



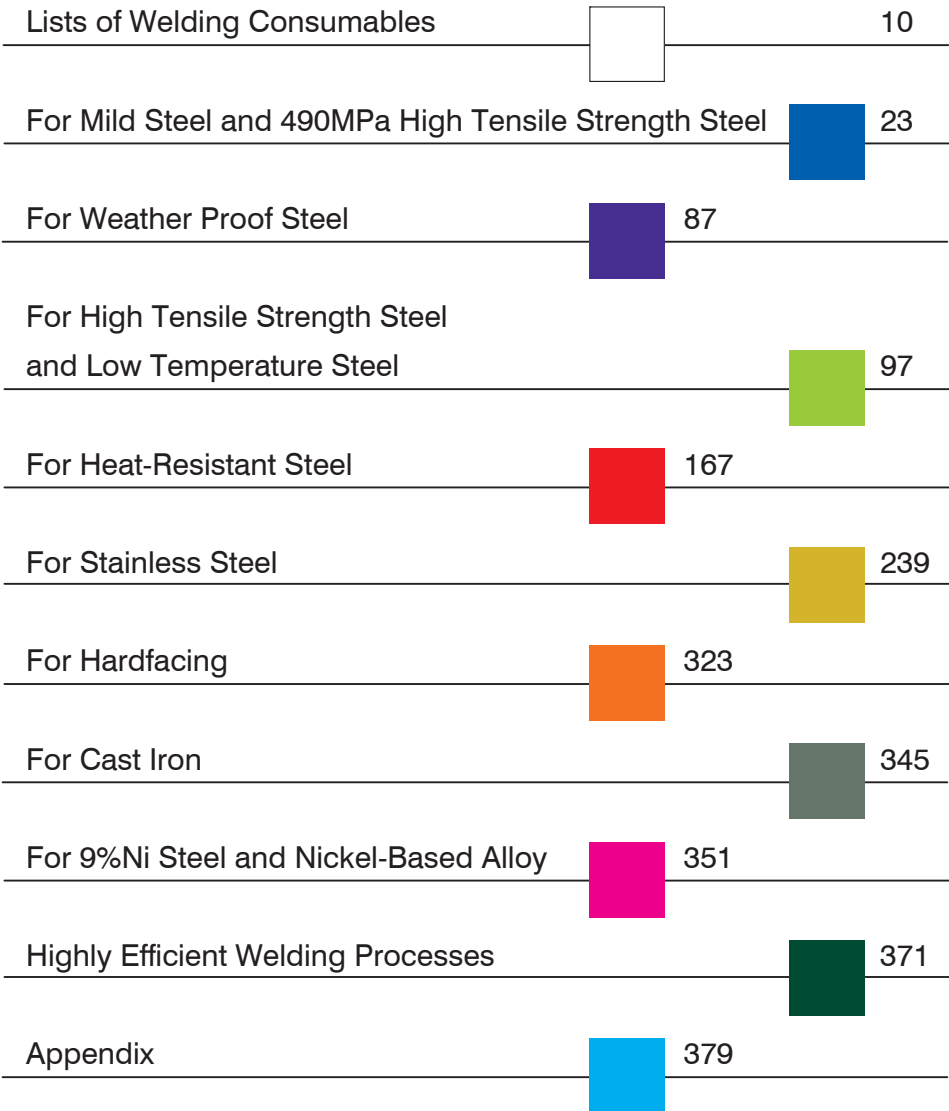
KOBELCO

WELDING HANDBOOK

KOBE STEEL, LTD.

WELDING BUSINESS

Overall Index



• For your further information of welding consumable specifications, classifications, approvals and packages, please contact the nearest Kobelco office or sales representative.

Notification

We, Welding Business of Kobe Steel, Ltd., thank you very much for your continuous patronage of our products and services. We have changed the designation system of welding consumable as described in the following from April 2008. However, the technical design of the products is not changed.

New group brand names and the corresponding products

All KOBELCO welding consumables are designated with “Trade Designation” and are grouped into the following three new groups on the basis of the characteristics of individual products as detailed below.

- (1) **FAMILIARC™** (Famili-Arc)
A coined word produced by combining “Familiar” and “Arc.”
Welding consumables grouped into this group are used for general welded structures made of mild steels and high tensile strength steels that have the tensile strength of less than 590 MPa.

- (2) **TRUSTARC™** (Trust-Arc)
A coined word produced by combining “Trust” and “Arc.”
Welding consumables grouped into this group are used for such steels that require highly credible qualities as high tensile strength steels with the tensile strength of 570 MPa and higher, low temperature steels, and heat-resistant low-alloy steels.

- (3) **PREMIARC™** (Premi-Arc)
A coined word produced by combining “Premium” and “Arc.”
Welding consumables grouped into this group are used for high-alloy steels, stainless steels, and nonferrous metals.

The new group brand name (referred to as “Trademark” hereinafter) is put on the head of an individual trade designation. The trade designations are made by modifying the traditional brand names in accordance with the new designation system in which the position of hyphen is reviewed so that a hyphen comes after one letter or two letters. That is, the new brand name consists of “Trademark” and “Product name” as shown in the following. We are determined to control all the trade designations so that they can clearly be identified.

