

**KOBELCO**  
KOBELCO GROUP



**KOBE STEEL**

Japan International Welding Show 2010

**Welding Business**

# CONTENTS

- Welding Robot System ..... 2
- Welding Consumables for Building Structure ..... 4
- Welding Consumables for Bridges ..... 6
- Welding Consumables for Shipbuilding ..... 8
- Welding Consumables for Pressure Vessels For Cr-Mo Steel ..... 10
- Welding Consumables for LNG Storage Tanks ..... 12
- Welding Consumables for Automobile ..... 14
- Welding Consumables for Off-shore Structures ..... 16



Image of Kobelco Booth

# Welding Robot System

## 1 **REGARC** Core welding robot system

This welding robot system for architectural steel structures has the REGARC function, using an ultra low spatter CO<sub>2</sub> welding process. The REGARC function significantly reduces the spatter attached around weld zones, and decreases the works of improving quality and removing spatter. The REGARC process has a feature of low heat input and high welding, which contributes to improving the mechanical property and efficiency of weld zones. This system has improved the weaving function and the nozzle geometry in order to enhance the REGARC performance, and prevented defective shielding and a decline in toughness.

Thus, this system contributes to reducing manufacturing costs of steel structures, and improving quality.

In the welding show, this robot will weld a column to show the low spatter performance.



Comparison of the spatter attached to a diaphragm

## 2 **CABLE-THRU-ARM ROBOT** AR700 (to be exhibited for reference)

This manipulator with a built-in cable is suitable for ceiling-suspended systems, which have an advantage in terms of space saving and the work-handling performance.

Its single torch version enables an approach without any trouble caused by interference of the torch cable with a work or by cable handling, since the torch body and torch cable are passed through the upper arm. While we are promoting simplification of teaching using off-line teaching, we expect that the simplification of teaching could be accelerated since the cable handling, which cannot be controlled off-line, is eliminated.

A tandem torch can be built in the wrist, and an approach to narrower sections is enabled (the torch cable is handled outside).

With its wrist built-in version, a single torch can be automatically replaced with a tandem torch, since it has a tool replacing function of a hollow structure in the wrist.

Since a back-flip motion (the robot bends backward) is possible, the operating range of the ceiling-suspended version is expanded, which may enable to shorten the slider stroke.



## 3 **Digital control welder** **SENSARC AB500**

This digital control welder is specialized for welding robots. Digital communication between the welder and the robot controller enabled highly precise and quality welding, control, and maintenance.

The 500A welding power supply has various welding modes (CO<sub>2</sub> welding, Ar+CO<sub>2</sub> welding, single pulse welding, tandem pulse welding, etc.) suitable for welding steel plates of medium thickness.

### Feature 1: Stable and precise wire feed and arc control

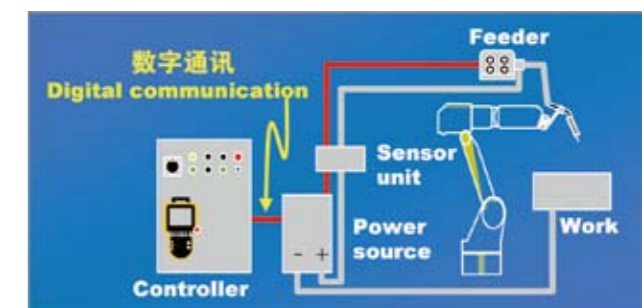
Digital control of the welding output waveform and a new type feed motor realized the optimum arc and stable wire feed that ensure the ultra low spatter performance in every welding mode. It also has the REGARC mode that realized the ultra low spatter performance in CO<sub>2</sub> welding as mentioned above.

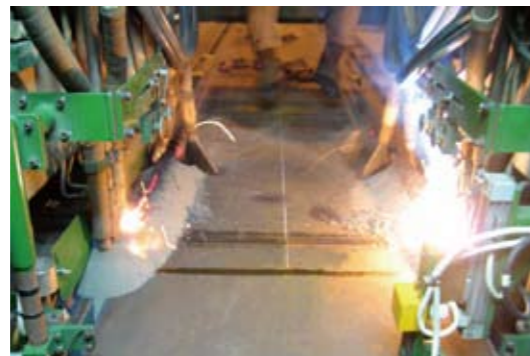
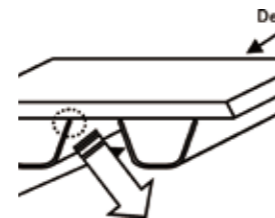
### Feature 2: Improvement in ease of use

Digital communication between the welder and controller allowed adding various application functions, which were impossible with a conventional analog control.

For example, it enables to switch with/without pulse during welding or in every multi-layer pass, and increase the variation of welding conditions. Also, the display of the current/voltage during welding, the monitoring function of the wire feed speed/load, the switch of welding mode, and the upgrade of the software version can be done quickly from the teaching pendant, which are effective for specifying welding conditions and welding control. Thus, it has improved significantly ease of use, including maintenance.

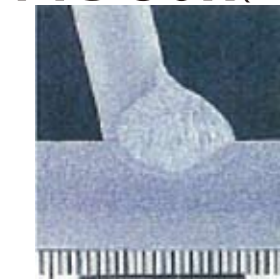
In the welding show, the REGARC core robot welding system and high-current MAG process will be exhibited, and they will demonstrate welding.





