/100g	CVN Impact °C (°F)	Weldability remark
S-717	M-12K	SA AB1	1.9	✓	✓	✓	✓			✓	-51 (-60) (AWS Spec)	
Superflux 55ULT	H-14, A-G	SA FB1	2.5	✓		✓	✓			✓	-62 (-80) (AWS Spec)	Superb impact toughness at high heat input for two-run welding
Superflux 787	H-12K, Ni-5	SA FB1	2.7	✓	✓	✓	✓		✓	✓ (H4)	-62 (-80) (AWS Spec)	Excellent slag detachability in narrow gap welding
Superflux 800T	M-12K	SA AB1	2.4	✓	✓	✓	✓				-62 (-80) (AWS Spec)	
S-800WT	M-12K	SA FB1	2.7	✓	✓	✓	✓			✓	-62 (-80) (AWS Spec)	

APPROVALS

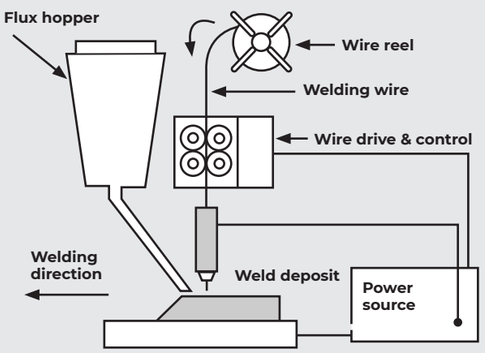
Product	AWS	EN ISO	CWB	TUV	DB	CE	KR	ABS		LR	BV	DNV	NK	MRS	RS	RINA	CCS	CRS	PRS
S-717 / M-12K	A5.17 F7A(P)6-EM12K	ISO 14174-S A AB 1 / 14171-A-S42 4 AB S2Si	✓	✓	✓	✓	3M, 3YM	3M, 3YM		3YM	A3 , A3YM	IIIYM	KAW53M	3YM	-	✓	-	-	-
Superflux800T / M-12K	A5.17 F7A8-EM12K	ISO 14174-S A FB 1 / 14171-A- S42 5 FB S2Si	-		✓	✓	-	-		✓	-	V Y40M	-	-	-	-	-	-	-
S-800WT / M-12K	A5.17 F7A8-EM12K	ISO 14174-S A FB 1 / 14171-A- S42 5 FB S2Si		-	✓	✓	-	-		-	-	-	-	-	-	-	-	-	-
Superflux55ULT / H-14	A5.17 F7A(P)8-EH14	ISO 14174-S A FB 1 / 14171-A-S 46 6 FB S4	-		✓	✓	4Y40M H5 (-60°C ≥41 J) 4YT	5Y400M H5, 4YT		5Y40M H5 4YT H5	A5Y40M HHH, A4YT	VY40M H5, IV YT H5	KAW54T H5, KAW54Y40M H5	5YT, 4Y40T, 5Y40M H5	5Y40M H5 4YT	✓	-	-	-
Superflux55ULT / A-G	A5.23 F8A(P)8-EG	ISO 14174-S A FB 1 / 14171-A-S 46 6 FB S4		✓		✓				-	-	VY42TM H5	-	-	-	-	-	-	-
Superflux787 / H-12K	A5.17 F7A(P)8-EH12K	ISO 14174 S A FB1 / 14171 –A-S 42 6 FB S3Si	✓	✓	-	-		5Y40M H5		-	-	V Y 40M(H5)	-	-	-	-	-	-	-
Superflux787 / Ni-5	A5.23 F8A(P)8-ENi5-Ni1	ISO 14174 S A FB 1 14171 –A-S 46 6 FB S3Ni1Mo0.2	✓	✓		✓		A5.23 F8A(P)8-ENi5-Ni1		-	-	-	-	-	-	-	-	-	-
Supercored 71	A5.20 E71T-1C	ISO 17632-A-T 42 2 P C1 1	✓	✓	✓	✓	3SMG, 3YSMG(C) H10	3SAH10, 3YSA		3YS H10	SA3M, SA3YM, A3M, A3YM HH	IIIYMS H10	KSW53Y40G(C) H10	-	3YSM H10	3YS H10	3YSMH10	3YS H10	3YS H10
Supercored 81-K2	A5.29 E81T1-K2C H4	ISO 17632-A-T46 6 1.5Ni P C 1 H5	✓	✓	-	✓	5Y40SG(C) H5, L3SG(C) H5	5Y400SA H5		5Y40S H5	SA5Y40M HHH	VY40MS H5	KSWL3SG(C) H5, KSW54Y40G(C) H5 (-60°C ≥47J, ≥37J(Butt))	-	5Y40SM H5	5YS H10	5Y40SMH5	-	
SC-71LHM Cored	A5.20 E71T-1C/-9C/9C-J	ISO 17632-A-T 46 3 P M21 1 H5	✓		✓	✓	-	3YSA H5		3YS H5	SA3Y HHH	IIIYMS H5	-	-	-	-	3YSMH5	-	
SC-420MC	A5.20 E71T-1C H4/-1M H8	ISO 17632-A-T 42 2 P C1 1 H5 ISO 17632-A-T 42 2 P M21 1 H5			✓	✓	-	3YSA H5		3YS H5	SA3YM HHH	IIIYMS H5	-	-	-	3YS H5	-	-	3YS H5
Supercored 81MAG	A5.29 E81T1-Ni1M H4	ISO 17632-A-T 46 6 1Ni P M21 2 H5			✓	✓	-	5Y400SA H5		5Y40S H5	SA5Y40M HHH	VY40MS H5	-	-	5Y42SM H5	5Y40S H5	-	-	

