



A Quick Guide to Suitable Welding Consumables

■ For FCAW and GMAW

Ar-20%CO₂

TS (MPa) min.	490	520	550	610	670	770	
YS (MPa) min.	350	400	420	500	550	690	
IV (J) min.	35	40	42	50	55	69	
Service temperature (°C)	-20	DW-A50 MG-S50 (SR)	DW-A81Ni1 MG-T1NS		DW-A65L MG-T1NS	MG-S70	MG-S80
	-30	DW-A55E DW-A55ESR (SR)					
	-40				DW-A80L	DW-A80L	
	-50	DW-A55L MX-A55Ni1 MX-A55T MG-S50LT (SR)	DW-A55L DW-A55LSR (SR)	DW-A81Ni1	DW-A62L MG-S62L	MX-A80L MG-S88A	MX-A80L MG-S88A
	-60		DW-A55L DW-A55LSR MX-A55Ni1 MX-A55T				

100%CO₂

TS (MPa) min.	490	520	550	610	
YS (MPa) min.	350	400	420	500	
IV (J) min.	35	40	42	50	
Service temperature (°C)	-20	DW-50	DW-55L		DW-62L
	-40	DW-55E			
	-50	DW-50LSR (SR)	DW-55LSR (SR)	DW-55LSR	
	-60	DW-55L			

MG-...Solid Wire
MX-...Metal-cored Wire

Tips for successful welding results

1. This guidance is to help users select appropriate welding consumables. Users are requested to confirm whether the selected brand (Trademark + Trade designation) can satisfy the job specifications including ship-class approvals and other specific requirements before use. The Charpy impact energies are based on the requirements for offshore structures, which may be stricter than for other common low-temperature applications. The Charpy impact absorbed energies are the average of three testing specimens. Yield strength includes yield point and 0.2% offset strength.
2. Mechanical properties of weld metal may adversely be affected by postweld heat treatment (PWHT). Therefore, the trade designations having no designation of "SR" in the parentheses are recommended to use in the as-welded condition, whereas the brands having the SR designation can be used in the PWHT condition as well as in the as-welded condition.
3. A change of polarity may affect the usability of welding consumables, and the chemical composition and mechanical properties of weld metals; therefore, use the polarity as indicated in the parentheses.

■ For SMAW

DCEP

TS (MPa) min.	490	520	550	610	670	770
YS (MPa) min.	350	400	420	500	550	690
IV (J) min.	35	40	42	50	55	69
Service temperature (°C)	-20	LB-52 (SR) LB-52-18	LB-57	LB-62UL LB-62 (SR) LB-62U (SR)		LB-106
	-40	LB-52U LB-7018-1				LB-70L
	-60	NB-1SJ (SR) LB-52NS (SR) LB-52NSU (SR)	NB-1SJ (SR)	LB-62L (SR) LB-55NS (SR)	LB-65L (SR) LB-67L (SR) LB-67LJ	—

AC

TS (MPa) min.	490	520	550	610	670	770
YS (MPa) min.	350	400	420	500	550	690
IV (J) min.	35	40	42	50	55	69
Service temperature (°C)	-20	LB-52 (SR) LB-52-18	LB-57 (SR)	LB-62UL LB-62 (SR) LB-62U (SR)		LB-106
	-40	LB-52U (SR)				
	-60	NB-1SJ (SR) LB-52NS (SR) LB-52NSU (SR)	NB-1SJ (SR) LB-52NS LB-52NSU (SR)	NB-1SJ (SR) LB-62L (SR)	LB-62L (SR)	LB-Y75

LB-52U }
LB-52NSU } for Uranami welding
LB-62U }



■ For SAW

DCEP

TS (MPa) min.	490	520	550	610	670	770	
YS (MPa) min.	350	400	420	500	550	690	
IV (J) min.	35	40	42	50	55	69	
Service temperature (°C)	-20	PF-H55AS / US-36J (SR)	PF-H55AS / US-36J PF-H58AS / US-36J	PF-H80AK / US-56B		PF-H80AS / US-255	PF-H80AS / US-80LT
	-40			—	PF-H62AS / US-2N		
	-60					—	