## Solid wires suitable for building structure welding robots

**MG-50R**(YGW11) **MG-56R(N)**(YGW18)



Conventional wire



Excellent slag-detachability

**MG-56R(N)**



## Combinaiton of steel class and welding consumables

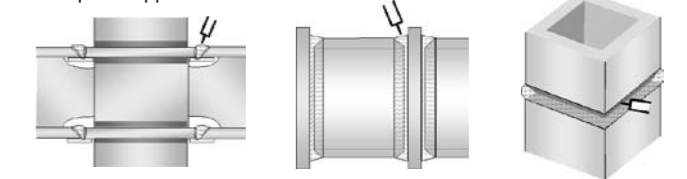
Steel <sup>1)</sup>	Strength class <sup>1)</sup>	Welding method	JIS classification	Brand name of welding consumable		
Carbon steel	400,490MPa	GMAW <sup>2)</sup>	CO <sub>2</sub> semi-auto	Z3312 YGW11	FAMILIARC MG-50	
			CO <sub>2</sub> robot	Z3312 YGW11	FAMILIARC MG-50R	
			Ar+CO <sub>2</sub> robot	Z3312 YGW15	FAMILIARC MIX-50R	
	400,490MPa 520,550MPa		CO <sub>2</sub> semi-auto	Z3312 YGW18	FAMILIARC MG-56	
			CO <sub>2</sub> robot		FAMILIARC MG-56R(N)	
			Ar+CO <sub>2</sub> robot	Z3312 YGW19	FAMILIARC MIX-55R	
400,490,520MPa	Sub-merged arc (SAW)	Z3183 S502-H	FAMILIARC US-36L / PF-I53ES			
High tensile steel	570,590MPa	GMAW <sup>2)</sup>	CO <sub>2</sub>	Z3312 G59JA1UC3M1T	FAMILIARC MG-60	
			Ar+CO <sub>2</sub>	Z3312 G59JA1UMCM1T	FAMILIARC TRUSTARC MG-S63B	
	690MPa 780MPa	GMAW <sup>2)</sup>	Sub-merged arc (SAW)		Z3183 S502-H	FAMILIARC US-49 / PF-I55ES
			CO <sub>2</sub>	Z3312 G69A2UCN2M4T	FAMILIARC MG-70	
Fire-resistant steel	400MPa級	GMAW <sup>2)</sup>	CO <sub>2</sub>	Z3312 G43A0UC11	FAMILIARC MG-400FR	
	400,490,520MPa		CO <sub>2</sub>	Z3312 G49A0UC3M1T	FAMILIARC MG-490FR	
			Sub-merged arc (SAW)		Z3183 S502-H	FAMILIARC US-400LFR / PF-I53ES
High HAZ toughness steel	YP325,355 (490,520MPa)	GMAW <sup>2)</sup>	Sub-merged arc (SAW)		Z3183 S502-H	FAMILIARC US-55ST / PF-I55ST
			Electro-slag (ESW)		Z3353 YES60 / FS-FG3	FAMILIARC ES-55ST / EF-38
	SA440 (590MPa)		Sub-merged arc (SAW)		Z3183 S623-H1 / FS-FG3	FAMILIARC US-60ST / PF-I60ST
			Electro-slag (ESW)		Z3353 YES60	FAMILIARC ES-60ST / EF-38

※2):Solid wire (Flux-cored wires is prepared elsewhere,too)

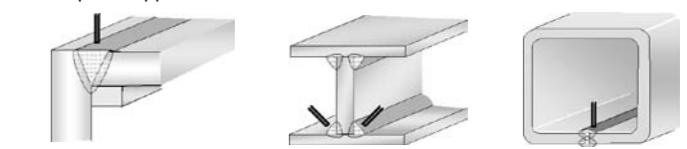
### ※1) Example of steel for building structure

Kind,class	The sign name of steel of the object
400MPa	SN400,SM400,SS400,STKN400,STKR400 BCP235,BCR295
490MPa	SN490,SM490,TMC325,STKN490,STKR490 BCP325,BCP325T
520MPa	SM520,TMC355
550MPa	TMC385
570MPa	SM570
590MPa	SA440
Fire-resistant	SM400-FR,SM490-FR,SM520-FR
High HAZ toughness	KCL A325-ST, KCL A355-ST KCL SA440-ST (“Kobelco super-toughness” series)

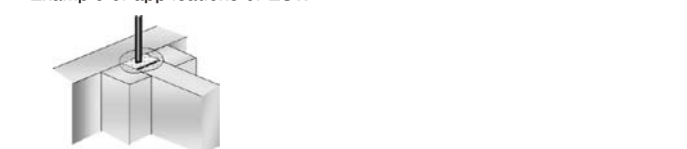
### Example of applications of GMAW



### Example of applications of SAW



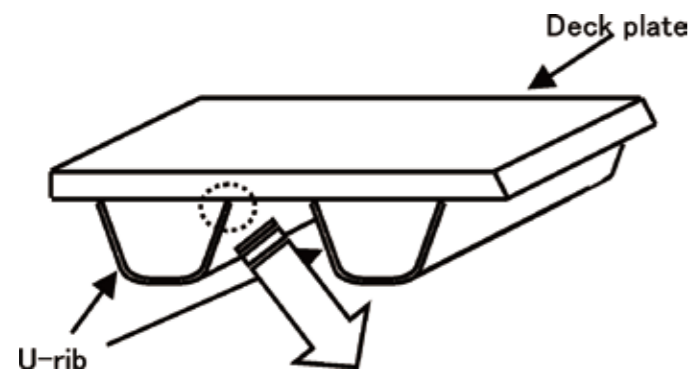
### Example of applications of ESW



# Welding Consumables for Bridges

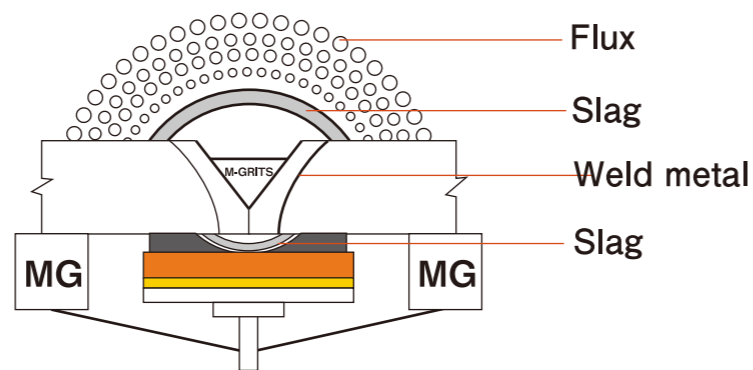


Carquinez Bridge (USA)  
picture:courtesy IHI corporation Aichi Works



**MX-Z200(1.4mmφ)**

## One-side SAW FABprocess



**US-36/MF-38/M-GRITS/FA-B1**

## Welding consumables for mild steel and high tensile strength steel

Steel Type (JIS)	SMAW	FCAW	GMAW	SAW	
	All position Flat and horizontal fillet	All position Flat and horizontal fillet	All position Flat and horizontal fillet	Butt-Flat fillet Flat and horizontal fillet	One-side
SM400	<b>FAMILIARC</b> LB-26 (for mild steel)	<b>FAMILIARC</b> DW-Z100	<b>FAMILIARC</b> MG-50	<b>FAMILIARC</b> <b>FAMILIARC</b> US-36/ MF-38	<b>FAMILIARC</b> <b>FAMILIARC</b> US-36/MF-38/ <b>FAMILIARC</b> <b>FAMILIARC</b> RR-2/FA-B1
SM490	<b>FAMILIARC</b> LB-52 <b>FAMILIARC</b> LT-B50 <b>FAMILIARC</b> LT-B52A	<b>FAMILIARC</b> <b>FAMILIARC</b> MX-Z200/ MX-Z210 <b>FAMILIARC</b> DW-300	—	<b>FAMILIARC</b> <b>FAMILIARC</b> US-36/ MF-53	
SM570	<b>TRUSTARC</b> LB-62 —	<b>TRUSTARC</b> DW-60 <b>TRUSTARC</b> MX-60	<b>TRUSTARC</b> MG-60 —	<b>TRUSTARC</b> <b>FAMILIARC</b> US-49/ MF-38 <b>TRUSTARC</b> <b>TRUSTARC</b> US-49/ MF-63	—

