KOBELCO

WELDING HANDBOOK

KOBE STEEL, LTD.

WELDING BUSINESS

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• 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 since April 2008. However, the technical design of the products is not changed.

Our group brand names and the corresponding products

All KOBELCO welding consumables are designated with “Trade Designation” and are grouped into the following three 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 590 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.

Our 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 our designation system in which the position of hyphen is reviewed so that a hyphen comes after one letter or two letters. That is, Our 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 our current and previous brand names

Previous Brand Name	Current 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) ZERODE-44	FAMILIARC™	Z-44
(6) CMA-106N	TRUSTARC™	CM-A106N
(7) DW-308	PREMIARC™	DW-308

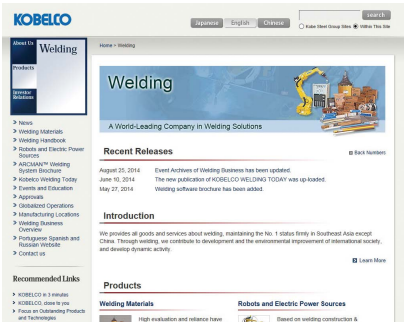
The purpose of our designation system

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 current 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."

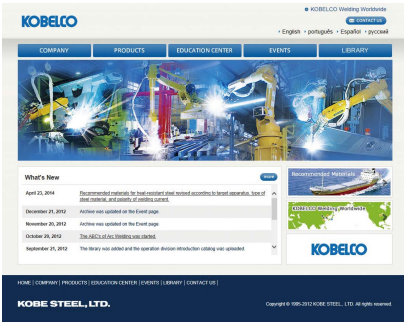
Our designation system is not only to prevent counterfeit products in Japan and overseas countries, but also to prevent our customers and users from suffering such a trouble in terms our products.

This modification may have caused 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



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

search words

kobelco, english, welding

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

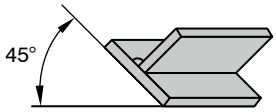
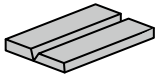
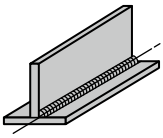
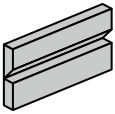
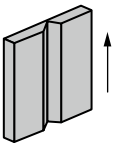
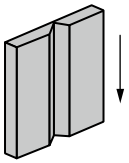
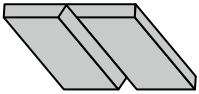
Welding parameters indicates the recommended current range of each welding position.

6. Approvals

We have displayed the certification of the grade of classification society of the time in December, 2019.
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 Global Operations & Marketing Dept. of the Welding Business of Kobe Steel when you need the ship classification approval of a particular welding consumable to be used. Ship classification approvals are available at our website ; https://kobelco-welding.jp/company/certification

[Ship classification societies]
ABS: American Bureau of Shipping LR: Lloyd’s Register of Shipping
DNV-GL: Det Norske Veritas and Germanischer Lloyd
BV: Bureau Veritas NK: Nippon Kaiji Kyokai CR: Central Research of Ships S. A.
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
El	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.
- Prior to use, please read and understand SDS, the manufacturer's instructions, and the precautionary labels.
  SDS can be found in KOBELCO Website.
  https://www.kobelco.co.jp/english/welding/sds/

⚠ WARNING 	**Electric shock can kill.**

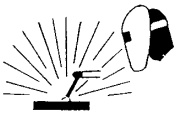
- Do not touch live electrical parts (A stick electrode held with an electrode holder and a welding wire are electrically live).
- Wear dry, insulated gloves. Do not wear torn or wet gloves. Use an electric shock preventing device (e.g., open-circuit-voltage-reducing device) when welders or operators 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 T 8141.
- 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 torch 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 potion 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 drum 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.

WARNING	**These products can expose you to chemicals including Nickel and Titanium Dioxide, which are known to the State of California to cause cancer, and Chromium, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.**

- Please refer to SDS before use. SDS is available on KOBELCO website. https://www.kobelco.co.jp/english/welding/sds/
- Please be informed that special warning indication may be required in certain area. You are kindly requested to check local laws/regulations where welding materials are to be used.

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	-	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	1	44
	LB-52-18	A5.1 E7018	ISO 2560-A-E 42 3 B	4	1	45
	LT-B52A	A5.1 E7018	-	4	1	46
	LB-52T	A5.1 E7048	-	4	1	47
	LB-78VS	A5.1 E7048	-	4	1	48
	KOBE-7010S	A5.5 E7010-P1	-	3	-	49
	LB-76	A5.5 E7016-G	-	4	1	52
	KOBE-8010S	A5.5 E8010-P1	-	3	-	50
	LB-55U	A5.5 E8016-G	-	4	-	43
	LB-8018	A5.5 E8018-G	-	4	-	51
	LB-88VS	A5.5 E8018-G	-	4	-	53
	LB-98VS	A5.5 E9018-G	-	4	-	54
	LT-B50	-	-	-	1	55
FCAW	**MX-100T**	A5.18 E70C-6C/6M	ISO 17632-A- T 42 2 M C/M 1 H5	6	-	56
	MX-A100	A5.18 E70C-6M	ISO 17632-A- T 42 4 M M 3 H5	6	-	57
	DW-200	A5.20 E70T-1C	-	6	-	58
	MX-100	A5.20 E70T-1C	-	6	-	59

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
FCAW	**MX-200**	A5.20 E70T-1C	ISO 17632-A- T 42 0 R C 3 H5	6	-	60
	MX-200H	A5.20 E70T-1C	ISO 17632-A- T 42 2 R C 3 H5	6	-	61
	MX-200E	A5.20 E70T-9C	-	6	-	62
	MX-A200	A5.20 E70T-1M	ISO 17632-A- T 42 2 R M 3 H5	6	-	63
	DW-50	A5.20 E71T-1C/1M, -9C/9M	ISO 17632-A- T 42 2 P C/M 1 H5	6	1	64
	DW-100	A5.20 E71T-1C	ISO 17632-A- T 42 0 P C 1 H10	6	1	65
	DW-100V	A5.20 E71T-1C	-	6	1	66
	DW-100E	A5.20 E71T-9C	-	6	1	67
	DW-A50	A5.20 E71T-1M	ISO 17632-A- T 42 2 P M 1 H5	6	1	68
	DW-A51B	A5.20 E71T-5M-J	-	6	1	69
GMAW	**MIX-50**	A5.18 ER70S-3	-	6	-	70
	MG-51T	A5.18 ER70S-6	-	6	1	71
	MG-50	A5.18 ER70S-G	-	6	1	72
	MG-S50	A5.18 ER70S-G	-	6	1	73
	MIX-50S	A5.18 ER70S-G	-	6	1	74
	SE-A50	A5.18 ER70S-G	-	6	1	75
	MG-50T	-	-	-	1	76
	MIX-1TS	-	-	-	-	77
GTAW	**NO65G**	A5.18 ER70S-2	-	6	1	78
	TG-S70S2	A5.18 ER70S-2	-	6	1	79
	TG-S70S3	A5.18 ER70S-3	-	6	1	80
	TG-S51T	A5.18 ER70S-6	-	6	1	81
	TG-S50	A5.18 ER70S-G	-	6	1	82
SAW	**MF-53/US-36**	A5.17 F7A0-EH14	-	6	-	83
	G-50/US-36	A5.17 F7A2-EH14	-	6	-	84
	G-60/US-36	A5.17 F7A2-EH14	-	6	-	85
	G-80/US-36	A5.17 F7A2-EH14, F6P2-EH14	-	6	-	86

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
SAW	**AF-490E/US-29**	A5.17 F7A2-EM12K, F6P4-EM12K	-	6	1	90
	PF-H55E/US-36	A5.17 F7A4-EH14	-	6	1	87
	AF-490SP/US-36	A5.17 F7A4-EH14, F7P4-EH14	-	6	1	91
	MF-38/US-36	A5.17 F7A6-EH14, F7P6-EH14	-	6	-	88
	MF-300/US-36	A5.17 F7A6-EH14, F7P6-EH14	-	6	-	89
	AF-490AS/US-36	A5.17 F7A6-EH14, F7P6-EH14	-	6	-	92
For Weather Proof Steel						
SMAW	**LB-W52**	A5.5 E7016-G	-	4	-	96
	LB-W52B	A5.5 E7016-G	-	4	-	97
FCAW	**DW-588**	A5.29 E81T1-W2C	-	6	-	98
	DW-50W	-	-	-	-	99
GMAW	**MG-W50TB**	A5.28 ER80S-G	-	6	-	100
SAW	**MF-53/US-W52B**	A5.23 F7A0-EG-G	-	6	-	101
	MF-38/US-W52B	A5.23 F7A2-EG-G	-	6	-	102
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	110
	NB-3J	A5.5 E7016-C2L	-	4	10	111
	LB-52NS	A5.5 E7016-G	-	4	-	114
	LB-52NSU	A5.5 E7016-G	-	4	-	115
	LB-62L	A5.5 E8016-C1	ISO 2560-A-E 50 6 2Ni B	4	10	112
	LB-65L	A5.5 E8016-C1	-	4	10	113
	LB-55NS	A5.5 E8016-G	-	4	-	116
	NB-1SJ	A5.5 E8016-G	-	4	10	117
	LB-62	A5.5 E9016-G	ISO 2560-A-E 50 3 Z B 1 2	4	-	118
	LB-62UL	A5.5 E9016-G	-	4	-	119
	LB-62U	A5.5 E9016-G	-	4	-	120
	LB-67L	A5.5 E9016-G	-	4	10	121
	LB-62D	A5.5 E9018-G	-	4	-	122
	LB-106	A5.5 E10016-G	-	4	-	123
	LB-Y75	A5.5 E10016-G	-	4	-	124
	LB-70L	A5.5 E10016-G	-	4	-	125

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
SMAW	**LB-116**	A5.5 E11016-G	ISO 18275-A- E 69 2 ZMn2NiCrMo B	4	12	126
	LB-80UL	A5.5 E11016-G	-	4	12	127
	LB-88LT	A5.5 E11016-G	-	4	-	128
	LB-80L	A5.5 E11018-G H4	18275-A E69 6 ZMn3Ni2Mo B 2 2 H5	4	-	129
FCAW	**MX-55LF**	A5.20 E70T-9C-J	-	6	-	136
	DW-100KS	A5.20 E71T-1C, E71T-9C-J	-	6	-	130
	DW-55E	A5.20 E71T-9C-J	ISO 17632-A- T 42 4 P C 1 H5	6	-	131
	DW-A55E	A5.20 E71T-9M-J	ISO 17632-A- T 42 4 P M 1 H5	6	1	132
	DW-A55ESR	A5.20 E71T-12M-J	ISO 17632-A- T 42 4 P M 1 H5	6	1	133
	MX-A55T	A5.28 E80C-G	ISO 17632-A- T 46 6 1.5Ni M M 1 H5	6	10	144
	MX-A55Ni1	A5.28 E80C-G	ISO 17632-A- T 46 6 Mn1Ni M M 3 H5	6	-	145
	MX-A80L	A5.28 E110C-G H4	ISO 18276-A- T69 6 Mn2.5Ni M M 3 H5	6	-	146
	DW-50LSR	A5.29 E71T1-GC	-	6	-	147
	DW-55L	A5.29 E81T1-K2C	ISO 17632-A- T 46 6 1.5Ni P C 1 H5	6	10	134
	DW-55LSR	A5.29 E81T1-K2C	ISO 17632-A- T 46 6 1.5Ni P C 1 H5	6	10	135
	DW-A55L	A5.29 E81T1-K2M	ISO 17632-A- T 46 6 1.5Ni P M 1 H5	6	10	137
	DW-A55LSR	A5.29 E81T1-Ni1M	ISO 17632-A- T 46 6 Z P M 1 H5	6	10	138
	DW-A81Ni1	A5.29 E81T1-Ni1M-J	ISO 17632-A- T 46 6 1Ni P M 2 H5	6	10	139
	DW-A65Ni1	A5.29 E91T-GM	ISO 18276-A- T 55 5 Mn1Ni P M 2 H5	6	10	140
	DW-62L	A5.29 E91T1-Ni2C-J	ISO 17632-A- T 50 6 Z P C 2 H5	6	10	141
	DW-A62L	A5.29 E91T1-Ni2M-J	ISO 17632-A- T 50 6 Z P M 2 H5	6	10	142
	DW-A62LSR	A5.29 E91T1-GM	-	6	10	143
	DW-A70L	A5.29 E101T1-GM	ISO 18276-A- T62 5 Mn1NiMo P M 2 H5	6	-	148

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
FCAW	**DW-A80L**	A5.29 E111T1-GM-H4	ISO 18276-A-T69 4 Z P M 2 H5	6	-	149
	DW-460L	-	-	-	-	150
GMAW	**MG-S50LT**	A5.18 ER70S-G	-	6	-	151
	MG-S1N	A5.28 ER70S-G	-	6	10	152
	MG-S3N	A5.28 ER70S-G	-	6	-	153
	MG-60	-	-	6	-	154
	MG-S63B	A5.28 ER90S-G	-	6	-	155
	MG-70	A5.28 ER100S-G	-	6	-	156
	MG-S70	A5.28 ER100S-G	-	6	12	157
	MG-80	A5.28 ER110S-G	-	6	-	158
	MG-S80	A5.28 ER110S-G	-	6	-	159
	MG-S88A	A5.28 ER120S-G	-	6	-	160
GTAW	**TG-S1N**	A5.28 ER70S-G	-	6	-	161
	TG-S3N	A5.28 ER70S-G	-	6	10	162
	TG-S62	A5.28 ER80S-G	-	6	2	163
	TG-S60A	A5.28 ER80S-G	-	6	-	164
	TG-S80AM	A5.28 ER110S-G	-	6	-	165
SAW	**MF-38/US-49A**	A5.17 F7A6-EH14, F7P6-EH14	-	6	-	166
	PF-H55LT/US-36	A5.17 F7A8-EH14, F7P8-EH14	-	6	-	167
	PF-H55AS/US-36J	A5.17 F7A8-EH14, F7P8-EH14	-	6	1	168
	PF-H203/US-203E	A5.23 F7P15-ENi3-Ni3	-	6	10	169
	MF-38/US-A4	A5.23 F8A4-EA4-A4, F8P6-EA4-A4	-	6	2	170
	MF-38/US-49	A5.23 F8A4-EG-A4, F8P6-EG-A4	-	6	2	172
	MF-38/US-40	A5.23 F9A6-EA3-A3, F8P6-EA3-A3	-	6	-	171
	PF-H62AS/US-2N	A5.23 F9A8-EG-Ni2, F9P8-EG-Ni2	-	6	10	174
	PF-H62AK/US-2N	A5.23 F9A8-EG-Ni2, F9P8-EG-Ni2	-	6	10	175

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Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
SAW	**PF-H55S/US-2N**	A5.23 F9A10-EG-Ni2, F9P8-EG-Ni2	-	6	-	173
	PF-H80AS/US-80LT	A5.23 F11A10-EG-G	-	6	-	176
	PF-H80AK/US-80LT	A5.23 F12A10-EG-G	-	6	-	177
For Heat-Resistant Steel						
SMAW	**CM-B95**	A5.5 E7015-B2L	-	4	3	192
	CM-A76	A5.5 E7016-A1	-	4	2	188
	CM-B105	A5.5 E8015-B3L	-	4	4	197
	CM-A96	A5.5 E8016-B2	ISO 3580-A-E CrMo1 B	4	3	189
	CM-A96MB	A5.5 E8016-B2	-	4	3	190
	CM-A96MBD	A5.5 E8016-B2	-	4	3	191
	CM-B98	A5.5 E8018-B2	-	4	3	193
	CM-95B91	A5.5 E9015-B91	-	4	5	202
	CM-A106	A5.5 E9016-B3	ISO 3580-A-E CrMo2 B	4	4	194
	CM-A106N	A5.5 E9016-B3	-	4	4	195
	CM-A106ND	A5.5 E9016-B3	-	4	4	196
	CM-96B91	A5.5 E9016-B91	-	4	5	203
	BL-96	A5.5 E9016-G	ISO 3580-A-E Z B	4	-	186
	CM-A106H	A5.5 E9016-G	-	-	4	199
	CM-A106HD	A5.5 E9016-G	-	-	4	200
	CM-2CW	A5.5 E9016-G	-	4	-	201
	CM-9Cb	A5.5 E9016-G	-	4	-	204
	CR-12S	A5.5 E9016-G	-	4	-	205
	CM-B108	A5.5 E9018-B3	-	4	4	198
	BL-106	A5.5 E10016-G	ISO 18275-A-E 62 0 ZMn1NiMo B T	4	-	187
GMAW	**MG-S70SA1**	A5.28 ER70S-A1	-	6	2	208
	MG-S80B2F	A5.28 ER80S-B2	-	6	3	211
	MG-S56	A5.28 ER80S-G	-	6	-	206
	MG-SM	A5.28 ER80S-G	-	6	2	209
	MG-S1CM	A5.28 ER80S-G	-	6	3	210
	MG-S90B91	A5.28 ER90S-B9	-	6	5	214

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
GMAW	**MG-S63S**	A5.28 ER90S-G	-	6	-	207
	MG-S2CM	A5.28 ER90S-G	-	6	4	212
	MG-S2CW	A5.28 ER90S-G	-	6	-	213
	MG-S9Cb	A5.28 ER90S-G	-	6	-	215
	MG-S12CRS	A5.28 ER90S-G	-	6	-	216
GTAW	**TG-S70SA1**	A5.28 ER70S-A1	-	6	2	219
	TG-S80B2	A5.28 ER80S-B2	-	6	3	221
	TG-S56	A5.28 ER80S-G	-	6	11	217
	TG-SM	A5.28 ER80S-G	-	6	2	220
	TG-S1CM	A5.28 ER80S-G	-	6	3	222
	TG-S1CML	A5.28 ER80S-G	-	6	3	223
	TG-S2CML	A5.28 ER80S-G	-	6	4	226
	TG-S2CW	A5.28 ER80S-G	-	6	-	228
	TG-S90B3	A5.28 ER90S-B3	-	6	4	224
	TG-S90B91	A5.28 ER90S-B9	-	6	5	229
	TG-S63S	A5.28 ER90S-G	-	6	12	218
	TG-S2CM	A5.28 ER90S-G	-	6	4	225
	TG-S2CMH	A5.28 ER90S-G	-	-	4	227
	TG-S9Cb	A5.28 ER90S-G	-	6	5	230
	TG-S12CRS	A5.28 ER90S-G	-	6	-	231
SAW	**G-80/US-B2**	A5.23 F7PZ-EB2-B2	-	6	3	239
	MF-38/US-A4	A5.23 F8P6-EA4-A4, F8A4-EA4-A4	-	6	2	234
	MF-38/US-49	A5.23 F8P6-EG-A4, F8A4-EG-A4	-	6	2	235
	MF-38/US-40	A5.23 F8P6-EA3-A3, F9A6-EA3-A3	-	6	-	236
	PF-200/US-511N	A5.23 F8P2-EG-B2	-	6	3	237
	PF-200D/US-511ND	A5.23 F8P2-EG-B2	-	6	3	238
	PF-200D/US-B2R	A5.23 F8P2-EB2R-B2R	-	6	3	240
	PF-200/US-521S	A5.23 F9P2-EG-B3	-	6	4	241
	PF-200D/US-521S	A5.23 F9P2-EG-B3	-	6	4	242
	PF-500/US-521H	A5.23 F9P2-EG-G	-	-	4	243

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Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
SAW	**PF-200/US-56B**	A5.23 F9P4-EG-G	-	6	-	232
	PF-200S/US-90B91	A5.23 F9PZ-EB91-B91	-	6	5	245
	PF-90B91/US-90B91	A5.23 F9PZ-EB91-B91	-	6	-	246
	PF-200/US-63S	A5.23 F10P2-EG-G	-	6	-	233
	PF-200S/US-9Cb	A5.23 F10PZ-EG-G	-	6	-	247
	MF-29A/US-2CW	-	-	-	-	244
	PF-200S/US-12CRSD	-	-	-	-	248
For Stainless Steel						
SMAW	**NC-38**	A5.4 E308-16	-	5	8	258
	NC-38H	A5.4 E308H-16	-	5	8	259
	NC-38L	A5.4 E308L-16	-	5	8	260
	NC-38LT	A5.4 E308L-16	-	5	8	261
	NC-39	A5.4 E309-16	-	5	8	262
	NC-39L	A5.4 E309L-16	ISO 3581-A-E 23 12 L R	5	8	263
	NC-39MoL	A5.4 E309LMo-16	-	5	8	264
	NC-32	A5.4 E312-16	-	5	-	265
	NC-36	A5.4 E316-16	-	5	8	266
	NC-36L	A5.4 E316L-16	-	5	8	267
	NC-36LT	A5.4 E316L-16	-	5	8	268
	NC-317L	A5.4 E317L-16	-	5	8	269
	NC-37	A5.4 E347-16	-	5	8	270
	NC-37L	A5.4 E347-16	ISO 3581-A-E Z 19 9 Nb R	5	8	271
	CR-40Cb	A5.4 E409Nb-16	-	4	7	272
	CR-40	A5.4 E410-16	-	4	6	273
	NC-2209	A5.4 E2209-16	-	5	8	274
	NC-2594	A5.4 E2594-16	-	5	-	275
	NC-316MF	-	-	-	-	276
FCAW	**DW-308H**	A5.22 E308HT1-1/4	-	6	8	277
	DW-308L	A5.22 E308LT0-1/4	ISO 17633-A- T 19 9 L R C1/M21 3	6	8	278
	DW-308LT	A5.22 E308LT0-1/4	-	6	8	279
	DW-308L-XR	A5.22 E308LT0-1/4	-	6	8	283

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
FCAW	**DW-308LH**	A5.22 E308LT1-1/4	-	6	8	280
	DW-308LP	A5.22 E308LT1-1/4	ISO 17633-A- T 19 9 L P C1/M21 1	6	8	281
	DW-308LP-XR	A5.22 E308LT1-1/4	-	6	8	284
	DW-308	A5.22 E308T0-1/4	ISO 17633-A- T Z 19 9 R C1/M21 3	6	8	282
	DW-309MoL	A5.22 E309LMoT0-1/4	ISO 17633-A- T 23 12 2 L R C1/M21 3	6	8	285
	DW-309MoLP	A5.22 E309LMoT1-1/4	ISO 17633-A- T 23 12 2 L R C1/M21 1	6	8	286
	DW-309L	A5.22 E309LT0-1/4	ISO 17633-A- T 23 12 L R C1/M21 3	6	8	287
	DW-309L-XR	A5.22 E309LT0-1/4	-	6	8	291
	DW-309LH	A5.22 E309LT1-1/4	-	6	8	288
	DW-309LP	A5.22 E309LT1-1/4	ISO 17633-A- T 23 12 L P C1/M21 1	6	8	289
	DW-309LP-XR	A5.22 E309LT1-1/4	-	6	8	292
	DW-309	A5.22 E309T0-1/4	ISO 17633-A- T Z 23 12 R C1/M21 3	6	8	290
	DW-310	A5.22 E310T0-1/4	-	6	9	293
	DW-312	A5.22 E312T0-1	-	6	-	294
	DW-316L	A5.22 E316LT0-1/4	ISO 17633-A- T Z 19 12 3 R C1/M21 3	6	8	295
	DW-316L-XR	A5.22 E316LT0-1/4	-	6	8	300
	DW-316LT	A5.22 E316LT1-1/4	-	6	8	296
	DW-316LH	A5.22 E316LT1-1/4	-	6	8	297
	DW-316LP	A5.22 E316LT1-1/4	ISO 17633-A- T 19 12 3 L P C1/M21 1	6	8	298
	DW-316LP-XR	A5.22 E316LT1-1/4	-	6	8	301
	DW-316H	A5.22 E316T1-1/4	-	6	8	299
	DW-317L	A5.22 E317LT0-1/4	-	6	8	302
	DW-317LP	A5.22 E317LT1-1/4	-	6	8	303
	DW-347	A5.22 E347T0-1/4	-	6	8	304
	DW-410Cb	A5.22 E409NbT0-1	-	6	7	309
	DW-2209	A5.22 E2209T1-1/4	-	6	8	305

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
FCAW	**DW-329AP**	A5.22 E2209T1-1/4	-	6	8	306
	DW-2307	A5.22 E2307T1-1/4	-	6	-	307
	DW-2594	A5.22 E2594T1-1/4	-	6	-	308
	MX-A410NiMo	A5.22 EC410NiMo	-	-	-	310
	MX-A430M	-	-	-	7	311
	TG-X308L	A5.22 R308LT1-5	-	-	8	313
	TG-X309L	A5.22 R309LT1-5	-	-	8	314
	TG-X316L	A5.22 R316LT1-5	-	-	8	315
	TG-X347	A5.22 R347T1-5	-	-	8	316
GMAW	**MG-S308**	A5.9 ER308	-	6	8	317
	MG-S308LS	A5.9 ER308LSi	-	6	8	318
	MG-S309	A5.9 ER309	-	6	8	319
	MG-S309LS	A5.9 ER309LSi	-	6	8	320
	MG-S316LS	A5.9 ER316LSi	-	6	8	321
GTAW	**TG-S308**	A5.9 ER308	-	6	8	322
	TG-S308L	A5.9 ER308L	-	6	8	323
	TG-S309	A5.9 ER309	-	6	8	324
	TG-S309L	A5.9 ER309L	-	6	8	325
	TG-S309MoL	A5.9 ER309LMo	-	6	8	326
	TG-S310	A5.9 ER310	-	6	9	327
	TG-S316	A5.9 ER316	-	6	8	328
	TG-S316L	A5.9 ER316L	-	6	8	329
	TG-S317L	A5.9 ER317L	-	6	8	330
	TG-S347	A5.9 ER347	-	6	8	331
	TG-S410	A5.9 ER410	-	6	6	332
	TG-S2209	A5.9 ER2209	-	6	8	333
	TG-S2594	A5.9 ER2594	-	6	-	334
	TG-S310MF	-	-	-	-	335
	TG-S410Cb	-	-	-	7	336
	NO4051	-	-	-	-	337
SAW	**PF-S1D/US-2209**	A5.9 ER2209※	-	6※	8	338

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.
※Wire only

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
For Hardfacing						
SMAW	**HF-240**	-	-	-	-	344
	HF-260	-	-	-	-	344
	HF-330	-	-	-	-	344
	HF-350	-	-	-	-	344
	HF-450	-	-	-	-	346
	HF-500	-	-	-	-	346
	HF-600	-	-	-	-	346
	HF-650	-	-	-	-	346
	HF-700	-	-	-	-	348
	HF-800K	-	-	-	-	348
	HF-950	-	-	-	-	348
	HF-11	-	-	-	-	350
	HF-12	-	-	-	-	350
	HF-13	-	-	-	-	350
	HF-16	-	-	-	-	350
	HF-30	-	-	-	-	350
FCAW	**DW-H250**	-	-	-	-	352
	DW-H350	-	-	-	-	352
	DW-H450	-	-	-	-	352
	DW-H600	-	-	-	-	352
	DW-H700	-	-	-	-	352
	DW-H800	-	-	-	-	352
	DW-H11	-	-	-	-	354
	DW-H16	-	-	-	-	354
For Cast Iron						
SMAW	**CI-A1**	A5.15 ENi-CI	-	-	-	360
	CI-A2	A5.15 ENiFe-CI	-	-	-	360
	CI-A3	-	-	-	-	360

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

Welding Process	Product names	AWS	EN	ASME		Page
				F No.	A No.	
For 9%Ni Steel and Nickel-Based Alloy						
SMAW	**NI-C70A**	A5.11 ENiCrFe-1	-	43	-	368
	NI-C703D	A5.11 ENiCrFe-3	-	43	-	369
	NI-C70S	A5.11 ENiCrFe-9	-	43	-	370
	NI-C1S	A5.11 ENiMo-8	-	44	-	371
FCAW	**DW-N82**	A5.34 ENiCr3T1-4	-	43	-	372
	DW-N625	A5.34 ENiCrMo3T1-1/4	-	43	-	373
	DW-NC276	A5.34 ENiCrMo4T1-4	-	43	-	374
	DW-N709SP	A5.34 ENiMo13T1-1/4	ISO 12153- T Ni 1013 P M21 2	43	-	375
GMAW	**MG-S70NCb**	A5.14 ERNiCr-3	-	43	-	376
GTAW	**TG-S70NCb**	A5.14 ERNiCr-3	-	43	-	377
	TG-SN625	A5.14 ERNiCrMo-3	-	43	-	378
	TG-S709S	A5.14 ERNiMo-8	-	44	-	379
SAW	**PF-N4/US-709S**	A5.14 ERNiMo-8※	-	44※	-	380
Highly Efficient Welding Processes						
FCB™	**PF-I55E/US-36/ PF-I50R**	-	-	-	-	382
FA-B	**MF-38/US-36/ RR-2/FA-B1**	-	-	-	-	384
	MF-38/US-49/ RR-2/FA-B1	-	-	-	-	384
	PF-I52E/US-36/ RR-2/FA-B1	-	-	-	-	384
EGW	**DW-S43G**	A5.26 EG70T-2	-	6	-	386
	DW-S1LG	-	-	-	-	386
	DW-S60G	-	-	-	-	386

Note: Classification stated herein are in accordance with basically the mechanical and chemical requirements of the standard. Please ask KOBELCO for details.