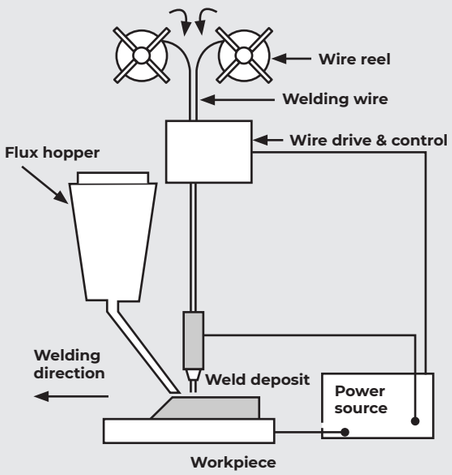
· Superflux 787 has excellent slag detachability in narrow gap welding, leading to improved productivity.

· Superflux 55ULT is widely used in two-run welding, thanks to its superb impact toughness at high heat input.

PROCESS HIGHLIGHT

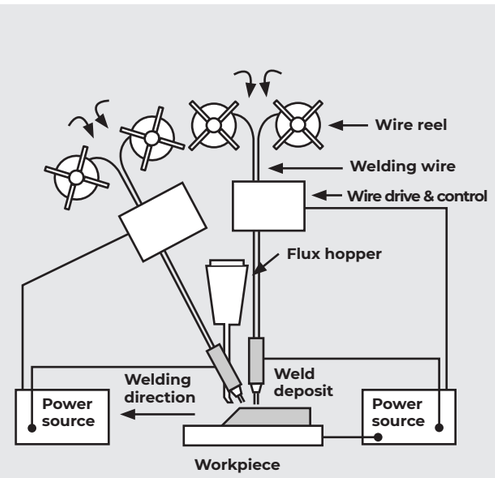
◎ One Power Source





Single-wire welding is the most widely used SAW method. For twin-wire welding, two wires are connected to the same power source. It offers up to 30% higher deposition rates and can be used at higher speeds.

◎ Multi Power Source



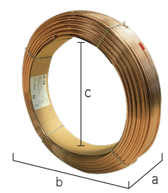
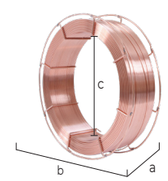
Power Source & Wire		Current Intensity (A)	Deposition rate kg/hr (lbs/hr)
One Power Source	Single Wire	500~1200	3~17 (6.6~37.5)
	Twin Wire	700~1200	8~20 (17.6~44)
Multi Power Source	Tandem Twin Wire	1000~1800	10~33 (22~72.8)

As the current increases, the deposition rates increase. At the same current, the smaller the wire size, the higher the deposition rate.