## Welding consumables for atmospheric corrosion resisting steel (JIS Z3114 1998)

Steel Type (JIS)	SMAW	FCAW	GMAW	SAW	
	All position Flat and horizontal fillet	All position Flat and horizontal fillet	All position Flat and horizontal fillet	Butt-Flat fillet Flat and horizontal fillet	One-side
SMA400P	<b>FAMILIARC</b> TB-W52B	<b>FAMILIARC</b> DW-50W	<b>FAMILIARC</b> MG-W50TB	<b>FAMILIARC</b> <b>FAMILIARC</b> US-W52B/ MF-38	<b>FAMILIARC</b> <b>FAMILIARC</b> US-W52B/MF-38/ <b>FAMILIARC</b> <b>FAMILIARC</b> RR-2/FA-B1
SMA490P	<b>FAMILIARC</b> LB-W52B				
SMA400W	—	<b>FAMILIARC</b> MX-50W <b>FAMILIARC</b> DW-300W	<b>FAMILIARC</b> MG-W50B	<b>FAMILIARC</b> <b>FAMILIARC</b> US-W52B/ MF-53	
SMA490W					
SM570	<b>FAMILIARC</b> LB-W62G —	<b>FAMILIARC</b> DW-60W <b>FAMILIARC</b> MX-60W	— <b>FAMILIARC</b> MG-W588	<b>FAMILIARC</b> <b>FAMILIARC</b> US-W62B/ MF-38 <b>FAMILIARC</b> <b>TRUSTARC</b> US-W62B/ MF-63	—

## Welding consumables for Ni-advanced weathering steel (Supertycor W:1Ni-1Cu-0.05Ti type)

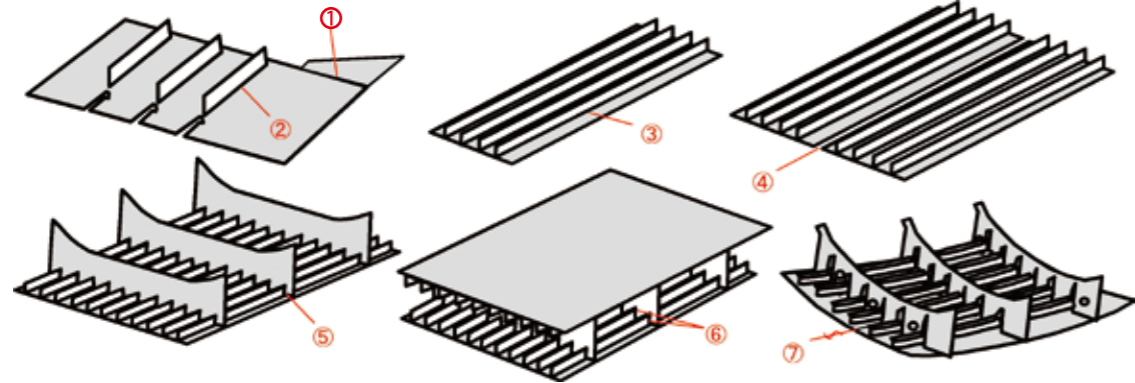
Steel type	SMAW	FCAW		SAW	
	All position	All position	Fillet	Butt	Fillet
Mild steel and 490MPa high tensile strength steel	<b>FAMILIARC</b> LB-50WT	<b>FAMILIARC</b> DW-50WT	<b>FAMILIARC</b> MX-50WT	<b>FAMILIARC</b> US-50WT/ <b>FAMILIARC</b> MF-38	<b>FAMILIARC</b> US-50WT/ <b>FAMILIARC</b> MF-53
570MPa high tensile strength steel	<b>FAMILIARC</b> LB-60WT	<b>FAMILIARC</b> DW-60WT	<b>FAMILIARC</b> MX-60WT	<b>FAMILIARC</b> US-60WT/ <b>FAMILIARC</b> MF-38	<b>FAMILIARC</b> US-60WT/ <b>TRUSTARC</b> MF-63

## Welding consumables for BHS steel

Steel type	Joint type	SMAW	FCAW	GMAW	SAW
BHS500	Butt	<b>TRUSTARC</b> LB-62UL	<b>TRUSTARC</b> DW-60 <b>TRUSTARC</b> MX-60	<b>TRUSTARC</b> MG-60 (100%CO <sub>2</sub> )	<b>TRUSTARC</b> <b>FAMILIARC</b> US-40/ MF-38 <b>TRUSTARC</b> <b>TRUSTARC</b> US-49A/ PF-H50LT (Heat input:3~10kJ/mm)
	Fillet		<b>TRUSTARC</b> MX-60F	<b>TRUSTARC</b> MG-S63B (Ar-20%CO <sub>2</sub> )	<b>TRUSTARC</b> <b>TRUSTARC</b> US-40/ MF-63

