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KOBELCO Puts the Customer First with All-in-One Product and Service

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Greeting upon starting the fiscal year 2022 from the new Head of the Welding Business

Dear KWT readers! I'd like to express my heartfelt gratitude for your continuous support and patronage of KOBELCO products.

By taking this opportunity, I'd like to introduce myself. My name is Kazuyuki Suenaga, and I've taken over as Head of the Welding Business since April, 2022. Due to the COVID-19 pandemic, I haven't been able to travel overseas and meet with all of you; however, I believe the day will come soon when I'll be able to travel abroad and meet with colleagues, partners and customers.

The KOBELCO Group's Mid-Term Management Plan (from 2021 to 2023) has been implemented since it was established in 2021. The Welding Business Group has promoted the plan by determining areas for creating value and improving management, as well. In particular, in order to build a stable profit base, we have focused on organizational restructuring and have sought to expand profits by putting welding solutions (technical proposals and adding value through the combination of welding consumables, systems and processes) to practical use.

In the Welding Business Group, we have long valued "quality and technologies," "trust" and "human resources." Regarding quality and technologies, we perform our activities, placing quality as the pillar of management, and will continue to contribute to our customers' Monodzukuri by providing high quality products, technologies, and services as well. As for the trust, I believe we can acquire it by helping our clients find solutions to problems they face in Monozukuri. As part of our aim to continue being the most reliable welding solutions company in the world, we will never stop working to gain trust. Concerning human resources, we know that in whatever we want to do, progress will not take place without involvement by a human being. In other words, humans are the most important factor to be your best partner.

Recent progress in digital technology has been incredibly fast, and digital transformation (DX) is also worthy of remark. I hope that the development of our welding solutions that combine our welding consumables, robotic welding systems, power sources and processes together with Information Technology shall manifest the state-of-the-art as well as contribute to society. KWT readers can look forward to new innovative welding solutions as well as KOBELCO products and services.

Although the world has been politically divided into various groups over the last few years, I pray for the elimination of the epidemic as well as conflict once again. Finally, I wish all of you KWT readers, your families and friends will remain healthy and safe, even though the ability to travel beyond our respective areas or meet face-to-face in business remains limited.

Kazuyuki Suenaga
Executive Officer
Head of the Welding Business
KOBE STEEL, LTD.

FAMILIARC™ DW-50AY: New flux cored wire for structural steel industry in the North American market

FDW-50AY is a newly developed flux cored wire (FCW) for the architectural steel structures in the North American market. It offers excellent weldability and arc stability at high welding current range over 400 A, as well as low spatter and fume generation.

FDW-50AY is classified as AWS A5.20 E70T-9C in compliance with AWS D1.8 Structural Welding Code-Seismic Supplement. The specifications are indicated in Tables 1, 2 and 3. The results of heat input envelope test that is required by AWS D1.8 specifications are shown in Table 4.

AWS D1.8 Seismic Arc

The two trials of actual welding with FDW-50AY were conducted. One involved horizontal fillet welding in two passes on 12mm thick steel plates. In the other, four (4) layer/ten (10) pass horizontal fillet welding was carried out on 20 mm thick plates with a groove (bevel angle of 55°).

Figure 1 shows the bead appearances of the first and second passes of the first trial and cross-sectional macrostructures of each pass. Figure 2 shows the bead appearance and cross-sectional macrostructure of the latter trial.

It can be seen that the beads of fillet welding with and without groove exhibit a beautiful and flat profile as well as excellent penetration.

Reported by
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Table 1: Specification of FDW-50AY

Applied steel	Mild and low alloy steels
Polarity	DC-EP
AWS classification	A5.20 E70T-9C
Size available	2.4 mmφ (3/32 inchφ)

Table 2: Mechanical properties of all weld metal

	0.2%OS MPa (ksi)	TS MPa (ksi)	El (%)	vE at -29°C (-20°F) J (ft-lbs)
FDW-50AY	483 (70)	561 (81)	32	132, 132, 120, Avg. 128 (97, 97, 89, Avg. 94)
AWS A5.20 E70T-9C	400 min. (58 min)	483-655 (70-95)	22 min.	27 min (20 min)

Table 3: Chemical composition of all weld metal (wt%)