PACKAGING SPECIFICATIONS

STANDARD PACKAGING

Subarc Wire

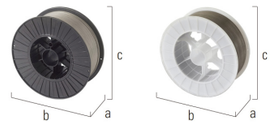
Type	Wire	Size mm (in)			
		Wire	a	b	c
Coil Type		25kg (55lbs)	75/100 (3.0/3.9)	410/420 (16.1/16.5)	305/315 (12.0/12.4)
		30kg (66lbs)	95 (3.7)	400 (15.7)	305 (12.0)
		100kg (220lbs)	90/100 (3.5/3.9)	760 (29.9)	630 (24.8)
		150kg (330lbs)	90 (3.5)	790 (31.1)	630 (24.8)
Basket Spool		25kg (55lbs)	103 (4.1)	413-419 (16.3-16.5)	297-303 (11.7-11.9)

* Other coil sizes available upon request

Subarc Flux

Packaging		
TIN CAN	PE BAG	PAPER BAG
		
15kg, 20kg (33lbs, 44lbs)	20kg, 25kg (44lbs, 55lbs)	20kg, 25kg (44lbs, 55lbs)

Flux Cored Wire

Type	Spool
Spool Type	
Wire	12.5kg (27.6lbs) / 15kg (33lbs) / 20kg (44lbs)

Spool size mm (in)	
a	110 (4.3)
b	270-280 (10.6-11.0)
c	270-280 (10.6-11.0)

PACKAGING SPECIFICATIONS

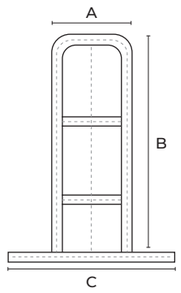
SUBARC WIRE - MEGA COIL

USER ADVANTAGES

- 1 ton / 1.5 ton type COIL (2200 lbs / 3300 lbs type COIL)
- Increased productivity
- Less downtime for spool exchange
- Excellent moisture protection
- Steel frame one-off purchase
- Turntable available upon request

1. MEGA COIL with Steel Frame

On request, the MEGA COIL can be ordered mounted one–off purchase steel frame for use with a mechanical turn table. Turntable can also be ordered separately.



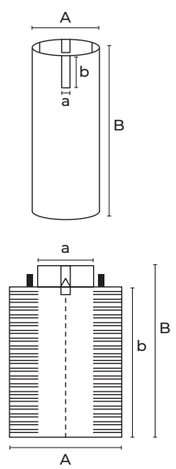
Unit : mm (in)

	1 Ton TYPE	1.5 Ton TYPE
A	450 (17.7)	450 (17.7)
B	1,400 (55.1)	1,700 (66.9)
C	950 (37.4)	950 (37.4)

Steel frame required for de-coiling of MEGA COIL, one –off purchase. Steel frame is re-usable in welding operations .

2. MEGA COIL – Spooled (without Steel Frame)

The MEGA COIL is standard spooled on a fully recyclable cardboard tube with four lifting eyes. In the tables below, the dimensions of the cardboard tube and MEGA COIL-spooled product are displayed.



Unit : mm (in)