※Wire only

For Mild Steel and 490MPa High Tensile Strength Steel

Welding Consumables for

SMAW

FCAW

GMAW

GTAW

SAW

A guide for selecting the type of stick electrode (1)

Type of covering and AWS classification	High titania potassium E6013	Low hydrogen potassium E7016	Iron oxide titania potassium E6019	High cellulose sodium E6010	Iron-powder titania E7024
Weldability					
▪ Crack resistant	○	◎	○	○	△
▪ X-ray soundness	○	◎	○	△	△
Usability					
▪ Penetration	○	○	◎	◎	△
▪ Spatter	○	○	○	△	○
▪ Suitability for thin metal	◎	△	○	△	○

Note (1) ◎: Excellent, ○: Good, △: Fair

Tips for better welding results

(1) Slag and fumes on tack weld beads absorb moisture; therefore, they must be removed right after tack welding to prevent adverse effects on the subsequent main welding.

(2) When wind velocity is more than 3m/sec in field welding, use a wind screen, or nitrogen in the wind decreases X-ray soundness and impact value of the weld.

(3) In welding medium and heavy thick mild steels by using non-low-hydrogen electrodes, keep the work at appropriate preheat and interpass temperature to remove diffusible hydrogen and thereby prevent cracking in the weld.

(4) In order to get better impact values, it is effective to lay each weld layer as thin as possible.

(5) Many stick electrodes can be used with both AC and DC power sources. Low-hydrogen type electrodes, however, should be tested on mechanical properties beforehand, because DC current causes a little lower strength of the weld metal.

(6) Low-hydrogen type electrodes are more suitable for surface finishing and repair welding of gas shielded metal arc and self-shielded metal arc welded deposits in order to prevent pits and blowholes, than other type electrodes.

How to keep stick electrodes in good condition

(1) Store stick electrodes in a warehouse where the humidity is low.

(2) Low-hydrogen type electrodes should be stored in an oven (100-150℃) placed near the welding area after re-drying was finished so that welders can take out the electrodes little by little. This manner is good for preventing the electrodes from moisture pick up and thereby decrease the diffusible hydrogen content of the weld metal.

(3) A change of the color of the flux coating to become darker, much more spatter, stronger arc, and irregular slag-covering are signs that the electrodes picked up moisture excessively. In such a case, re-drying is effective even for non-low-hydrogen electrodes to improve usability and X-ray soundness. But excessive drying for long hours at high temperatures deteriorates X-ray soundness of the weld metal.

(4) Welders should bring an appropriate amount of electrodes for half-a-day use at sites in order to prevent electrodes from excessive moisture pick up.

SMAW

A guide for selecting filler metals for API grade pipes (1)

API 5L pipe grade	Welding pass	High cellulose electrodes	Low hydrogen electrodes		
		Downhill welding process	Downhill welding	Uphill welding	Downhill welding
			With a combination of electrodes	Low hydrogen electrodes	
A25 A, B X42 X46 X52	Root	KOBE-6010 KOBE-7010S	KOBE-6010 KOBE-7010S	LB-52U	LB-78VS
	Hot			LB-52 LB-52-18	
	Filler and cap		LB-78VS		
X56	Root	KOBE-6010 KOBE-7010S	KOBE-6010 KOBE-7010S	LB-52U	
	Hot			LB-52 LB-52-18	
	Filler and cap	KOBE-7010S	LB-78VS		
X60	Root	KOBE-6010 KOBE-7010S	KOBE-6010 KOBE-7010S	LB-52U	LB-78VS LB-88VS
	Hot			LB-52 LB-52-18	
	Filler and cap	KOBE-7010S KOBE-8010S	LB-78VS LB-88VS		
X65	Root	KOBE-7010S KOBE-8010S	KOBE-7010S KOBE-8010S	LB-52U	LB-88VS
	Hot			LB-57 LB-62 LB-62D LB-8018	
	Filler and cap	KOBE-8010S	LB-88VS		
X70	Root	KOBE-7010S KOBE-8010S	KOBE-7010S KOBE-8010S	LB-55U LB-62U	
	Hot			LB-62 LB-62D	
	Filler and cap	KOBE-8010S	LB-88VS		
X80	Root	-	KOBE-7010S KOBE-8010S	LB-62U	LB-98VS
	Hot			LB-65D	
	Filler and cap		LB-98VS		
Weldability					
▪ Stability of root pass		○	○	◎	△
▪ Weld soundness		○	○	◎	○
▪ Crack resistance		△	○	◎	◎
Welding efficiency		◎	◎	△	○
Groove size tolerance		○	○	◎	△

Note (1) ◎: Excellent, ○: Fair, △: Inferior

Tips for better welding results

1) Sizes and tolerances of welding grooves

In one-side butt welding of pipes, it is important to make sound root pass welds without incomplete joint penetration and other discontinuities. For this, it is essential to prepare welding grooves suitable for individual welding procedures. Refer to the recommended sizes and tolerances of the grooves shown in the table below.

Type of stick electrode	Welding process	Recommen-dation and tolerance	Groove angle degree	Root face mm	Root gap mm	Mis-alignment mm
High cellulose	Downhill	Recommen-datiion	60-70	1.2-2.4 (1.2-2.0)	1.2-2.0	≦0.8
		Tolerance	50-75	0.8-2.4	0.8-2.4	≦1.6
Low hydrogen	Uphill	Recommen-datiion	60-80 (70-80)	0.4-2.0	2.0-3.2 (2.0-2.6)	≦1.6 (≦0.8)
		Tolerance	55-90	0.4-2.4	1.6-3.6	≦2.0
	Downhill	Recommen-datiion	60-80	1.2-2.0	2.6-3.4 (2.6-3.2)	≦0.6
		Tolerance	55-90	1.0-2.0	2.5-3.5	≦1.0

Note: Recommended ranges in parentheses are suitable for small diameter tubes with an approximate thickness of 7mm or less.

2) How to proceed root pass welding

(1) Downhill welding should be started at the 11 to 1 o'clock position of a pipe, whereas uphill welding should be started at the 5 to 7 o'clock position in common procedures. However, welding should be started at where there is a narrower root opening.

(2) It is recommended to strike an arc on the groove face and transfer the arc to the root of the groove, maintaining the arc in stable condition.

(3) Joint penetration can be adjusted by controlling the shape of a keyhole molten crater by adjusting welding current, electrode holding angle, the extent of sticking an electrode into the root opening, and weaving width. Control the penetration more strictly particularly at the 12 o'clock position where reverse side bead extrusion tends to be excessive and the 6 o'clock position that tends to cause a concave reverse side beads.

(4) Before joining beads particularly with low hydrogen electrodes, the end of the preceding bead should be tapered by grinding.

(5) After the completion of root pass welding, remove slag and unacceptable portion of beads, and shape the beads along the entire circumference of the pipe by grinding. Particularly, where the weld surfaces contain deep undercut, the shaping should be conducted more carefully.

Types and features of flux-cored wires

There are two types of flux cored wires: DW series rutile type and MX series metal type. Both DW and MX series include a variety of wires that use either CO_2 or Ar-CO_2 admixture shielding gas. The following paragraphs describe essential characteristics of both types of flux-cored wires to provide users with a useful guide.

DW series:
DW series is the most popular type of flux-cored wire, most of which contains rutile flux. This series offers excellent weldability with good arc stability and very low spatter generation. With CO_2 or Ar-CO_2 admixture shielding gas, DW wires show good slag removability and smooth, glossy bead appearance. Because of high deposition rates, highly efficient welding can be conducted. DW series includes those suitable for out-of-position welding and those suitable for horizontal fillet welding for a variety of applications.

MX series:
MX series is the flux-cored wire containing metal powder in flux. Due to high deposition rates, highly efficient welding can be conducted. MX wires offer excellent weldability with good arc stability and low spatter generation. With some wires, the amount of slag is as little as in gas metal arc welding with solid wires; therefore, multi-pass welding can continuously be conducted without removing the slag on each pass. A variety of MX wires are available to cover wide applications of thin plate, medium and thick plate, and primer-coated plates.

Deposition rate:
Compared at the same welding current, the deposition rates of flux-cored wires are higher by 50 - 60% relative to stick electrodes and 10 - 20% higher than solid wires. Spatter generation in use of flux-cored wires is much lower than in use of solid wires.

Tips for better welding results

In addition to the tips for gas metal arc welding with solid wires, the following tips especially for flux-cored wires are essential to use the excellent features of the wires.

(1) Because the wire is softer than solid wire, do not excessively tighten the pressure roller of the wire feeder so as not to cause the deformation of the wire.
(2) In flat butt welding, backhand technique is better for stable penetration. In horizontal and overhead fillet welding, forehand technique is better for flat bead appearance.
(3) In vertical down fillet welding, the first layer run should be straight and keep the welding speed faster to avoid slag inclusions and to get better penetration. For the 2nd and subsequent layers, remove the slag of preceding beads and avoid weaving.
(4) In one-side welding, welding parameter should carefully be selected to prevent welding defects such as hot cracking.
(5) In horizontal fillet welding of primer-coated plates, porosity defects such as pit and gas hole are apt to occur; therefore, the selection of proper wires and welding parameters suitable for welding primer-coated plates are essential. Figure 1 shows the relationship between welding speed and the number of pits occurred in the weld metal. Figure 2 shows proper welding speeds related to fillet leg lengths.

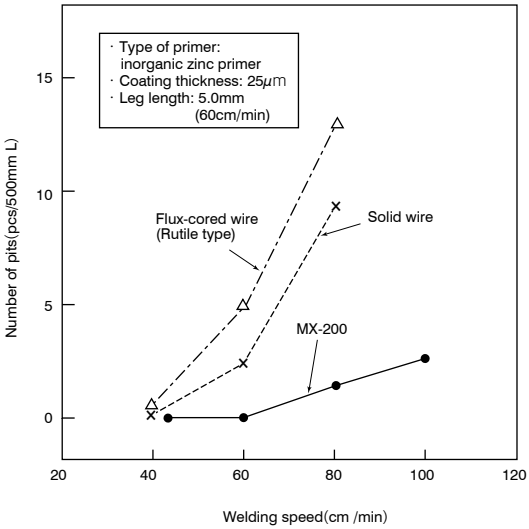


Fig.1 Porosity resistance to primer

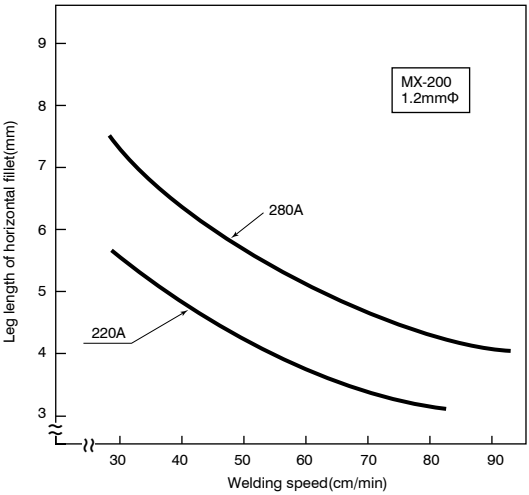


Fig.2 Horizontal fillet leg length vs. welding speed

Tips for better welding results in GMAW

(1) Use a CO_2 shielding gas corresponding to ANSI/AWS A5.32/A5.32M SG-C or an equivalent CO_2 gas purified for welding.
(2) Control the mixing ratio of Ar and CO_2 in an Ar-CO_2 admixture shielding gas because fluctuation of the mixing ratio affects the usability of a solid wire.
(3) Adjust the shielding gas flow rate in the 20 to 25 l/min range.
(4) Use a wind screen in welding in a windy area because a strong wind causes blowholes.
(5) Use a proper ventilation system at where general ventilation is inadequate.
(6) Keep the tip-to-work distance at around 15 mm with welding currents less than 250A and at around 20 to 25 mm with welding currents over 250A.
(7) The use of an excessively low arc voltage may generate a large sound in spray arc welding with an Ar-CO_2 shielding gas. In such a case increase the arc voltage to prevent blowholes.
(8) Torch angle, welding speed, wire diameter, and welding current markedly affect bead appearance and penetration; therefore, adjust such welding parameters according to the application.

Tips for better welding results in GTAW

(1) Welding power source:
Use the DCEN connection with the constant current or drooping characteristic DC power source in general applications.
(2) Shielding gas:
Use an argon gas with a high purity equivalent to that of JIS K 1105, in order to prevent pits and blowholes in the weld metal and decrease consumption of the tip of a tungsten electrode. When the length of the Ar gas piping is long, use metal pipes or Teflon tubes to prevent porosity in the weld metal, because moisture can permeates into the Ar gas through the wall of a rubber hose and thereby causes porosity. Adjust the shielding gas flow rate in the 12-18 l/min range.
(3) Tungsten electrode:
A 1-2% thoriated tungsten electrode is suitable. The tip of the tungsten electrode must be kept sharp in order to maintain the arc stable.
(4) Tungsten electrode extension length and arc length:
In order to keep the shielding of molten weld pool in good condition, the extension of a tungsten electrode from shielding nozzle should be approx. 5 mm. Maintain the arc length at 1-3 mm. The use of an excessively long arc length can deteriorate the shielding effect and causes undercut.
(5) Cleaning of welding groove:
Because the quality of gas tungsten arc welds is markedly affected by dirt on groove surfaces, scale, rust, water and oil must be removed before welding because they can cause pits, blowholes and unstable arcs.
(6) Wind protection and ventilation:
Use a wind screen in a windy site to maintain the shielding gas in good condition. Use an appropriate ventilation system where welding is carried out in a confined area to prevent welders from oxygen deficiency.

Tips for better welding results in SAW

(1) Accuracy of groove sizes:
The accuracy of root gap and groove angle affects the quality of welds much more than with other welding processes; where the accuracy is poor, burn-through, lack of penetration, excessive or insufficient reinforcement can occur.

(2) Surface of groove:
Rust and oil in the groove shall be removed before welding to prevent pits and blowholes.

(3) Distribution and circulation of flux:
Where a flux is supplied excessively on the base plate, the bead appearance becomes irregular particularly in use of melted fluxes. In case where a flux is used repetitively by means of a circulation system, the flux can be contaminated with scale and dust and its grain size distribution can be varied; therefore, add new flux occasionally to maintain good performances of the flux.

(4) Grain size of flux:
Several grain sizes are available for a certain melted flux. The most proper size depends on welding currents to be used. The use of high currents with a coarse grain size flux can deteriorates bead appearance; in contrast, the use of low currents with a fine grain size flux can cause pock marks because of poor degassing.

(5) Welding condition and penetration:
Submerged arc welding can use a wide range of parameters such as wire diameter, welding current, arc voltage and welding speed; however, erroneous setting of the parameter causes burn-through, and insufficient or excessive penetration and reinforcement. The bead shape can be affected by the travel angle of a wire; that is, where the wire is leaned to the direction of welding (backhand welding), the bead shape becomes narrower with comparatively deep penetration. In contrast, where the wire is leaned to the opposite direction of welding (forehand welding), the bead shape becomes wider with shallower penetration.

KOBE-6010 FAMILIARC™

Stick electrode

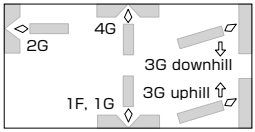
Features:
- Suitable for butt welding of pipes
- Excellent usability in vertical downward welding

Classification: AWS A5.1 E6010

Identification color: 1st Yellowish green

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.4	300	2	20	13	300W, 100H, 330L
3.2	350	5	20	27	175W, 115H, 380L
4.0	350	5	20	40	175W, 115H, 380L
4.8	350	5	20	58	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.12	0.20
Si	0.15	1.00
Mn	0.51	1.20
P	0.009	0.035
S	0.008	0.035
Ni	0.02	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	<0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2G, 3G uphill, 3G downhill, 4G
2.4	40~75
3.2	70~130
4.0	90~180
4.8	140~225

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	430	331min.
TS (MPa)	510	414min.
El on 4d (%)	27	22min.
IV -29℃ (J)	63	27min.

B-33 FAMILIARC™

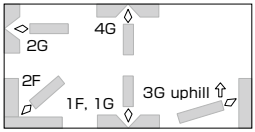
Stick electrode

Features: ▪ Excellent usability in the flat and horizontal positions

Classification: AWS A5.1 E6013

Redrying Conditions: 70~100℃x0.5~1h
Identification color: 1st Pink
Polarity: AC, DCEP, DCEN

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	300	2	20	10	270W, 85H, 330L
2.6	350	5	20	20	170W, 105H, 380L
3.2	350	5	20	30	170W, 105H, 380L
4.0	400	5	20	55	170W, 95H, 430L
5.0	400	5	20	82	170W, 100H, 430L
6.0	450	5	20	138	170W, 90H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.20
Si	0.30	1.00
Mn	0.33	1.20
P	0.013	0.035
S	0.009	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.0	30~60	30~60
2.6	55~95	50~90
3.2	80~130	70~120
4.0	125~175	100~160
5.0	170~230	120~200
6.0	230~300	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	430	331min.
TS (MPa)	480	414min.
El on 4d (%)	25	17min.

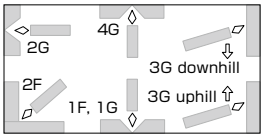
RB-26

FAMILIARC™

Stick electrode

Features:
- Suitable for butt and fillet welding of thin plates
- Excellent usability in all positions including vertical downward

Welding Positions:



Classification: AWS A5.1 E6013

Redrying Conditions: 70~100℃x0.5~1h
Identification color: 1st Black
Polarity: AC, DCEP, DCEN

Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	300	2	20	10	270W, 90H, 330L
2.6	350	5	20	19	170W, 100H, 380L
3.2	350	5	20	29	170W, 100H, 380L
4.0	400	5	20	53	170W, 95H, 430L
5.0	400	5	20	81	170W, 95H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.20
Si	0.30	1.00
Mn	0.37	1.20
P	0.012	0.035
S	0.010	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	0.02	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G, 3G downhill	3G uphill, 4G
2.0	30~65	30~65
2.6	45~95	45~95
3.2	60~125	60~125
4.0	105~170	100~150
5.0	150~220	125~190

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	450	331min.
TS (MPa)	510	414min.
El on 4d (%)	25	17min.

Approvals

ABS	2
LR	2m
NK [a)]	KMW2

Note: [a)] AC

Z-44 FAMILIARC™

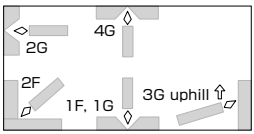
Stick electrode

Features: ▪ Typical lime titania type electrode

Classification: AWS A5.1 E6013

Redrying Conditions: 70~100℃x0.5~1h
Identification color: 1st Silver grey, 2nd Blue white
Polarity: AC, DCEP, DCEN

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.0	300	2	20	11	270W, 85H, 330L
2.6	350	5	20	22	170W, 105H, 380L
3.2	350	5	20	34	170W, 105H, 380L
4.0	450	5	20	64	170W, 90H, 480L
5.0	450	5	20	98	170W, 90H, 480L
6.0	450	5	20	142	170W, 90H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.20
Si	0.14	1.00
Mn	0.34	1.20
P	0.014	0.035
S	0.009	0.035
Ni	0.02	0.30
Cr	0.02	0.20
Mo	0.01	0.30
V	0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.0	30~60	25~55
2.6	60~100	50~90
3.2	100~140	90~130
4.0	140~190	120~170
5.0	190~250	140~210
6.0	250~330	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	410	331min.
TS (MPa)	460	414min.
El on 4d (%)	32	17min.
IV 0℃ (J)	110	-

Approvals

ABS	3
LR	3m
DNV-GL	3
BV	3
NK	KMW3

B-10 FAMILIARC™

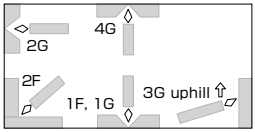
Stick electrode

Features:
- Suitable for butt and fillet welding of thin and thick plates (up to 20mm)
- Better usability

Classification: AWS A5.1 E6019

Redrying Conditions: 70~100℃x0.5~1h
Identification color: 1st Green
Polarity: AC, DCEP, DCEN

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	19	170W, 100H, 380L
3.2	350	5	20	30	170W, 105H, 380L
4.0	400	5	20	56	170W, 95H, 430L
5.0	400	5	20	84	170W, 95H, 430L
6.0	450	5	20	136	170W, 90H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.10	0.20
Si	0.09	1.00
Mn	0.39	1.20
P	0.016	0.035
S	0.008	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	<0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	40~70
3.2	80~130	60~110
4.0	120~180	100~150
5.0	170~250	130~200
6.0	230~300	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	400	331min.
TS (MPa)	450	414min.
El on 4d (%)	30	22min.
IV -18℃ (J)	68	27min.

B-14 FAMILIARC™

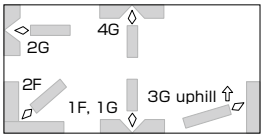
Stick electrode

Features:
- Suitable for butt and fillet welding of thin and medium-thick plates (up to 20mm)
- Excellent usability

Classification: AWS A5.1 E6019

Redrying conditions: 70~100℃x0.5~1h
Identification color: 1st Pale brown
Polarity: AC, DCEP, DCEN

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	20	170W, 120H, 380L
3.2	400	5	20	35	170W, 120H, 430L
4.0	450	5	20	62	170W, 120H, 480L
5.0	450	5	20	94	170W, 120H, 480L
6.0	450	5	20	141	170W, 120H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.10	0.20
Si	0.10	1.00
Mn	0.43	1.20
P	0.015	0.035
S	0.007	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1G, 1F, 2G, 2F	3G uphill, 4G
2.6	55~90	45~75
3.2	85~140	60~120
4.0	130~190	100~160
5.0	180~260	135~210
6.0	240~310	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	410	331min.
TS (MPa)	460	414min.
El on 4d (%)	32	22min.
IV -18℃ (J)	82	27min.