	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V
FDW-50AY	0.06	0.37	1.52	0.011	0.005	0.03	0.01	0.03	<0.01	0.02
AWS A5.20 E70T-9C	≤0.12	≤0.90	≤1.75	≤0.03	≤0.03	≤0.35	≤0.50	≤0.20	≤0.30	≤0.08

Table 4: Heat input envelope test results

		Average of heat input kJ/mm (kJ/inch)	Layers/Passes	Tensile properties 0.2%OS MPa (ksi)	TS MPa (ksi)	El %	Impact properties vE at 20°C (+70°F) J (ft-lbs)
FDW-50AY		1.3 (33)	8/22	561 (81)	622 (90)	29	171, 171, 173, Avg. 172 (126, 126, 128, Avg. 127)
		3.2 (81)	5/9	428 (62)	513 (74)	39	292, 306, 321, Avg. 306 (215, 226, 237, Avg. 226)
AWS D1.8	Low heat input	0.9-1.4 (24-36)	–	400 min. (58 min.)	483 min. (70 min.)	22 min.	54 min. (40 min.)
	High heat input	2.5-3.7 (63-95)	–				

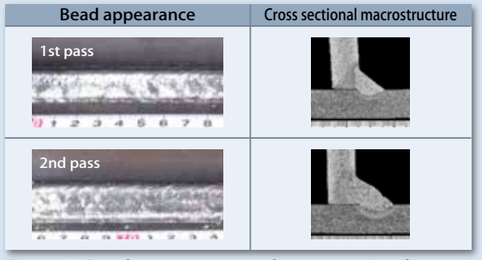

Figure 1: Bead appearance and cross sectional macrostructure in horizontal fillet welding

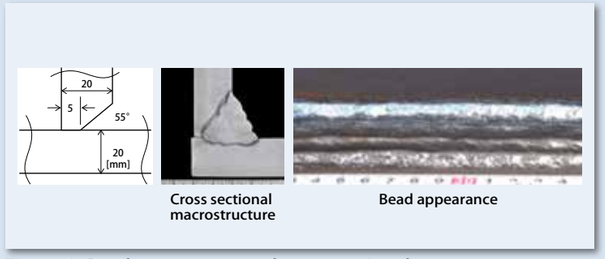

Figure 2: Bead appearance and cross sectional macrostructure in horizontal fillet welding at bevel angle 55°

Stainless Steel Flux Cored Wires: selection by application

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1 Preface

KOBE STEEL offers a wide range of stainless steel flux cored wires (FCWs), to meet specific requirements from various industries. The features of these wires and understanding how to choose the best stainless steel FCW(s) for a particular application is the subject of this article.

2 Features of DW-Series stainless steel FCWs

FCWs are known for a high deposition rate and excellent usability. The former contributes to shorten welding time while the latter, by decreasing spatter generation, helps reduce time spent on treatments like removing spatter that sticks to steel plates during welding. Accordingly, both features contribute to improving productivity. In particular, when FCWs are applied to welding an austenitic stainless steel, the welds have beautiful bead appearance and high corrosion resistance.

Because of many of their advantages, KOBE STEEL has developed many kinds of stainless steel FCWs. The DW-Series stainless steel FCWs is one of the company's iconic lines.

The DW-Series stainless steel FCWs provide excellent arc stability with not only 100%CO_2 but also Ar-CO_2 mixed shielding gases. Furthermore, as P DW-308L and P DW-316L are designed to offer easy slag removal after welding, the temper color on bead surfaces can be avoided as shown in Figure 1. Preventing the generation of temper color can save time spent on acid treatment and raise productivity.

Besides the DW-Series, KOBE STEEL also offers metal type FCWs, including the MX-Series FCWs; the MM-Series FCWs used for the MX-MIG Process, Metal Inert Gas (MIG) Welding with 100% Ar shielding; TG-X-Series filler rods for TIG root pass welding without purging gas; and the DW-N-Series FCWs for welding Nickel-based alloy.