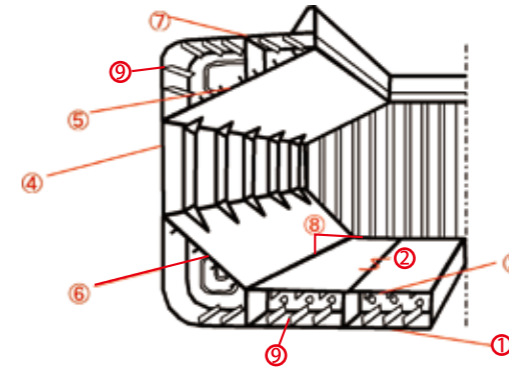
# Welding Consumables for Shipbuilding

## Typical welding process and consumable in assembly



No.	Production	Type of members and joints	Welding position	Welding process	Typical welding consumables		Remarks
					D grade	E grade	
①	Sub-Assembly	Flat panel/butt	Flat	Both side SAW	FAMILIARC US-36/ PF-H55E		Automatic
②		Stiffener/Fillet	Horizontal	GMAW	FAMILIARC MX-Z200 FAMILIARC DW-200	FAMILIARC MX-200E FAMILIARC DW-200	Simple mechanical
③	Assembly	Longi./Fillet	Horizontal	GMAW	FAMILIARC MX-200 FAMILIARC MX-200H FAMILIARC MX-200HS	FAMILIARC MX-200E FAMILIARC MX-200H FAMILIARC MX-200HS	Multi-heads type mechanical
④		Panel plate/butt	Flat	One side SAW	FAMILIARC US-36/ PF-I55E/ PF-I50R FAMILIARC US-36/ PF-I55E/ RF-1	FAMILIARC PF-I50R FAMILIARC RF-1	(FCB/RF)
⑤		Slot-trans./Fillet	Horizontal Vertical	GMAW	FAMILIARC DW-100V	FAMILIARC DW-55E	Robotic
⑥		Inner double hull/Fillet	Horizontal Vertical	GMAW	FAMILIARC DW-Z100	FAMILIARC DW-55E	Semi-automatic
⑦		Bilge shell/butt	Flat	One side SAW One side GMAW	FAMILIARC US-36/ PF-I52E/ RR-2/ FA-B1 FAMILIARC DW-Z100/ FB-B3	FAMILIARC RR-2/ FA-B1 FAMILIARC DW-55E/ FB-B3	(FAB) Semi-automatic

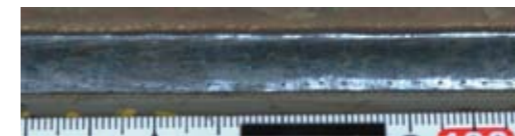
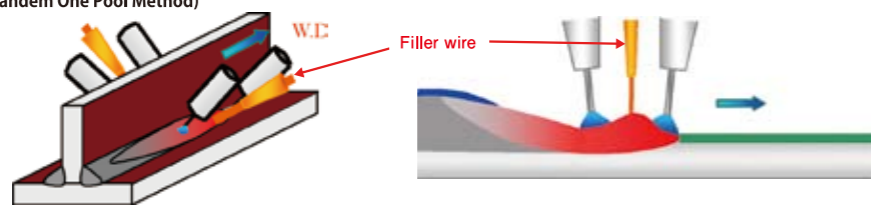
## Typical welding process and consumable in erection (Bulk Carrier)



No.	Type of blocks and joints	Welding position	Welding Process	Typical welding consumables		Remark
				D grade	E grade	
①	Bottom shell/Butt	Flat	One side GMAW	FAMILIARC DW-Z100/ FB-B3	FAMILIARC DW-55E/ FB-B3	Semi-automatic
②	Tank top (Long.)/Butt	Flat	One side SAW	FAMILIARC US-36/ PF-I52E/ RR-2/ FA-B1		(FAB)
			One side GMAW	FAMILIARC MG-50D/ FB-B3	FAMILIARC	Automatic(MAG)
③	Tank top (Trans.)/Butt	Flat	One side GMAW + SAW	FAMILIARC DW-Z100/ FB-B3 FAMILIARC +US-36/ PF-H55E	FAMILIARC DW-55E/ FB-B3 FAMILIARC +US-36/ PF-H55E	Semi-automatic + Automatic
④	Side shell/Butt	Vertical	Electrogas	FAMILIARC HS-42G, DW-S43G/ KL-4, DW-S1LG/ KL-4	FAMILIARC KL-4	Automatic (SEG)
				FAMILIARC DW-100V	—	Semi-automatic
⑤	Top side tank/Butt	Flat	One side GMAW	FAMILIARC DW-Z100/ FB-B3	FAMILIARC DW-55E/ FB-B3	Semi-automatic
⑥	Bilge hopper/Butt	Horizontal Vertical	One side GMAW	FAMILIARC DW-Z100/ FB-B3	FAMILIARC DW-55E/ FB-B3	Semi-automatic
				FAMILIARC DW-100V/ FB-B3	—	(FAB)
⑦	Upper deck L/Butt	Flat	One side GMAW + SAW	FAMILIARC DW-Z100/ FB-B3 FAMILIARC +US-36/ PF-H55E	FAMILIARC DW-55E/ FB-B3 FAMILIARC +US-36/ PF-H55E	Automatic(MAG)
⑧	Tank top/Fillet	Horizontal	GMAW	FAMILIARC MX-Z200	FAMILIARC MX-200E	Simple mechanical
⑨	Long./Fillet	Flat Vertical	One side GMAW	FAMILIARC DW-Z100/ FB-B3	FAMILIARC DW-55E/ FB-B3	Semi-automatic

TRIFARC Method(High Speed Triple Tandem One Pool Method)

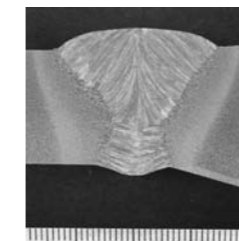
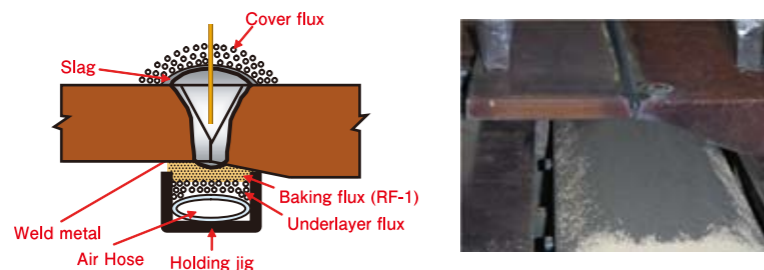
High Speed Triple Method



**[Consumable]**

Wire: MX-200HS(1.6mmφ)  
Plate Thickness:12mm  
Travel speed:2.0m/min.  
Thickness of paint:30μm

RF Process



**[Consumable]**

Wire: US-36(4.8mmφ、6.4mmφ)  
Cover flux: PF-I55E  
Backing flux: RF-1  
Plate Thickness:20mm×50mm(Dissimilar thickness by 30mm)  
Process: One side RF process with three electrodes