Approvals

ABS	3
LR	3m
DNV-GL	3
BV	3
NK [a)]	KMW3
CR	3

Note: [a)] AC

B-17 FAMILIARC™

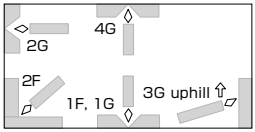
Stick electrode

Features:
- Suitable for butt and fillet welding of thin and thick plate (up to 20mm)
- Good mechanical properties

Classification: AWS A5.1 E6019

Redrying Conditions: 70~100℃x0.5~1h
Identification color: 1st Yellow
Polarity: AC, DCEP, DCEN

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	19	170W, 100H, 380L
3.2	350	5	20	31	170W, 105H, 380L
4.0	400	5	20	57	170W, 95H, 430L
5.0	400	5	20	85	170W, 100H, 430L
6.0	450	5	20	154	170W, 95H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.09	0.20
Si	0.08	1.00
Mn	0.60	1.20
P	0.012	0.035
S	0.006	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	<0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	40~70
3.2	80~130	60~110
4.0	120~180	100~150
5.0	170~250	130~200
6.0	240~310	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	420	331min.
TS (MPa)	470	414min.
El on 4d (%)	31	22min.
IV -18℃ (J)	80	27min.

Approvals

ABS	3
LR	3m
DNV-GL	3
BV	3
NK	KMW3
CR	3

LB-26

FAMILIARC™

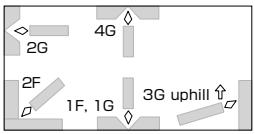
Stick electrode

Features: ▪ Low hydrogen type containing iron powder

Classification: AWS A5.1 E7016

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

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	20	170W, 110H, 380L
3.2	350	5	20	34	170W, 115H, 380L
4.0	400	5	20	60	170W, 110H, 430L
5.0	450	5	20	106	170W, 110H, 480L
6.0	450	5	20	150	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.15
Si	0.50	0.75
Mn	1.01	1.60
P	0.013	0.035
S	0.003	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	0.01	0.08
Others [b]	1.05	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	100~140	90~130
4.0	140~190	120~180
5.0	190~250	160~210
6.0	260~320	-

All-weld mechanical properties

	Typical (AC)		Guaranty	
0.2%YS (MPa)	480	410	400min.	340min.
TS (MPa)	550	500	483min.	450min.
El on 4d (%)	33	34	22min.	25min.
IV -29℃ (J)	100	130	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Approvals

ABS	3, H15
LR	3Ym, H15
DNV	3Y, H10
BV	3, 3Y, H15
NK [a)]	KMW3, H15
CR	3, 3Y, H15

Note: [a)] AC

LB-52

FAMILIARC™

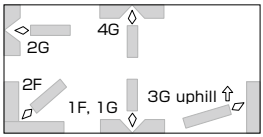
Stick electrode

Features:
- Suitable for butt and fillet welding of heavy structures
- Excellent mechanical properties

Classification: AWS A5.1 E7016

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

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	20	170W, 110H, 380L
3.2	350	5	20	31	170W, 110H, 380L
4.0	400	5	20	54	170W, 110H, 430L
5.0	450	5	20	97	170W, 110H, 480L
6.0	450	5	20	137	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.15
Si	0.60	0.75
Mn	0.94	1.60
P	0.011	0.035
S	0.006	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	0.01	0.08
Others [b]	0.98	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	150~200
6.0	250~310	-

All-weld mechanical properties

	Typical (AC)		Guaranty	
0.2%YS (MPa)	500	420	400min.	350min.
TS (MPa)	570	520	483min.	460min.
El on 4d (%)	32	33	22min.	25min.
IV -29℃ (J)	120	150	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Approvals

ABS	3H10, 3Y, 3Y400
LR	3Ym, H15
DNV-GL	3Y, H10
BV	3YH10
NK	KMW53Y40, H10
CR	3Y, H10

LB-52A

FAMILIARC™

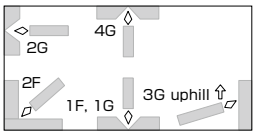
Stick electrode

Features: ▪ Better impact value

Classification: AWS A5.1 E7016

Redrying Conditions: 350~400℃x1h
Identification color: 1st Red, 2nd White
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 110H, 430L
5.0	450	5	20	96	170W, 105H, 480L
6.0	450	5	20	141	170W, 105H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.15
Si	0.57	0.75
Mn	1.06	1.60
P	0.012	0.035
S	0.005	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	<0.01	0.08
Others [b]	1.09	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	150~200
6.0	250~310	-

All-weld mechanical properties

	Typical (AC)		Guaranty	
0.2%YS (MPa)	500	430	400min.	370min.
TS (MPa)	580	530	483min.	480min.
El on 4d (%)	31	33	22min.	25min.
IV -29℃ (J)	120	150	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Approvals

NK	KMW53, H10

LB-52U

FAMILIARC™

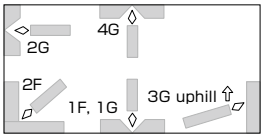
Stick electrode

Features:
- Suitable for one side welding of pipes
- Extremely good arc stability in one side welding with relatively low current

Classification: AWS A5.1 E7016

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

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	20	170W, 110H, 380L
3.2	400	5	20	35	170W, 110H, 430L
4.0	400	5	20	53	170W, 110H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.15
Si	0.64	0.75
Mn	0.86	1.60
P	0.012	0.035
S	0.008	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	0.01	0.08
Others [b]	0.90	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G	Root pass [c]
2.6	60~90	50~80	30~80
3.2	90~130	80~120	60~110
4.0	130~180	110~170	90~140
5.0	180~240	150~200	130~180

Note: [c] DCEN is also suitable.

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	480	400min.
TS (MPa)	560	483min.
El on 4d (%)	31	22min.
IV -29℃ (J)	80	27min.

Approvals

ABS	3Y, MG, H10
LR	3Ym, MG, H15
DNV-GL	3Y, H10
BV	3YH10
NK [a)]	KMW53, H10
CCS	3Y, H10
NAKS	AWS A5.1 E7016

Note: [a)] AC

LB-55U

FAMILIARC™

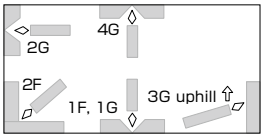
Stick electrode

Features:
- Suitable for one side welding of pipes
- Good arc stability in one side welding with relatively low current

Classification: AWS A5.5 E8016-G

Redrying Conditions: 350~400℃x1h
Identification color: -
Polarity: AC, DCEP, DCEN (Root Pass only)

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	20	170W, 110H, 380L
3.2	400	5	20	35	170W, 110H, 430L
4.0	400	5	20	53	170W, 110H, 430L

Composition (all-weld metal mass%)

	Typical (DCEP)	Guaranty [a]
C	0.06	0.15
Si	0.49	0.75
Mn	1.70	1.40~2.25
P	0.015	0.030
S	0.005	0.030

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G	Root pass [b]
2.6	60~90	50~80	30~80
3.2	90~130	80~120	60~110
4.0	130~180	110~170	90~140

Note: [b] DCEN is also suitable.

All-weld mechanical properties

	Typical (DCEP)	Guaranty
0.2%YS (MPa)	570	462min.
TS (MPa)	620	552min.
El on 4d (%)	31	19min.
IV -40℃ (J)	110	32min.

Approvals

ABS	3YQ460 H10, MG
LR	3Y46m, H10
DNV-GL	3Y46 H10, MG
BV	3Y46H10 UP

LB-57 FAMILIARC™

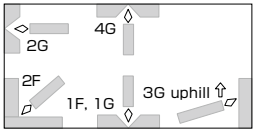
Stick electrode

Features: ▪ Suitable for butt and fillet welding of 520MPa high tensile steel

Classification: AWS A5.1 E7016

Redrying Conditions: 350~400℃x1h
Identification color: 1st Blue, 2nd Brown
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	20	170W, 125H, 380L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 110H, 430L
5.0	450	5	20	97	170W, 105H, 480L
6.0	450	5	20	138	170W, 105H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.15
Si	0.64	0.75
Mn	0.81	1.60
P	0.011	0.035
S	0.003	0.035
Ni	0.01	0.30
Cr	0.03	0.20
Mo	0.17	0.30
V	0.01	0.08
Others [b]	1.03	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	50~85	50~80
3.2	90~130	80~115
4.0	130~180	110~170
5.0	180~250	150~200
6.0	250~310	-

All-weld mechanical properties

	Typical (AC)		Guaranty	
0.2%YS (MPa)	530	470	400min.	400min.
TS (MPa)	610	540	483min.	500min.
El on 4d (%)	31	32	22min.	25min.
IV -29℃ (J)	100	130	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x10

LB-52-18

FAMILIARC™

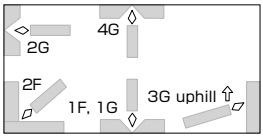
Stick electrode

Features:
- Suitable for butt and fillet welding of heavy structure
- Good performance by DCEP current

Classification: AWS A5.1 E7018

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

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	24	170W, 105H, 380L
3.2	400	5	20	41	170W, 105H, 430L
4.0	450	5	20	69	170W, 105H, 480L
5.0	450	5	20	106	170W, 105H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.15
Si	0.59	0.75
Mn	0.97	1.60
P	0.013	0.035
S	0.007	0.035
Ni	0.02	0.30
Cr	0.03	0.20
Mo	<0.01	0.30
V	0.01	0.08
Others [b]	1.03	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	65~95	60~90
3.2	90~130	80~120
4.0	130~190	110~170
5.0	190~250	165~210

All-weld mechanical properties

	Typical (AC)		Guaranty	
0.2%YS (MPa)	500	420	400min.	350min.
TS (MPa)	560	520	483min.	460min.
El on 4d (%)	31	32	22min.	25min.
IV -29℃ (J)	110	140	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Approvals

ABS	3Y, H10
LR	3Ym, H15
DNV-GL	3Y, H10
NK	KMW53, H10

LT-B52A

FAMILIARC™

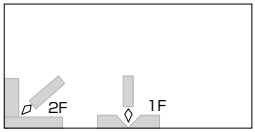
Stick electrode

Features:
- Suitable for flat and horizontal fillet welding
- Iron powder low hydrogen type

Classification: AWS A5.1 E7018

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

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
6.0	550	5	20	210	170W, 75H, 580L
6.4	700	10	20	295	170W, 65H, 730L
8.0	450, 550, 700	5, 10	20	268, 327, 416	170W, 80~115H, 480~730L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.11	0.15
Si	0.40	0.75
Mn	1.12	1.60
P	0.014	0.035
S	0.004	0.035
Ni	0.02	0.30
Cr	0.03	0.20
Mo	<0.01	0.30
V	0.01	0.08
Others [b]	1.18	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 2F
6.0	250~300
6.4	270~320
8.0	350~400

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	480	400min.
TS (MPa)	550	483min.
El on 4d (%)	30	22min.
IV -29℃ (J)	74	27min.

Approvals

ABS	3, 3Y, H10
LR	3Ym, 3YG, H15
DNV-GL	3Y, H15
BV	3, 3Y, H10
NK [a)]	KMW53, H10

Note: [a)] AC

LB-52T

FAMILIARC™

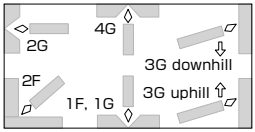
Stick electrode

Features: ▪ Low hydrogen type for tack welding

Classification: AWS A5.1 E7048

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

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	36	170W, 115H, 380L
4.0	400	5	20	60	170W, 105H, 430L
5.0	450	5	20	96	170W, 105H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.15
Si	0.47	0.90
Mn	1.04	1.60
P	0.012	0.035
S	0.002	0.035
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	<0.01	0.08
Others [b]	1.07	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	All position (1F, 1G, 2F, 2G, 3G uphill, 4G) & 3G downhill
3.2	110~160
4.0	160~220
5.0	200~260

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	450	400min.
TS (MPa)	540	483min.
El on 4d (%)	32	22min.
IV -29℃ (J)	110	27min.
PWHT	AW	AW

Approvals

ABS	3, 3Y, 3Y400, H10
LR	3Ym, H15
DNV-GL	3Y, H10
BV	3, 3Y, H10
NK	KMW53Y40, H10
CR [a)]	3, 3Y, H10

Note: [a)] AC

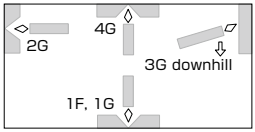
LB-78VS

FAMILIARC™

Stick electrode

Features:
- Suitable for butt welding of pipes
- Excellent usability in vertical downward welding
- Good mechanical properties

Welding Positions:



Classification: AWS A5.1 E7048

Redrying Conditions: 350~400℃x1h
Identification color: 1st Orange, 2nd Black
Polarity: AC, DCEP

Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	33	170W, 110H, 380L
4.0	400	5	20	56	170W, 110H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.15
Si	0.56	0.90
Mn	1.18	1.60
P	0.012	0.035
S	0.005	0.035
Ni	0.01	0.30
Cr	0.03	0.20
Mo	0.01	0.30
V	<0.01	0.08
Others [b]	1.23	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 1G, 2G	3G uphill, 4G	3G downhill
3.2	80~140	80~120	80~140
4.0	130~210	110~160	130~210

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	490	400min.
TS (MPa)	580	483min.
El on 4d (%)	30	22min.
IV -29℃ (J)	100	27min.

KOBE-7010S FAMILIARC™

Stick electrode

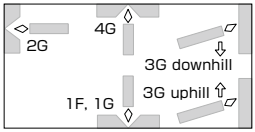
Features:
- Suitable for butt welding of pipes
- Excellent usability in vertical downward welding

Classification: AWS A5.5 E7010-P1

Identification color: 1st Brown, 2nd Black

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.4	300	2	20	13	300W, 100H, 330L
3.2	350	5	20	27	175W, 115H, 380L
4.0	350	5	20	40	175W, 115H, 380L
4.8	350	5	20	58	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.14	0.20
Si	0.10	0.60
Mn	1.01	1.20
P	0.01	0.03
S	0.01	0.03
Ni	0.01	1.00
Cr	0.02	0.30
Mo	<0.01	0.50
V	<0.01	0.10

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2G	3G uphill, 4G	3G downhill
2.4	40~70	40~70	40~70
3.2	60~120	60~120	70~120
4.0	90~170	80~160	100~170
4.8	130~210	120~200	150~210

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	470	414min.
TS (MPa)	570	483min.
El on 4d (%)	30	22min.
IV -29℃ (J)	61	27min.

KOBE-8010S FAMILIARC™

Stick electrode

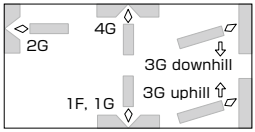
Features:
- Suitable for butt welding of pipes
- Excellent usability in vertical downward welding

Classification: AWS A5.5 E8010-P1

Identification color: 1st Blue white

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	26	175W, 115H, 380L
4.0	350	5	20	40	175W, 115H, 380L
4.8	350	5	20	58	175W, 115H, 380L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.15	0.20
Si	0.12	0.60
Mn	1.05	1.20
P	0.01	0.03
S	0.01	0.03
Ni	0.01	1.00
Cr	0.03	0.30
Mo	0.27	0.50
V	<0.01	0.10

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2G	3G uphill, 4G	3G downhill
3.2	60~120	70~120	60~120
4.0	90~170	100~170	80~160
4.8	130~210	150~210	120~200

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	520	462min.
TS (MPa)	620	552min.
El on 4d (%)	28	19min.
IV -29℃ (J)	54	27min.

LB-8018

FAMILIARC™

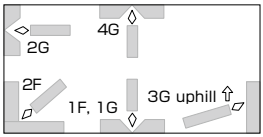
Stick electrode

Features:
- Suitable for butt and fillet welding of heavy structure
- Good performance by DCEP current

Classification: AWS A5.5 E8018-G

Redrying Conditions: 350~400℃x1h
Identification color: -
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	24	170W, 105H, 380L
3.2	400	5	20	41	170W, 105H, 430L
4.0	450	5	20	69	170W, 105H, 480L

Composition (all-weld metal mass%)

	Typical (DCEP)	Guaranty [a]
C	0.07	0.15
Si	0.34	0.75
Mn	1.74	1.40~2.25
P	0.012	0.030
S	0.007	0.030

Note: [a] Single values are maximum.

Welding parameters (A)

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

All-weld mechanical properties

	Typical (DCEP)	Guaranty
0.2%YS (MPa)	540	462min.
TS (MPa)	615	552min.
El on 4d (%)	30	19min.
IV -40℃ (J)	150	32min.

Approvals

ABS	3YQ460 H10, MG
LR	3Y46m, H10
DNV-GL	3Y46 H10, MG
BV	3Y46H10 UP

LB-76

FAMILIARC™

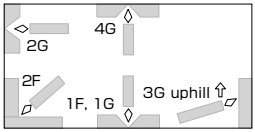
Stick electrode

Features: ▪ Suitable for butt and fillet welding of 520MPa high tensile steel

Classification: AWS A5.5 E7016-G

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

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	33	170W, 120H, 380L
4.0	400	5	20	58	170W, 110H, 430L
5.0	450	5	20	102	170W, 110H, 480L
6.0	450	5	20	145	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.08	0.05~0.10
Si	0.58	0.30~0.75
Mn	1.30	1.00~1.50
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.30
Cr	0.03	0.20
Mo	<0.01	0.30
V	0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~120
4.0	140~190	120~180
5.0	190~250	-
6.0	250~320	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	510	393min.
TS (MPa)	600	483min.
El on 4d (%)	29	25min.
IV -29℃ (J)	110	-

LB-88VS

FAMILIARC™

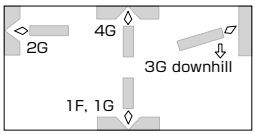
Stick electrode

Features:
- Suitable for butt welding of pipes
- Excellent usability in vertical downward welding
- Good mechanical properties

Classification: AWS A5.5 E8018-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Yellowish green, 2nd Yellowish green
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 110H, 380L
4.0	400	5	20	56	170W, 110H, 430L
4.5	400	5	20	68	170W, 110H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.05~0.10
Si	0.55	0.30~0.75
Mn	1.20	1.00~1.40
P	0.01	0.03
S	0.01	0.03
Ni	0.53	0.40~0.80
Mo	0.07	0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2G	4G	3G downhill
3.2	80~140	80~120	80~140
4.0	130~200	110~160	130~200
4.5	160~250	130~190	160~250

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	510	462min.
TS (MPa)	620	552min.
El on 4d (%)	30	19min.
IV -18℃ (J)	120	-

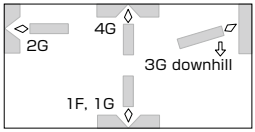
LB-98VS

FAMILIARC™

Stick electrode

Features:
- Suitable for butt welding of pipes
- Excellent usability in vertical downward welding
- Good mechanical properties

Welding Positions:



Classification: AWS A5.5 E9018-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Blue, 2nd Silver
Polarity: AC, DCEP

Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 110H, 380L
4.0	400	5	20	56	170W, 110H, 430L
4.5	400	5	20	67	170W, 110H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.05~0.10
Si	0.61	0.30~0.75
Mn	1.27	1.00~1.50
P	0.01	0.03
S	<0.01	0.03
Ni	1.17	0.90~1.40
Mo	0.18	0.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2G	4G	3G downhill
3.2	80~140	80~120	80~140
4.0	130~200	110~160	130~200
4.5	160~250	130~190	160~250

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	560	531min.
TS (MPa)	660	621min.
El on 4d (%)	30	17min.
IV -18℃ (J)	130	-

LT-B50

TRUSTARC™

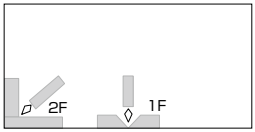
Stick electrode

Features:
- Suitable for flat and horizontal fillet welding
- Lime titania type

Classification: AWS -

Redrying Conditions: 70~100℃x0.5~1h
Identification color: 1st Purple, 2nd Orange
Polarity: AC, DCEP, DCEN

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
4.0	450	5	20	76	170W, 90H, 480L
4.5	550, 700	5	20	138, 175	170W, 60~75H, 580~730L
5.0	450, 550, 700	5, 10	20	130, 159, 203	170W, 60~95H, 480~730L
5.5	450, 550, 700	5, 10	20	153, 187, 239	170W, 65~95H, 480~730L
6.0	450, 550, 700	5, 10	20	176, 215, 273	170W, 65~95H, 480~730L
6.4	450, 550, 700	5, 10	20	189, 231, 294	170W, 60~95H, 480~730L
7.0	700	10	20	350	170W, 60H, 730L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.13
Si	0.39	0.10~0.70
Mn	0.94	0.60~1.25
P	0.017	0.030
S	0.009	0.025
Ni	0.01	0.30
Cr	0.02	0.20
Mo	<0.01	0.30
V	0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 2F
4.0	135~195
4.5	170~220
5.0	200~240
5.5	230~280
6.0	260~310
6.4	280~330
7.0	300~350

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	480	390min.
TS (MPa)	530	490min.
El on 4d (%)	29	16min.
IV 0℃ (J)	74	47min.

Approvals

ABS	3, 3Y
LR	3Ym, 3YG
DNV-GL	3Y, MG
BV	3Y
NK	KMW53
CR	3Y

MX-100T

FAMILIARC™

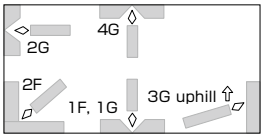
Flux cored wire

Features:
- Suitable for thin plates (e.g., 0.8mm)
- Excellent arc stability in low current range (50~180A) for short circuiting welding

Classification: AWS A5.18 E70C-6C/6M

Shielding gas: CO_2 or Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum
1.2	20kg	250kg
1.4	20kg	250kg
Volume mm	300W, 110H, 300L	530ϕ, 820H

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.08	0.12
Si	0.49	0.90
Mn	1.53	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.02	0.20
Mo	0.01	0.30
V	<0.01	0.08
Cu	0.02	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	50~300	50~180
1.4	80~400	70~180

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	480	400min.
TS (MPa)	560	490min.
El on 4d (%)	31	22min.
IV -29℃ (J)	62	27min.

Approvals

	CO_2	Ar-CO_2
ABS	3YSA, H5	-
LR	3YS, H5	
DNV-GL	ⅢYMS (H5)	
BV	SA3YM (H5)	
CR	3YS-HH	-

MX-A100

FAMILIARC™

Flux cored wire

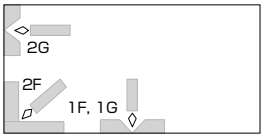
Features: ▪ Better arc stability and wider optimum current range for spray transfer arc with less spattering than solid wire

Classification: AWS A5.18 E70C-6M

Shielding gas: Ar-CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum	
1.2	15kg	20kg	200kg	-
1.4	15kg	20kg	-	250kg
1.6	15kg	20kg	-	250kg
Volume mm	300W, 110H, 300L		530ϕ, 820H	680ϕ, 770H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.74	0.90
Mn	1.58	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.02	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	<0.01	0.08
Cu	0.02	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G	2F, 2G
1.2	150~350	150~300
1.4	200~450	200~400
1.6	250~500	250~450

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	450	400min.
TS (MPa)	550	483min.
El on 4d (%)	33	22min.
IV -40℃ (J)	71	27min.

Approvals

ABS	4YSA, H5
LR	4YS, H5
DNV-GL	ⅣYMS, H5
BV	SA4YM, H5

DW-200

FAMILIARC™

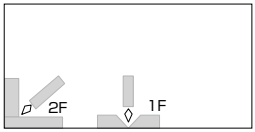
Flux cored wire

Features:
- Suitable for flat and horizontal fillet welding
- A large leg length of about 9mm in horizontal fillet

Classification: AWS A5.20 E70T-1C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum
1.2	12.5kg, 15kg, 20kg	-
1.4	12.5kg, 15kg, 20kg	200kg
Volume mm	300W, 110H, 300L	530ϕ, 820H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.51	0.90
Mn	1.50	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	0.01	0.08
Cu	0.01	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F	2F
1.2	200~320	200~300
1.4	230~400	230~360

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	490	400min.
TS (MPa)	560	490~655
El on 4d (%)	28	22min.
IV -18℃ (J)	60	27min.

Approvals

ABS	3YSA
LR	3YS, H10
DNV-GL	ⅢYMS
BV	SA3YM
NK	KSW53G (C)

MX-100

FAMILIARC™

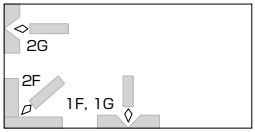
Flux cored wire

Features: ▪ Suitable for butt and fillet welding

Classification: AWS A5.20 E70T-1C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum
1.2	20kg	-
1.4	15kg, 20kg	250kg
1.6	20kg	-
2.0	20kg	-
Volume mm	300W, 110H, 300L	530ϕ, 820H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.68	0.90
Mn	1.48	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.02	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	<0.01	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G	2F, 2G
1.2	200~350	200~300
1.4	250~450	250~400
1.6	300~500	300~450
2.0	400~600	400~500

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	510	400min.
TS (MPa)	580	490~655
El on 4d (%)	30	22min.
IV -18℃ (J)	50	27min.

Approvals

ABS	2YSA
LR	2YS, H10
DNV-GL	ⅡYMS
BV	SA2YM
NK	KSW52G (C)
CR	2YS

MX-200 FAMILIARC™

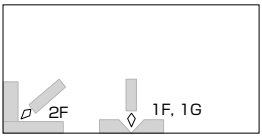
Flux cored wire

Features: ▪ Excellent porosity resistibility to inorganic zinc primer

Classification: AWS A5.20 E70T-1C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum	
1.2	15kg	20kg	250kg	-
1.4	15kg	20kg	250kg	-
1.6	-	20kg	-	350kg
Volume mm	300W, 110H, 300L		530ϕ, 820H	600ϕ, 770H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.50	0.90
Mn	1.50	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	0.01	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G	2F
1.2	150~300	180~300
1.4	170~400	200~350
1.6	200~450	270~400

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	530	400min.
TS (MPa)	590	490~655
El on 4d (%)	29	22min.
IV -18℃ (J)	55	27min.