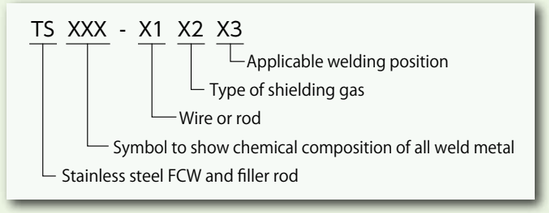
Figure 1: Easy slag removal and beautiful bead appearance right after welding of P DW-308L

3 Standards of stainless steel FCWs

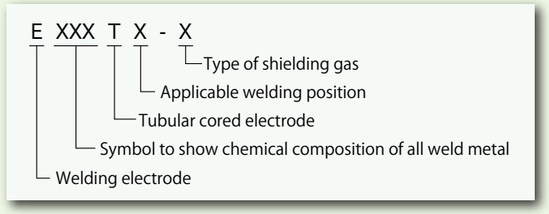
The three well known standards related to welding are JIS, AWS and ISO. Their respective classifications are shown in Table 1. FCWs are classified by the chemical composition of the weld metal, type of shielding gas and applicable welding position.

Table 1: Classification by standards

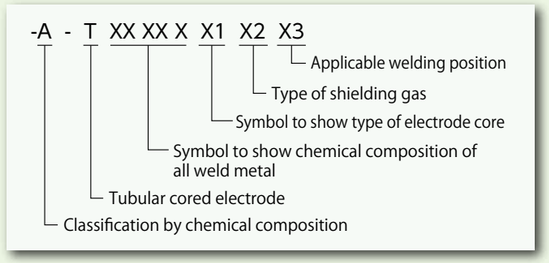
(1) JIS Z 3323-2007



(2) AWS A5.22-2012



(3) ISO 17633-2017



As an example, how P DW-308L is classified under each standard is shown in Table 2. Symbols such as 308 or 316, which show the chemical compositions of all weld metal in the trade names of stainless steel FCWs, correspond to JIS and AWS classifications in general.

Table 2: Example of standard and classification of P DW-308L

Standard	Classification
JIS Z 3323-2007	TS308L-FB0
AWS A5.22	E308LT0-1 E308LT0-4
ISO 17633	- A - T 19 9 L R C1 3 - A - T 19 9 L R M21 3

4 DW-Series stainless steel FCWs

4-1. DW-Series stainless steel FCWs for general purposes

The DW-Series stainless steel FCWs for general purposes provide excellent usability in flat position welding as well as horizontal fillet welding. The zero (0) in the AWS and JIS classifications indicates the welding position. Typical DW-Series stainless steel FCWs for general purposes are as shown in Table 3.

Users should select a particular FCW by the base metal and intended use, as shown in Table 4.

Table 3: Typical DW-Series FCWs for general purpose

Trade name	AWS A5.22	JIS Z 3323	Major chemical composition	Applicable welding position
P DW-308	E308T0-1/4	TS308-FB0	20Cr-10Ni	Flat & horizontal fillet
P DW-309	E309T0-1/4	TS309-FB0	24Cr-13Ni	Ditto
P DW-316	E316T0-1/4	TS316-FB0	19Cr-12Ni-2.3Mo	Ditto
P DW-347	E347T0-1/4	TS347-FB0	19Cr-11Ni-0.6Nb	Ditto

Table 4: Stainless steel FCWs and applicable base metals

Stainless steel FCWs	Base metals
308	304
308L	304L
309	Dissimilar material
309L	Ditto
316	316
316L	316L
347	321, 347

As the crack resistance tends to deteriorate when the ferrite content in the weld metal is low in general, P DW-308 and P DW-316 are designed to provide about 10% ferrite content in the all weld metal because crack resistance tends to drop when the ferrite content in the weld metal is low.

4-2. Low carbon DW-Series stainless steel FCWs

An L attached to the symbol for chemical composition indicates low carbon type and is suited to weld a similar low carbon base metal. A weld containing high carbon may have reduced tensile strength because the chromium carbide that is generated at the heat affected zone (HAZ) causes the intergranular corrosion resistance to drop. However, a low carbon stainless steel is usually superb in intergranular corrosion resistance. Therefore, attention should be paid. Typical low carbon stainless steel FCWs are shown in Table 5.

Table 5: Typical low carbon stainless steel FCWs

Trade name	AWS A5.22	JIS Z 3323	Major chemical composition	Applicable welding position
P DW-308L	E308LT0-1/4	TS308L-FB0	20Cr-10Ni	Flat, horizontal fillet
P DW-309L	E309LT0-1/4	TS309L-FB0	24Cr-13Ni	Ditto
P DW-316L	E316LT0-1/4	TS316L-FB0	19Cr-12Ni-2.3Mo	Ditto

4-3. DW-Series stainless steel FCWs for all position welding

An FCW with a suffix P in the product name indicates it is for all position (or positional) welding. It provides beautiful bead shape in vertical (upward) and overhead position welding, as shown in Figure 2. In the AWS and JIS classifications, the one (1) indicates the welding position. Typical DW-Series stainless steel FCWs for all position welding are shown in Table 6.