# Welding Consumables for Pressure Vessels

## For Cr-Mo Steel

Steel type	Welding Method	Welding Consumables	ASME/AWS	Polarity	Flux grain size (mesh) Diameter(mmφ)
1..25Cr-0.5Mo steel ASTM A387 Gr.11 Cl.1 & Cl.2	SAW (Flux/Wire)	TRUSTARC PF-200/US-511N	SFA/A 5.23 F8P2-EG-B2	AC	Flux:10×48 3.2, 4.0
	SMAW	TRUSTARC CM-A96MB	SFA/A 5.5 E8016-B2	AC	2.6, 3.2 4.0, 5.0
	GTAW	TRUSTARC TG-S1CM	SFA/A 5.28 ER80S-G	DCEN	1.2, 1.6 2.0, 2.4
2.25Cr-1Mo steel ASTM A387 Gr.22 Cl.1 & Cl.2	SAW (Flux/Wire)	TRUSTARC PF-200/US-521S	SFA/A 5.23 F9P2-EG-B3	AC	Flux:10×48 3.2, 4.0
	SMAW	TRUSTARC CM-A106N	SFA/A 5.5 E9016-B3	AC	2.6, 3.2 4.0, 5.0
	GTAW	TRUSTARC TG-S2CM	SFA/A 5.28 ER90S-G	DCEN	1.2, 1.6 2.0, 2.4
2.25Cr-1Mo-V steel ASTM A387 Gr.22V	SAW (Flux/Wire)	TRUSTARC PF-500/US-521H	ASME Sec.VIII Div.2-2007	AC	Flux:10×48 3.2, 4.0
	SMAW	TRUSTARC CM-A106H	ASME Sec.VIII Div.2-2007	AC	3.2, 4.0 5.0
	GTAW	TRUSTARC TG-S2CMH	ASME Sec.VIII Div.2-2007	DCEN	1.2, 1.6 2.0, 2.4



### Example of chemical composition of weld metal(mass%)

Welding consumables	C	Si	Mn	P	S	Cr	Mo	Nb	V
TRUSTARC PF-200/US-511N	0.09	0.10	0.74	0.006	0.005	1.43	0.54	—	—
TRUSTARC CM-A96MB	0.06	0.51	0.74	0.007	0.003	1.30	0.54	—	—
TRUSTARC TG-S1CM	0.06	0.45	0.98	0.007	0.006	1.22	0.54	—	—
TRUSTARC PF-200/US-521S	0.11	0.10	0.85	0.006	0.005	2.34	1.04	—	—
TRUSTARC CM-A106N	0.11	0.33	0.81	0.005	0.002	2.28	0.98	—	—
TRUSTARC TG-S2CM	0.09	0.32	0.71	0.007	0.006	2.26	1.04	—	—
TRUSTARC PF-500/US-521H	0.08	0.13	1.16	0.004	0.004	2.53	1.03	0.015	0.35
TRUSTARC CM-A106H	0.08	0.31	1.18	0.004	0.002	2.42	1.01	0.017	0.29
TRUSTARC TG-S2CMH	0.10	0.14	0.42	0.005	0.006	2.30	1.04	0.034	0.28

### Example of mechanical properties of weld metal

Welding consumables	PWHT	0.2%Y.S. MPa	T.S. MPa	El. %	vE J
TRUSTARC PF-200/US-511N	690°C×4hr	480	605	29	120(-18°C)
TRUSTARC CM-A96MB	690°C×1hr	490	590	30	180(-18°C)
TRUSTARC TG-S1CM	690°C×1hr	540	630	28	270( 0°C)
TRUSTARC PF-200/US-521S	690°C×8hr	470	610	27	150(-29°C)
TRUSTARC CM-A106N	690°C×8hr	510	650	28	125(-40°C)
TRUSTARC TG-S2CM	690°C×1hr	610	720	28	250( 0°C)
TRUSTARC PF-500/US-521H	705°C×7hr	620	710	26	120(-18°C)
TRUSTARC CM-A106H	705°C×7hr	610	710	23	150(-18°C)
TRUSTARC TG-S2CMH	705°C×7hr	623	718	22	240(-18°C)

# Welding Consumables for LNG Storage Tanks

Steel type	Welding method	Welding Consumables	ASME/AWS	Polarity	Flux grain size (mesh) Diameter(mmφ)	Example of application section
9%Ni steel JIS G3127 SL9N590 ASTM A533 Type 1	SAW (Flux/Wire)	PREMARC PF-N4/ PREMARC US-709S	SFA/A 5.14 ERNiMo-8 (US-709S)	DCEP	Flux:12×65 2.4	Side plate (Horizontal)
	SMAW	PREMARC NI-C70S	SFA/A 5.11 ENiCrFe-9	AC	3.2, 4.0, 5.0	Side plate (Vertical,Horizontal) Bottom plate
		PREMARC NI-C1S	SFA/A 5.11 ENiMo-8			Tack and Repair welding
	GTAW	PREMARC TG-S709S	SFA/A 5.14 ERNiMo-8	DCEN	1.2, 1.6 2.0, 2.4	Side plate, Bottom plate , Tack and Repair welding ,etc.
FCAW		PREMARC DW-N70S※	—	DCEP	1.2	Loof , Jig ,etc Side plate(Vertical), etc, Bottom plate
		FAMILIARC DW-N709SP※	—	DCEP	1.2	
Mild steel JIS G3106 SM490 ASTM A36	SMAW	FAMILIARC LB-52A	SFA/A 5.1 E7016	AC/ DCEP	2.6, 3.2, 4.0 5.0, 6.0	Outer tank
	GTAW	FAMILIARC TG-S50	SFA/A 5.18 ER70S-G	DCEP	1.2, 1.6, 2.0 2.4, 3.2	Outer tank
304type stainless steel JIS G4304 SUS304L ASTM A167 Type 304L	SMAW	PREMARC NC-38LT	SFA/A 5.4 E308L-16	AC/ DCEP	2.6, 3.2, 4.0	Pipe
	GTAW	PREMARC TG-S308L	SFA/A 5.9 ER308L	DCEN	1.0, 1.2, 1.6	Pipe
					2.0, 2.4, 3.2	
FCAW	PREMARC DW-308LP	SFA/A 5.22 E308LT1-1/4	DCEP	1.2	Pipe	