Approvals

ABS	2YSA, 2Y400SA, H5
LR	2YS, 2YM, H5
DNV-GL	Ⅱ Y40MS, H5
BV	SA2Y40M, H5
NK	KSW52Y40G (C), H5
CR	2YSM, HH
KR	2YSG (C), H10
CCS	2YS, H5

MX-200H

FAMILIARC™

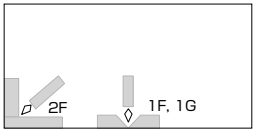
Flux cored wire

Features:
- Suitable for horizontal fillet welding by high speed tandem method (150cm/min)
- Excellent porosity resistibility to inorganic zinc primer

Classification: AWS A5.20 E70T-1C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Drum
1.4	200kg, 250kg
1.6	200kg, 250kg
Volume mm	530ϕ, 820H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.55	0.90
Mn	1.55	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.02	0.20
Mo	0.01	0.30
V	0.01	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F
1.4	200~450
1.6	250~500

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	500	400min.
TS (MPa)	600	490~655
El on 4d (%)	27	22min.
IV -18℃ (J)	90	27min.

Approvals

	Single	Tandem
ABS	3Y400SA, H5	3Y400A, H5
LR	3YS, H5	3YM, H5
DNV-GL	Ⅲ YS	Ⅲ YM
BV	SA3Y40M, H5	A3Y40M
NK	KSW53Y40G (C)	KAW53Y40G (C)
CCS	-	3YM

MX-200E FAMILIARC™

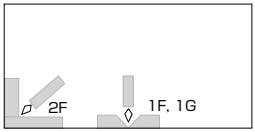
Flux cored wire

Features:
- Excellent porosity resistibility to inorganic zinc primer
- Excellent impact value at low temperatures down to -29℃

Classification: AWS A5.20 E70T-9C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	15kg, 20kg
Volume mm	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.12
Si	0.51	0.90
Mn	1.48	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	0.01	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G	2F
1.2	150~300	180~300

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	540	400min.
TS (MPa)	600	490~655
El on 4d (%)	30	22min.
IV -29℃ (J)	70	27min.

Approvals

ABS	4Y400SA, H5
LR	4Y40S, H5
DNV-GL	ⅣY40MS, H5
BV	SA4Y40M, H5
NK	KSW54Y40G (C), H5

MX-A200

FAMILIARC™

Flux cored wire

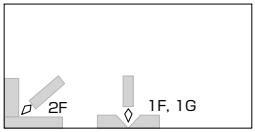
Features:
- Suitable for flat and horizontal fillet welding
- Excellent porosity resistibility to inorganic zinc primer

Classification: AWS A5.20 E70T-1M

Shielding gas: Ar-CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum
1.1	-	250kg
1.2	15kg	-
1.3	20kg	-
Volume mm	300W, 110H, 300L	530ϕ, 820H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.56	0.90
Mn	1.52	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.02	0.20
Mo	0.01	0.30
V	0.01	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G	2F
1.1	150~300	180~300
1.2	150~300	180~300
1.3	170~400	200~350

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	520	400min.
TS (MPa)	590	490~655
El on 4d (%)	29	22min.
IV -18℃ (J)	67	27min.

Approvals

ABS	3YSA, H5
LR	3YS, H5
DNV-GL	ⅢYMS, H5

DW-50 FAMILIARC™

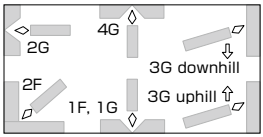
Flux cored wire

Features: ▪ Excellent usability with soft and stable arc, less fume and spattering, good bead appearance and smooth slag removal

Classification: AWS A5.20 E71T-1C/1M, -9C/9M

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

Welding Positions:



Packaging data

ϕ mm	Spool			Drum
1.2	5kg	15kg	20kg	250kg
1.6	-	15kg	20kg	250kg
Volume mm	220W, 130H, 435L/4pcs	300W, 110H, 300L		530ϕ, 820H

Composition (all-weld metal mass%)

	Typical (CO_2)	Guaranty [a]
C	0.04	0.12
Si	0.67	0.90
Mn	1.29	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	0.02	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G	3G downhill
1.2	120~250	120~250	200~250
1.6	180~340	180~280	250~300

All-weld mechanical properties

	Typical (CO_2)	Guaranty
0.2%YS (MPa)	510	400min.
TS (MPa)	582	490~655
El on 4d (%)	27	22min.
IV -29℃ (J)	71	27min.

Approvals

ABS	3YSA, H5
LR	3YS, H5
DNV-GL	ⅢYMS (H5)
NK [c]	KSW53G (C), H5
CWB	E491T-9C-H8, E491T-9M-H8

Note: [c] CO_2

DW-100

FAMILIARC™

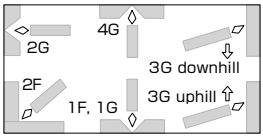
Flux cored wire

Features: ▪ Soft and stable arc, less fume and spattering, smooth bead appearance, and good slag removal

Classification: AWS A5.20 E71T-1C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool			Drum	
1.2	12.5kg	15kg	20kg	250kg	-
1.4	-	15kg	20kg	250kg	350kg
1.6	-	15kg	20kg	-	350kg
Volume mm	300W, 110H, 300L			530ϕ, 820H	680ϕ, 770H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.45	0.90
Mn	1.35	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.02	0.20
Mo	0.01	0.30
V	0.01	0.80
Cu	0.02	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	510	400min.
TS (MPa)	570	490~655
El on 4d (%)	30	22min.
IV -18℃ (J)	85	27min.

Approvals

ABS	2YSA, 2Y400SA, H10
LR	2YS, 2YM, H10
DNV-GL	ⅡYMS, ⅡY40MS,H10
BV	SA2M, SA2YM, SA2Y40M H10
NK	KSW52Y40G (C) H10
CR	2YS-HH
KR	2YSG (C)
CCS	2SH10, 2YSH10

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G	3G downhill
1.2	120~300	120~280	120~260	200~300
1.4	160~350	160~320	160~270	220~300
1.6	200~400	200~350	200~280	250~300

DW-100V

FAMILIARC™

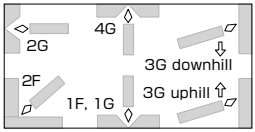
Flux cored wire

Features:
- Suitable for welding in all positions including vertical downward
- Excellent performance especially in vertical upward

Classification: AWS A5.20 E71T-1C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum
1.2	12.5kg, 15kg, 20kg	250kg
1.4	12.5kg, 15kg, 20kg	-
Volume mm	300W, 110H, 300L	530ϕ, 820H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.55	0.90
Mn	1.28	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.02	0.20
Mo	0.01	0.30
V	0.02	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	490	400min.
TS (MPa)	580	490~655
El on 4d (%)	30	22min.
IV -18℃ (J)	50	27min.

Approvals

ABS	2YSA, 2Y400SA, H10
LR	2YS, 2YM, H10
DNV-GL	ⅡYMS
BV	SA2Y40M
NK	KSW52Y40G (C)
CCS	2YS, H10

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G	3G downhill
1.2	120~300	120~280	120~300	200~300
1.4	160~350	220~320	150~300	220~300

DW-100E

FAMILIARC™

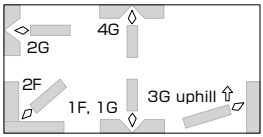
Flux cored wire

Features: ▪ Excellent impact value at low temperatures down to -29℃

Classification: AWS A5.20 E71T-9C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	12.5kg	15kg
1.4	-	15kg
Volume mm	300W, 110H, 300L	

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.38	0.90
Mn	1.44	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.38	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	0.02	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	510	400min.
TS (MPa)	570	483~655
El on 4d (%)	29	22min.
IV -29℃ (J)	100	27min.

Approvals

ABS	3YSA, 3Y400SA, H10
LR	3YS, H10, 3YM, H10
DNV-GL	Ⅲ YMS
BV	SA3, 3YM
NK	KSW53G (C)
CR	3YS
CCS	3YS, H10

Welding parameters (A)

ϕ mm	1F, 1G	2F	2G	3G uphill, 4G
1.2	120~300	120~300	120~280	120~250
1.4	150~400	150~350	150~320	150~250

DW-A50

FAMILIARC™

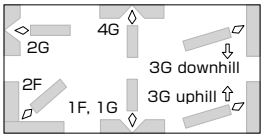
Flux cored wire

Features: ▪ Excellent usability with soft and stable arc, less fume and spattering, good bead appearance and smooth slag removal

Classification: AWS A5.20 E71T-1M

Shielding gas: Ar-CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	15kg	20kg
1.6	15kg	-
Volume mm	300W, 110H, 300L	

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.48	0.90
Mn	1.16	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.01	0.50
Cr	0.02	0.20
Mo	0.01	0.30
V	0.01	0.08
Cu	0.01	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	510	400min.
TS (MPa)	570	490~655
El on 4d (%)	30	22min.
IV -18℃ (J)	110	27min.

Approvals

ABS	3YSA, H5
LR	3YS, H5
DNV-GL	ⅢYMS, MG, H5
BV	SA3YM H5
NK	KSW52G (M2), H5

Welding parameters (A)

ϕ mm	1F, 1G	2F	2G	3G uphill, 4G	3G downhill
1.2	120~300	120~300	120~280	120~260	200~300
1.6	180~450	180~400	180~350	180~280	250~300

DW-A51B

FAMILIARC™

Flux cored wire

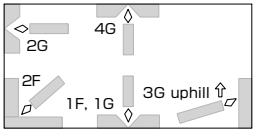
Features: ▪ Suitable for butt and fillet welding in all positions

Classification: AWS A5.20 E71T-5M-J

Shielding gas: Ar-CO_2

Polarity: DCEN

Welding Positions:



Packaging data

ϕ mm	Spool	Drum
1.2	12.5kg, 15kg, 20kg	200kg
Volume mm	300W, 110H, 300L	530ϕ, 820H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.45	0.90
Mn	1.40	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.02	0.50
Cr	0.03	0.20
Mo	0.02	0.30
V	<0.01	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	150~300	150~200

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	480	400min.
TS (MPa)	570	483~655
El on 4d (%)	30	22min.
IV -40℃ (J)	95	27min.

MIX-50 FAMILIARC™

Solid wire

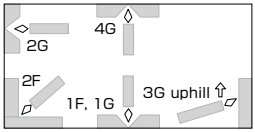
Features:
- Suitable for butt and fillet welding in all positions
- Suitable for lower currents

Classification: AWS A5.18 ER70S-3

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum	
0.9	10kg	20kg	250kg	-
1.0	10kg	20kg	250kg	-
1.2	-	20kg	-	300kg
Volume mm	240W, 110H, 240L	300W, 110H, 300L	530ϕ, 820H	

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.06~0.15
Si	0.55	0.45~0.75
Mn	1.11	0.90~1.40
P	0.012	0.025
S	0.011	0.035
Cu	0.24	0.50
Ni	0.01	0.15
Cr	0.03	0.15
Mo	<0.01	0.15
V	<0.01	0.03

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	440	400min.
TS (MPa)	540	483min.
El on 4d (%)	32	22min.
IV -18℃ (J)	170	27min.
PWHT	AW	AW

Approvals

ABS	3YSA
NK	KSW53G (M2)

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
0.9	50~200	50~180	50~140	50~120
1.0	50~220	50~200	50~140	50~120
1.2	80~350	80~300	50~160	50~140

MG-51T

FAMILIARC™

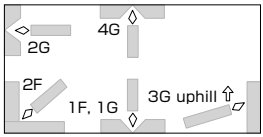
Solid wire

Features:
- Higher currents can be applied in vertical and overhead positions
- Suitable for pipe welding in all positions

Classification: AWS A5.18 ER70S-6

Shielding gas: CO_2, Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	Drum	
0.9	20kg	-	-
1.0	20kg	250kg	-
1.2	20kg	-	300kg
Volume mm	300W, 110H, 300L	530ϕ, 820H	

Composition (wire mass%)

	Typical (CO_2)	Guaranty [a]
C	0.10	0.06~0.15
Si	0.88	0.80~1.15
Mn	1.56	1.40~1.85
P	0.011	0.025
S	0.012	0.035
Ni	0.01	0.15
Cr	0.02	0.15
Mo	<0.01	0.15
Cu	0.24	0.50
V	<0.01	0.03

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	470	520	400min.
TS (MPa)	560	600	483min.
El on 4d. (%)	32	31	22min.
IV -29℃ (J)	70	90	27min.
SG	CO_2	Ar-20%CO_2	CO_2

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
0.9	50~200	50~180	50~140	50~120
1.0	50~220	50~200	50~140	50~120
1.2	80~350	80~300	50~160	50~140

MG-50 FAMILIARC™

Solid wire

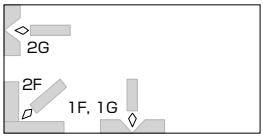
Features: ▪ Higher currents are recommended

Classification: AWS A5.18 ER70S-G

Shielding gas: CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool			Drum		
1.0	-	-	20kg	-	-	-
1.2	10kg	15kg	20kg	-	300kg	-
1.4	-	15kg	20kg	250kg	-	400kg
1.6	-	-	20kg	-	-	400kg
Volume mm	240W, 110H, 240L	300W, 110H, 300L		530ϕ, 820H		680ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.02~0.15
Si	0.73	0.55~1.10
Mn	1.58	1.40~1.90
P	0.010	0.030
S	0.010	0.030
Cu	0.23	0.50
Ti+Zr	0.22	0.02~0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.0	50~220	50~200
1.2	100~350	100~300
1.4	150~450	150~350
1.6	200~550	200~400

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	490	420	400min.
TS (MPa)	570	530	483min.
El on 4d (%)	30	34	22min.
IV -18℃ (J)	100	110	0℃: 47min.
PWHT (℃xh)	AW	625x1	AW

Approvals

	CO_2	Ar-CO_2
ABS	3YSA	3SA, 3YSA
LR	3YS, H15	
DNV-GL	ⅢYMS	
BV	SA3M, SA3YM	SA3YM
NK	KSW53G (C)	KSW53G (M2)
CR	3YS	-
KR	3YSG (C)	-
CCS	3Y	-

MG-S50 FAMILIARC™

Solid wire

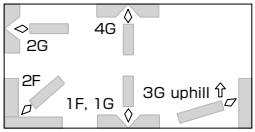
Features: ▪ Suitable for butt and fillet welding in all positions

Classification: AWS A5.18 ER70S-G

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

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum		
0.8	10kg	-	-	-	-
0.9	10kg	20kg	-	-	-
1.0	10kg	20kg	100kg	-	-
1.2	10kg	20kg	-	250kg	-
1.4	-	20kg	-	-	-
1.6	10kg	20kg	-	-	400kg
Volume mm	240W, 110H, 240L	300W, 110H, 300L	530ϕ, 820H		680ϕ, 770H

Composition (wire mass%)

	Typical (Ar-20%CO_2)	Guaranty [a]
C	0.10	0.02~0.15
Si	0.75	0.40~1.00
Mn	1.38	0.90~1.60
P	0.011	0.030
S	0.012	0.030
Cu	0.24	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
0.8	50~180	50~180	50~140	50~120
0.9	50~200	50~180	50~140	50~120
1.0	50~220	50~200	50~140	50~120
1.2	80~300	80~300	50~160	50~140
1.4	150~400	150~350	-	-
1.6	200~450	200~400	-	-

All-weld mechanical properties

	Typical		Typical		Guaranty
0.2%YS (MPa)	450	370	490	400	400min.
TS (MPa)	570	520	590	540	483min.
El on 4d (%)	28	32	33	33	22min.
IV -29℃ (J)	180	190	180	200	27min.
PWHT (℃xh)	AW	620x1	AW	620x1	AW
SG	Ar-20%CO_2		Ar-2%O_2		Ar-20%CO_2 & Ar-2%O_2

Approvals

ABS	3YSA
LR	3YS
DNV-GL	ⅢYMS

MIX-50S FAMILIARC™

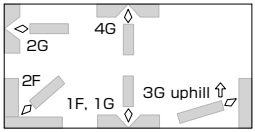
Solid wire

Features:
- Suitable for butt and fillet welding in all positions
- Suitable for higher currents

Classification: AWS A5.18 ER70S-G

Shielding gas: Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.02~0.15
Si	0.57	0.40~1.00
Mn	1.17	1.00~1.60
P	0.009	0.030
S	0.011	0.030
Cu	0.24	0.50
Ti+Zr	0.07	0.02~0.15

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	470	400min.
TS (MPa)	550	483min
El on 4d (%)	32	22min.
IV -18℃ (J)	170	27min.
PWHT	AW	AW

Approvals

ABS	3YSA
LR	3YS, H15
DNV-GL	ⅢYMS
BV	SA3YM
NK	KSW53G (M2)

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
0.9	50~200	50~180	50~140	50~120
1.0	50~220	50~200	50~140	50~120
1.2	80~350	80~300	50~160	50~140
1.4	150~400	150~350	-	-
1.6	200~450	200~400	-	-

SE-A50 FAMILIARC™

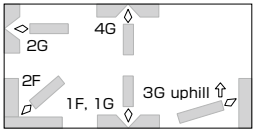
Solid wire

Features:
- Smooth wire feeding, Smooth arc start and stable arc with little spatter generation
- The special surface treatment that eliminates the need for Cu coating

Classification: AWS A5.18 ER70S-G

Shielding gas: Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum			
0.9	10kg	20kg	-	250kg	-	-
1.0	10kg	20kg	-	250kg	-	-
1.2	10kg	20kg	100kg	-	300kg	400kg
Volume mm	240W, 110H, 240L	300W, 110H, 300L	530ϕ, 820H			680ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.05	0.02~0.15
Si	0.89	0.40~1.00
Mn	1.40	0.90~1.60
P	0.010	0.030
S	0.015	0.030
Cu	0.01	0.50
Ni	0.01	0.15
Cr	0.02	0.15
Mo	<0.01	0.15
V	<0.01	0.03

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G	3G uphill, 4G
0.9	50~220	50~150
1.0	50~250	50~160
1.2	80~300	50~180

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	460	400min.
TS (MPa)	559	490min.
El on 4d (%)	30	22min.
IV -20℃ (J)	120	27min.

Approvals

NK	KSW53G (M2)

MG-50T FAMILIARC™

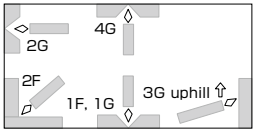
Solid wire

Features:
- Suitable for butt and fillet welding in all positions
- Suitable for lower currents

Classification: AWS -

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum	
0.9	10kg	20kg	250kg	-
1.0	10kg	20kg	250kg	-
1.2	10kg	20kg	-	300kg
Volume mm	240W, 110H, 240L	300W, 110H, 300L	530ϕ, 820H	

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.05	0.02~0.15
Si	0.75	0.50~1.00
Mn	1.34	1.25~2.00
P	0.010	0.030
S	0.013	0.030
Cu	0.24	0.50

Note: [a] Single values are maximum.

Approvals

	CO_2	Ar-CO_2
ABS	3YSA	
LR	3YS, H15	
DNV-GL	ⅢYMS	
BV	SA3M, SA3YM	
NK	KSW53G (C) KWS53Y40G (C)	KSW53G (M2)
CR	3YS	
KR	3YSG (C)	-

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	460	360	390min.
TS (MPa)	540	490	490~600
El on 4d (%)	31	34	18min. (5d)
IV -18℃ (J)	100	110	0℃: 27min.
PWHT (℃xh)	AW	625x2	AW

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill	4G
0.9	50~200	50~180	50~140	50~120
1.0	50~220	50~200	50~140	50~120
1.2	80~350	80~300	50~160	50~140

MIX-1TS

FAMILIARC™

Solid wire

Features: ▪ Pulsed MAG with MIX-1TS offers better bead appearance on a galvanized steel plate

Classification: AWS -

Shielding gas: Ar-20%CO_2

Polarity: DCEP (Pulse MAG)

Packaging data

ϕ mm	Spool	Drum
1.2	20kg	300kg
Volume mm	300W, 110H, 300L	680ϕ, 770H

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.05	0.02~0.15
Si	0.77	0.40~1.00
Mn	1.24	0.90~1.60
P	0.011	0.030
S	0.004	0.030
Cu	0.24	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	Pulse MAG
1.2	100~280

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	440	390min.
TS (MPa)	540	490~670
El on 4d (%)	30	18min.
IV -20℃ (J)	150	27min.

N065G FAMILIARC™

TIG welding rod and wire

Features: ▪ Suitable for root pass welding of pipes

Classification: AWS A5.18 ER70S-2

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

Packaging data

	Spool		Tube		
ϕ mm	**kg**		**kg**	**Length mm**	**g/piece**
0.9	10	-	-	-	-
1.0	10	-	-	-	-
1.2	-	-	5	1,000	9
1.6	-	20	5	1,000	16
2.0	-	-	5	1,000	25
2.4	-	-	5	1,000	35
3.2	-	-	5	1,000	63
Volume mm	240W, 110H, 230L	280W, 110H, 270L	40W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.07
Si	0.54	0.40~0.70
Mn	1.25	0.90~1.40
P	0.007	0.025
S	0.014	0.035
Ni	0.04	0.15
Cr	0.05	0.15
Mo	0.01	0.15
Cu	0.16	0.50
V	<0.01	0.03
Al	0.07	0.05~0.15
Ti	0.08	0.05~0.15
Zr	0.05	0.02~0.12

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	560	520	400min.
TS (MPa)	620	600	483min.
El on 4d (%)	28	30	22min.
IV -29℃ (J)	200	160	27min.
PWHT (℃xh)	AW	625x8	AW

TG-S70S2

FAMILIARC™

TIG welding rod and wire

Features: ▪ Suitable for root pass welding of pipes and general use

Classification: AWS A5.18 ER70S-2

Shielding Gas: Ar
Identification color: -
Polarity: DCEN

Packaging data

	Tube		
ϕ mm	**kg**	**Length mm**	**g/piece**
2.0	5	1,000	25
2.4	5	1,000	35
Volume mm	430W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.05	0.07
Si	0.45	0.40~0.70
Mn	1.01	0.90~1.40
P	0.010	0.025
S	0.004	0.035
Ni	0.01	0.15
Cr	0.06	0.15
Mo	0.01	0.15
V	0.01	0.03
Cu	0.13	0.50
Ti	0.09	0.05~0.15
Zr	0.07	0.02~0.12
Al	0.10	0.05~0.15

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	582	400min.
TS (MPa)	636	483min.
El on 4d (%)	29	22min.
IV -30℃ (J)	213	27min.

TG-S70S3

FAMILIARC™

TIG welding rod and wire

Features: ▪ Suitable for root pass welding of pipes and general use

Classification: AWS A5.18 ER70S-3

Shielding Gas: Ar
Identification color: -
Polarity: DCEN

Packaging data

	Tube		
ϕ mm	**kg**	**Length mm**	**g/piece**
2.0	5	1,000	25
2.4	5	1,000	35
Volume mm	430W, 35H, 1015L		

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.06~0.15
Si	0.56	0.45~0.75
Mn	1.12	0.90~1.40
P	0.008	0.025
S	0.016	0.035
Ni	0.01	0.15
Cr	0.02	0.15
Mo	0.01	0.15
V	0.01	0.03
Cu	0.14	0.50

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	476	400min.
TS (MPa)	560	483min.
El on 4d (%)	35	22min.
IV -20℃ (J)	240	27min.

TG-S51T

FAMILIARC™

TIG welding rod and wire

Features: ▪ Its tensile strength after long time PWHT is high enough for 490MPa

Classification: AWS A5.18 ER70S-6

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

Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.06~0.15
Si	0.86	0.80~1.15
Mn	1.56	1.40~1.85
P	0.012	0.025
S	0.012	0.035
Ni	0.01	0.15
Cr	0.02	0.15
Mo	<0.01	0.15
Cu	0.24	0.50
V	<0.01	0.03
Al	<0.01	-
Ti	<0.01	-
Zr	<0.01	-

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	510	420	400min.
TS (MPa)	610	550	483min.
El on 4d (%)	32	35	22min.
IV -29℃ (J)	210	160	27min.
PWHT (℃xh)	AW	625x24	AW

Approvals

ABS	3Y
LR	3Ym
DNV-GL	ⅢYM

TG-S50 FAMILIARC™

TIG welding rod and wire

Features:
- Good impact value at low temperatures
- Most widely used in Japan

Classification: AWS A5.18 ER70S-G

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

Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.02~0.12
Si	0.74	0.40~0.95
Mn	1.40	1.00~1.50
P	0.011	0.025
S	0.012	0.025
Cu	0.24	0.50
Al	<0.01	0.15
Ti	<0.01	0.15
Zr	<0.01	0.12

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	480	380	400min.
TS (MPa)	580	500	483min.
El on 4d (%)	33	36	22min.
IV -29℃ (J)	180	230	27min.
PWHT (℃xh)	AW	625x8	AW

Approvals

ABS	3Y
LR	3Ym, H15
DNV-GL	ⅢYM
BV	SA3YM
NK	KSW53G (I)
CCS	3, 3YSM

MF-53/US-36

SAW flux and wire combination

Features:
- Suitable for fillet welding
- Excellent bead appearance and slag removal

Classification: AWS A5.17 F7A0-EH14

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

Packaging data

Flux	Mesh	Can
MF-53	8x48	20kg
Volume mm		240W, 350H, 240L

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕmm) 600ϕ, 920H (3.2, 4.0ϕmm)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.05
Si	0.67
Mn	1.61
P	0.016
S	0.009

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	430	400min.
TS (MPa)	510	483~655
El on 4d (%)	29	22min.
IV -18℃ (J)	40	27min.