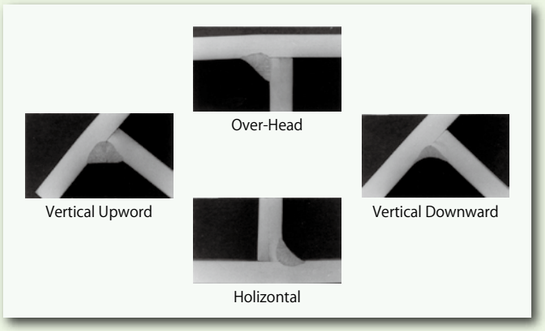


Figure 2: Cross-setion of macrostructure of P DW-308LP fillet weld (304L base plate of 3 mm thick)

Table 6: Typical DW-Series stainless steel FCWs for all position welding

Trade name	AWS A5.22	JIS Z 3323	Major chemical composition	Applicable welding position
P DW-308LP	E308LT1-1/4	TS308L-FB1	20Cr-10Ni	All position
P DW-309LP	E309LT1-1/4	TS309L-FB1	24Cr-13Ni	Ditto
P DW-316LP	E316LT1-1/4	TS316L-FB1	18Cr-12Ni-2.8Mo	Ditto

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4-4. DW-Series stainless steel FCWs for low temperature service

An LT in the product name indicates the FCW is intended for low temperature service. At low temperatures, toughness generally deteriorates when the ferrite content in the weld metal increases; therefore, this type of FCW is designed to restrain ferrite content. At the same time, it is also designed to maintain the absorbed energy equal to or more than 27J at -196 °C (the boiling temperature of liquified nitrogen). On the other hand, as the hot crack resistance drops when ferrite is low, the balance between toughness and hot crack resistance should be considered when designing; nevertheless, it is necessary to pay full attention to the welding procedures such as excess welding current and speed as well as a wide groove application in order to restrain hot cracks during welding.

Table 7 shows typical DW-Series stainless steel FCWs for low temperature service and their properties.

4-5. DW-H-Series stainless steel FCWs for high temperature service

In many of the DW-Series stainless steel FCWs for general purposes, an extremely small amount of bismuth trioxide (Bi_2O_3), a low-melting-metal-oxide, is added to improve slag removability.

However, Bismuth (Bi), a surface activating element, segregates at the boundary and can promote breakage under a sustainable tensile load when it is exposed to high temperatures for a long time. Therefore, according to AWS, a stainless steel FCW containing Bi is unsuitable for use in circumstances exceeding 400 °C or for post weld heat treatment (PWHT) exceeding 500 °C.

The DW-H-Series FCWs, which do not contain Bi, have been developed for use in high temperature environments and are suitable for such applications.

Although JIS Z 3323 specifies that the Bi content in the all weld metal be under 10 ppm (0.001%), this amount is practically interpreted as no addition of Bi, in other word, Bi-free. Hence, BiF indicates a Bi-free type of stainless steel welding consumable, such as in YF308C-BIF.

The typical DW-H-Series stainless steel FCWs for high temperature service are shown in Table 8. The effects of Bi on high temperature tensile tests on 308 and 347 type weld metals are shown in Figure 3.

It is clearly seen that Bi-free weld metal is superior in ductility at high temperature to weld metals containing Bi.

The DW-H-Series stainless steel FCWs are designed to produce lower ferrite than conventional stainless steel FCWs. This is because ferrite in the weld metal transforms to a brittle sigma (σ) phase at high temperature and causes mechanical properties of the weld metal to deteriorate. As a criterion of ferrite content, the API PR582 3rd Edition specifies that 9 FN (based on WRC Diagram-1992) or less shall be maintained if the weld metal is exposed to temperatures exceeding 538 °C.