Examples of new and old brand names

Old brand name	New brand name
(1) B-10	FAMILIARC™ B-10
(2) MG-50	FAMILIARC™ MG-50
(3) TGS-50	FAMILIARC™ TG-S50
(4) MGS-50	FAMILIARC™ MG-S50
(5) ZERO-44	FAMILIARC™ Z-44
(6) CMA-106N	TRUSTARC™ CM-A106N
(7) DW-308	PREMIARC™ DW-308

The purpose of changing the designation system

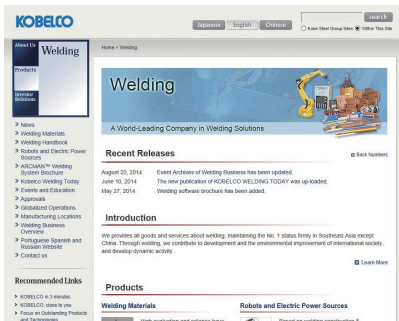
In recent years, we have found some other companies' products that have the same brand names as ours and false certificates that misrepresent our company's certificates in Japan and the Asian countries.

In order to cope with this problem, we have taken legal actions against the impostors that could be verified and have required them to change their product names. However, it is difficult in the traditional product designation system to protect all of our products from imitation. Hence, we have established the new designation system of welding consumable to ensure the trademark right in main countries and to make our products identifiable more clearly, in which the particular group brand name, "Trademark," is put on the head of an individual "Product name."

The new designation system is not only to prevent counterfeit products in Japan and overseas countries, but also to prevent our customers and users from suffering such a trouble in terms of our products.

This modification may cause customers and users to modify their relevant documents. We sincerely hope for your understanding of the abovementioned situation and for your cooperation with us.

Introduction to our Home page

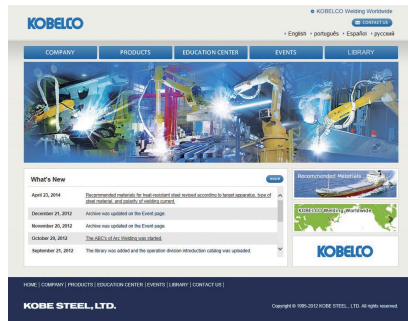


<http://www.kobelco.co.jp/english/welding>



search words

kobelco, english, welding



<http://www.kobelco-welding.jp/index>



search words

welding wire, welding robot,
kobelco

Foreword

Note the following preliminary information on use of this welding handbook.

1. Standards for welding consumables

AWS : American Welding Society
EN : European Norm

2. Classifications

Welding consumables are classified in accordance with basically the mechanical and/or chemical requirements of the standards, excluding such requirements as size, length, marking and identification manners.

3. The test conditions

- (1) Unless otherwise specified, the testing method and condition are as per AWS standard.
- (2) All mechanical and chemical data are given separately as “Typical” (one of the manufacturer’s test data) and “Guaranty” (the guaranty value).
- (3) Unless otherwise specified, all mechanical test are carried out in the as-welded condition.

4. Packaging data

Packaging data shows product length, and mass, the approximate volume.

5. Welding parameters

Welding parameters indicates the recommended current range of each welding position.

6. Approvals

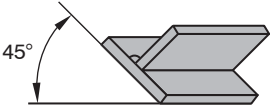
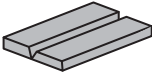
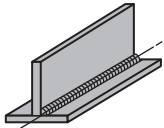
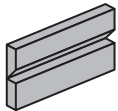
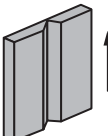
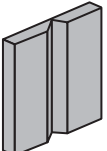
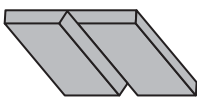
We have displayed the certification of the grade of classification society of the time in October 2014.

They may be cancelled, added, or changed and may not necessarily be applied to all the welding consumables produced at the production plants of Kobe Steel. Therefore, please contact with the International Operations Dept. of the Welding Company of Kobe Steel when you need the ship classification approval of a particular welding consumable to be used.

[Ship classification societies]

ABS: American Bureau of Shipping LR: Lloyd’s Register of Shipping
DNV: Det Norske Veritas BV: Bureau Veritas NK: Nippon Kaiji Kyokai
CR: Central Research of Ships S. A. GL: Germanischer Lloyd
KR: Korean Register of Shipping CCS: China Classification Society

7. Welding position

Illustration	AWS A3.0	ISO 6947
	1F	PA
	1G	PA
	2F	PB
	2G	PC
	3G uphill	PF
	3G downhill	PG
	4G	PE

Abbreviations and marks

This welding handbook uses the following abbreviations and marks if necessary.