G-50/US-36

FAMILIARC™

SAW flux and wire combination

Features:
- Suitable for welding of thin plates at high speeds
- DCEP is better for sheet metal of 4mm or thinner

Classification: AWS A5.17 F7A2-EH14

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

Packaging data

Flux	Mesh	Can
G-50	8x48	25kg
Volume mm		240W, 350H, 240L

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕmm) 600ϕ, 920H (3.2, 4.0ϕmm)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.06
Si	0.44
Mn	1.83
P	0.012
S	0.004

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	440	400min.
TS (MPa)	540	483~655
El on 4d (%)	29	22min.
IV -29℃ (J)	40	27min.

G-60/US-36

FAMILIARC™

SAW flux and wire combination

Features: ▪ Suitable for welding of thin or medium plate at high speeds

Classification: AWS A5.17 F7A2-EH14

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

Packaging data

Flux	Mesh	Can
G-60	12x65	25kg
	12x150	25kg
Volume mm		240W, 350H, 240L

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕmm) 600ϕ, 920H (3.2, 4.0ϕmm)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	460	400min.
TS (MPa)	560	483~655
El on 4d (%)	27	22min.
IV -29℃ (J)	40	27min.

Composition (weld metal mass%)

	Typical
C	0.07
Si	0.34
Mn	1.70
P	0.017
S	0.004

G-80/US-36

FAMILIARC™

SAW flux and wire combination

Features:
- Suitable for welding of medium or heavy thick plate
- Good Mechanical properties in multi-pass welding

Classification: AWS A5.17 F7A2-EH14, F6P2-EH14

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

Packaging data

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

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕmm) 600ϕ, 920H (3.2, 4.0ϕmm)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.09
Si	0.46
Mn	1.41
P	0.018
S	0.011

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	410	360	400min.	330min.
TS (MPa)	520	500	483~655	410~550
El on 4d (%)	29	35	22min.	22min.
IV -29℃ (J)	43	82	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

PF-H55E/US-36

FAMILIARC™

SAW flux and wire combination

Features:
- Suitable for single-pass-on-both-sides or multi-layer butt welding
- Good bead appearance and excellent impact value

Classification: AWS A5.17 F7A4-EH14

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

Packaging data

Flux	Mesh	Can
PF-H55E	10x48	20kg
Volume mm		240W, 350H, 240L

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕmm) 600ϕ, 920H (3.2, 4.0ϕmm)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.09
Si	0.21
Mn	1.23
P	0.015
S	0.007

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	460	400min.
TS (MPa)	530	483~655
El on 4d (%)	32	22min.
IV -40℃ (J)	118	27min.

Approvals

	Single	Tandem
ABS	3TM, 3YTM, 3Y400TM	3YTM, 3Y400TM
LR	3T, 3YM, 3YT	
DNV-GL	ⅢYTM	
BV	A3YTM	A3, A3YT
NK	KAW53Y40TM	KAW53Y40M
CR	3M, 3YTM	-

MF-38/US-36 FAMILIARC™

SAW flux and wire combination

Features:
- Suitable for welding of medium or heavy thick plate
- Excellent mechanical properties

Classification: AWS A5.17 F7A6-EH14, F7P6-EH14

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

Packaging data

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

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕmm) 600ϕ, 920H (3.2, 4.0ϕmm)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.09
Si	0.32
Mn	1.63
P	0.018
S	0.011

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	490	420	400min.	400min.
TS (MPa)	570	530	483~655	483~655
El on 4d (%)	30	31	22min.	22min.
IV -51℃ (J)	59	64	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

MF-300/US-36

FAMILIARC™

SAW flux and wire combination

Features:
- Suitable for welding of medium or heavy thick plate
- Excellent slag removal and good mechanical properties

Classification: AWS A5.17 F7A6-EH14, F7P6-EH14

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

Packaging data

Flux	Mesh	Can
MF-300	20x200	25kg
	20xD	25kg
Volume mm		240W, 350H, 240L

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕmm) 600ϕ, 920H (3.2, 4.0ϕmm)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	470	410	400min.	400min.
TS (MPa)	570	520	483~655	483~655
El on 4d (%)	30	31	22min.	22min.
IV -51℃ (J)	90	82	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Composition (weld metal mass%)

	Typical
C	0.09
Si	0.23
Mn	1.62
P	0.014
S	0.007

Approvals

NK	KAW52T

AF-490E/US-29 FAMILIARC™

SAW flux and wire combination

Features:
- Suitable for single-pass-on-both-sides or multi-layer butt welding & fillet welding
- Good bead appearance and impact value

Classification: AWS A5.17 F7A2-EM12K, F6P4-EM12K
ISO 14174 S A AB 1
Type of flux: Sintered
Redrying of flux: 200~300℃x1h
Polarity: DCEP

Packaging data

Flux	Mesh	Bag
AF-490E	12x65	20kg
Volume mm		500W, 50H, 700L

Wire	ϕ mm	Spool		Coil	
US-29	1.6	10kg	20kg	-	-
	2.0	10kg	20kg	25kg	-
	2.4	10kg	20kg	25kg	-
	3.2	-	-	25kg	-
	4.0	-	-	25kg	75kg
	4.8	-	-	25kg	75kg
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.09	0.05~0.15
Si	0.22	0.10~0.35
Mn	1.04	0.80~1.25
P	0.012	0.030
S	0.006	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	410	350	400min.	330min.
TS (MPa)	500	460	483~655	410~550
El on 4d (%)	34	36	22min.	22min.
IV X ℃ (J)	-29℃:140	-40℃:150	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Composition (weld metal mass%)

	Typical
C	0.04
Si	0.29
Mn	1.28
P	0.024
S	0.005

Approvals

ABS	3Y
LR	3T, 3YM, 3YT
DNV-GL	ⅢYTM
BV	3TM, 3YTM

Note: Single electrode

AF-490SP/US-36

FAMILIARC™

SAW flux and wire combination

Features:
- Suitable for single-pass-on-both-sides or multi-layer butt welding & spiral welding
- Good bead appearance and slag removability
- Excellent impact value

Classification: AWS A5.17 F7A4-EH14, F7P4-EH14
ISO 14174 S A AR 1
Type of flux: Sintered
Redrying of flux: 200~300℃x1h
Polarity: DCEP

Packaging data

Flux	Mesh	Bag
AF-490SP	12x65	20kg
Volume mm		500W, 50H, 700L

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕ) 600ϕ, 920H (3.2, 4.0ϕ)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.05
Si	0.35
Mn	1.19
P	0.022
S	0.004

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	500	480	400min.	400min.
TS (MPa)	570	570	483~655	483~655
El on 4d (%)	30	35	22min.	22min.
IV -40℃ (J)	150	110	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

AF-490AS/US-36 FAMILIARC™

SAW flux and wire combination

Features:
- Suitable for multi-layer butt welding
- Good bead appearance and excellent impact value

Classification: AWS A5.17 F7A6-EH14, F7P6-EH14
ISO 14174 S A FB 1

Type of flux: Sintered

Redrying of flux: 200~300℃x1h

Polarity: DCEP

Packaging data

Flux	Mesh	Bag
AF-490AS	12x65	20kg
Volume mm		500W, 50H, 700L

Wire	ϕ mm	Spool		Coil			Drum
US-36	1.6	10kg	20kg	-	-	-	-
	2.0	10kg	20kg	-	-	-	-
	2.4	10kg	-	25kg	76kg	-	300kg
	3.2	-	-	25kg	76kg	-	300kg
	4.0	-	-	25kg	75kg	150kg	300kg
	4.8	-	-	25kg	75kg	150kg	-
	6.4	-	-	25kg	78kg	159kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L	680ϕ, 770H (2.4ϕ) 600ϕ, 920H (3.2, 4.0ϕ)

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.005	0.030
Cu	0.11	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	460	410	400min.	400min.
TS (MPa)	550	512	483~655	483~655
El on 4d (%)	32	36	22min.	22min.
IV -51℃ (J)	200	170	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Composition (weld metal mass%)

	Typical
C	0.06
Si	0.18
Mn	1.55
P	0.021
S	0.004

Approvals

ABS	4Y
LR	4YM
DNV-GL	ⅣYM
BV	4YM

Note: Single electrode

For Weather Proof Steel

Welding Consumables for

SMAW

FCAW

GMAW

SAW

A guide for selecting welding consumables

Table 1 shows suitable welding consumables for shielded metal arc welding (SMAW), flux cored arc welding (FCAW), gas metal arc welding (GMAW), and submerged arc welding (SAW) of weather proof steels.

Table 1 Welding consumables for weather proof steel

Steel grade	ASTM A709 Gr.36	ASTM A588 A709 Gr.50W A242
SMAW	**LB-W52B**	**LB-W588** **LB-W62G**
FCAW	**DW-50W**	**DW-588**
GMAW	**MG-W50TB**	-
SAW	**MF-38/US-W52B** **MF-53/US-W52B (2F)**	-

Note: 2F designate suitable welding position.

Tips for better welding results

In addition to the tips for mild steel and 490MPa high tensile strength steel, the following notes should be taken into consideration in welding weather proof steels.

(1) Remove rust and dirt from welding grooves to prevent pits and blowholes in the weld metal.

(2) Use an appropriate welding procedure taking into account the requirements for the mechanical properties of the weldment, because heat input, interpass temperature and plate thickness affect the cooling rate of welds and, where the cooling rate is excessively low, the tensile strength and notch toughness of the weld decrease.

(3) Use appropriate preheating according to the type of base metal and the thickness of the work to prevent cold cracking in the weld. Table 2 shows the minimum preheat temperatures used in general applications.

Table 2 Minimum preheat temperatures (℃) for general uses

Steel grade (See Table 1)	**Welding process**	**Plate thickness (mm)**		
		25 max	**Over 25 Up to 38**	**Over 38 Up to 50**
A709 Gr.36	SMAW	-	50	100
	FCAW, GMAW, SAW	-	-	50
A588 A709 Gr.50W A242	SMAW	50	100	100
	FCAW, GMAW, SAW	-	-	50

(4) For welding a high-phosphorous weather proof steel (e.g., A242), use lower welding currents and slower welding speeds to prevent hot cracking.

LB-W52

FAMILIARC™

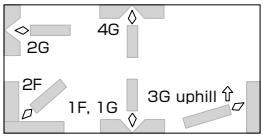
Stick electrode

Features: ▪ Suitable for weather proof steel

Classification: AWS A5.5 E7016-G

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

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	30	170W, 110H, 380L
4.0	400	5	20	55	170W, 105H, 430L
5.0	450	5	20	95	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.12
Si	0.53	0.90
Mn	0.86	0.30~1.40
P	0.01	0.03
S	<0.01	0.03
Ni	0.30	0.25~0.70
Cr	0.04	0.30
Cu	0.33	0.20~0.60

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	80~130	80~115
4.0	130~180	110~170
5.0	180~240	150~210

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	490	393min.
TS (MPa)	550	483min.
El on 4d (%)	31	22min.
IV -29℃ (J)	130	-

LB-W52B

FAMILIARC™

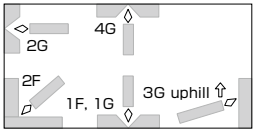
Stick electrode

Features: ▪ Suitable for weather proof steel

Classification: AWS A5.5 E7016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Green, 2nd Red
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	32	170W, 110H, 380L
4.0	400	5	20	55	170W, 105H, 430L
5.0	450	5	20	96	170W, 110H 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.12
Si	0.59	0.90
Mn	0.65	0.30~1.40
P	0.01	0.03
S	<0.01	0.03
Ni	0.22	0.05~0.45
Cr	0.61	0.45~0.75
Cu	0.32	0.30~0.70

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	150~210

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	480	393min.
TS (MPa)	570	483min.
El on 4d (%)	29	22min.
IV -29℃ (J)	140	-

DW-588

FAMILIARC™

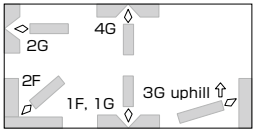
Flux cored wire

Features: ▪ Applicable for A588 steel

Classification: AWS A5.29 E81T1-W2C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		
1.2	12.5kg	15kg	20kg
Volume mm	300W, 110H, 300L		

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.03	0.12
Si	0.62	0.35~0.80
Mn	1.23	0.50~1.30
P	0.010	0.030
S	0.010	0.030
Ni	0.45	0.40~0.80
Cr	0.49	0.45~0.70
Cu	0.34	0.30~0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	120~280	120~260

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	550	469min.
TS (MPa)	620	552~689
El on 4d (%)	27	19min.
IV -29℃ (J)	60	27min.

DW-50W

FAMILIARC™

Flux cored wire

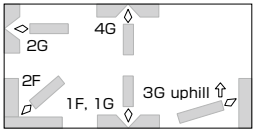
Features: ▪ Applicable for weather proof steel

Classification: AWS -

Shielding gas: CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool			Drum
1.2	12.5kg	15kg	20kg	250
Volume mm	300W, 110H, 300L			530ϕ, 820H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.12
Si	0.49	0.90
Mn	1.12	0.50~1.60
P	0.010	0.030
S	0.008	0.030
Ni	0.33	0.10~0.45
Cr	0.48	0.45~0.75
Cu	0.39	0.30~0.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	120~280	120~260

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	510	400min.
TS (MPa)	590	490~670
El on 4d (%)	27	20min.
IV 0℃ (J)	140	47min.

MG-W50TB FAMILIARC™

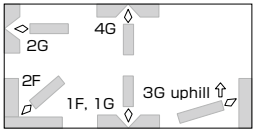
Solid wire

Features:
- Applicable for weatherproof steel
- Lower currents are suitable

Classification: AWS A5.28 ER80S-G

Shielding gas: CO_2, Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
0.9	-	20kg
1.0	10kg	-
1.2	10kg	20kg
Volume mm	240W, 110H, 240L	300W, 110H, 300L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.03	0.12
Si	0.77	0.50~0.90
Mn	1.35	1.00~1.80
P	0.008	0.030
S	0.013	0.030
Ni	0.18	0.10~0.80
Cr	0.61	0.50~0.80
Cu	0.45	0.30~0.60

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
0.9	50~200	50~180	50~120
1.0	50~220	50~200	50~120
1.2	80~320	80~300	50~140

All-weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	450	480	400min.	400min.
TS (MPa)	560	580	552min.	552min.
El on 4d (%)	30	29	19min.	19min.
IV (J)	0℃: 110	-18℃: 120	0℃: 47min.	-18℃: 47min.
SG	CO_2	Ar-20%CO_2	CO_2	Ar-20%CO_2

MF-53/US-W52B FAMILIARC™

Flux and wire combination

Features:
- Suitable for fillet welding
- Excellent bead appearance and good slag removal

Classification: AWS A5.23 F7A0-EG-G

Redrying Conditions: 150~350℃x1h

Polarity: AC

Packaging data

Flux	Mesh	Can			
MF-53	8x48	20kg			
Volume mm		240W, 350H, 240L			
Wire	**ϕ mm**	**Spool**		**Coil**	
US-W52B	1.6	10kg	20kg	-	-
	2.0	10kg	20kg	-	-
	2.4	10kg	-	-	-
	3.2	-	-	25kg	76kg
	4.0	-	-	25kg	75kg
	4.8	-	-	25kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.15
Si	0.03	0.10
Mn	1.51	1.20~1.80
P	0.010	0.025
S	0.004	0.025
Ni	0.14	0.10~0.25
Cr	0.62	0.50~0.80
Cu	0.36	0.30~0.55

Composition (weld metal mass%)

	Typical
C	0.05
Si	0.58
Mn	1.35
P	0.009
S	0.007
Ni	0.18
Cr	0.59
Cu	0.36

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	430	400min.
TS (MPa)	530	483~655
El on 4d (%)	23	22min.
IV -18℃ (J)	35	27min.

MF-38/US-W52B FAMILIARC™

Flux and wire combination

Features: ▪ Suitable for butt and flat fillet welding
▪ Good impact value

Classification: AWS A5.23 F7A2-EG-G

Redrying Conditions: 150~350℃x1h
Polarity: AC

Packaging data

Flux	Mesh	Can			
MF-38	12x65	25kg			
	20x200	25kg			
	20xD	25kg			
Volume mm		240W, 350H, 240L			
Wire	**ϕ mm**	**Spool**		**Coil**	
US-W52B	1.6	10kg	20kg	-	-
	2.0	10kg	20kg	-	-
	2.4	10kg	-	25kg	-
	3.2	-	-	25kg	76kg
	4.0	-	-	25kg	75kg
	4.8	-	-	25kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.15
Si	0.03	0.10
Mn	1.51	1.20~1.80
P	0.010	0.025
S	0.004	0.025
Ni	0.14	0.10~0.25
Cr	0.62	0.50~0.80
Cu	0.36	0.30~0.55

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.05
Si	0.32
Mn	1.48
P	0.017
S	0.005
Ni	0.14
Cr	0.51
Cu	0.35

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	490	400min.
TS (MPa)	590	483~655
El on 4d (%)	25	22min.
IV -29℃ (J)	76	27min.

For High Tensile Strength Steel and Low Temperature Steel

Welding Consumables for

SMAW

FCAW

GMAW

GTAW

SAW

A guide for selecting welding consumables

TS (MPa) min.	490	520	550
YS (MPa) min.	350	400	420
IV (J) min.	35	40	42
SMAW			
-20℃	**LB-52** (SR) **LB-52A**	**LB-57**	**LB-62U** (SR) **LB-62UL** **LB-62** (SR)
-40℃	**LB-7018-1** (DCEP) **LB-52NSU** (SR)	**LB-52NSU** (AC, SR) **LB-52NS** (AC) **NB-1SJ** (SR)	**LB-55NS** (DCEP) **NB-1SJ** (AC, SR) **LB-62L** (SR)
-60℃	**NB-1SJ** (SR) **LB-52NS** (SR)		
FCAW, GMAW			
-20℃	**DW-100E** (CO_2) **MG-S50** (Ar-20%CO_2)	**DW-55L** (CO_2) **MG-T1NS** (Ar-20%CO_2) **DW-A62LSR** (Ar-20%CO_2, SR)	
-30℃	**DW-100KS** (CO_2) **DW-55E** (CO_2) **DW-A55E** (Ar-20%CO_2) **DW-A55ESR** (do., SR)		
-40℃			
-50℃	**DW-50LSR** (CO_2)	**DW-55LSR** (CO_2, SR) **DW-A55L** (Ar-20%CO_2) **DW-A55LSR** (do., SR) **MG-S50LT** (do.) **MX-A55Ni1** (do.)	**DW-A81Ni1** (Ar-20%CO_2)
-60℃	**DW-55L** (CO_2) **DW-A55L** (Ar-20%CO_2) **MG-S50LT** (do., SR) **MX-A55Ni1** (do.)		**DW-55LSR** (CO_2) **DW-A55L** (Ar-20%CO_2) **DW-A55LSR** (do.) **MX-A55Ni1** (do.)
GTAW			
-20℃	**TG-S50** (SR) **TG-S51T** (SR)	**TG-S62** (SR)	
-30℃		**TG-S60A** (SR)	
-40℃	**TG-S1MT** **TG-S1N**		
-60℃			
SAW			
-20℃	**MF-38**/**US-36** (AC, SR)	**MF-38**/**US-49A** (AC)	
-40℃	**PF-H55LT**/**US-36** (AC, SR) **PF-H55AS**/**US-36J** (DCEP, SR)	**PF-H55S**/**US-49A** (AC, SR)	**PF-H80AK**/**US-56B** (DCEP)
-60℃		**PF-H55LT**/**US-36** (AC) **PF-H55LT**/**US-36J** (do., SR) **PF-H55AS**/**US-36J** (DCEP) **PF-H58AS**/**US-36J** (do.)	**PF-H55LT**/**US-36J** (AC)

Tips for successful welding results

1. 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 absorbed energies are the average of three testing specimens. Yield strength includes yield point and 0.2% offset strength.

	610 500 50	670 550 55	770 690 69
	LB-62U (SR) **LB-62UL** **LB-62** (SR)	**LB-106**	**LB-80UL** (AC) **LB-116** (AC)
	LB-62L (AC, SR) **LB-65L** (DCEP) **LB-67L** (do.) **LB-67LJ** (do.)	**LB-70L** (DCEP)	**LB-88LT** (AC) **LB-80L** (DCEP)
		LB-Y75 (AC)	
	DW-A65L (Ar-20%CO_2) **MG-T1NS** (do.) **DW-A65Ni1** (Ar-20%CO_2)	**MG-S70** (Ar-20%CO_2)	**MG-S80** (Ar-20%CO_2)
		DW-A70L (Ar-20%CO_2)	**DW-A80L** (Ar-20%CO_2)
	DW-62L (CO_2) **DW-A62L** (Ar-20%CO_2) **DW-A62LSR** (do.) **MX-A62L** (do.)	-	**MG-S88A** (Ar-20%CO_2) **MX-A80L** (do.)
		TG-S80AM (SR)	**TG-S80AM**
	MF-38/**US-40** (AC)	**PF-H80AS**/**US-255** (DCEP)	**PF-H80AK**/**US-80LT** (AC) **PF-H80AS**/**US-80LT** (DCEP)
	PF-H55S/**US-40** (AC) **PF-H80AK**/**US-56B**		
	PF-H80AK/**US-56B** (AC) **PF-H55S**/**US-2N** (do., SR) **PF-H62AS**/**US-2N** (DCEP) **PF-H62AK**/**US-2N** (AC, SR)	**PF-H80AK**/**US-255** (AC)	

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.

Tips for better welding results

Common

(1) Use an appropriate welding procedure taking into account the requirements for the mechanical properties of the weldment, because heat input, Interpass temperature and plate thickness affect the cooling rate of welds and, where the cooling rate is excessively low, the tensile strength and notch toughness of the weld decrease.

(2) Use appropriate preheat and interpass temperatures to prevent cold cracking assisted by the diffusible hydrogen in welds. Suitable preheat and interpass temperatures vary depending upon welding process, plate thickness, and kind of steel plate. In general, higher tensile strength steels need higher preheat and interpass temperatures.

(3) Select appropriate welding consumables and welding conditions carefully particularly in cases where the weld metal dilution by the base metal is large, because the chemical composition of the weld metal can remarkably be affected by the base metal chemical composition and thereby the properties of the weld metal can be varied.

(4) Confirm the applicability of postweld heat treatment for welding consumables before use, because some welding consumables can provide good notch toughness only in the as-welded condition and some welding consumables can provide sufficient notch toughness in the postweld heat treated conditions.

(5) Confirm the suitable electric current characteristics for welding consumables before use, because each welding consumable is designed to provide the highest performances with specific type of electric current (AC, DC, or both) and polarity (DCEP, DCEN, or both). Therefore, when a welding consumable designed for AC is used in DC or in opposite case, there are possibilities to deteriorate the properties of the weld metal and usability.

(6) Some welding consumable can be used by both AC and DCEP; however, the use of DCEP causes a little decrease in strength of the weld metal.

SMAW

(1) Low-hydrogen type electrodes should be stored in an oven (100-150°C) placed near the welding area after re-drying was finished. Take out minimum amounts of electrodes needed for a certain work from the oven. This manner is to keep the diffusible hydrogen content of the weld metal in a low level.

(2) Use the backstep technique directly in the welding groove or strike an arc on a scrap plate before transferring the arc into the groove to prevent cracking.

(3) Keep the arc length as short as possible to maintain good shielding by the coating flux decomposed gases during welding. The use of a long arc can cause a decrease of impact value of the weld metal caused by the nitrogen in the atmosphere and, where the arc length is excessive, blowholes can occur in the weld metal. Use a wind screen in windy areas.

(4) Refer to the tips for Mild Steel and 490MPa High Tensile Strength Steel for other notes.

FCAW, GMAW, and GTAW

(1) Use suitable shielding gas for each welding wire because the composition of a shielding gas can affect the mechanical properties of the weld metal.

(2) Use a wind screen in windy areas to maintain the shielding gas in good condition. Insufficient or irregular shielding gas can cause weld defects.

(3) Refer to the tips for welding Mild Steel and 490MPa High Tensile Strength Steel for other notes.

SAW

(1) Remove rust, oil, grease, and water in the welding groove beforehand because such dirt can cause weld defects like pits and blowholes.

(2) Select suitable steel plates and welding consumables carefully taking into account the dilution of weld metal by the base metal. Submerged arc welding characterizes deeper penetration and thus larger dilution; therefore, the properties of the weld metal can remarkably be varied by the chemical composition of the base metal. Especially in the single-pass-on-both-side welding, the dilution ratio becomes as large as about 60% and thus the properties of the weld metal is considerably affected by the chemical composition of the base metal.

(3) Refer to the tips for Mild Steel and 490MPa High Tensile Strength Steel for other notes.

How to prevent cold cracks

In order to prevent cold cracks in arc welding, preheat temperature is a key factor, which relates to the hardenability of the steel material, the amount of diffusible hydrogen in the weld metal, and the degree of restraint of the welding joint. Fig. 1 shows the relationship between preheat temperature and the Cracking Parameter (P_C) which consists of the Cracking Parameter of Material (P_{CM}), plate thickness (t), and diffusible hydrogen (H). This diagram was developed through the y-groove cracking test of high tensile strength steels having a variety of chemical compositions. It can be considered that P_{CM} relates to the hardenability of a steel material, and plate thickness relates to the degree of restraint of a welding joint. Hence, P_C can be a guide to estimating the preheat temperature needed for preventing a cold crack in arc welding of a particular steel material.