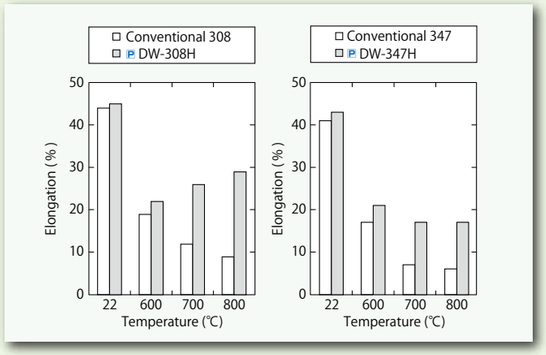

Figure 3: The effect of Bi on ductility at high temperatures

Table 7: Typical DW-Series stainless steel FCWs for low temperature service

Trade name	AWS A5.22	JIS Z 3323	Chemical composition of all weld metal (mass%)							Tensile properties		Impact properties (-196°C)	
			C	Si	Mn	Ni	Cr	Mo	FN*	TS (MPa)	El (%)	Absorbed energy (J)	Lateral expansion (mm)
P DW-308LT	E308LT0-1/4	TS308L-FB0	0.021	0.31	2.49	10.36	18.58	–	3	530	51	38	0.60
P DW-316LT	E316LT1-1/4	TS316L-FB0	0.020	0.37	1.58	11.89	17.57	2.20	5	530	44	39	0.56

*FN: Ferrite number based on DeLong Diagram.

Table 8: Typical DW-H-Series stainless steel FCWs for high temperature service

Trade name	AWS A5.22	JIS Z 3323	Chemical composition of all weld metal (mass%)									Tensile properties	
			C	Si	Mn	Ni	Cr	Mo	Bi	N	FNW *	TS (MPa)	El (%)
P DW-308H	E308HT1-1/4	TS308H-BiF-FB0	0.056	0.49	1.16	9.14	18.65	–	<0.001	0.028	5	607	47
P DW-308LH	E308LT1-1/4	TS308L-BiF-FB0	0.026	0.41	1.35	10.20	18.70	–	<0.001	0.030	4	540	52
P DW-316H	E316T1-1/4	TS316H-BiF-B0	0.059	0.52	1.16	11.48	19.03	2.32	<0.001	0.026	7	584	45
P DW-316LH	E316LT1-1/4	TS316L-BiF-FB0	0.023	0.45	1.08	11.94	18.47	2.45	<0.001	0.030	7	540	45
P DW-347H	E347T1-1/4	TS347-BiF-FB0	0.059	0.45	1.59	9.57	18.92	Nb: 0.69	<0.001	0.034	5	662	34
P DW-309LH	E309LT1-1/4	TS309L-BiF-FB0	0.028	0.47	1.24	12.58	24.17	–	<0.001	0.021	20	578	39
P DW-310	E310T0-1/4	TS310-FB0	0.18	0.42	2.01	20.73	25.76	–	<0.001	0.019	0	620	40

*FNW: Ferrite number based on WRC-1992 Diagram.

4-6. Low Cr(VI) emission DW-XR-Series stainless steel FCWs

Welding fumes are a complex mixture of metallic oxides, silicates, and fluorides that come from metal vapor during welding. In the case of welding stainless steel, the fume contains about 5 to 20% chromium (Cr) oxide, a part of which exists as the hazardous 6-valent chromium compound, Cr(VI). Accordingly, strict control of Cr(VI) is now a worldwide trend.

DW-XR-Series stainless steel FCWs are designed to reduce Cr(VI) in the welding fume. 308L, 316L and 309L stainless steel FCWs were targeted for the development of DW-XR-Series stainless steel FCWs for flat and horizontal fillet welding as well as for all position welding. The present line-up is shown in Table 9.

Figure 4 compares the Cr(VI) emission rate between P DW-308LP-XR and conventional P DW-308LP, which was measured according to ISO 15011-1 and ISO 16740.

It shows that the Cr(VI) emission rate of P DW-308LP-XR is substantially reduced to 1/6 that of P DW-308LP.