	1 Ton TYPE	1.5 Ton TYPE
A	454 (17.9)	454 (17.9)
B	1,200 (47.2)	1,600 (63.0)
a	50 (2.0)	50 (2.0)
b	250 (9.8)	150 (5.9)

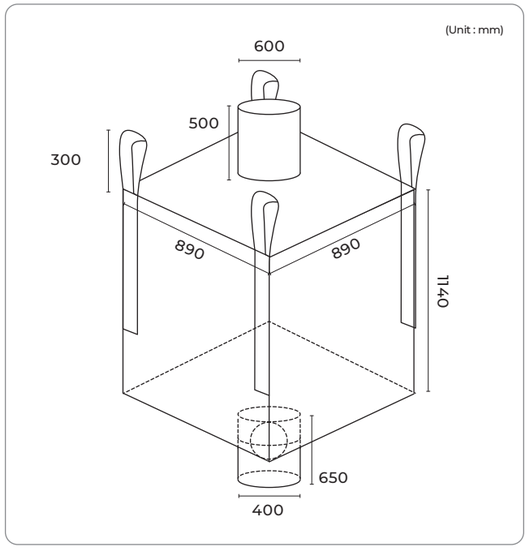
	1 Ton TYPE	1.5 Ton TYPE
A	850 (33.5)	850 (33.5)
B	1,200 (47.2)	1,600 (63.0)
a	454 (17.9)	454 (17.9)
b	1,000 (39.4)	1,500 (59.1)

Pallet Size – MEGA COIL: 900 x 900 x 169 mm (35.4 x 35.4 x 6.7 in)

SUBARC FLUX - MEGA BAG

USER ADVANTAGES

- 1 ton type FLUX (2200 lbs type FLUX)
- No moisture pick-up during transportation, storage and usage
- No redrying
- Less downtime for spool exchange
- High productivity



Unit : mm (in)

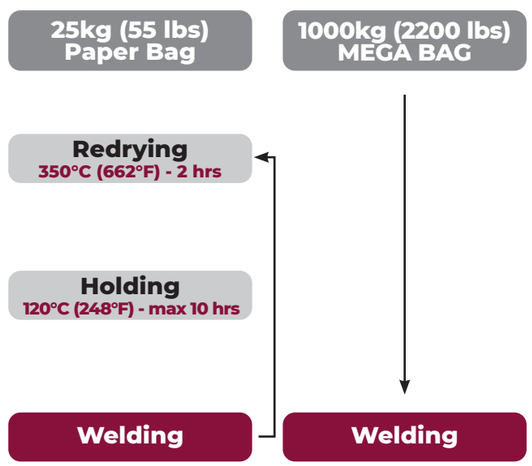
Item	Dimensions
Bag size (W*L*H)	890*890*1,140 (35*35*44.9)

Moisture & Hydrogen

- Moisture can cause porosity and pock-marking
- Moisture may influence slag fluidity, causing a rough weld surface
- Moisture is a source of hydrogen, which, in combination with stress in the welded zone, can cause hydrogen induced cracking

The hermetically sealed **MEGA BAG** preserves the original low moisture condition of the HYUNDAI WELDING flux, as delivered from our production plants, until the moment of welding. Climate controlled storage is not necessary and the flux can be used without redrying. This accounts for a major cost reduction on storage and handling, as there are no labor and energy cost involved in redrying and holding operations.

Labor and energy cost reduction



REFERENCES

CS WIND

HYUNDAI ENGINEERING & STEEL INDUSTRIES

SeAH Steel

SK oceanplant

DK 동국S&C

SPECO

大金重工 DAJIN HEAVY INDUSTRY

GRI Renewable Industries

HYUNDAI WELDING is a global manufacturer of welding consumables and equipment. As the top leading manufacturer of welding consumables in Korea, and with a global network of sales, distribution and manufacturing plants, HYUNDAI WELDING has developed into a key player in the international welding industry.

Our company is fully committed to the ever-changing needs of our customers and has evolved in just under 50 years to provide welding expertise and breakthroughs in welding technology. HYUNDAI WELDING understands customer needs and offers customers world-class products and world-class solutions.

HYUNDAI WELDING's wind tower welding solutions meet customer requirements for wind tower fabrication backed with a superior customer service and support. By using high quality consumables and equipment portfolio of HYUNDAI WELDING, our customers experience improved productivity and competitiveness in the market.

Hyundai Welding is a world-class manufacturer that specializes in providing optimum welding solutions to its customers, by supplying top-notch welding consumables and equipment. Hyundai Welding has contributed to the development and success of the global welding industry for almost 50 years since its foundation in 1975.

For more information on Hyundai Welding, please visit www.hyundaiwelding.com

E-book

HYUNDAI WELDING

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