However, in the stricter sense, the following formula (P_W) is more recommended to use for estimating the cooling time after welding that relates to preheat temperature, heat input, ambient temperature, and other factors to prevent a cold crack in arc welding of actual steel structures. The applicable ranges of individual parameters are given in Table 1.

$$P_W = P_{CM} + H/60 + R_F/400{,}000$$

where P_{CM} (%): the same as that contained in the P_C formula

R_F (N/mm•mm): the degree of restraint of a welding joint

The degree of restraint (N/mm•mm) of a y-groove welding joint used for developing P_C is about 700 times the plate thickness (mm); if R_F is substituted by 700 x t, P_W becomes almost the same as P_C.

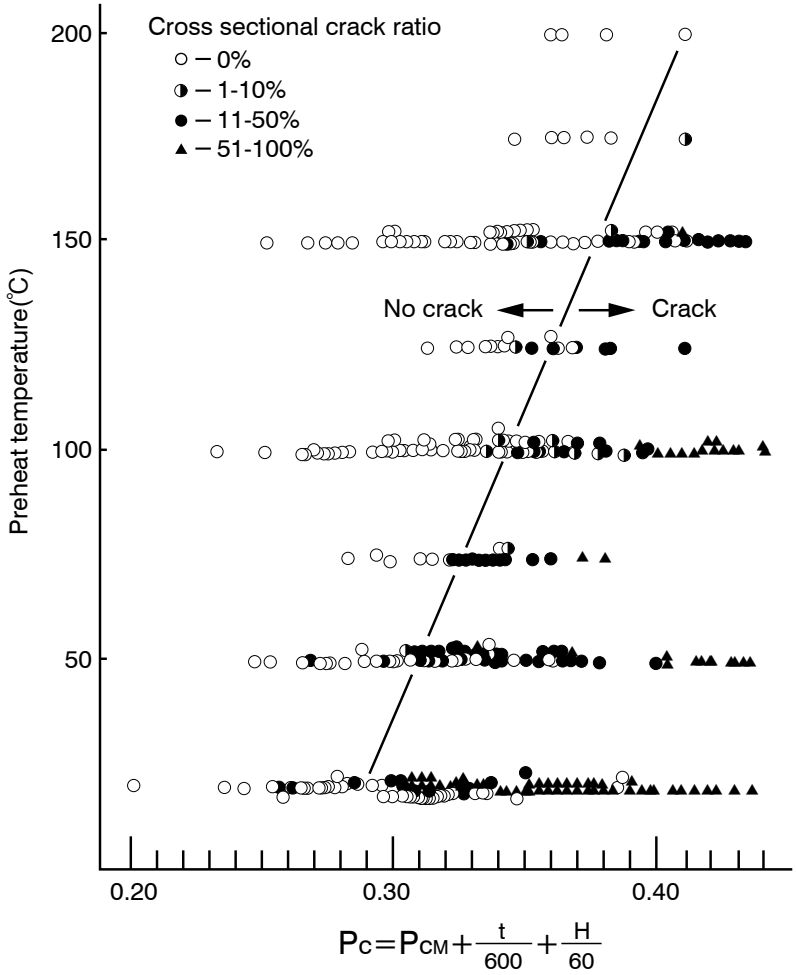


Fig. 1 Preheat temperature vs. cracking parameter Pc (t: 16~50 mm)

P_{CM} = C + Si/30 + Mn/20 + Cu/20 + Ni/60 + Cr/20 + Mo/15 + V/10 + 5B (%)

t: Plate thickness (mm)

H: Content of diffusible hydrogen of deposited metal (Glycerine method) (ml/100 g)

H (Glycerine method) = 0.79H (Gas chromatography method) - 1.73

Table 1 Applicable ranges of parameters for P_W formula

Chemical composition of steels (%) [a]										
C	Si	Mn	Cu	Ni	Cr	Mo	V	Ti	Nb	B
0.07~ 0.22	0.60	0.40~ 1.40	0.50	1.20	1.20	0.70	0.12	0.05	0.04	0.005

Amount of diffusible hydrogen, H	Plate thickness, t	Degree of restraint, R_F
1.0~5.0 ml/100g	19~50 mm	5,000~33,000 N/mm·mm

Note: [a] Single values are maximum.

$$Pw = P_{CM} + H/60 + R_F/400{,}000$$

(References: WES 3001-1996 and JIS Z 3118-1992)

LB-7018-1 TRUSTARC™

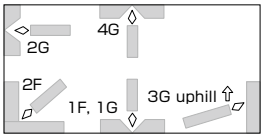
Stick electrode

Features: ▪ Suitable for low temperature service steel

Classification: AWS A5.1 E7018-1

Redrying Conditions: 350~400℃x1h
Identification color: 1st Brown, 2nd White
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	23	170W, 105H, 380L
3.2	350	5	20	35	170W, 105H, 380L
4.0	400	5	20	61	170W, 105H, 430L
4.0	450	5	20	69	170W, 100H, 480L
5.0	450	5	20	106	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical (DCEP)	Guaranty [a]
C	0.08	0.15
Si	0.37	0.75
Mn	1.53	1.60
P	0.012	0.035
S	0.003	0.035
Ni	0.01	0.30
Cr	0.03	0.20
Mo	0.01	0.30
V	<0.01	0.08
Ti	0.025	-
B	0.0045	-
Others [b]	1.58	1.75

Note: [a] Single values are maximum.
[b] Combined Limit for Mn+Ni+Cr+Mo+V

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	70~100	65~95
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	-

All-weld mechanical properties

	Typical (DCEP)	Guaranty
0.2%YS (MPa)	490	400min.
TS (MPa)	580	483min.
El on 4d (%)	31	22min.
IV -46℃ (J)	135	27min.

Approvals

ABS	4Y400, H10
LR	4Y40m H10

NB-3J

TRUSTARC™

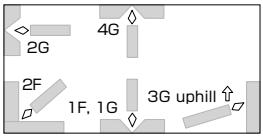
Stick electrode

Features: ▪ Suitable for 3.5%Ni steel

Classification: AWS A5.5 E7016-C2L

Redrying Conditions: 350~400℃x1h
Identification color: 1st Yellow green, 2nd Silver grey
Polarity: AC

Welding Positions:



Packaging data

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

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.05
Si	0.36	0.50
Mn	0.73	1.25
P	<0.01	0.03
S	<0.01	0.03
Ni	3.50	3.00~3.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~120
4.0	130~170	110~150

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	470	440	393min.
TS (MPa)	560	530	483min.
El on 4d (%)	31	35	25min.
IV (J)	-85℃:170	-100℃:140	-101℃: 27min.
PWHT (℃xh)	AW	605x1	AW & 605±15x1

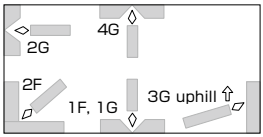
LB-62L

TRUSTARC™

Stick electrode

Features:
- Good CTOD properties down to -10℃
- Better impact values down to -60℃
- AC is recommended for 570 to 610MPa class steel

Welding Positions:



Classification: AWS A5.5 E8016-C1

Redrying Conditions: 350~400℃x1h
Identification color: 1st Blue, 2nd Orange
Polarity: AC, DCEP

Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 120H, 430L
5.0	450	5	20	97	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.12
Si	0.36	0.60
Mn	0.86	1.25
P	0.01	0.03
S	<0.01	0.03
Ni	2.40	2.00~2.75
Mo	0.12	-
Ti	0.018	-
B	0.0021	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~120
4.0	130~180	100~170
5.0	180~240	-

All-weld mechanical properties

	Typical (AC)		Guaranty
0.2%YS (MPa)	540	530	462min.
TS (MPa)	650	640	552min.
El on 4d (%)	27	28	19min.
IV -60℃ (J)	130	120	27min.
PWHT (℃xh)	AW	608x1	AW & 605±15x1

Approvals

ABS	5YQ500 H5, MG
LR	5Y50m (H5)
DNV-GL	5Y50 H5

LB-65L

TRUSTARC™

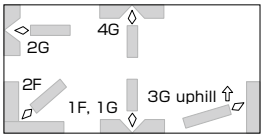
Stick electrode

Features:
- Suitable for 610MPa tensile strength steel
- Good impact values down to -60℃
- Excellent crack resistibility

Classification: AWS A5.5 E8016-C1

Redrying Conditions: 350~400℃x1h
Identification color: 1st White, 2nd Yellow
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 120H, 430L
5.0	450	5	20	97	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.42	0.60
Mn	1.00	1.25
P	<0.01	0.03
S	<0.01	0.03
Ni	2.58	2.00~2.75
Mo	0.12	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	80~120	70~110
4.0	120~170	90~160
5.0	170~230	-

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	570	560	462min.
TS (MPa)	660	645	552min.
El on 4d (%)	27	28	19min.
IV -60℃ (J)	120	110	27min.
PWHT (℃xh)	AW	605x1	AW & 605±15x1

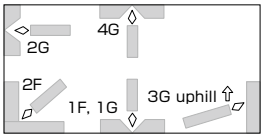
LB-52NS

TRUSTARC™

Stick electrode

Features:
- Good CTOD properties at temperatures down to -30℃
- Better impact values at temperatures down to -60℃

Welding Positions:



Classification: AWS A5.5 E7016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st White, 2nd Green
Polarity: AC, DCEP

Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 90H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 110H, 430L
5.0	450	5	20	97	170W, 105H, 480L
6.0	450	5	20	140	170W, 105H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.10
Si	0.36	0.20~0.90
Mn	1.38	1.00~1.60
P	0.01	0.03
S	<0.01	0.03
Ni	0.46	0.30~0.70
Ti	0.019	0.005~0.035
B	0.0027	0.0005~0.0045

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	150~200
6.0	250~310	-

All-weld mechanical properties

	Typical (AC)		Guaranty
0.2%YS (MPa)	490	470	393min.
TS (MPa)	580	570	483min.
El on 4d (%)	29	31	25min.
IV -60℃ (J)	130	120	27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

Approvals

ABS	3Y, 4Y400, MG, H10
LR	5Y40m (H15)
DNV-GL	5Y40H10, VL2-4 (L), 4-4 (L)
BV	4Y40M, H10 (KV-60), UP
NK	KMWL3 H10, KMW54Y40

LB-52NSU TRUSTARC™

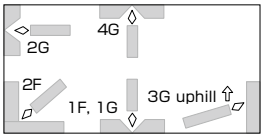
Stick electrode

Features:
- Suitable for one-side welding
- Good arc stability in one-side welding with relatively low current
- Good impact values down to -60℃

Classification: AWS A5.5 E7016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st White, 2nd Pink
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	20	170W, 110H, 380L
3.2	400	5	20	35	170W, 105H, 430L

Composition (all-weld metal mass%)

	Typical (DCEP)	Guaranty [a]
C	0.06	0.10
Si	0.62	0.30~0.90
Mn	1.25	1.00~1.60
P	0.02	0.03
S	<0.01	0.03
Ni	0.50	0.30~0.70
Ti	0.01	-
B	0.003	-

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G	Root pass [b]
2.6	60~90	50~80	30~80
3.2	90~130	80~120	60~110

Note: [b] DCEN is also suitable

All-weld mechanical properties

	Typical (DCEP)		Guaranty
0.2%YS (MPa)	510	500	393min.
TS (MPa)	600	590	483min.
El on 4d (%)	32	33	22min.
IV -60℃ (J)	60	55	27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

Approvals

ABS	5Y400 H10
LR	5Y40m (H10)
DNV-GL	5Y40 H10
BV	5Y40 H10

LB-55NS TRUSTARC™

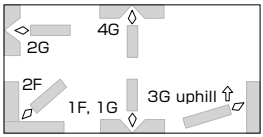
Stick electrode

Features:
- Suitable for butt and fillet welding
- Good impact values down to -60℃
- Ni Content is normaly 1% max.

Classification: AWS A5.5 E8016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Purple, 2nd Green
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 90H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 110H, 430L
5.0	450	5	20	97	170W, 105H, 480L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.10
Si	0.35	0.30~0.90
Mn	1.40	1.00~1.60
P	0.01	0.03
S	<0.01	0.03
Ni	0.93	0.70~1.0
Mo	0.10	0.05~0.15
Ti	0.018	0.005~0.035
B	0.0025	0.0005~0.0045

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	150~200

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	520	510	462min.
TS (MPa)	610	590	552min.
El on 4d (%)	33	31	19min.
IV -60℃ (J)	170	140	27min.
PWHT (℃xh)	AW	605x1	AW & 605±15x1

Approvals

ABS	5YQ420 H5
LR	5Y42m (H5)
DNV-GL	5Y42 H5

NB-1SJ

TRUSTARC™

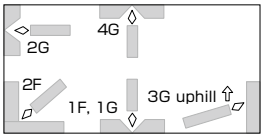
Stick electrode

Features:
- Good CTOD properties down to -45℃
- Good impact values down to -80℃

Classification: AWS A5.5 E8016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st White, 2nd Brown
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 90H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 120H, 430L
5.0	450	5	20	97	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.10
Si	0.43	0.15~0.50
Mn	1.36	1.10~1.70
P	0.01	0.03
S	<0.01	0.03
Ni	1.37	1.10~1.70
Ti	0.021	0.005~0.035
B	0.0035	0.0005~0.0045

Note: [a] Single values are maximum.

Recommended welding parameters

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~120
4.0	130~180	110~170
5.0	180~240	150~200

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	520	490	462min.
TS (MPa)	610	580	552min.
El on 4d (%)	29	29	19min.
IV -80℃ (J)	127	130	-60℃: 27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

Approvals

ABS	5YQ420 H5
LR	5YQ40m H5
DNV-GL	5YH5, VL2-4L, 4-4L
BV	5Y40M H5
NK	KMW5Y42 H5

LB-62 TRUSTARC™

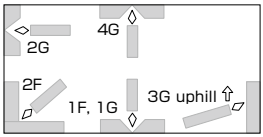
Stick electrode

Features:
- Suitable for butt and fillet welding
- Typical stick electrode in this classification

Classification: AWS A5.5 E9016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Blue white, 2nd Yellow
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 90H, 330L
3.2	350	5	20	30	170W, 120H, 380L
4.0	400	5	20	55	170W, 110H, 430L
5.0	400	5	20	85	170W, 120H, 430L
6.0	450	5	20	140	170W, 105H, 480L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.06	0.09
Si	0.66	0.40~0.80
Mn	1.04	0.75~1.35
P	0.01	0.03
S	<0.01	0.03
Ni	0.61	0.40~0.75
Mo	0.26	0.20~0.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~115
4.0	130~180	110~170
5.0	180~240	150~200
6.0	250~310	-

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	550	531min.
TS (MPa)	650	621min.
El on 4d (%)	30	17min.
IV -18℃ (J)	150	-

Approvals

ABS	3YQ500 H10
LR	3Y50m H10
NK [a)]	KMW3Y50 H10
CR	3Y50 H10

Note: [a)] AC

LB-62UL

TRUSTARC™

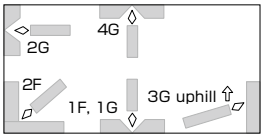
Stick electrode

Features: ▪ Excellent crack resistibility

Classification: AWS A5.5 E9016-G

Redrying Conditions: 350~430℃x1h
Identification color: 1st Brown, 2nd Silver
Polarity: AC, DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 120H, 430L
5.0	400	5	20	85	170W, 125H, 430L

Composition (all-weld metal mass%)

	Typical (AC)	Guaranty [a]
C	0.07	0.09
Si	0.68	0.40~0.80
Mn	1.13	0.75~1.35
P	0.01	0.03
S	<0.01	0.03
Ni	0.65	0.45~0.80
Mo	0.25	0.20~0.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~115
4.0	130~180	110~170
5.0	180~240	150~200

All-weld mechanical properties

	Typical (AC)	Guaranty
0.2%YS (MPa)	550	531min.
TS (MPa)	650	621min.
El on 4d (%)	30	17min.
IV -18℃ (J)	160	-

Approvals

NK	KMW63Y47
CCS	3Y50 H10

LB-62U

TRUSTARC™

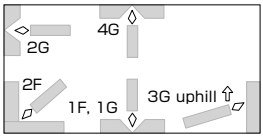
Stick electrode

Features:
- Suitable for one-side welding
- Good arc stability with relatively low currents
- Excellent crack resistibility

Classification: AWS A5.5 E9016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Blue, 2nd Yellow
Polarity: AC, DCEP, DCEN (Root pass only)

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	350	5	20	20	170W, 120H, 380L
3.2	350	5	20	30	170W, 120H, 380L
4.0	400	5	20	53	170W, 110H, 430L

Composition (all-weld metal mass%)

	Typical (DCEP)	Guaranty [a]
C	0.08	0.09
Si	0.70	0.20~0.75
Mn	1.08	0.70~1.35
P	0.01	0.03
S	<0.01	0.03
Ni	0.62	0.45~0.80
Mo	0.25	0.20~0.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G	Root pass
2.6	60~90	50~80	30~80
3.2	90~130	80~115	60~110
4.0	130~180	110~170	90~140

All-weld mechanical properties

	Typical (DCEP)	Guaranty
0.2%YS (MPa)	560	531min.
TS (MPa)	650	621min.
El on 4d (%)	26	17min.
IV -20℃ (J)	88	-

Approvals

ABS	3YQ500 H10
LR	3Y50m H10

LB-67L

TRUSTARC™

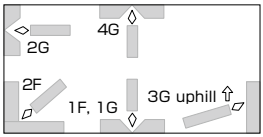
Stick electrode

Features:
- Good CTOD properties down to -20℃
- Better impact values down to -60℃
- Excellent crack resistibility

Classification: AWS A5.5 E9016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st White, 2nd Yellow
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	270W, 90H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 120H, 430L
5.0	450	5	20	97	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.42	0.15~0.60
Mn	0.97	0.60~1.20
P	0.01	0.03
S	<0.01	0.03
Ni	2.55	2.00~2.75
Mo	0.12	0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	70~100	65~95
3.2	80~120	70~110
4.0	120~170	90~160
5.0	170~230	-

All-weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	560	560	530min.	490min.
TS (MPa)	660	640	620min.	590min.
El on 4d (%)	29	28	17min.	16min.
IV -60℃ (J)	130	112	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Approvals

ABS	5YQ500 H5
LR	5Y50m, H5
DNV-GL	5Y50 H5

LB-62D

TRUSTARC™

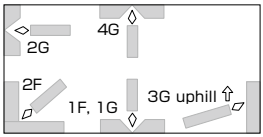
Stick electrode

Features: ▪ Suitable for 550 to 610MPa tensile strength steel

Classification: AWS A5.5 E9018-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Pink, 2nd Yellow
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	34	170W, 120H, 380L
4.0	400	5	20	61	170W, 120H, 430L
5.0	450	5	20	93	170W, 110H, 480L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.09
Si	0.68	0.40~0.75
Mn	1.21	0.80~1.40
P	0.01	0.03
S	<0.01	0.03
Ni	0.59	0.45~0.80
Mo	0.26	0.20~0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~120
4.0	135~185	110~170
5.0	190~250	150~200

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	570	531min.
TS (MPa)	660	621min.
El on 4d (%)	29	17min.
IV -20℃ (J)	170	27min.

LB-106

TRUSTARC™

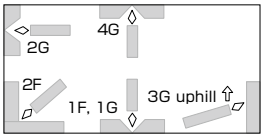
Stick electrode

Features: ▪ Suitable for 690MPa tensile strength steel

Classification: AWS A5.5 E10016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Blue white, 2nd Purple
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 105H, 430L
5.0	400	5	20	85	170W, 105H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.08	0.09
Si	0.65	0.40~0.75
Mn	1.29	1.20~1.70
P	0.01	0.03
S	<0.01	0.03
Ni	1.44	1.20~1.70
Cr	0.22	0.10~0.30
Mo	0.19	0.10~0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~115
4.0	130~180	110~170
5.0	180~240	150~220

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	660	600min.
TS (MPa)	760	690min.
El on 4d (%)	25	16min.
IV -20℃ (J)	110	27min.

Approvals

ABS	MG (AWS A5.5 E10016-G)
NK	KMW3Y62 H5
CR	MG (E10016-G)

LB-Y75 TRUSTARC™

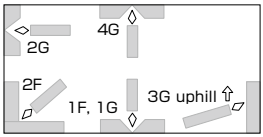
Stick electrode

Features:
- Suitable for butt and fillet welding
- Good impact values down to -40℃
- Excellent crack resistibility

Classification: AWS A5.5 E10016-G

Redrying Conditions: 350~430℃x1h
Identification color: 1st Green, 2nd Yellowish green
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	32	170W, 120H, 380L
4.0	400	5	20	56	170W, 120H, 430L
5.0	400, 450	5	20	87, 98	170W, 110~120H, 430~480L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.07
Si	0.38	0.20~0.60
Mn	1.21	0.80~1.40
P	0.01	0.03
S	<0.01	0.03
Ni	3.56	3.05~3.80
Cr	0.24	0.10~0.40
Mo	0.40	0.30~0.60

Note: [a] Single values are maximum.

Welding parameters (A)

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

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	680	600min.
TS (MPa)	760	690min.
El on 4d (%)	23	16min.
IV -40℃ (J)	115	27min.

LB-70L

TRUSTARC™

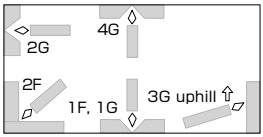
Stick electrode

Features:
- Suitable for butt and fillet welding
- Good impact values down to -60℃
- Excellent crack resistibility

Classification: AWS A5.5 E10016-G

Redrying Conditions: 350~430℃x1h
Identification color: 1st Green, 2nd Yellowish green
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	270W, 90H, 330L
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 120H, 430L
5.0	400	5	20	87	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.07
Si	0.40	0.20~0.60
Mn	1.18	0.80~1.40
P	0.01	0.03
S	<0.01	0.03
Ni	3.71	3.05~3.90
Cr	0.22	0.10~0.40
Mo	0.40	0.30~0.60

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	70~100	65~95
3.2	80~120	70~110
4.0	120~170	90~160
5.0	170~230	-

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	685	600min.
TS (MPa)	755	690min.
El on 4d (%)	27	16min.
IV -60℃ (J)	110	27min.

Approvals

ABS	4YQ620 H5
DNV-GL	4Y62 H5

Note: DCEP

LB-116

TRUSTARC™

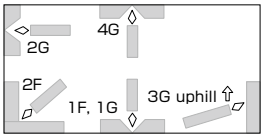
Stick electrode

Features: ▪ Suitable for 780MPa tensile strength steel

Classification: AWS A5.5 E11016-G

Redrying Conditions: 350~400℃x1h
Identification color: 1st Blue white, 2nd Red
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	17	270W, 90H, 330L
3.2	350	5	20	30	170W, 120H, 380L
4.0	400	5	20	54	170W, 110H, 430L
5.0	400	5	20	86	170W, 110H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.09
Si	0.70	0.40~0.80
Mn	1.41	1.20~1.70
P	0.01	0.03
S	<0.01	0.03
Ni	1.89	1.50~2.10
Cr	0.28	0.20~0.40
Mo	0.46	0.35~0.55

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	55~85	50~80
3.2	90~130	80~115
4.0	130~180	110~170
5.0	180~240	-

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	730	669min.
TS (MPa)	830	759min.
El on 4d (%)	24	15min.
IV -20℃ (J)	110	27min.

LB-80UL TRUSTARC™

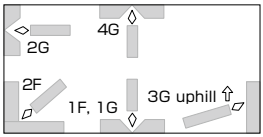
Stick electrode

Features:
- Suitable for 780MPa tensile strength steel
- Ultra low hydrogen type

Classification: AWS A5.5 E11016-G

Redrying Conditions: 350~430℃x1h
Identification color: 1st Brown, 2nd Green
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	31	170W, 120H, 380L
4.0	400	5	20	55	170W, 115H, 430L
5.0	400	5	20	87	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.09
Si	0.59	0.35~0.70
Mn	1.50	1.30~1.80
P	0.01	0.03
S	<0.01	0.03
Ni	1.90	1.70~2.10
Cr	0.22	0.10~0.40
Mo	0.45	0.25~0.55

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~115
4.0	130~180	110~170
5.0	180~240	-

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	710	669min.
TS (MPa)	820	759min.
El on 4d (%)	25	15min.
IV -20℃ (J)	110	27min.

Approvals

NK [a)]	KMW3Y69 H5
CCS	3Y69 H5

Note: [a)] AC

LB-88LT

TRUSTARC™

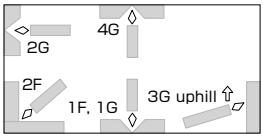
Stick electrode

Features:
- Good impact values down to -80℃
- Excellent crack resistibility

Classification: AWS A5.5 E11016-G

Redrying Conditions: 350~430℃x1h
Identification color: 1st Brown, 2nd Brown
Polarity: AC

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
3.2	350	5	20	30	170W, 120H, 380L
4.0	400	5	20	54	170W, 110H, 430L
5.0	400	5	20	87	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.09
Si	0.70	0.40~0.75
Mn	1.75	1.40~2.00
P	0.01	0.03
S	<0.01	0.03
Ni	2.62	2.10~2.80
Mo	0.73	0.50~0.80

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
3.2	90~130	80~115
4.0	130~180	100~170
5.0	180~240	-

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	750	669min.
TS (MPa)	840	759min.
El on 4d (%)	20	15min.
IV -80℃ (J)	63	27min.