Table 9: Low Cr(VI) emission DW-XR-Series stainless steel FCWs

Trade name	AWS A5.22	Major chemical composition	Applicable welding position
P DW-308L-XR	E308LT0-1/4	20Cr-10Ni	Flat & horizontal fillet
P DW-309L-XR	E309LT0-1/4	24Cr-13Ni	Ditto
P DW-316L-XR	E316LT0-1/4	18Cr-12Ni-2.3Mo	Ditto
P DW-308LP-XR	E308LT1-1/4	20Cr-10Ni	All position
P DW-309LP-XR	E309LT1-1/4	24Cr-13Ni	Ditto
P DW-316LP-XR	E316LT1-1/4	18Cr-12Ni-2.3Mo	Ditto

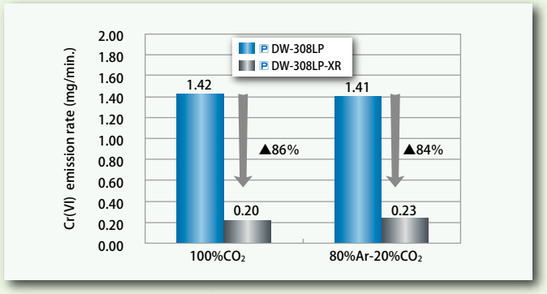

Figure 4: Comparison of Cr(VI) emission rate between P DW-308LP-XR and conventional P DW-308LP

4-7. DW-G-Series stainless steel FCWs for sheet metal

DW-G-Series stainless steel FCWs enable stable welding on sheet metals even at low welding current. To be more precise, though the welding of sheet metals requires 0.9 mm diameter (φ) when a conventional FCW or solid wire is used, with DW-G-Series FCWs, 1.2 mmφ can be used, which is more convenient and less expensive. Table 10 shows the line-up of DW-G-Series stainless steel FCWs.

Table 10: DW-G-Series stainless steel FCWs for sheet metal welding

Trade name	AWS A5.22	JIS Z 3323	Major chemical composition	Applicable welding position
P DW-G308L	E308LT0-1/4	TS308L-FB0	20Cr-10Ni	Flat and horizontal fillet
P DW-G309L	E309LT0-1/4	TS309L-FB0	24Cr-13Ni	Ditto
P DW-G316L	E316LT0-1/4	TS316L-FB0	19Cr-12Ni-2.3Mo	Ditto

The relationship between leg length and welding speed in horizontal fillet welding is shown in Figure 5, while Figure 6 shows the optimum range of welding parameters of the DW-G-Series stainless steel FCWs (1.2 mmφ) in comparison with conventional FCWs (0.9 mmφ).

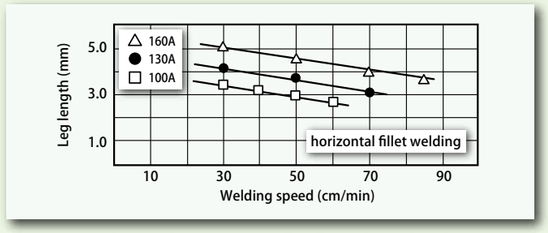

Figure 5: Relationship between leg length and welding speed in horizontal fillet welding by DW-G-Series stainless steel FCW (1.2 mmφ)

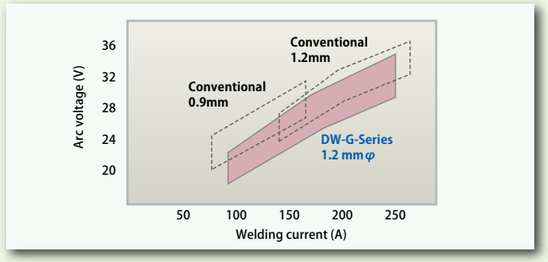

Figure 6: Optimum range of welding parameters by DW-G-Series

Although the DW-G-Series FCWs are available in a size of 1.2 mmφ only, they allow for low current welding of about 100A as well as smaller leg length down to about 3 mm. The welding of sheet metals with plate thickness of 1.0-2.0 mm, which was not easy with conventional FCWs or solid wires, has become possible with 1.2 mmφ

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DW-G-Series FCWs as shown in Figure 7.

Additionally, another advantage of DW-G-Series FCWs is that, because they are excellent in arc restarting, clipping off the wire end during intermittent or tack welding is not necessary. The state of wire end is shown in Figure 8.