※Recommended shielding gas:80%Ar-20%CO<sub>2</sub>



## Example of chemical composition of weld metal (mass%)

Welding consumables	C	Si	Mn	P	S	Ni	Cr	Mo	Fe	Nb	W
PREMARC PF-N4/US-709S	0.02	0.61	0.30	0.002	0.001	67.1	1.8	18.6	8.3	—	2.9
PREMARC NI-C70S ※	0.09	0.23	2.20	0.003	0.002	65.0	16.5	4.9	9.8	1.2	0.6
PREMARC NI-C1S ※	0.03	0.49	0.30	0.003	0.002	68.6	1.9	18.6	6.8	—	2.9
PREMARC TG-S709S	0.02	0.03	0.03	0.002	0.001	70.4	2.0	19.0	5.5	—	3.0
PREMARC DW-N70S	0.05	0.20	5.91	0.002	0.002	62.6	16.8	10.2	1.8	2.0	—
PREMARC DW-N709SP	0.02	0.21	2.75	0.003	0.002	62.1	6.9	17.6	7.7	—	—
FAMILIARC LB-52A※	0.08	0.57	1.12	0.012	0.005	—	—	—	—	—	—
FAMILIARC TG-S50	0.09	0.73	1.35	0.009	0.010	—	—	—	—	—	—
PREMARC NC-38LT※	0.03	0.38	2.12	0.022	0.002	10.9	18.4	—	—	—	—
PREMARC TG-S308L	0.02	0.48	1.98	0.023	0.003	9.7	19.9	—	—	—	—
PREMARC DW-308LP	0.03	0.71	1.18	0.023	0.009	9.5	20.4	—	—	—	—

※AC

## Example of mechanical properties of weld metal

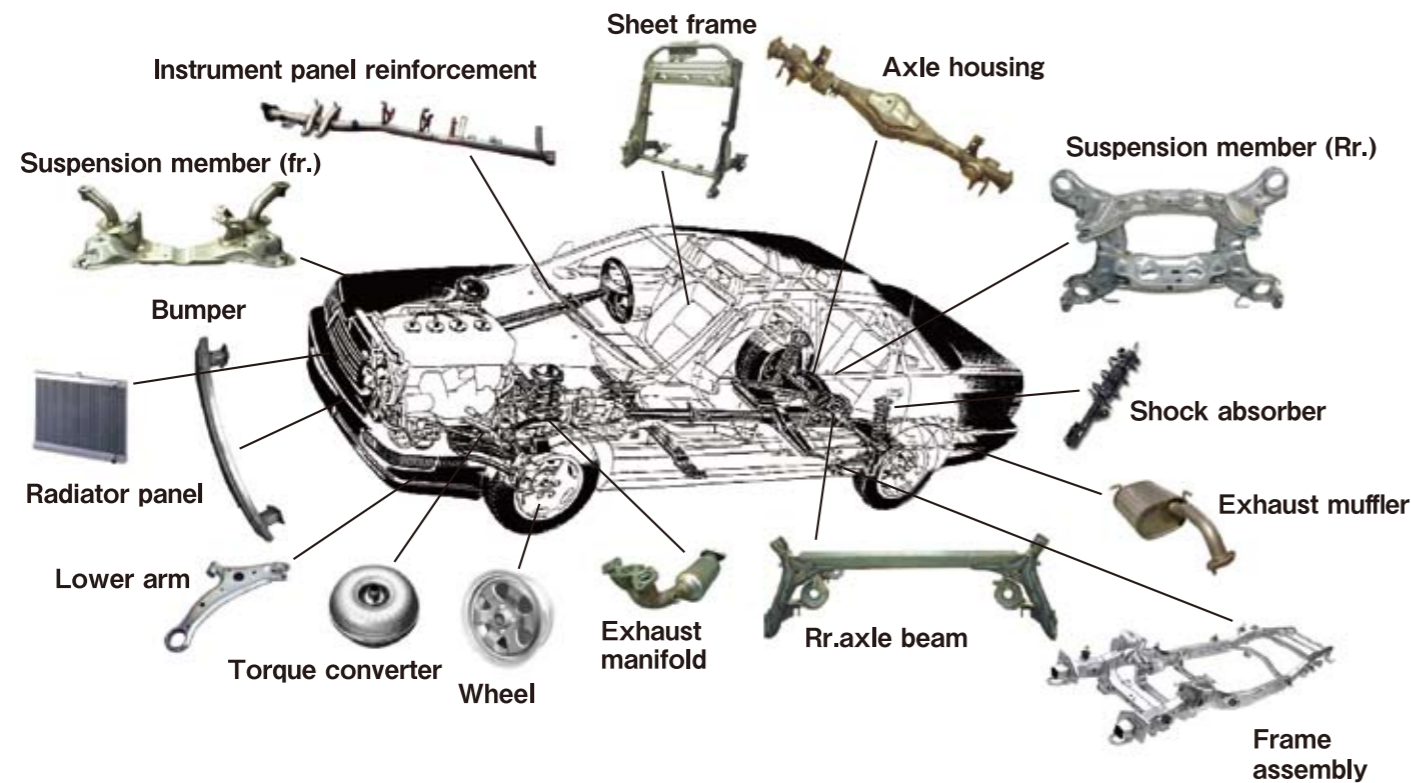
Welding consumables	0.2%Y.S. MPa	T.S. MPa	El. %	vE-196°C J
PREMARC PF-N4/US-709S	435	716	48	88
PREMARC NI-C70S ※	450	710	41	67
PREMARC NI-C1S ※	440	730	48	83
PREMARC TG-S709S	460	730	47	160
PREMARC DW-N70S	425	716	46	106
PREMARC DW-N709SP	450	710	46	90
FAMILIARC LB-52A ※	500	580	31	230 ( 0°C)
FAMILIARC TG-S50	480	580	31	180 (-30°C)
PREMARC NC-38LT ※	370	540	51	51
PREMARC TG-S308L	420	590	45	78
PREMARC DW-308LP	420	630	40	35

※AC



# Welding Consumables for Automobile

Example of typical automobile assembly that the arc welding is applied.