Abbrev. and mark	Definition	Abbrev. and mark	Definition
AC	Alternating current or Air cooling	L	Length
A	Ampere	MS	Mild steel
AP	All positions	NR	Not required
AW	As-welded	Pre. H	Preheat
Bal	Balance	PWHT	Postweld heat treatment
CR	Cooling rate	RC	Redrying conditions
DC	Direct current	RT	Room temperature
DCEN	DC, electrode negative	SAW	Submerged arc welding
DCEP	DC, electrode positive	SG	Shielding gas
Dia.	Diameter	SMAW	Shielded metal arc welding
EGW	Electrogas arc welding	SR	Stress relief
EI	Elongation	SW	Solid wire
FCW	Flux-cored wire	TIG	Tungsten inert gas
FCAW	Flux Cored Arc Welding	TS	Tensile strength
GMAW	Gas Metal Arc Welding	V	Voltage
GTAW	Gas Tungsten Arc Welding	W	Width
H	Height	WP	Welding position
HAZ	Heat-affected zone	[F]	FAMILIARC™
HI	Heat input	[T]	TRUSTARC™
HT	High tensile	[P]	PREMIARC™
Hv	Hardness (Vickers)		
IPT	Interpass temperature		
IV	Impact value		

Warning and Caution in Welding

Pay your attention to the following warnings and cautions for your safety and health during welding and related operations



WARNING

Be sure to follow safety practices stated in the following in order to protect welders, operators and accompanied workers from a serious accident resulting in injury or death.

- Be sure to follow safety practices stated in the following when you use welding consumables.
- Be sure to follow safety practices stated in the instruction manual of welding equipment when you use it.



WARNING



Electric shock can kill.

- Do not touch live electrical parts (A stick electrode held with an electrode holder and a welding wire are electrically live).
- Wear dry, insulated gloves. Do not wear torn or wet gloves. Use an electric shock preventing device (e.g., open-circuit-voltage-reducing device) when welders or operators work in confined or high-level spaces. Use also a lifeline when welders or operators conduct welding at a high-level space.
- Follow safety practices stated in the instruction manual of welding machines before use. Do not use a welding machine the case or cover of which is removed. Welding cables must have an adequate size for the capacity expected. Welding cables must be kept in an appropriate condition and a damaged cable must be repaired or replaced with new one.



CAUTION



Flying spatter and slag can injure eyes and cause skin burns.

High temperature heat of welding can cause skin burns.

- Wear safety glasses, safety leather gloves for welding, long sleeve shirts, foot covers, leather aprons, etc.
- Do not touch weldments while they are hot.



CAUTION



Fumes and gases generated during welding are dangerous to your health.

Welding in confined spaces is dangerous because it can be a cause to suffocation by oxygen deficient.

- Keep your head out of the source of fumes or gases to prevent you from directly breathing high density fumes or gases.
- Use local exhaust ventilation, or wear respirators in order to prevent you from breathing fumes and toxic gases which cause toxication, poor health and suffocation by oxygen deficient.
- Use general ventilation during welding in a workshop. Particularly during welding in confined spaces, be sure to use adequate ventilation or respirators, and welding should be done at the presence of a trained supervisor.
- Do not conduct welding at where degreasing, solvent cleaning, spraying, or painting operations are carried out nearby. Welding work accompanied by these operations may cause generation of harmful gases.
- Use adequate ventilation or respirators with special attention during welding plated and coated steels.
- Use respirators, eye safety glasses and safety leather gloves when using welding fluxes in order to prevent you from flux dust.



CAUTION



Arc rays can injure eyes and burn skin.

- Wear hand shields with an adequate shade grade during welding operations and supervising the welding work. Select the correct shade grade for filter lenses and filter plates suitable for exact welding work by referring the standard JIS T81 41.
- Wear suitable protectors for protecting you from an arc ray; e.g., safety leather glove for welding, long sleeve shirt, foot cover, leather apron.
- Use, at need, shade curtains for welding by surrounding the welding areas in order to prevent accompanied workers from arc rays.



CAUTION



The tip of a welding wire and filler wire can injure eyes, faces, etc.

- When take off the tip of a wire fastened in the spool, be sure to hold the tip of the wire.
- When check the wire feeding condition, do not direct the welding touch to your face.



CAUTION



Fire and explosion can take place.

- Never conduct welding at areas adjacent to highly inflammable materials. Remove combustibles so that spatters cannot ignite them. If combustibles cannot be removed, cover them with a noninflammable material.
- Do not weld vessels or pipes which contain combustibles or being sealed.
- Do not put a hot weldment close to combustibles right after welding finished.
- When welding ceilings, floors, walls, remove combustibles put at the other side of them.
- Any part of a welding wire, with exception of the portion appropriately extended from the tip of the torch, must be free from touching the electrical circuit of the base metal side.
- Fasten cable joints and seal them with an insulation tape. The cable of the base metal side should be connected as close as possible to the welding portion of the work.
- Prepare fire-extinguishing equipment at where welding is carried out, in order to cope with a possible accident.



CAUTION



Falling down or dropping welding consumables can injure you.

- Wear safety shoes and pay your attention not to drop welding consumables on your body when carrying and handling them. Keep yourself in a correct posture not to cause a crick in your back while handling them.
- Follow the handling instructions shown on the surface of the pail pack wire packages when handle them.
- Pile up welding consumables in a correct way so as not to cause falling or dropping while they are stored or carried.