Approvals

ABS	5YQ690 H5
DNV-GL	5Y69 H5

Note: AC only

LB-80L

TRUSTARC™

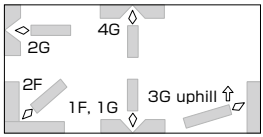
Stick electrode

Features:
- Good impact values down to -60℃
- Excellent crack resistibility

Classification: AWS A5.5 E11018-G H4

Redrying Conditions: 350~400℃x1h
Identification color: 1st Brown, 2nd Brown
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Length mm	kg/pack	kg/carton	g/piece	carton mm
2.6	300	2	20	18	270W, 90H, 330L
3.2	350	5	20	32	170W, 120H, 380L
4.0	400	5	20	57	170W, 110H, 430L
5.0	400	5	20	90	170W, 120H, 430L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.09
Si	0.60	0.20~0.75
Mn	1.49	1.20~1.90
P	0.01	0.03
S	<0.01	0.03
Ni	2.92	2.50~3.30
Mo	0.77	0.40~1.00

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
2.6	70~100	65~95
3.2	80~120	70~110
4.0	120~160	90~150
5.0	170~210	-

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	770	669min.
TS (MPa)	830	759min.
El on 4d (%)	24	15min.
IV -60℃ (J)	100	47min.

Approvals

ABS	5YQ690 H5
LR	5Y69m H5
DNV-GL	5Y69 H5
BV	5Y69 H5
CCS	5Y69 H5

Note: DCEP only

DW-100KS

FAMILIARC™

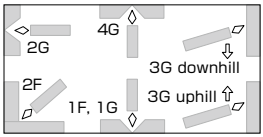
Flux cored wire

Features: ▪ Suitable for shipping class steel down to -40℃

Classification: AWS A5.20 E71T-1C, E71T-9C-J

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		
1.2	12.5kg	15kg	20kg
1.4	12.5kg	15kg	20kg
Volume mm	300W, 110H, 300L		

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.54	0.90
Mn	1.47	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.33	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	0.01	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	525	400min.
TS (MPa)	600	483~655
El on 4d (%)	28	22min.
IV -40℃ (J)	100	27min.

Approvals

ABS	4YSA, 4Y400SA, H5
LR	4Y40S H5
DNV-GL	ⅣY40MS, H10
BV	SA4Y40M H5
NK	KSW54Y40G (C) H5
KR	4Y40SG (C) H5

Welding parameters (A)

ϕ mm	1F, 1G	2F	2G	3G uphill, 4G	3G downhill
1.2	120~300	120~300	120~280	120~260	200~300
1.4	150~400	150~350	150~320	150~270	220~300

DW-55E

FAMILIARC™

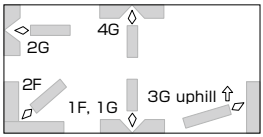
Flux cored wire

Features: ▪ Excellent impact values down to -40℃

Classification: AWS A5.20 E71T-9C-J

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		
1.2	12.5kg	15kg	20kg
1.4	-	15kg	-
Volume mm	300W, 110H, 300L		

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.38	0.90
Mn	1.42	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.35	0.50
Cr	0.03	0.20
Mo	0.01	0.30
V	0.02	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	540	400min.
TS (MPa)	590	483~655
El on 4d (%)	29	22min.
IV -40℃ (J)	80	27min.

Approvals

ABS	4Y400SA, H5
LR	4Y40S, H5
DNV-GL	ⅣYMS (H5)
BV	SA4YM H5
NK	KSW54Y40G (C) H5
CR	3YS-HH, L1YS-HH, MG
CCS	4Y40S, H5

Welding parameters (A)

ϕ mm	1F, 1G	2F	2G	3G uphill, 4G
1.2	150~300	150~300	150~280	150~250
1.4	150~400	150~350	150~300	150~250

DW-A55E FAMILIARC™

Flux cored wire

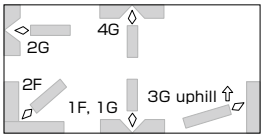
Features: ▪ Excellent impact values down to -40℃

Classification: AWS A5.20 E71T-9M-J

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	12.5kg	15kg
Volume mm	300W, 110H, 300L	

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.54	0.90
Mn	1.31	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.34	0.50
Cr	0.02	0.20
Mo	0.01	0.30
Cu	0.02	0.35
V	0.01	0.08

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	540	400min.
TS (MPa)	600	483~655
El on 4d (%)	28	22min.
IV -40℃ (J)	100	27min.

Approvals

ABS	4Y400SA (H5)
LR	4Y40S, H5
DNV-GL	ⅣYMS (H5)
BV	SA4Y40M H5

Welding parameters (A)

ϕ mm	1F, 1G	2F	2G	3G uphill, 4G
1.2	150~300	150~300	150~280	150~250

DW-A55ESR

FAMILIARC™

Flux cored wire

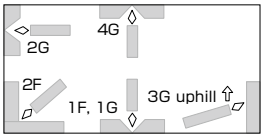
Features: ▪ Excellent impact value down to -46℃

Classification: AWS A5.20 E71T-12M-J

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	5kg	20kg
1.6	-	20kg
Volume mm	220W, 130H, 435L/4pcs	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.50	0.90
Mn	1.40	1.60
P	0.01	0.03
S	0.01	0.03
Ni	0.40	0.50
Cr	0.02	0.20
Mo	0.01	0.30
V	<0.01	0.08
Cu	0.02	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	100~250	120~250
1.6	150~340	180~280

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	500	470	400min.
TS (MPa)	580	560	483~620
El on 4d (%)	30	31	22min.
IV -46℃ (J)	100	60	27min.
PWHT (℃xh)	AW	620x3	AW

Approvals

ABS	4Y400SA, H5
CWB	E491 T-12MJ-H8

DW-55L TRUSTARC™

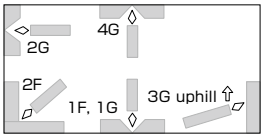
Flux cored wire

Features: ▪ Excellent impact values down to -60℃

Classification: AWS A5.29 E81T1-K2C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		
1.2	12.5kg	15kg	20kg
1.4	-	15kg	-
Volume mm	300W, 110H, 300L		

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.15
Si	0.38	0.80
Mn	1.32	0.50~1.75
P	0.010	0.030
S	0.008	0.030
Ni	1.51	1.00~2.00
Cr	0.02	0.15
Mo	0.01	0.35
V	0.02	0.05

Note: [a] Single values are maximum.

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	550	469min.
TS (MPa)	620	552~689
El on 4d (%)	27	22min.
IV -60℃ (J)	70	27min.

Approvals

ABS	3YSA, 5Y400SA, MG, H5
LR	5Y40S, 5Y40M, H5
DNV-GL	V Y40MS (H5)
BV	SA5Y40M H5
NK	KSWL3G (C), KSWL3G (C) H5-TS540M, KSW54Y40G (C), H5
KR	L 3SG (C) H5, 5Y40SG (C) H5
CCS	5Y40S H5

Welding parameters (A)

ϕ mm	1F, 1G	2F	2G	3G uphill, 4G
1.2	150~300	150~300	150~280	150~250
1.4	150~400	150~350	150~300	150~250

DW-55LSR

TRUSTARC™

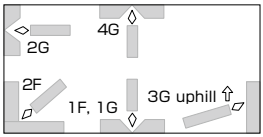
Flux cored wire

Features: ▪ Excellent impact value down to -60℃ in the as-welded and PWHT conditions

Classification: AWS A5.29 E81T1-K2C

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		
1.2	12.5kg	15kg	20kg
Volume mm	300W, 110H, 300L		

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.15
Si	0.29	0.80
Mn	1.21	0.50~1.75
P	0.008	0.030
S	0.007	0.030
Ni	1.56	1.00~2.00
Cr	0.01	0.15
Mo	0.01	0.35
V	<0.01	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	480	440	469min.
TS (MPa)	565	530	552~689
El on 4d (%)	33	34	22min.
IV -60℃ (J)	115	100	27min.
PWHT (℃xh)	AW	620X1	AW

Approvals

ABS	5YQ420SA (H5) 4Y400SA (H5)
LR	5Y42S, MG, H5
DNV-GL	V Y42MS (H5), MG VL2-4L, 4-4L
BV	SA4Y40M, UP, H5
NK	MG (KSW5Y42G (C) H5)

MX-55LF TRUSTARC™

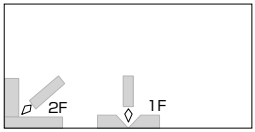
Flux cored wire

Features:
- Excellent porosity resistibility to inorganic zinc primer
- Excellent impact value down to -60℃

Classification: AWS A5.20 E70T-9C-J

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool		Drum
1.2	15kg	-	-
1.4	15kg	-	150kg
1.6	-	20kg	-
Volume mm	300W, 110H, 300L		530ϕ, 820H

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.44	0.90
Mn	1.42	1.75
P	0.01	0.03
S	0.01	0.03
Ni	0.34	0.50
Cr	0.03	0.20
Mo	0.01	0.30
Cu	0.02	0.35
V	0.01	0.08

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F	2F
1.2	150~300	180~300
1.4	170~400	200~350
1.6	200~450	270~400

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	540	400min.
TS (MPa)	590	483~655
El on 4d (%)	29	22min.
IV -60℃ (J)	58	27min.

Approvals

	Single	Tandem
ABS	3YSA, MG	3YA, MG
LR	5Y40S H5	-
DNV-GL	V YMS	-
BV	SA3YM, UP	A3YM, UP
NK	KSW54G (C), KSWL3G (C)	KAWL3MPG (C)

DW-A55L

TRUSTARC™

Flux cored wire

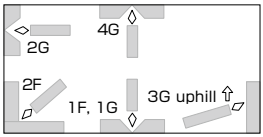
Features: ▪ Excellent impact values down to -60℃

Classification: AWS A5.29 E81T1-K2M

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	15kg
Volume mm	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.15
Si	0.32	0.80
Mn	1.17	0.50~1.75
P	0.008	0.030
S	0.008	0.030
Ni	1.53	1.00~2.00
Cr	0.02	0.15
Mo	0.01	0.35
V	0.02	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	560	469min.
TS (MPa)	630	552~689
El on 4d (%)	27	22min.
IV -60℃ (J)	94	27min.

Approvals

ABS	3YSA, MG
LR	5Y46S, H5
DNV-GL	V Y46MS (H5)
BV	SA5Y46 H5
CCS	5Y46SH5

DW-A55LSR TRUSTARC™

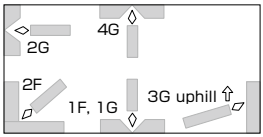
Flux cored wire

Features:
- Excellent impact value down to -60℃ in the as-welded and PWHT conditions
- Meets the NACE MR0175 requirements for both chemistry and hardness. The nickel content is normally 1% max.

Classification: AWS A5.29 E81T1-Ni1M

Shielding gas: Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	15kg
Volume mm	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.31	0.80
Mn	1.37	1.50
P	0.008	0.030
S	0.008	0.030
Ni	0.93	0.80~1.00
Cr	0.01	0.15
Mo	0.01	0.35
V	<0.01	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	510	450	469min.
TS (MPa)	570	530	552~689
El on 4d (%)	29	33	22min.
IV -60℃ (J)	120	70	27min.
PWHT (℃xh)	AW	620x2	AW

Approvals

ABS	5YQ420SA (H5)
LR	5Y42S (H5)
DNV-GL	V Y42MS (H5), MG, VL2-4L, 4-4L
BV	SA5Y42 H5
CCS	5Y42S, H5

DW-A81Ni1

TRUSTARC™

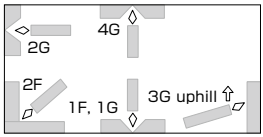
Flux cored wire

Features:
- Excellent impact values down to -60℃
- Meets the NACE MR0175 requirements for both chemistry and hardness. The nickel content is normally 1% max.

Classification: AWS A5.29 E81T1-Ni1M-J

Shielding gas: Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	15kg
Volume mm	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.35	0.80
Mn	1.30	1.50
P	0.009	0.030
S	0.008	0.030
Ni	0.91	0.80~1.00
Cr	0.02	0.15
Mo	0.01	0.35
V	0.02	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	520	469min.
TS (MPa)	580	552~689
El on 4d (%)	29	19min.
IV -60℃ (J)	142	27min.

Approvals

ABS	5YQ420SA (H5) 4Y400SA (H5), MG
LR	5Y42S, H5
DNV-GL	V̈Y42MS (H5)
CWB	E551T1-Ni1MJ-H8 (E81T1-Ni1MJ-H8)

DW-A65Ni1

TRUSTARC™

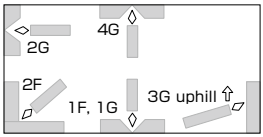
Flux cored wire

Features:
- Suitable for welding up to X70 grade pipe
- Excellent impact value down to -50℃
- The nickel content is normally 1% max.

Classification: AWS A5.29 E91T-GM

Shielding gas: Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	5kg	15kg
Volume mm	220W, 130H, 435L/4pcs	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.03~0.10
Si	0.33	0.90
Mn	1.51	1.40~2.00
P	0.009	0.020
S	0.008	0.020
Ni	0.95	0.60~1.00
Cr	0.02	0.20
Mo	0.16	0.20
V	<0.01	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	610	538min.
TS (MPa)	670	621~758
El on 4d (%)	23	17min.
IV -50℃ (J)	84	27min.

Approvals

LR	4Y50SH5
DNV-GL	ⅣY50MSH5

DW-62L

TRUSTARC™

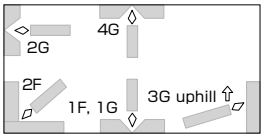
Flux cored wire

Features:
- Excellent impact value down to -60℃
- Excellent CTOD value down to -40℃

Classification: AWS A5.29 E91T1-Ni2C-J

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	12.5kg	15kg
Volume mm	300W, 110H, 300L	

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.08	0.12
Si	0.30	0.80
Mn	1.37	1.50
P	0.008	0.030
S	0.010	0.030
Ni	2.57	1.75~2.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	580	538min.
TS (MPa)	650	621~758
El on 4d (%)	25	17min.
IV -60℃ (J)	93	27min.

Approvals

ABS	5YQ500 H5
LR	5Y50S, H5
DNV-GL	V Y50MS (H5)
BV	SA5Y50M H5
NK	KSW5Y50G (C) H5
RS	5Y50 MS H5

DW-A62L

TRUSTARC™

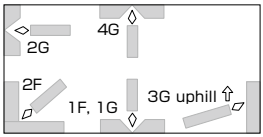
Flux cored wire

Features:
- Excellent impact value down to -60℃
- Excellent CTOD value down to -40℃

Classification: AWS A5.29 E91T1-Ni2M-J

Shielding gas: Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	12.5kg	15kg
Volume mm	300W, 110H, 300L	

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.30	0.80
Mn	1.38	1.50
P	0.008	0.030
S	0.009	0.030
Ni	2.13	1.75~2.75

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld Mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	560	538min.
TS (MPa)	640	621~758
El on 4d (%)	27	17min.
IV -60℃ (J)	82	27min.

Approvals

ABS	5YQ500SA H5
LR	5Y50S, H5
DNV-GL	V Y50MS (H5)

DW-A62LSR

TRUSTARC™

Flux cored wire

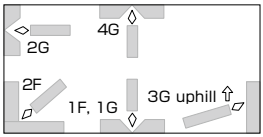
Features:
- Excellent impact value down to -60℃ in the as-welded condition and -40℃ in PWHT condition

Classification: AWS A5.29 E91T1-GM

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.15
Si	0.15	0.80
Mn	1.30	1.00~1.75
P	0.007	0.030
S	0.008	0.030
Ni	2.59	2.00~2.75
Cr	0.02	0.15
Mo	0.20	0.35
V	<0.01	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	610	595	538min.
TS (MPa)	675	660	621~758
El on 4d (%)	23	24	17min.
IV (J)	-60℃:98	-40℃:92	27min.
PWHT (℃xh)	AW	620x2	AW

MX-A55T

TRUSTARC™

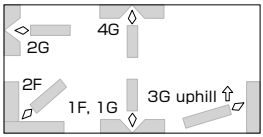
Flux cored wire

Features:
- Suitable with a short circuit arc
- Excellent impact value down to -60℃

Classification: AWS A5.28 E80C-G

Shielding gas: Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	15kg
Volume mm	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.15
Si	0.40	0.80
Mn	1.40	0.50~1.75
P	0.010	0.030
S	0.014	0.030
Ni	1.42	1.00~2.00
Cr	0.02	0.15
Mo	0.01	0.20
V	0.01	0.05
Cu	0.04	0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	50~300	50~180

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	540	469min.
TS (MPa)	600	552~689
El on 4d (%)	29	19min.
IV -60℃ (J)	90	27min.

Approvals

LR	5Y40S, H5
DNV-GL	V̈YMS (H5)
BV	SA3YM H5, UP

MX-A55Ni1

TRUSTARC™

Flux cored wire

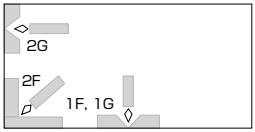
Features: ▪ Excellent impact values down to -60℃

Classification: AWS A5.28 E80C-G

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	15kg
Volume mm	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.15
Si	0.34	0.80
Mn	1.67	1.40~2.00
P	0.007	0.030
S	0.008	0.030
Ni	0.86	0.70~1.00
Cr	0.02	0.15
Mo	0.01	0.20
V	<0.01	0.05
Cu	0.03	0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	150~300	150~300

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	540	470min.
TS (MPa)	610	552~680
El on 4d (%)	29	20min.
IV -60℃ (J)	120	27min.

MX-A80L TRUSTARC™

Flux cored wire

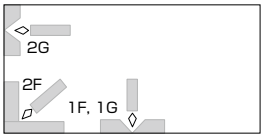
Features: ▪ Excellent impact values down to -60℃

Classification: AWS A5.28 E110C-G H4

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	12.5kg
Volume mm	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.03~0.10
Si	0.48	0.90
Mn	1.87	1.1~2.0
P	0.009	0.020
S	0.009	0.020
Ni	2.49	2.1~3.0
Cr	0.01	0.2
Mo	0.09	0.2
V	<0.01	0.05
Nb	<0.01	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
1.2	150~300	150~300

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	720	676min.
TS (MPa)	800	759~896
El on 4d (%)	24	15min.
IV -60℃ (J)	120	47min.

Approvals

ABS	5YQ690SA (H5)
LR	5Y69S, H5
DNV-GL	V Y69MS (H5)

DW-50LSR

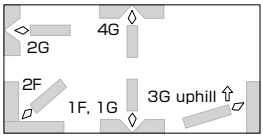
TRUSTARC™

Flux cored wire

Features:

- Excellent impact values down to -60℃ and down to -50℃ in the PWHT condition
- Meets the NACE MR0175 requirements for both chemistry and hardness. The nickel content is normally 1% max.

Welding Positions:



Classification: AWS A5.29 E71T1-GC

Shielding gas: CO_2
Polarity: DCEP

Packaging data

ϕ mm	Spool	
1.2	12.5kg	15kg
Volume mm	300W, 110H, 300L	

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.29	1.00
Mn	1.34	0.50~1.75
P	0.009	0.030
S	0.007	0.030
Ni	0.88	0.70~1.00
Cr	0.01	0.15
Mo	0.01	0.35
V	<0.01	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	480	425	400min.
TS (MPa)	560	520	483~655
El on 4d (%)	31	35	20min.
IV -60℃ (J)	110	110	27min.
PWHT (℃xh)	AW	620x1	AW

Approvals

ABS	5Y400SA, H5
LR	5Y40S, H5
DNV-GL	ⅤY40MS (H5)
RS	5Y40SM H5

DW-A70L

TRUSTARC™

Flux cored wire

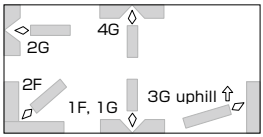
Features:
- Suitable for welding up to X80 grade pipe
- Excellent impact value down to -50℃
- The nickel content is normally 1% max.

Classification: AWS A5.29 E101T1-GM

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	5kg	15kg
Volume mm	220W, 130H, 435L/4pcs	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.05	0.15
Si	0.36	0.80
Mn	1.90	1.00~2.00
P	0.005	0.030
S	0.008	0.030
Ni	0.89	0.40~1.00
Cr	0.02	0.20
Mo	0.42	0.30~0.70
V	<0.01	0.05

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	660	607min.
TS (MPa)	740	690~827
El on 4d (%)	21	16min.
IV -50℃ (J)	70	27min.

Approvals

LR	4Y62S H5
DNV-GL	ⅣY62MS H5

DW-A80L

TRUSTARC™

Flux cored wire

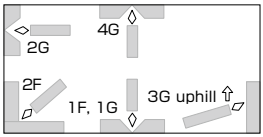
Features: ▪ Excellent impact value down to -40℃

Classification: AWS A5.29 E111T1-GM-H4

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	5kg	12.5kg
Volume mm	220W, 130H, 435L/4pcs	300W, 110H, 300L

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.31	0.80
Mn	1.86	1.25~2.25
P	0.007	0.030
S	0.006	0.030
Ni	2.49	1.75~2.75
Cr	0.02	0.20
Mo	0.16	0.50
Cu	0.01	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	760	676min.
TS (MPa)	810	759~896
El on 4d (%)	21	15min.
IV -40℃ (J)	90	27min.

Approvals

ABS	4YQ690SA H5, MG
LR	4Y69S H5
DNV-GL	ⅣY69MS, MG (H5)
NK	KSW4Y69G (M2) H5

DW-460L

TRUSTARC™

Flux cored wire

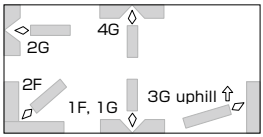
Features:
- Suitable for YP47 grade hull structural steel plates
- Excellent impact value down to -60℃

Classification: AWS -

Shielding gas: CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool	
1.2	12.5kg	15kg
Volume mm	300W, 110H, 300L	

Composition (all-weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.15
Si	0.43	0.80
Mn	1.53	0.50~1.75
P	0.009	0.030
S	0.007	0.030
Ni	1.56	1.00~2.00

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F,1G, 2F	2G	3G uphill, 4G
1.2	150~300	150~280	150~250

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	580	460min.
TS (MPa)	650	570~720
El on 4d (%)	25	20min.
IV -20℃ (J)	140	57min.

Approvals

ABS	5YQ460H5
LR	5Y46S, 3Y47S H5
DNV-GL	V Y46MSH5
BV	SA3Y47MH5, SA5Y46MH5
NK	KSW5Y46G (C) H5, KSW63Y47G (C) H5
KR	5Y46SMG (C1), H5
CCS	For YP47 Steel Plate

MG-S50LT TRUSTARC™

Solid wire

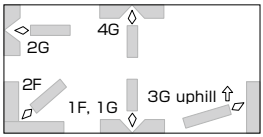
Features: ▪ Suitable for 400 to 490MPa tensile strength steel

Classification: AWS A5.18 ER70S-G

Shielding gas: Ar-20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.03~0.10
Si	0.40	0.30~0.50
Mn	1.91	1.50~2.10
P	0.006	0.015
S	0.002	0.015
Cu	0.21	0.40
Ti	0.08	0.04~0.12
B	0.006	0.003~0.010

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	80~300	50~180

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	470	440	400min.
TS (MPa)	540	510	483min.
El on 4d (%)	33	35	22min.
IV -60℃ (J)	110	88	27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

Approvals

ABS	3YSA, MG
LR	5Y40S (H15)
DNV-GL	VYMS, VL2-4L, 4-4L
NK	KSWL3G (M2)

MG-S1N TRUSTARC™

Solid wire

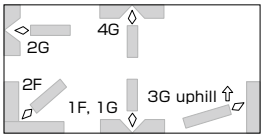
Features: ▪ Suitable for low temperature steel

Classification: AWS A5.28 ER70S-G

Shielding gas: Ar-5~20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.07
Si	0.43	0.20~0.60
Mn	1.37	1.00~1.60
P	0.003	0.020
S	0.008	0.020
Ni	1.76	1.50~2.00
Mo	0.20	0.40
Cu	0.21	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	80~300	50~180

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	410	360min.
TS (MPa)	520	483min.
El on 4d (%)	32	22min.
IV -60℃ (J)	140	27min.
PWHT (℃xh)	620x1	620±15x1
SG	Ar-20%CO_2	Ar-20%CO_2

MG-S3N

TRUSTARC™

Solid wire

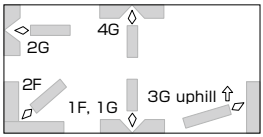
Features: ▪ Suitable for 3.5% Ni steel

Classification: AWS A5.28 ER70S-G

Shielding gas: Ar-5~20%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.02	0.07
Si	0.29	0.50
Mn	1.24	1.00~1.50
P	0.006	0.020
S	0.002	0.020
Ni	4.16	3.80~4.50
Mo	0.21	0.40
Cu	0.22	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	80~300	50~180

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	470	360min.
TS (MPa)	570	483min.
El on 4d (%)	32	16min.
IV (J)	-101℃: 130	-105℃: 27min.
PWHT (℃xh)	620x1	620±15x1
SG	Ar-5%CO_2	Ar-5%CO_2

MG-60 TRUSTARC™

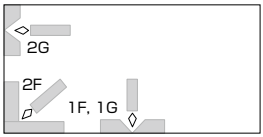
Solid wire

Features: ▪ Suitable for flat, horizontal and horizontal fillet welding

Classification: -

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
0.9	20kg
1.2	20kg
1.4	20kg
1.6	20kg
Volume mm	280W, 110H, 270L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.04	0.12
Si	0.82	0.60~1.00
Mn	1.95	1.40~2.10
P	0.013	0.025
S	0.010	0.025
Mo	0.35	0.10~0.45
Cu	0.25	0.50
Ti	0.20	0.02~0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G
0.9	50~200	50~180
1.2	100~350	100~300
1.4	150~450	150~350
1.6	200~550	200~400

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	590	570	500min.
TS (MPa)	670	660	552min.
El on 4d (%)	28	29	19min.
IV -18℃ (J)	90	80	-5℃: 47min.
PWHT (℃xh)	AW	620x5	AW

Approvals

ABS	3YQ500
DNV-GL	ⅢY46MS, MG
NK	KSW3Y50G (C) H5

MG-S63B

TRUSTARC™

Solid wire

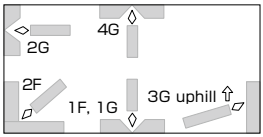
Features: ▪ Suitable for 550 to 610MPa tensile strength steel

Classification: AWS A5.28 ER90S-G

Shielding gas: Ar-5~25%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.02~0.15
Si	0.71	0.50~0.90
Mn	1.36	1.10~1.60
P	0.006	0.025
S	0.012	0.025
Cr	0.45	0.30~0.60
Mo	0.28	0.10~0.45
Cu	0.25	0.40
Ti	0.08	0.02~0.30

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F	2G	3G uphill, 4G
1.2	80~350	80~300	50~160

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	580	500min.
TS (MPa)	660	621min.
El on 4d (%)	29	19min.
IV -18℃ (J)	150	-5℃: 47min.
SG	Ar-20%CO_2	Ar-20%CO_2

MG-70 TRUSTARC™

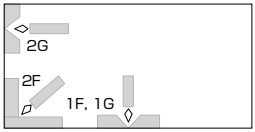
Solid wire

Features: ▪ Suitable for 690MPa tensile strength steel

Classification: AWS A5.28 ER100S-G

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	20kg
1.6	20kg
Volume mm	280W, 110H, 270L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.78	0.50~1.00
Mn	2.00	1.70~2.30
P	0.011	0.030
S	0.007	0.030
Ni	1.05	0.70~1.50
Mo	0.64	0.40~0.90
Cu	0.23	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G
1.2	100~300
1.6	200~450

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	610	550min.
TS (MPa)	720	690min.
El on 4d (%)	26	16min.
IV -18℃ (J)	90	27min.