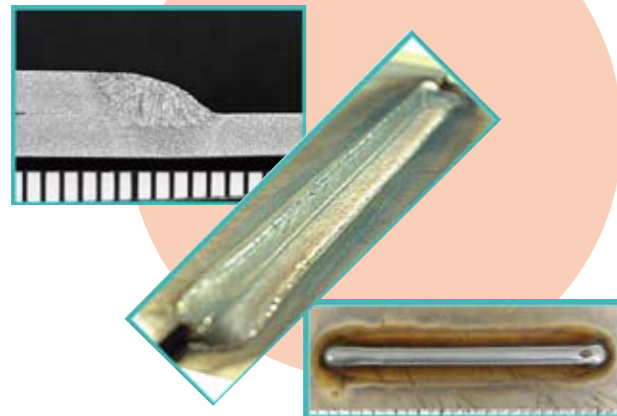
New concept wires that have excellent bead appearance, shape, paint-ability

**MIX-50FS SE-A50FS**

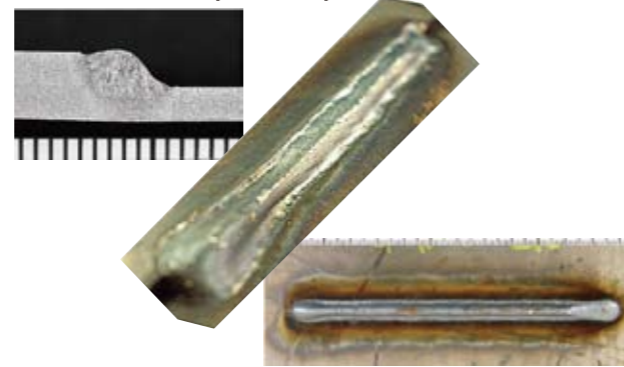
Classification of welding wire for Ar+CO<sub>2</sub> mixed gas by the viscosity of molten weld metal

Surface type	larger ← Viscosity → Lower		
	Cu-coated	FAMILIARC MIX-1TS	FAMILIARC MIX-50
SE(non-Cu)	FAMILIARC SE-A1TS	FAMILIARC SE-A50	FAMILIARC SE-A50FS
Recommended	Galvanized steel, Downhill	General purpose	Flat, horizontal

**MIX-50FS, SE-A50FS**



Conventional (YGW12)



Example of recommended wires to automobile assemblies

Name of assembly	Type of steel and thickness	Welding method	Recommended brand	wire dia.
•Frame •Lower arm •Axle beam •Axle housing •Torque converter	Carbon steel 2.3~4.0mm	CO <sub>2</sub>	FAMILIARC SE-50T, MG-50T	1.2mm
		MAG Pulsed-MAG	FAMILIARC SE-A50, MIX-50 FAMILIARC SE-A50S FAMILIARC MIX-50FS	
•Axle housing for truck	Carbon steel 3.2~6.0mm	CO <sub>2</sub>	FAMILIARC MG-50	1.2~1.6mm
•Impact beam •Bumper	Carbon steel sheet and pipe 1.4~2.3mm	CO <sub>2</sub>	FAMILIARC SE-50T, MG-50T	1.2mm
		MAG Pulsed-MAG	FAMILIARC SE-A50, MIX-50	
•Suspension member	Carbon steel 1.6~2.6mm	CO <sub>2</sub>	FAMILIARC SE-50T, MG-50T	1.2mm
		MAG Pulsed-MAG	FAMILIARC SE-A50, MIX-50 FAMILIARC MIX-50FS	
	Galvanized steel 1.6~2.6mm	CO <sub>2</sub>	FAMILIARC SE-50T, MG-1Z FAMILIARC MX-100Z	1.2mm
		Pulsed-MAG	FAMILIARC SE-A1TS, MIX-1TS FAMILIARC MIX-1Z	
Anti-corrosion Steel 1.6-2.6mm	Pulsed-MAG	FAMILIARC SE-A1TS, MIX-1TS		
•Instrument panel reinforcement •Sheet frame	Carbon steel 0.8~1.6mm	CO <sub>2</sub>	FAMILIARC SE-50T, MG-50T	0.8~1.0mm
		MAG +Variable porarity power souce	FAMILIARC SE-A50, MIX-50 FAMILIARC MG-1SP	
•Car body	Galvanized steel 0.6~1.0mm	MAG	FAMILIARC MIX-1T	0.6~0.9mm
•Exhaust muffler •Exhaust manifold	Stainless steel 0.8~2mm	MAG	PREMARC MX-A430M (Ferritic)	1.2mm
		Pulsed-MIG	PREMARC MG-S430M (Ferritic) PREMARC MG-S308 (Austenitic) PREMARC MG-S309 (Austenitic)	
•Radiator panel	Aluminum alloy	TIG	PREMARC A-4043BY	1.2mm
		MIG	PREMARC A-4043WY	
•Fuel tank	Aluminum alloy	MIG	PREMARC A-4043WY, A-5356WY	1.2mm
•Alminum wheel		MIG	PREMARC A-5356WY	
•Brake tank		MIG	PREMARC A-5183WY, A-5356WY	

**SE-50T, SE-A50**

- Non-Cu-coated technology (Kobe Steel original)
- Excellent generality
- Non trouble by Cu-flake
- Low spatter generation
- Excellent wire feedability
- Eco-friendly

**MIX-1TS, MIX-1Z, MX-100Z**

- Suitable for galvanized steel
- Low spatter generation
- Prevent-ability of blow holes and pits is excellent.
- MIX-1TS and MIX-1Z is for pulsed-MAG welding.
- MX-100Z is for CO<sub>2</sub> welding.

**MX-A430M**

- Metal cored wire for ferritic stainless steel contained 13-17%Cr.
- Excellent crack resistance
- Excellent corrosion resistance in the high temperature range

# Welding Consumables for Off-shore Structures

## For Shielded Metal Arc Welding (SMAW)

Tensile strength(MPa)		≥490	≥520	≥550	≥610	≥670	≥770
Yield strength(MPa)		≥350	≥400	≥420	≥500	≥550	≥690
Absorbed energy(J)		≥35	≥40	≥42	≥50	≥55	≥69
Service temperature (°C)	-20	FAMLIARC LB-52 (AC/DCEP) [AW/SR] FAMLIARC LB-52A (AC/DCEP) [AW/SR]	FAMLIARC LB-57 (AC/DCEP) [AW/SR]	TRUSTARC LB-62UL (AC/DCEP) [AW/SR] TRUSTARC LB-62 (AC/DCEP) [AW/SR]	TRUSTARC LB-106 (AC/DCEP) [AW]	TRUSTARC LB-116 (AC/DCEP) [AW] TRUSTARC LB-80UL (AC) [AW]	
	-40	TRUSTARC LB-7018-1 (DCEP) [AW]	TRUSTARC NB-1SJ (AC/DCEP) [AW/SR]	TRUSTARC NB-1SJ (AC) [AW/SR]	TRUSTARC LB-62L (AC) [AW/SR]	TRUSTARC LB-70L (DCEP) [AW]	TRUSTARC LB-88LT (AC) [AW]
	-60	TRUSTARC NB-1SJ (AC/DCEP) [AW/SR] TRUSTARC LB-52NS (AC/DCEP) [AW/SR]	TRUSTARC LB-52NS (AC) [AW]	TRUSTARC LB-62L (AC/DCEP) [AW/SR]	TRUSTARC LB-65L (AC) [AW/SR]	TRUSTARC LB-Y75 (AC) [AW]	