Lists of Welding Consumables

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
For Mild Steel and 490MPa High Tensile Strength Steel						
SMAW	KOBE-6010	A5.1 E6010	ISO 2560-A-E 35 0 C	3	1	32
	B-33	A5.1 E6013	-	2	1	33
	RB-26	A5.1 E6013	ISO 2560-A-E 35 0 R	2	1	34
	Z-44	A5.1 E6013	-	2	1	35
	B-10	A5.1 E6019	-	2	1	36
	B-14	A5.1 E6019	ISO 2560-A-E 35 2 RA	2	1	37
	B-17	A5.1 E6019	-	2	1	38
	LB-26	A5.1 E7016	-	4	1	39
	LB-52	A5.1 E7016	ISO 2560-A-E 42 3 B	4	1	40
	LB-52A	A5.1 E7016	-	4	1	41
	LB-52U	A5.1 E7016	ISO 2560-A-E 42 2 B	4	1	42
	LB-57	A5.1 E7016	-	4	-	43
	LB-52-18	A5.1 E7018	ISO 2560-A-E 42 3 B	4	1	44
	LT-B52A	A5.1 E7018	-	4	1	45
	KOBE-7024	A5.1 E7024	ISO 2560-A-E 42 0 RR	1	1	46
	LB-52T	A5.1 E7048	-	4	1	47
	LB-78VS	A5.1 E7048	ISO 2560-A-E 42 2 B	4	1	48
	KOBE-7010S	A5.5 E7010-P1	ISO 2560-A-E 42 0 C	3	-	49
	KOBE-8010S	A5.5 E8010-P1	ISO 2560-A-E 36 0 Z C	3	-	50
	LB-76	A5.5 E7016-G	-	4	1	51
LB-88VS	A5.5 E8018-G	ISO 2560-A-E 46 2 Z B	4	-	52	
LB-98VS	A5.5 E9018-G	ISO 2560-A-E 50 2 Z B	4	-	53	
LT-B50	-	-	-	1	54	
FCAW	MX-100T	A5.18 E70C-6C/6M	ISO 17632-A - T 42 2 M C/M 1 H5	6	1	55
	MX-A100	A5.18 E70C-6M	ISO 17632-A - T 42 4 M M 3 H5	6	1	56
	DW-200	A5.20 E70T-1C	-	6	1	57
	MX-100	A5.20 E70T-1C	-	6	1	58
	MX-200	A5.20 E70T-1C	ISO 17632-A - T 42 0 R C 3 H5	6	1	59

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
FCAW	MX-200H	A5.20 E70T-1C	-	6	1	60
	MX-200E	A5.20 E70T-9C	ISO 17632-A - T 42 3 R C 3 H5	6	1	61
	MX-A200	A5.20 E70T-1M	-	6	1	62
	DW-50	A5.20 E71T-1C/1M, -9C/9M	ISO 17632-A - T 42 2 P C/M 1 H5	6	1	63
	DW-100	A5.20 E71T-1C	ISO 17632-A - T 42 0 P C 1 H10	6	1	64
	DW-100V	A5.20 E71T-1C	-	6	1	65
	DW-100E	A5.20 E71T-9C	ISO 17632-A - T 42 2 P C 1 H10	6	1	66
	DW-A50	A5.20 E71T-1M	ISO 17632-A - T 42 2 P M 1 H5	6	1	67
	DW-A51B	A5.20 E71T-5M-J	-	6	1	68
GMAW	MIX-50	A5.18 ER70S-3	-	6	1	69
	MG-51T	A5.18 ER70S-6	-	6	1	70
	MG-50	A5.18 ER70S-G	-	6	1	71
	MG-S50	A5.18 ER70S-G	-	6	1	72
	MIX-50S	A5.18 ER70S-G	-	6	1	73
	SE-A50	A5.18 ER70S-G	-	6	1	74
	MG-50T	-	-	-	1	75
	MIX-1TS	-	-	-	1	76
GTAW	NO65G	A5.18 ER70S-2	-	6	1	77
	TG-S51T	A5.18 ER70S-6	-	6	1	78
	TG-S50	A5.18 ER70S-G	-	6	1	79
SAW	MF-53/US-36	A5.17 F7A0-EH14	-	6	-	80
	G-50/US-36	A5.17 F7A2-EH14	-	6	-	81
	G-60/US-36	A5.17 F7A2-EH14	-	6	-	82
	G-80/US-36	A5.17 F7A2-EH14, F6P2-EH14	-	6	-	83
	PF-H55E/US-36	A5.17 F7A4-EH14	-	6	1	84
	MF-38/US-36	A5.17 F7A6-EH14, F7P6-EH14	-	6	-	85
	MF-300/US-36	A5.17 F7A6-EH14, F7P6-EH14	-	6	-	86