AC

TS (MPa) min.	490	520	550	610	670	770	
YS (MPa) min.	350	400	420	500	550	690	
IV (J) min.	35	40	42	50	55	69	
Service temperature (°C)	-20	MF-38 / US-36 (SR)	MF-38 / US-49A (SR)		MF-38 / US-40	PF-H80AK / US-255	PF-H80AK / US-80LT
	-40	PF-H55LT / US-36 (SR)	PF-H55S / US-49A (SR)		PF-H55S / US-40 PF-H80AK / US-56B		
	-60		PF-H55LT / US-36 PF-H55LT / US-36J (SR)	PF-H55LT / US-36J	PF-H80AK / US-56B PF-H55S / US-2N (SR)		

- MF-38 : Fused type flux
- PF-H... : Bonded type flux

■ For GTAW

TS (MPa) min.	490	520	550	610	670	770
YS (MPa) min.	350	400	420	500	550	690
IV (J) min.	35	40	42	50	55	69
Service temp. (°C)	-20	TG-S50 (SR) TG-S51T (SR)	TG-S62 (SR)		TG-S80AM (SR)	
	-30		—			
	-40	TG-S1MT TG-S1N	TG-S60A (SR)			
	-60		—			

Table 1: Typical welding consumables for low temperature services (As welded condition)