\*) ( ): Current and polarity, [AW]: for as welded, [SR]: for PWHT

## For Submerged Arc Welding (SAW)

Tensile strength(MPa)		≥490	≥520	≥550	≥610	≥670	≥770
Yield strength(MPa)		≥350	≥400	≥420	≥500	≥550	≥690
Absorbed energy(J)		≥35	≥40	≥42	≥50	≥55	≥69
Service temperature (°C)	-20	FAMLIARC MF-38/ FAMLIARC US-36 (AC) [AW/SR]	FAMLIARC TRUSTARC MF-38/US-49A (AC) [AW/SR]	FAMLIARC TRUSTARC MF-38/US-40 (AC) [AW]			
	-40	TRUSTARC PF-H55AS/ TRUSTARC US-36J (DCEP) [AW/SR]	TRUSTARC PF-H55S/US-49A (AC) [AW/SR]	TRUSTARC PF-H55S/US-40 (AC) [AW]	TRUSTARC PF-H80AK/ TRUSTARC US-255 (AC) [AW]	TRUSTARC PF-H80AS/ TRUSTARC US-80LT (DCEP) [AW]	
	-60	TRUSTARC PF-H55LT/ FAMLIARC US-36 (AC) [AW/SR]	TRUSTARC PF-H55S/US-36J (DCEP) [AW]	TRUSTARC PF-H80AK/US-56B (AC/DCEP) [AW]	TRUSTARC PF-H80AK/US-56B (AC) [AW/SR]	TRUSTARC US-80LT (AC) [AW]	

\*) ( ): Current and polarity, [AW]: for as welded, [SR]: for PWHT

## For Gas Metal Arc Welding (GMAW) [Polarity : DCEP]

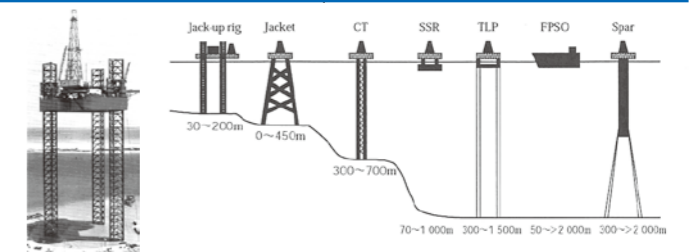
Tensile strength(MPa)		≥490	≥520	≥550	≥610	≥670	≥770
Yield strength(MPa)		≥350	≥400	≥420	≥500	≥550	≥690
Absorbed energy(J)		≥35	≥40	≥42	≥50	≥55	≥69
Service temperature (°C)	-20	FAMLIARC DW-100E (100%CO <sub>2</sub> ) [AW] FAMLIARC MG-S50 (Ar+20%CO <sub>2</sub> ) [AW/SR]	TRUSTARC DW-55L (100%CO <sub>2</sub> ) [AW] TRUSTARC MG-T1NS (Ar+20%CO <sub>2</sub> ) [AW]		TRUSTARC DW-A65L (Ar+20%CO <sub>2</sub> ) [AW] TRUSTARC MG-T1NS (Ar+20%CO <sub>2</sub> ) [AW]	TRUSTARC MG-S70 (Ar+20%CO <sub>2</sub> ) [AW]	TRUSTARC MG-S80 (Ar+20%CO <sub>2</sub> ) [AW]
	-30	FAMLIARC DW-55E (100%CO <sub>2</sub> ) [AW] FAMLIARC DW-A55E (Ar+20%CO <sub>2</sub> ) [AW]					
	-40	FAMLIARC DW-A55ESR (Ar+20%CO <sub>2</sub> ) [AW/SR]					
	-50	TRUSTARC DW-50LSR (100%CO <sub>2</sub> ) [AW/SR]	TRUSTARC DW-55LSR (100%CO <sub>2</sub> ) [AW/SR]	TRUSTARC DW-A81Ni1 (Ar+20%CO <sub>2</sub> ) [AW]		TRUSTARC DW-62L (100%CO <sub>2</sub> ) [AW]	TRUSTARC MG-S88A (Ar+20%CO <sub>2</sub> ) [AW]
	-60	TRUSTARC DW-55L (100%CO <sub>2</sub> ) [AW] TRUSTARC DW-A55L (Ar+20%CO <sub>2</sub> ) [AW]	TRUSTARC DW-A55L (Ar+20%CO <sub>2</sub> ) [AW] TRUSTARC DW-A55LSR (Ar+20%CO <sub>2</sub> ) [AW/SR]	TRUSTARC DW-55LSR (100%CO <sub>2</sub> ) [AW] TRUSTARC DW-A55L (Ar+20%CO <sub>2</sub> ) [AW]	TRUSTARC DW-A62L (Ar+20%CO <sub>2</sub> ) [AW] TRUSTARC MG-S62L (Ar+20%CO <sub>2</sub> ) [AW]		
		TRUSTARC MG-S50LT (Ar+20%CO <sub>2</sub> ) [AW/SR]	TRUSTARC MG-S50LT (Ar+20%CO <sub>2</sub> ) [AW]	TRUSTARC DW-A55LSR (Ar+20%CO <sub>2</sub> ) [AW]			

\*) ( ): Shielding gas, [AW]: for as welded, [SR]: for PWHT

## For Gas Tungsten Arc Welding (GTAW) [Polarity:DCEN , Shielding gas:Ar]

Tensile strength(MPa)		≥490	≥520	≥550	≥610	≥670	≥770
Yield strength(MPa)		≥350	≥400	≥420	≥500	≥550	≥690
Absorbed energy(J)		≥35	≥40	≥42	≥50	≥55	≥69
Service temperature (°C)	-20	FAMLIARC TG-S50 [AW/SR] FAMLIARC TG-S51T [AW/SR]		TRUSTARC TG-S62 [AW/SR] TRUSTARC TG-S60A [AW/SR]			
	-40	TRUSTARC TG-S1MT [AW]		TRUSTARC TG-S60A [AW/SR]			TRUSTARC TG-S80AM [AW/SR]
	-60	TRUSTARC TG-S1N [AW]					

\*) [AW]: for as welded, [SR]: for PWHT





# KOBELCO



**FAMILIARC**<sup>™</sup>

**TRUSTARC**<sup>™</sup>

**PREMIARC**<sup>™</sup>