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
For Weather Proof Steel						
SMAW	LB-W52	A5.5 E7016-G	-	4	-	90
	LB-W52B	A5.5 E7016-G	-	4	-	91
FCAW	DW-588	A5.29 E81T1-W2C	-	6	-	92
	DW-50W	-	-	-	-	93
GMAW	MG-W50TB	A5.28 ER80S-G	-	6	-	94
SAW	MF-53/US-W52B	A5.23 F7A0-EG-G	-	6	-	95
	MF-38/US-W52B	A5.23 F7A2-EG-G	-	6	-	96
For High Tensile Strength Steel and Low Temperature Steel						
SMAW	LB-7018-1	A5.1 E7018-1	ISO 2560-A-E 42 4 B	4	1	104
	NB-3J	A5.5 E7016-C2L	-	4	10	105
	LB-62L	A5.5 E8016-C1	-	4	10	106
	LB-65L	A5.5 E8016-C1	-	4	10	107
	LB-52NS	A5.5 E7016-G	ISO 2560-A-E 42 6 Z B	4	-	108
	LB-52NSU	A5.5 E7016-G	-	4	-	109
	LB-55NS	A5.5 E8016-G	-	4	-	110
	NB-1SJ	A5.5 E8016-G	-	4	10	111
	LB-62	A5.5 E9016-G	ISO 2560-A-E 50 3 Z B	4	-	112
	LB-62UL	A5.5 E9016-G	ISO 2560-A-E 50 3 Z B	4	-	113
	LB-62U	A5.5 E9016-G	-	4	-	114
	LB-67L	A5.5 E9016-G	-	4	10	115
	LB-62D	A5.5 E9018-G	-	4	-	116
	LB-106	A5.5 E10016-G	-	4	-	117
	LB-Y75	A5.5 E10016-G	-	4	-	118
	LB-70L	A5.5 E10016-G	-	4	-	119
	LB-116	A5.5 E11016-G	-	4	12	120
	LB-80UL	A5.5 E11016-G	-	4	12	121
LB-88LT	A5.5 E11016-G	-	4	12	122	
LB-80L	A5.5 E11018-G H4	-	4	-	123	
FCAW	MX-55LF	A5.20 E70T-9C-J	-	6	-	124
	DW-55E	A5.20 E71T-9C-J	ISO 17632-A - T 42 4 P C 1 H5	6	-	125

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
FCAW	DW-A55E	A5.20 E71T-9M-J	ISO 17632-A - T 42 4 P M 1 H5	6	1	126
	DW-A55ESR	A5.20 E71T-12M-J	ISO 17632-A - T 42 4 P M 1 H5	6	1	127
	DW-55L	A5.29 E81T1-K2C	ISO 17632-A - T 46 6 1.5Ni P C 1 H5	6	10	128
	DW-55LSR	A5.29 E81T1-K2C	ISO 17632-A - T 46 6 1.5Ni P C 1 H5	6	10	129
	DW-A55L	A5.29 E81T1-K2M	ISO 17632-A - T 46 6 1.5Ni P M 1 H5	6	10	130
	DW-A55LSR	A5.29 E81T1-Ni1M	ISO 17632-A - T 46 6 Z P M 1 H5	6	10	131
	DW-A81Ni1	A5.29 E81T1-Ni1M-J	ISO 17632-A - T 46 6 1Ni P M 2 H5	6	10	132
	DW-62L	A5.29 E91T1-Ni2C-J	ISO 17632-A - T 50 6 Z P C 2 H5	6	10	133
	DW-A62L	A5.29 E91T1-Ni2M-J	ISO 17632-A - T 50 6 Z P M 2 H5	6	10	134
	MX-A55T	A5.28 E80C-G	-	6	10	135
	MX-A55Ni1	A5.28 E80C-G	ISO 17632-A - T 46 6 Mn1Ni M M 3 H5	6	-	136
	MX-A80L	A5.28 E110C-G H4	ISO 18276-A - T69 6 Mn2.5Ni M M 3 H5	6	-	137
	DW-50LSR	A5.29 E71T1-GC	-	6	-	138
	DW-A70L	A5.29 E101T1-GM	ISO 18276-A - T62 5 Mn1NiMo P M 2 H5	6	-	139
	DW-A80L	A5.29 E111T1-GM-H4	ISO 18276-A - T69 4 Z P M 2 H5	6	-	140
DW-460L	-	-	-	-	141	
GMAW	MG-S50LT	A5.18 ER70S-G	-	6	-	142
	MG-S1N	A5.28 ER70S-G	-	6	10	143
	MG-S3N	A5.28 ER70S-G	-	6	-	144
	MG-60	A5.28 ER80S-G	-	6	-	145
	MG-T1NS	A5.28 ER80S-G	-	6	10	98
	MG-S63B	A5.28 ER90S-G	-	6	-	146
	MG-70	A5.28 ER100S-G	-	6	-	147
	MG-S70	A5.28 ER100S-G	-	6	12	148
	MG-80	A5.28 ER110S-G	-	-	-	149