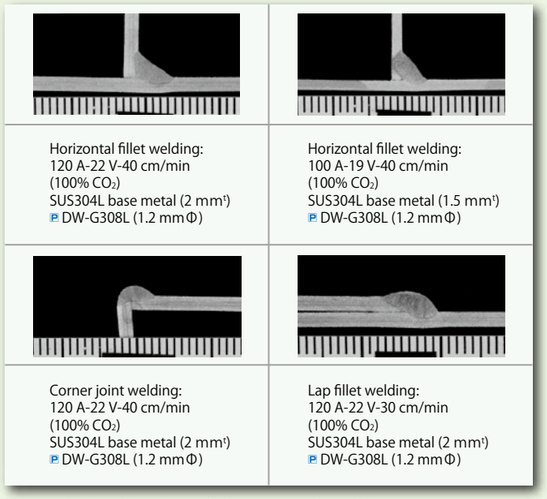


Figure 7: Application of sheet metal welding by P DW-G308L (1.2 mmφ)

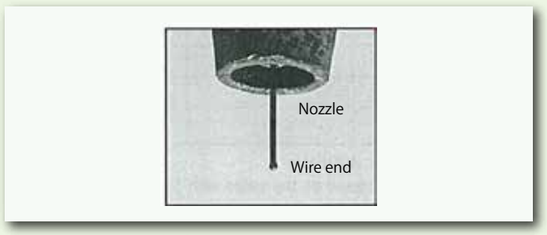


Figure 8: Wire end of DW-G-Series FCW

4-8. DW-N-Series FCWs for Ni-based alloy

The N (Nickel) in the DW-N-Series means nickel base. DW-N-Series FCWs offer usability as excellent as stainless steel FCWs.

When DW-N-Series FCWs are utilized in welding operations, it is recommended to avoid excess welding current as well as speed and to make the groove wider as well. Typical DW-N-Series FCWs are shown in Table 11.

Table 11: Typical DW-N-Series FCWs

Trade name	AWS A5.34	JIS Z 3335	Major chemical composition	Applicable welding position
P DW-N625	ENiCrMo3T1-1/4	TNi6625-PB1	63Ni-21Cr-9Mo-3.5Nb	All position
P DW-N709SP	ENiMo13T1-1/4	TNi1013-PB1	63Ni-7Cr-18Mo	Ditto

5 Metal type MX-Series stainless steel FCWs

As the metal type MX-Series stainless steel FCWs have nearly the same deposition efficiency as solid wires, welding operations are more efficient with MX-Series FCWs than with the slag type stainless steel FCWs. Typical MX-Series FCWs are displayed in Table 12.

Table 12: Typical MX-Series FCWs

Trade name	AWS A5.22	JIS Z 3323	Major chemical composition	Applicable welding position
P MX-A308L	EC308L	TS308L-MM0	20Cr-10Ni	Flat and horizontal fillet
P MX-A309L	EC309L	TS309L-MM0	24Cr-13Ni	Ditto
P MX-A316L	EC316L	TS316L-MM0	19Cr-12Ni-2.3Mo	Ditto

6 MM-Series stainless steel FCWs for MIG welding with 100% Ar shielding

The MM-Series FCWs are exclusively utilized for the MX-MIG process, which is MIG welding with 100% Ar shielding. The products are available for carbon steel and stainless steel applications.

The MX-MIG process for stainless steel applications has the following features:

(1) The use of pure Ar shielding gas provides the weld metal with the same level of low carbon content as TIG welding.
(2) It can be used in a wider welding current range from as low as about 150 A to as high as about 300 A.
(3) Low spatter and fume generation improves the welding environment.
(4) The low carbon weld metal provides corrosion resistance that is as high as TIG weld metal.
(5) It can create a low dilution rate even at a high welding current range like 300 A that is almost equivalent to CO_2 gas shielded arc welding at 150 A.

Typical MM-Series stainless steel FCWs are exhibited in Table 13.

Table 13: Typical MM-Series stainless steel FCWs

Trade name	AWS A5.22	JIS Z 3323	Major chemical composition	Applicable welding position
P MM-308L	E308LT0-G	TS308L-FG0	20Cr-10Ni	Flat and horizontal fillet
P MM-309L	E309LT0-G	TS309L-FG0	24Cr-13Ni	Ditto
P MM-316L	E316LT0-G	TS316L-FG0	19Cr-12Ni-2.3Mo	Ditto

7 TG-X-Series Flux Cored filler rods for TIG root pass welding

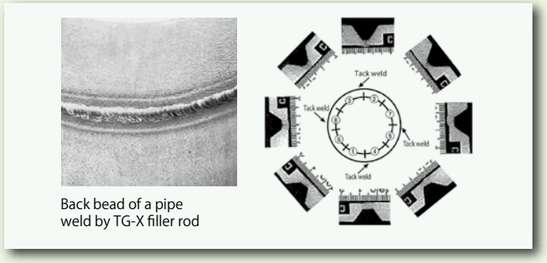
For TIG root pass welding on stainless steel pipes, back shielding (or back purging) by 100% Ar gas is normally required in order to prevent oxidation in the back bead. However, the large amount of time and Ar gas required for shielding raises cost enormously.