Welding process	Shielding gas or polarity	Welding consumables	AWS Classification	Min. applicable strength (MPa)	Applicable temperature(°C)		Chemical compositions of weld metal (mass %)						
					vE	CTOD (δ)	C	Si	Mn	Ni	Mo	Ti	B
GMAW (Solid)		MG-S50LT	A5.18 ER70S-G	400/520	-60	-30	0.07	0.2	1.4	-	-	0.02	0.003
		MG-T1NS	A5.28 ER80S-G	500/610	-40	-	0.06	0.3	1.4	1.1	0.3	-	-
		MG-S62L	A5.28 ER90S-G	500/610	-60	-	0.07	0.3	1.4	1.9	-	0.02	0.003
		MG-S88A	A5.28 ER120S-G	690/770	-60	-	0.07	0.3	1.2	3.4	0.8	-	-
GMAW (FCW)	80%Ar-20%CO ₂	DW-A55ESR	A5.20 E71T-12M-J	400/490	-40	-	0.05	0.5	1.4	0.4	-	0.05	0.003
		MX-A55Ni1	A5.28 E80C-G	400/520	-60	-	0.05	0.3	1.7	0.9	-	-	-
		MX-A55T	A5.28 E80C-G	400/520	-60	-	0.05	0.3	1.4	1.4	-	-	-
		DW-A81Ni1	A5.29 E81T1-Ni1M-J	420/550	-60	-	0.05	0.3	1.3	0.9	-	0.04	0.005
		DW-A55LSR	A5.29 E81T1-Ni1M	420/550	-60	-20	0.05	0.3	1.3	0.9	-	0.04	0.003
		DW-A55L	A5.29 E81T1-K2M	460/550	-60	-20	0.06	0.3	1.2	1.4	-	0.06	0.003
		DW-A62L	A5.29 E91T1-GM	500/610	-60	-40 *1	0.07	0.3	1.3	2.1	-	0.04	0.003
	CO ₂	DW-A65L	A5.29 E91T1-K2M-J	550/620	-60	-	0.05	0.3	1.2	1.8	0.1	0.04	0.003
		DW-A80L	A5.29 E111T1-GM-H4	690/770	-40	-	0.07	0.3	1.9	2.5	0.2	0.07	-
		MX-A80L	A5.28 E110C-G H4	690/770	-60	-	0.06	0.5	1.9	2.4	0.1	-	-
		DW-50LSR	A5.29 E71T1-GC	400/490	-50	-10	0.07	0.3	1.3	0.9	-	0.06	0.04
		DW-55L	A5.29 E81T1-K2C	400/520	-60	0	0.04	0.4	1.3	1.4	-	0.05	0.003
		DW-55LSR	A5.29 E81T1-K2C	420/550	-60	-10	0.06	0.3	1.2	1.5	-	0.05	0.004
		DW-62L	A5.29 E91T1-Ni2C-J	500/610	-60	-40 *1	0.08	0.3	1.3	2.6	-	0.06	0.004
SMAW	DCEP /AC	LB-7018-1	A5.1 E7018-1	400/490	-40	0	0.06	0.4	1.5	-	-	0.03	0.004
		LB-52U	A5.1 E7016	400/490	-40	-	0.06	0.5	1.0	-	-	-	-
		LB-52NSU	A5.5 E7016-G	400/490	-60	-	0.06	0.6	1.3	0.5	-	0.02	0.003
		LB-52NS	A5.5 E7016-G	400/490	-60	-30	0.08	0.4	1.4	0.5	-	0.02	0.002
		LB-55NS	A5.5 E8016-G	420/550	-60	-10	0.06	0.3	1.5	0.9	0.1	0.01	0.003
	DCEP	NB-1SJ	A5.5 E8016-G	420/550	-60	-40	0.08	0.3	1.3	1.3	-	0.02	0.002
		LB-62L	A5.5 E8016-C1	500/610	-60	-10	0.07	0.3	1.0	2.1	0.1	0.02	0.002
		LB-67L	A5.5 E9016-G	500/610	-60	-20	0.06	0.3	1.1	2.6	-	0.01	0.002
		LB-67LJ	A5.5 E9016-G	500/610	-60	-40 *1	0.07	0.4	1.1	2.6	-	0.02	0.002
		LB-70L	A5.5 E10016-G	620/720	-40	-	0.03	0.4	1.1	3.5	0.4	Cr: 0.2	-
AC	LB-80L	A5.5 E11018-G H4	690/770	-60	-	0.04	0.6	1.4	2.9	0.7	-	-	
	LB-Y75	A5.5 E10016-G	620/720	-60	-	0.05	0.4	1.2	3.6	0.4	Cr: 0.2	-	
	LB-88LT	A5.5 E11016-G	690/770	-60	-	0.04	0.6	1.8	2.6	0.7	-	-	
SAW	DCEP	PF-H55AS/US-36J	A5.17 F7A8-EH14 F7P8-EH14	400/520	-60	-20	0.07	0.2	1.4	-	-	0.02	0.004
		PF-H58AS/US-36J	A5.17 F7A8-EH14 F7P8-EH14	420/530	-60	-20	0.07	0.2	1.4	-	-	0.02	0.004
		PF-H62AS/US-2N	A5.23 F9A8-EG-Ni2 F9P8-EG-Ni2	500/610	-60	-20	0.05	0.3	1.3	2.5	0.2	0.01	-
	AC	PF-H80AS/US-80LT	A5.23 F11A10-EG-G	690/770	-60	-	0.06	0.5	1.6	2.4	0.7	-	-
		PF-H55LT/US-36	A5.17 F7A8-EH14 F7P8-EH14	400/520	-60	-50	0.08	0.2	1.4	-	-	0.02	0.004
		PF-H55LT/US-36J	A5.23 F8A8-EG-G	420/550	-60	-20	0.09	0.3	1.7	-	-	0.02	0.004
GTAW	DCEN	PF-H55S/US-2N	A5.23 F9A10-EG-Ni2 F9P8-EG-Ni2	500/610	-60	-20	0.08	0.3	1.3	2.3	0.2	-	-
		PF-H80AK/US-255	A5.23 F10A8-EG-G F9P8-EG-G	620/720	-60	-	0.06	0.3	1.5	2.2	0.5	-	-
		PF-H80AK/US-80LT	A5.23 F12A10-EG-G	690/770	-60	-	0.08	0.3	1.7	2.5	0.7	-	-
		TG-S1N	A5.28 ER70S-G	400/490	-60	-	0.05	0.3	1.1	0.8	0.1	-	-
		TG-S60A	A5.28 ER80S-G	500/620	-60	-	0.06	0.1	1.2	0.9	0.6	-	-
		TG-S80AM	A5.28 ER110S-G	690/770	-60	-	0.06	0.1	1.2	2.8	0.7	Cr: 0.4	-

Note: *1: CTOD value at -40°C is ≥0.10mm.