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
GMAW	MG-S80	A5.28 ER110S-G	-	6	-	150
	MG-S88A	A5.28 ER120S-G	-	6	-	151
GTAW	TG-S1N	A5.28 ER70S-G	-	6	-	152
	TG-S3N	A5.28 ER70S-G	-	6	10	153
	TG-S62	A5.28 ER80S-G	-	6	2	154
	TG-S60A	A5.28 ER80S-G	-	6	-	155
	TG-S80AM	A5.28 ER110S-G	-	6	-	156
SAW	MF-38/US-49A	A5.17 F7A6-EH14, F7P6-EH14	-	6	-	157
	PF-H55S/US-49A	A5.17 F7A6-EH14, F7P6-EH14	-	6	1	98
	PF-H55LT/US-36	A5.17 F7A8-EH14, F7P8-EH14	-	6	-	158
	PF-H55AS/US-36J	A5.17 F7A8-EH14, F7P8-EH14	-	6	1	159
	PF-H203/US-203E	A5.23 F7P15-ENi3-Ni3	-	6	10	160
	MF-38/US-A4	A5.23 F8A4-EA4-A4, F8P6-EA4-A4	-	6	2	161
	MF-38/US-40	A5.23 F9A6-EA3-A3, F8P6-EA3-A3	-	6	-	162
	MF-38/US-49	A5.23 F8A4-EG-A4, F8P6-EG-A4	-	6	-	163
	PF-H80AK/US-80BN	A5.23 F11A4-EG-G	-	6	-	164
	PF-H80AS/US-80LT	A5.23 F11A10-EG-G	-	6	-	165
	PF-H80AK/US-80LT	A5.23 F12A10-EG-G	-	6	-	166
For Heat-Resistant Steel						
SMAW	CM-A76	A5.5 E7016-A1	-	4	2	174
	CM-B95	A5.5 E7015-B2L	-	4	3	175
	CM-A96	A5.5 E8016-B2	-	4	3	176
	CM-A96MB	A5.5 E8016-B2	-	4	3	177
	CM-A96MBD	A5.5 E8016-B2	-	4	3	178
	CM-B98	A5.5 E8018-B2	-	4	3	179
	CM-B105	A5.5 E8015-B3L	-	4	4	180
	CM-A106	A5.5 E9016-B3	-	4	4	181
	CM-A106N	A5.5 E9016-B3	-	4	4	182

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
SMAW	CM-A106ND	A5.5 E9016-B3	-	4	4	183
	CM-B108	A5.5 E9018-B3	-	4	4	184
	CM-5	A5.5 E8016-B6	-	4	4	185
	CM-9	A5.5 E8016-B8	-	4	5	186
	CM-95B9	A5.5 E9015-B9	-	4	5	187
	CM-96B9	A5.5 E9016-B9	-	4	5	188
	BL-96	A5.5 E9016-G	-	4	-	189
	CM-A106H	A5.5 E9016-G	-	-	4	190
	CM-A106HD	A5.5 E9016-G	-	-	4	191
	CM-9Cb	A5.5 E9016-G	-	4	-	192
	CR-12S	A5.5 E9016-G	-	-	-	193
CM-2CW	-	-	4	-	194	
GMAW	MG-S5CM	A5.28 ER80S-B6	-	6	4	195
	MG-S9CM	A5.28 ER80S-B8	-	6	5	196
	MG-S56	A5.28 ER80S-G	-	6	-	197
	MG-SM	A5.28 ER80S-G	-	6	2	198
	MG-S1CM	A5.28 ER80S-G	-	6	3	199
	MG-S2CM	A5.28 ER90S-G	-	6	4	200
	MG-S2CMS	A5.28 ER90S-G	-	6	4	201
	MG-S2CW	A5.28 ER90S-G	-	6	-	202
	MG-S9Cb	A5.28 ER90S-G	-	6	-	203
MG-S12CRS	A5.28 ER90S-G	-	-	-	204	
GTAW	TG-S70SA1	A5.28 ER70S-A1	-	6	2	205
	TG-S80B2	A5.28 ER80S-B2	-	6	3	206
	TG-S90B3	A5.28 ER90S-B3	-	6	4	207
	TG-S5CM	A5.28 ER80S-B6	-	6	4	208
	TG-S9CM	A5.28 ER80S-B8	-	6	5	209
	TG-S90B9	A5.28 ER90S-B9	-	6	5	210
	TG-SM	A5.28 ER80S-G	-	6	2	211
	TG-S56	A5.28 ER80S-G	-	6	11	212
	TG-S63S	A5.28 ER90S-G	-	6	12	213
	TG-S1CM	A5.28 ER80S-G	-	6	3	214