TG-X-Series Flux Cored filler rods for TIG root pass welding are TIG welding consumables containing flux inside (like conventional FCWs) and do not require back shielding because the slag generated during welding covers the back bead. Another advantage of TG-X filler rods is that no back shielding allows operators to work inside pipes without the danger of asphyxiation.

The line-up of TG-X filler rods is shown in Table 14, and back bead appearance and macrostructures of TG-X308L welds by circumferential pipe root pass welding are displayed in Figure 9.

Table 14: TG-X-Series Flux Cored filler rods

Trade name	AWS A5.22	JIS Z 3323	Major chemical composition	Applicable welding position
P TG-X308L	R308LT1-5	TS308L-RI	20Cr-10Ni	All position
P TG-X309L	R309LT1-5	TS309L-RI	24Cr-13Ni	Ditto
P TG-X316L	R316LT1-5	TS316L-RI	19Cr-12Ni-2.3Mo	Ditto
P TG-X347	R347T1-5	TS347-RI	19Cr-10Ni-0.6Nb	Ditto



Back bead of a pipe weld by TG-X filler rod

Figure 9: Back bead appearance and macrostructures of P TG-X308L welds by pipe root pass welding

The feeding speed by hand of TG-X filler rod is a little different from that of conventional TIG filler rod. In order to steadily melt an optimum quantity of the TG-X filler rod, it should be fed little by little in a fast pitch.

Moreover, as it is designed exclusively for root pass welding, using it for the second pass onwards is not recommended because it tends to cause slag inclusion.

8 Schematic diagram of DW-Series stainless steel FCWs

The schematic diagram of DW-Series stainless steel FCWs is shown in Figure 10.

9 Postscript

KOBE STEEL, LTD. has developed various kinds of stainless steel FCWs as shown in this issue to meet customers' requirements.

Whenever you face such troubles as how to select or how to use the optimum stainless steel welding consumables, please contact the nearest KOBELCO office(s) or agents.

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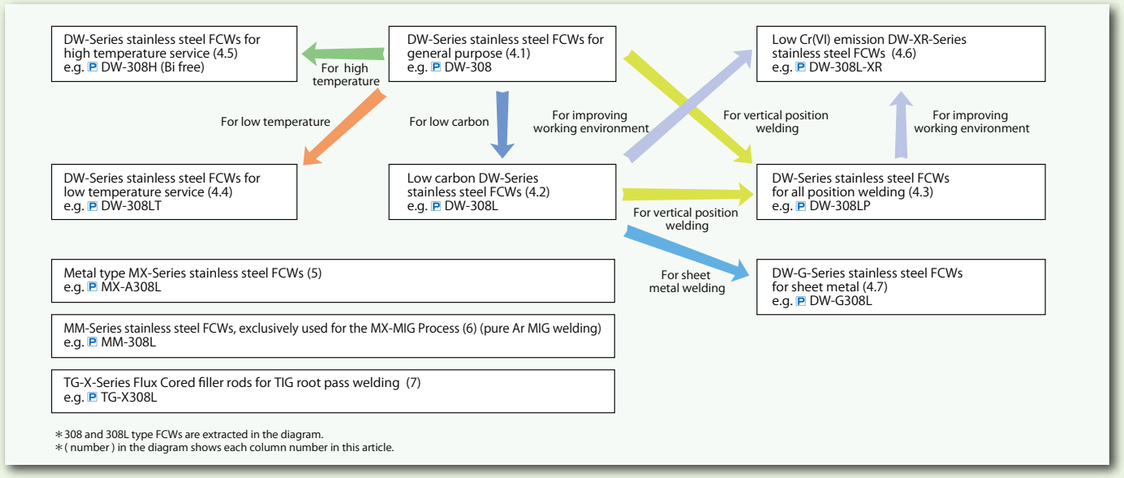

Figure 10: Schematic diagram of DW-Series stainless steel FCWs