MG-S70 TRUSTARC™

Solid wire

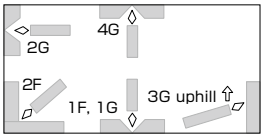
Features: ▪ Suitable for 690MPa tensile strength steel

Classification: AWS A5.28 ER100S-G

Shielding gas: Ar-5~25%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.11
Si	0.47	0.30~0.80
Mn	1.41	0.90~1.60
P	0.010	0.030
S	0.008	0.030
Ni	2.02	1.50~2.50
Cr	0.17	0.30
Mo	0.39	0.20~0.60
Cu	0.21	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	80~300	50~180

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	650	550min.
TS (MPa)	720	690min.
El on 4d (%)	25	16min.
IV -40℃ (J)	100	27min.
SG	Ar-20%CO_2	Ar-20%CO_2

MG-80 TRUSTARC™

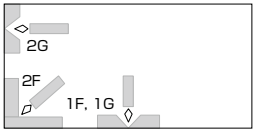
Solid wire

Features: ▪ Suitable for 780MPa tensile strength steel

Classification: AWS A5.28 ER110S-G

Shielding gas: CO_2
Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	20kg
Volume mm	300W, 110H, 300L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.67	0.40~0.90
Mn	1.78	1.60~2.20
P	0.009	0.025
S	0.008	0.025
Ni	2.16	1.80~2.60
Mo	0.62	0.40~0.90
Cu	0.23	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G
1.2	100~300

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	710	590min.
TS (MPa)	830	759min.
El on 4d (%)	24	15min.
IV -18℃ (J)	85	27min.

MG-S80 TRUSTARC™

Solid wire

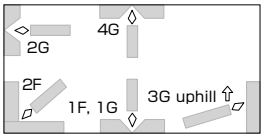
Features: ▪ Suitable for 780MPa tensile strength steel

Classification: AWS A5.28 ER110S-G

Shielding gas: Ar-5~25%CO_2

Polarity: DCEP

Welding Positions:



Packaging data

ϕ mm	Spool
1.2	20kg
Volume mm	300W, 110H, 300L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.05	0.12
Si	0.51	0.20~0.70
Mn	1.37	1.10~1.70
P	0.011	0.025
S	0.002	0.025
Ni	2.64	2.40~2.90
Cr	0.16	0.05~0.35
Mo	0.47	0.35~0.70
Ti	0.11	0.02~0.30
Cu	0.22	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	80~300	50~180

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	770	665min.
TS (MPa)	850	759min.
El on 4d (%)	20	15min.
IV -40℃ (J)	80	27min.
SG	Ar-20%CO_2	Ar-20%CO_2

Approvals

ABS	MG
DNV-GL	ⅣY69MS
NK	KSW4Y69G (M2)

MG-S88A TRUSTARC™

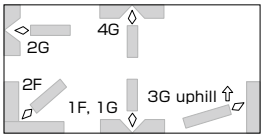
Solid wire

Features: ▪ Suitable for 780MPa tensile strength steel for low temperature service

Classification: AWS A5.28 ER120S-G

Shielding gas: Ar-20%CO_2
Polarity: DCEP

Welding Positions:



Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.09
Si	0.50	0.30~0.70
Mn	1.48	1.30~1.70
P	0.004	0.020
S	0.002	0.020
Ni	3.51	3.20~3.80
Mo	0.76	0.60~0.90
Cu	0.23	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	1F, 1G, 2F, 2G	3G uphill, 4G
1.2	80~300	50~180

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	770	690min.
TS (MPa)	880	828min.
El on 4d (%)	22	15min.
IV (J)	-80℃: 78	-60℃: 27min.

Approvals

ABS	4AQ690SAH5, MG
LR	4Y69S H5, MG
DNV-GL	ⅣY69MS (H5), MG
BV	SA4Y69M H5, MG
NK	KSW4Y69G (M2) H5
CCS	4Y69H5, MG

TG-S1N

TRUSTARC™

TIG welding rod and wire

Features: ▪ Suitable for low temperature steel

Classification: AWS A5.28 ER70S-G

Shielding gas: Ar
Identification color: 1st Black
Polarity: DCEN

Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.05	0.09
Si	0.31	0.60
Mn	1.07	0.70~1.30
P	0.005	0.025
S	0.007	0.025
Ni	0.79	0.60~1.00
Mo	0.15	0.30
Cu	0.15	0.40

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	Wire	Rod
1.2	50~280	-
1.6	-	60~220
2.0	-	80~240
2.4	-	100~260
3.2	-	150~300

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	460	390	360min.
TS (MPa)	540	450	483min.
El on 4d (%)	33	35	24min.
IV -60℃ (J)	200	250	27min.
PWHT (℃xh)	AW	620x1	AW

Approvals

ABS	4YSA, MG
LR	MG
DNV-GL	ⅤYM, VL4-4L
BV	4YM, UP
NK	KSWL2G (Ⅰ)

TG-S3N

TRUSTARC™

TIG welding rod and wire

Features: ▪ Suitable for 3.5% Ni steel

Classification: AWS A5.28 ER70S-G

Shielding gas: Ar
Identification color: 1st Yellowish green
Polarity: DCEN

Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.02	0.06
Si	0.34	0.60
Mn	0.86	0.60~1.10
P	0.004	0.020
S	0.008	0.020
Ni	3.53	3.20~3.90
Mo	0.15	0.30
Cu	0.17	0.35

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	Wire	Rod
1.2	50~280	-
1.6	-	60~220
2.0	-	80~240
2.4	-	100~260
3.2	-	150~300

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	510	490	360min.
TS (MPa)	580	570	483min.
El on 4d (%)	30	31	24min.
IV -101℃ (J)	69	78	-105℃: 27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

TG-S62

TRUSTARC™

TIG welding rod and wire

Features: ▪ Suitable for 550 to 590MPa tensile strength steel

Classification: AWS A5.28 ER80S-G

Shielding gas: Ar
Identification color: 1st White
Polarity: DCEN

Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.08	0.10
Si	0.74	0.30~0.85
Mn	1.38	1.15~1.65
P	0.007	0.020
S	0.006	0.020
Ni	0.03	0.60
Mo	0.52	0.25~0.65
Cu	0.16	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	Rod
1.6	60~220
2.0	80~240
2.4	100~260
3.2	150~300

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	540	530	420min.
TS (MPa)	660	640	552min.
El on 4d (%)	28	26	18min.
IV -20℃ (J)	180	98	27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

TG-S60A

TRUSTARC™

TIG welding rod and wire

Features: ▪ Suitable for 550 to 610MPa tensile strength steel

Classification: AWS A5.28 ER80S-G

Shielding gas: Ar
Identification color: 1st Orange
Polarity: DCEN

Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.12
Si	0.05	0.20
Mn	1.43	1.00~1.60
P	0.004	0.025
S	0.007	0.025
Ni	0.82	0.60~1.00
Mo	0.58	0.30~0.65
Cu	0.15	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	Wire	Rod
1.2	50~280	-
1.6	-	60~220
2.0	-	80~240
2.4	-	100~260

All-weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	590	590	420min.
TS (MPa)	670	660	552min.
El on 4d (%)	28	30	18min.
IV -60℃ (J)	270	280	27min.
PWHT (℃xh)	AW	600x1	AW & 600±15x1

Approvals

ABS	5YQ460SA
LR	5Y46m, H5
DNV-GL	VY46MS

TG-S80AM

TRUSTARC™

TIG welding rod and wire

Features: ▪ Suitable for 780MPa tensile strength steel

Classification: AWS A5.28 ER110S-G

Shielding gas: Ar
Identification color: -
Polarity: DCEN

Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.07	0.12
Si	0.07	0.20
Mn	1.10	0.90~1.40
P	0.004	0.025
S	0.008	0.025
Ni	2.92	2.60~3.10
Cr	0.36	0.10~0.60
Mo	0.69	0.40~0.90
Cu	0.14	0.50

Note: [a] Single values are maximum.

Welding parameters (A)

ϕ mm	Wire	Rod
1.2	50~280	-
1.6	-	60~220
2.0	-	80~240
2.4	-	100~260

All-weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	760	665min.
TS (MPa)	880	759min.
El on 4d (%)	23	15min.
IV -60℃ (J)	240	27min.

Approvals

ABS	5YQ690A H5, 5YQ690SA H5
LR	5Y69m H5, 5Y69M H5 (Auto)
DNV-GL	V Y69M, H5
BV	SA5Y69M H5
NK	KSW5Y69G (I) H5
CCS	5Y69SM H5

FAMILIARC™ MF-38/ TRUSTARC™ US-49A

Flux and wire combination

Features:
- Suitable for multi-layer butt welding
- Excellent impact value down to -40℃

Classification: AWS A5.17 F7A6-EH14, F7P6-EH14

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

Packaging data

Flux	Mesh	Can		
MF-38	12x65	25kg		
	20x200	25kg		
	20xD	25kg		
Volume mm		240W, 350H, 240L		
Wire	ϕ mm	Coil		
US-49A	2.4	25kg	-	-
	3.2	25kg	-	150kg
	4.0	25kg	75kg	150kg
	4.8	25kg	75kg	-
Volume mm		430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.02	0.10
Mn	1.99	1.70~2.20
P	0.007	0.030
S	0.005	0.030
Mo	0.24	0.20~0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.09
Si	0.40
Mn	1.63
P	0.019
S	0.013
Mo	0.21

Weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	540	490	400min.
TS (MPa)	620	590	483~655
El on 4d (%)	28	30	22min.
IV -51℃ (J)	50	60	27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

TRUSTARC™ PF-H55LT/ FAMILIARC™ US-36

Flux and wire combination

Features:
- Suitable for welding of structures for low temperature service
- Excellent impact value down to -60℃ and CTOD down to -50℃

Classification: AWS A5.17 F7A8-EH14, F7P8-EH14

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

Packaging data

Flux	Mesh	Can		
PF-H55LT	10x48	20kg		
Volume mm		240W, 350H, 240L		
Wire	ϕ mm	Coil		
US-36	3.2	25kg	76kg	-
	4.0	25kg	75kg	150kg
	4.8	25kg	75kg	150kg
Volume mm		430W, 90H, 430L	740W, 110H, 740L	840W, 110H, 840L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.10~0.20
Si	0.03	0.10
Mn	1.95	1.70~2.20
P	0.013	0.030
S	0.008	0.030
Cu	0.12	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	490	460	400min.
TS (MPa)	555	540	483~655
El on 4d (%)	34	34	22min.
IV -62℃ (J)	180	160	27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

Composition (weld metal mass%)

	Typical
C	0.08
Si	0.19
Mn	1.42
P	0.013
S	0.005
Ti	0.02
B	0.004

Approvals

	Single	Tandem
ABS	3M, 3YM, MG	4YM, MG
LR	5Y40M, H5	-
DNV-GL	ⅤYM, VL2-4, VL4-4	ⅤYM
BV	A4YM, UP	-
NK	KAWL3M	KAWL3M

PF-H55AS/US-36J TRUSTARC™

Flux and wire combination

Features:
- Suitable for welding of structures for low temperature service
- Excellent impact value down to -60℃ and CTOD at temperatures down to -20℃

Classification: AWS A5.17 F7A8-EH14, F7P8-EH14

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

Packaging data

Flux	Mesh	Can	
PF-H55AS	10x48	20kg	
Volume mm		240W, 350H, 240L	
Wire	**ϕ mm**	**Coil**	
US-36J	3.2	25kg	76kg
	4.0	25kg	75kg
	4.8	25kg	75kg
Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.13	0.10~0.20
Si	0.01	0.10
Mn	2.00	1.70~2.20
P	0.007	0.030
S	0.008	0.030
Cu	0.10	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	485	430	400min.
TS (MPa)	555	530	483~655
El on 4d (%)	33	31	22min.
IV -62℃ (J)	170	180	27min.
PWHT (℃xh)	AW	620x1	AW & 620±15x1

Composition (weld metal mass%)

	Typical
C	0.07
Si	0.23
Mn	1.42
P	0.009
S	0.004
Ti	0.02
B	0.004

Approvals

	Single	Tandem
ABS	5Y400 H5	5Y400 H5
LR	5Y40M, H5	5Y40M, H5
DNV-GL	ⅤY40M (H5), VL2-4L, VL4-4L	ⅤY40M (H5), VL2-4L, VL4-4L
BV	A5Y40M, H5	A5Y40M, H5
NK	KAWL3MH5	KAWL3M H10

PF-H203/US-203E

TRUSTARC™

Flux and wire combination

Features:
- Suitable for multi-layer butt welding of 3.5% Ni steel
- Excellent impact value down to -100℃ after PWHT

Classification: AWS A5.23 F7P15-ENi3-Ni3

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

Packaging data

Flux	Mesh	Can
PF-H203	10x48	20kg
Volume mm		240W, 350H, 240L
Wire	ϕ mm	Coil
US-203E	4.0	25kg
Volume mm		430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.06	0.13
Si	0.18	0.05~0.30
Mn	0.98	0.60~1.20
P	0.005	0.020
S	0.002	0.020
Ni	3.48	3.10~3.80
Cr	0.03	0.15
Cu	0.11	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.04	0.12
Si	0.21	0.80
Mn	0.73	1.60
P	0.008	0.030
S	0.004	0.025
Ni	3.35	2.80~3.80
Cr	0.02	0.15
Cu	0.10	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	440	400min.
TS (MPa)	530	483~655
El on 4d (%)	34	22min.
IV -101℃ (J)	130	27min.
PWHT (℃xh)	610x1	620±15x1

FAMILIARC™ MF-38/ TRUSTARC™ US-A4

Flux and wire combination

Features:
- Suitable for butt and fillet welding
- Applicable for 0.5%Mo steel

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

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

Packaging data

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

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.09	0.07~0.12
Si	0.04	0.05
Mn	1.59	1.25~1.70
P	0.01	0.025
S	0.014	0.025
Ni	0.02	0.25
Cr	0.04	0.15
Mo	0.52	0.45~0.60
Cu	0.10	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

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

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	520	510	469min.	
TS (MPa)	640	600	552~689	
El on 4d (%)	28	29	20min.	
IV (J)	-40℃: 37	-51℃: 40	-40℃: 27min.	-51℃: 27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

FAMILIARC™ MF-38/ TRUSTARC™ US-40

Flux and wire combination

Features:
- Suitable for butt and fillet welding
- Applicable for 0.5%Mo steel

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

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

Packaging data

Flux	Mesh	Can	Wire	ϕ mm	Coil	
MF-38	12x65	25kg	US-40	2.4	25kg	-
	20x200	25kg		3.2	25kg	-
	20xD	25kg		4.0	25kg	75kg
	-	-		4.8	25kg	75kg
Volume mm		240W, 350H, 240L	Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.13	0.10~0.17
Si	0.02	0.05
Mn	1.80	1.70~2.10
P	0.009	0.025
S	0.014	0.025
Ni	0.02	0.25
Cr	0.06	0.15
Mo	0.52	0.45~0.65
Cu	0.11	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	580	560	538min.	469min.
TS (MPa)	670	630	621~758	552~689
El on 4d (%)	28	29	17min.	20min.
IV -51℃ (J)	51	58	27min.	27min.
PWHT (℃xh)	AW	620x1	AW	620±15x1

Composition (weld metal mass%)

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

Note: [a] Single values are maximum.

Approvals

NK	KAW3Y50MH10

Note: Single electrode

FAMILIARC™ MF-38/ TRUSTARC™ US-49

Flux and wire combination

Features:
- Suitable for butt and fillet welding
- Applicable for 0.5%Mo steel

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

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

Packaging data & Type of flax

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

Wire	ϕ mm	Spool		Coil	
US-49	1.6	-	20kg	-	-
	2.4	10kg	-	25kg	-
	3.2	-	-	25kg	76kg
	4.0	-	-	25kg	75kg
	4.8	-	-	25kg	75kg
	6.4	-	-	25kg	-
Volume mm		240W, 110H, 240L	300W, 110H, 300L	430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.07~0.12
Si	0.03	0.05
Mn	1.58	1.25~1.80
P	0.009	0.025
S	0.011	0.025
Ni	0.02	0.25
Cr	0.05	0.15
Mo	0.52	0.45~0.60
Cu	0.12	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

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

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty	
0.2%YS (MPa)	520	510	470min.	
TS (MPa)	640	600	550~690	
El on 4d (%)	28	29	20min.	
IV (J)	-40℃: 37	-51℃: 40	-40℃: 27min.	-51℃: 27min.
PWHT (℃xh)	AW	600x3	AW	620±15x1

Approvals

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

PF-H55S/US-2N

TRUSTARC™

Flux and wire combination

Features:
- Suitable for welding of structures for low temperature service
- Excellent impact value down to -60℃ and CTOD at temperatures down to -20℃

Classification: AWS A5.23 F9A10-EG-Ni2, F9P8-EG-Ni2

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

Packaging data

Flux	Mesh	Can	
PF-H55S	10x48	20kg	
Volume mm		240W, 350H, 240L	
Wire	**ϕ mm**	**Coil**	
US-2N	3.2	25kg	-
	4.0	25kg	75kg
	4.8	25kg	-
Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.15
Si	0.01	0.10
Mn	1.70	1.50~1.90
P	0.007	0.015
S	0.004	0.015
Ni	2.60	2.40~2.80
Mo	0.25	0.20~0.30
Cu	0.10	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	610	590	538min.
TS (MPa)	675	645	621~758
El on 4d (%)	30	30	17min.
IV -62℃ (J)	140	120	27min.
PWHT (℃xh)	AW	620x2	AW & 620±15x2

Composition (weld metal mass%)

	Typical
C	0.06
Si	0.22
Mn	1.22
P	0.006
S	0.004
Ni	2.39
Mo	0.21
Cu	0.11

Approvals

LR	5Y50M H5
NK	KAW5Y50M H5

Note: Single electrode

PF-H62AS/US-2N TRUSTARC™

Flux and wire combination

Features:
- Suitable for welding of structures for low temperature service
- Excellent impact value down to -60℃ and CTOD at temperature to -20℃

Classification: AWS A5.23 F9A8-EG-Ni2, F9P8-EG-Ni2

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

Packaging data

Flux	Mesh	Can	
PF-H62AS	10x48	20kg	
Volume mm		240W, 350H, 240L	
Wire	**ϕ mm**	**Coil**	
US-2N	3.2	25kg	-
	4.0	25kg	75kg
	4.8	25kg	-
Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.15
Si	0.01	0.10
Mn	1.70	1.50~1.90
P	0.007	0.015
S	0.004	0.015
Ni	2.60	2.40~2.80
Mo	0.25	0.20~0.30
Cu	0.10	0.35

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	568	550	538min.
TS (MPa)	648	635	621~758
El on 4d (%)	29	30	17min.
IV -62℃ (J)	120	110	27min.
PWHT (℃xh)	AW	620x2	AW & 620±15x2

Composition (weld metal mass%)

	Typical
C	0.05
Si	0.25
Mn	1.30
P	0.011
S	0.005
Ni	2.46
Mo	0.24
Cu	0.10

Approvals

	Single	Tandem
ABS	5YQ500 H5	5YQ500 H5
LR	5Y50M H5	5Y50M H5
DNV-GL	VY50M H5	VY50 H5
BV	A5Y50M H5	A5Y50M H5
NK	KAW5Y50M H5	KAW5Y50M H5
CCS	5Y50M H5	5Y50M H5

PF-H62AK/US-2N

TRUSTARC™

Flux and wire combination

Features:
- Suitable for welding of structures for low temperature service
- Excellent impact value down to -60℃ in the as-welded and PWHT conditions

Classification: AWS A5.23 F9A8-EG-Ni2, F9P8-EG-Ni2

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

Packaging data

Flux	Mesh	Can	
PF-H62AK	10x48	20kg	
Volume mm		240W, 350H, 240L	
Wire	**ϕ mm**	**Coil**	
US-2N	3.2	25kg	-
	4.0	25kg	75kg
	4.8	25kg	-
Volume mm		430W, 90H, 430L	740W, 110H, 740L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.12	0.15
Si	0.01	0.10
Mn	1.70	1.50~1.90
P	0.007	0.015
S	0.004	0.015
Ni	2.60	2.40~2.80
Mo	0.25	0.20~0.30
Cu	0.10	0.35

Note: [a] Single values are maximum.

Composition (weld metal mass%)

	Typical
C	0.08
Si	0.17
Mn	1.31
P	0.005
S	0.003
Ni	2.33
Mo	0.22
Cu	0.11

Weld mechanical properties

	Typical		Guaranty
0.2%YS (MPa)	615	575	538min.
TS (MPa)	690	650	621~758
El on 4d (%)	26	30	17min.
IV -62℃ (J)	170	160	27min.
PWHT (℃xh)	AW	620x2	AW & 620±15x2

PF-H80AS/US-80LT TRUSTARC™

Flux and wire combination

Features:
- Suitable for welding of heavy duty structures
- Excellent impact value down to -80℃

Classification: AWS A5.23 F11A10-EG-G

Type of flux: Bonded
Redrying of flux: 250~350℃x1h
Polarity: DCEP

Packaging data

Flux	Mesh	Can	Wire	ϕ mm	Coil
PF-H80AS	10x48	20kg	US-80LT	3.2	25kg
				4.0	25kg
				4.8	25kg
Volume mm		240W, 350H, 240L	Volume mm		430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.15
Si	0.11	0.25
Mn	2.03	1.75~2.25
P	0.007	0.015
S	0.004	0.015
Ni	2.59	2.40~2.90
Mo	0.74	0.60~0.90
Cu	0.12	0.40

Note: [a] Single values are maximum.

Weld mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	740	676min.
TS (MPa)	860	759~896
El on 4d (%)	23	15min.
IV -73℃ (J)	83	27min.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.06	0.12
Si	0.51	0.80
Mn	1.64	1.20~2.20
P	0.011	0.030
S	0.002	0.030
Ni	2.42	2.10~2.90
Mo	0.73	0.50~1.00
Cu	0.11	0.35

Note: [a] Single values are maximum.

Approvals

ABS	4YQ690, MG
LR	4Y69M (H5)
DNV-GL	ⅣY69M (H5), MG
BV	4Y69M H5, MG
CCS	4Y69M H5, MG
NK	KAW4Y69M, H5

Note: Single electrode

PF-H80AK/US-80LT TRUSTARC™

Flux and wire combination

Features:
- Suitable for welding of heavy duty structures
- Excellent impact value down to -80℃

Classification: AWS A5.23 F12A10-EG-G

Type of flux: Bonded
Redrying of flux: 250~350℃x1h
Polarity: AC

Packaging data

Flux	Mesh	Can	Wire	ϕ mm	Coil
PF-H80AK	10x48	20kg	**US-80LT**	3.2 4.0 4.8	25kg 25kg 25kg
Volume mm		240W, 350H, 240L	**Volume mm**		430W, 90H, 430L

Composition (wire mass%)

	Typical	Guaranty [a]
C	0.10	0.15
Si	0.11	0.25
Mn	2.03	1.75~2.25
P	0.007	0.015
S	0.004	0.015
Ni	2.59	2.40~2.90
Mo	0.74	0.60~0.90
Cu	0.12	0.40

Note: [a] Single values are maximum.

Weld Mechanical properties

	Typical	Guaranty
0.2%YS (MPa)	760	745min.
TS (MPa)	840	828~965
El on 4d (%)	22	14min.
IV -73℃ (J)	90	27min.

Composition (weld metal mass%)

	Typical	Guaranty [a]
C	0.08	0.12
Si	0.28	0.80
Mn	1.65	1.20~2.20
P	0.009	0.030
S	0.004	0.030
Ni	2.45	2.10~2.90
Mo	0.74	0.50~1.00
Cu	0.12	0.35

Note: [a] Single values are maximum.

Approvals

	Single	Tandem
ABS	5YQ690, H5	5YQ690 H5
LR	5Y69M, H5	-
DNV-GL	VY69M	VY69M H5
BV	A5Y69M H5	A5Y69M H5
NK	KAW5Y69M, H5	KAW5Y69M H5

For Heat-Resistant Steel

Welding Consumables for

SMAW

GMAW

GTAW

SAW