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
GTAW	TG-S1CML	A5.28 ER80S-G	-	6	3	215
	TG-S2CM	A5.28 ER90S-G	-	6	4	216
	TG-S2CML	A5.28 ER80S-G	-	6	4	217
	TG-S2CMH	A5.28 ER90S-G	-	-	4	218
	TG-S9Cb	A5.28 ER90S-G	-	6	5	219
	TG-S12CRS	A5.28 ER90S-G	-	-	-	220
	TG-S2CW	-	-	6	-	221
SAW	MF-38/US-40	A5.23 F8P6-EA3-A3, F9A6-EA3-A3	-	6	-	222
	MF-38/US-A4	A5.23 F8P6-EA4-A4, F8A4-EA4-A4	-	6	2	223
	PF-90B9/US-90B9	A5.23 F9PZ-EB91-B91	-	6	-	224
	MF-38/US-49	A5.23 F8P6-EG-A4, F8A4-EG-A4	-	6	-	225
	MF-27/US-56B	A5.23 F9P4-EG-G	-	6	-	226
	PF-200/US-56B	A5.23 F9P4-EG-G	-	6	-	227
	PF-200/US-511N	A5.23 F8P2-EG-B2	-	6	3	228
	PF-200D/US-511ND	A5.23 F8P2-EG-B2	-	6	3	229
	PF-200/US-521S	A5.23 F9P2-EG-B3	-	6	4	230
	PF-200D/US-521S	A5.23 F9P2-EG-B3	-	6	4	231
	PF-200S/US-502	A5.23 F7P2-EG-B6	-	6	4	232
	PF-200S/US-9Cb	A5.23 F10PZ-EG-G	-	6	-	233
	PF-500/US-521H	A5.23 EG-G	-	-	4	234
	PF-500D/US-521HD	-	-	-	4	235
	MF-29A/US-2CW	-	-	-	-	236
PF-200S/US-12CRSD	-	-	-	-	237	
For Stainless Steel						
SMAW	NC-38	A5.4 E308-16	-	5	8	248
	NC-38H	A5.4 E308H-16	-	5	8	249
	NC-38L	A5.4 E308L-16	-	5	8	250
	NC-38LT	A5.4 E308L-16	-	5	8	251
	NC-39	A5.4 E309-16	-	5	8	252
	NC-39L	A5.4 E309L-16	-	5	8	253
	NC-39MoL	A5.4 E309LMo-16	-	5	8	254

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
SMAW	NC-30	A5.4 E310-16	-	5	9	240
	NC-32	A5.4 E312-16	-	5	-	255
	NC-36	A5.4 E316-16	-	5	8	256
	NC-36L	A5.4 E316L-16	-	5	8	257
	NC-36LT	A5.4 E316L-16	-	5	8	258
	NC-317L	A5.4 E317L-16	-	5	8	259
	NC-37	A5.4 E347-16	-	5	8	260
	NC-37L	A5.4 E347-16	-	5	8	261
	CR-40Cb	A5.4 E409Nb-16	-	-	7	262
	CR-40	A5.4 E410-16	-	4	6	263
	NC-2209	A5.4 E2209-16	-	5	8	264
	NC-2594	A5.4 E2594-16	-	5	8	265
NC-316MF	-	-	-	-	266	
FCAW	DW-308H	A5.22 E308HT1-1/4	-	6	8	267
	DW-308L	A5.22 E308LT0-1/4	ISO 17633-A-T 19 9 L R C/M 3	6	8	268
	DW-308LT	A5.22 E308LT0-1/4	-	6	8	269
	DW-308LH	A5.22 E308LT1-1/4	-	6	8	270
	DW-308LP	A5.22 E308LT1-1/4	ISO 17633-A-T 19 9 L P C/M 1	6	8	271
	DW-308	A5.22 E308T0-1/4	ISO 17633-A-T Z 19 9 R C/M 3	6	8	272
	DW-309MoL	A5.22 E309LMoT0-1/4	ISO 17633-A-T 23 12 2 L R C/M 3	6	8	273
	DW-309MoLP	A5.22 E309LMoT1-1/4	ISO 17633-A-T 23 12 2 L R C/M 1	6	8	274
	DW-309L	A5.22 E309LT0-1/4	ISO 17633-A-T 23 12 L R C/M 3	6	8	275
	DW-309LH	A5.22 E309LT1-1/4	-	6	8	276
	DW-309LP	A5.22 E309LT1-1/4	ISO 17633-A-T 23 12 L P C/M 1	6	8	277
	DW-309	A5.22 E309T0-1/4	ISO 17633-A-T Z 23 12 R C/M 3	6	8	278
	DW-310	A5.22 E310T0-1/4	-	6	9	279
	DW-312	A5.22 E312T0-1	-	6	-	280

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
FCAW	DW-316L	A5.22 E316LT0-1/4	ISO 17633-A-T Z 19 12 3 R C/M 3	6	8	281
	DW-316LT	A5.22 E316LT1-1/4	-	6	8	282
	DW-316LH	A5.22 E316LT1-1/4	-	6	8	283
	DW-316LP	A5.22 E316LT1-1/4	ISO 17633-A-T 19 12 3 L P C/M 1	6	8	284
	DW-316H	A5.22 E316T1-1/4	-	6	8	285
	DW-317L	A5.22 E317LT0-1/4	-	6	8	286
	DW-317LP	A5.22 E317LT1-1/4	-	6	8	287
	DW-347	A5.22 E347T0-1/4	-	6	8	288
	DW-347H	A5.22 E347T1-1/4	-	6	8	289
	DW-2209	A5.22 E2209T1-1/4	-	6	8	290
	DW-2307	A5.22 E2307T1-1/4	-	-	-	291
	DW-2594	A5.22 E2594T1-1/4	-	6	8	292
	DW-410Cb	A5.22 E409NbT0-1	-	6	7	293
	MX-A410NiMo	A5.22 EC410NiMo	-	-	-	294
	MX-A430M	-	-	-	7	295
	TG-X308L	A5.22 R308LT1-5	-	6	8	296
TG-X309L	A5.22 R309LT1-5	-	6	8	297	
TG-X316L	A5.22 R316LT1-5	-	6	8	298	
TG-X347	A5.22 R347T1-5	-	6	8	299	
GMAW	MG-S308	A5.9 ER308	-	6	8	300
	MG-S308LS	A5.9 ER308LSi	-	6	8	301
	MG-S309	A5.9 ER309	-	6	8	302
	MG-S309LS	A5.9 ER309LSi	-	6	8	303
	MG-S316LS	A5.9 ER316LSi	-	6	8	304
	MG-S430NbS	-	-	-	-	305
GTAW	TG-S308	A5.9 ER308	-	6	8	306
	TG-S308L	A5.9 ER308L	-	6	8	307
	TG-S309	A5.9 ER309	-	6	8	308
	TG-S309L	A5.9 ER309L	-	6	8	309
	TG-S309MoL	A5.9 ER309LMo	-	6	8	310
	TG-S310	A5.9 ER310	-	6	9	311

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
GTAW	TG-S316	A5.9 ER316	-	6	8	312
	TG-S316L	A5.9 ER316L	-	6	8	313
	TG-S317L	A5.9 ER317L	-	6	8	314
	TG-S347	A5.9 ER347	-	6	8	315
	TG-S410	A5.9 ER410	-	6	6	316
	TG-S2209	A5.9 ER2209	-	-	-	317
	TG-S2594	A5.9 ER2594	-	-	-	318
	TG-S310MF	-	-	-	-	319
	TG-S410Cb	-	-	-	7	320
	NO4051	-	-	-	-	321
For Hardfacing						
SMAW	HF-240	-	-	-	-	328
	HF-260	-	-	-	-	328
	HF-330	-	-	-	-	328
	HF-350	-	-	-	-	328
	HF-450	-	-	-	-	330
	HF-500	-	-	-	-	330
	HF-600	-	-	-	-	330
	HF-650	-	-	-	-	330
	HF-700	-	-	-	-	332
	HF-800K	-	-	-	-	332
	HF-950	-	-	-	-	332
	HF-11	-	-	-	-	334
	HF-12	-	-	-	-	334
	HF-13	-	-	-	-	334
	HF-16	-	-	-	-	334
HF-30	-	-	-	-	334	
FCAW	DW-H250	-	-	-	-	336
	DW-H350	-	-	-	-	336
	DW-H450	-	-	-	-	336
	DW-H600	-	-	-	-	336
	DW-H700	-	-	-	-	336

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
FCAW	DW-H800	-	-	-	-	336
	DW-H11	-	-	-	-	338
	DW-H16	-	-	-	-	338
	DW-H30	-	-	-	-	338
	DW-H30MV	-	-	-	-	338
SAW	G-50/US-H250N	-	-	-	-	340
	G-50/US-H350N	-	-	-	-	340
	G-50/US-H400N	-	-	-	-	340
	G-50/US-H450N	-	-	-	-	340
	G-50/US-H500N	-	-	-	-	342
	MF-30/US-H550N	-	-	-	-	342
	MF-30/US-H600N	-	-	-	-	342
For Cast Iron						
SMAW	CI-A1	A5.15 ENi-CI	-	-	-	348
	CI-A2	A5.15 ENiFe-CI	-	-	-	348
	CI-A3	A5.15 Est	-	-	-	348
For 9%Ni Steel and Nickel-Based Alloy						
SMAW	NI-C70A	A5.11 ENiCrFe-1	-	43	-	356
	NI-C703D	A5.11 ENiCrFe-3	-	43	-	357
	NI-C70S	A5.11 ENiCrFe-9	-	43	-	358
	NI-C1S	A5.11 ENiMo-8	-	44	-	359
	NI-C625	-	-	-	-	360
	ME-L34	-	-	-	-	361
FCAW	DW-N82	A5.34 ENiCr3T0-4	-	-	-	362
	DW-N625	A5.34 ENiCrMo3T1-1, ENiCrMo3T1-4	-	-	-	363
	DW-NC276	A5.34 ENiCrMo4T0-4	-	-	-	364
	DW-N70S	-	-	-	-	365
GMAW	MG-S70NCb	A5.14 ERNiCr-3	-	43	-	366
GTAW	TG-S70NCb	A5.14 ERNiCr-3	-	43	-	367
	TG-SN625	A5.14 ERNiCrMo-3	-	43	-	368
	TG-S709S	A5.14 ERNiMo-8	-	44	-	369
SAW	PF-N4/US-709S	A5.14 ERNiMo-8	-	44	-	370

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
Highly Efficient Welding Processes						
FCB™	PF-I55E/US-36/ PF-I50R (MF-1R)	-	-	-	-	372
FA-B	MF-38/US-36/ RR-2/FA-B1	-	-	-	-	374
	MF-38/US-49/ RR-2/FA-B1	-	-	-	-	374
	PF-I52E/US-36/ RR-2/FA-B1	-	-	-	-	374
EGW	DW-S43G	A5.26 EG70T-2	-	6	-	376
	DW-S1LG	-	-	-	-	376
	DW-S60G	-	-	-	-	376