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KOBELCO Puts the Customer First with All-in-One Product and Service
SG-Z2-CE / Equipment for the SEGARCTM process in EU Highly efficient electro-gas arc welding process

**SGARCTM 2Z** is an automatic electro-gas arc welding (EGW) process and equipment designed by Kobe Steel as a highly efficient and high deposition process that has been put into practical use mainly by Asian fabricators of ships, oil storage tanks and bridges for over 40 years. (See Table 1)

<table>
<thead>
<tr>
<th>Table 1: Application of SEGARCTM process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
</tr>
<tr>
<td>Shipyard</td>
</tr>
<tr>
<td>Bridge</td>
</tr>
<tr>
<td>Machinery</td>
</tr>
<tr>
<td>Storage tank</td>
</tr>
<tr>
<td>Steel structure</td>
</tr>
</tbody>
</table>

Because the SEGARCTM 2Z had not received CE Marking for the EU region, it could not be marketed within the EU region. However, it has recently been certified by conforming to the Machinery Directive (2006/42/EC), the Low voltage Directive (2006/95/EC) and the Electromagnetic Compatibility (EMC) Directive (2004/108/EC). Accordingly, SG-2Z-CE with CE Marking was developed to be marketed within the EU region.

**[Features of SG-Z2-CE]**

Fig. 1 shows schematic diagram of SEGARCTM process while an example of SG-Z2-CE equipment can be seen in Fig. 2.

**In addition**, welding is even possible if the thickness difference of joint plates is over 3 mm by adopting a tapered joint equal to or less than 1/3, as shown in Fig. 3 (a tapered joint not required below 3 mm).

**Welding consumables for SG-Z2-CE**

The welding consumables for SG-Z2-CE are shown in Table 2.

**Table 2: Welding consumables for SG-Z2-CE process**

<table>
<thead>
<tr>
<th>Trade designation</th>
<th>Type of steel</th>
<th>O2 %</th>
<th>NO</th>
<th>EL</th>
<th>Impact rate</th>
<th>Approaches by ship classification society</th>
</tr>
</thead>
<tbody>
<tr>
<td>DW-545G</td>
<td>Mid steel</td>
<td>HT490</td>
<td>400</td>
<td>600</td>
<td>29</td>
<td>60 (~20°C)</td>
</tr>
<tr>
<td>DW-565G</td>
<td>Mid steel</td>
<td>HT550</td>
<td>650</td>
<td>520</td>
<td>26</td>
<td>65 (~27°C)</td>
</tr>
<tr>
<td>DW-515G</td>
<td>High strength</td>
<td>HT600</td>
<td>500</td>
<td>615</td>
<td>26</td>
<td>100 (~60°C)</td>
</tr>
</tbody>
</table>

*O2% and NO% are designed for 300°C (E3) shielding gas. 
*NO% for a water-cooled sliding Electrode must be used as a backing material. 
*E3 (Stand for FAMULARC™ and FAMULARC™-squirrelcage)

The SG-Z2-CE equipment for live demonstration is available in KOBELCO WELDING OF EUROPE B.V. (KWE), the Netherlands or other branch and nearest Kobe Steel partners. Please feel free to ask for more detailed information about functions and live demonstrations.

**Figure 3: Application to a tapered joint & cross-sectional macrostructure of a tapered joint**

New Year’s greeting from the Head of the Welding Business

Dear KWT readers! I believe you have spent a marvelous New Year holiday. I would like to express my sincere gratitude for your patronage of KOBELCO products.

In Japan, the winter holiday is about a week long from the year end till the beginning of the year with New Year’s Day in between. How to spend it depends on the individual; one can go on a domestic or overseas trip, simply stay home, or return to one’s hometown. However, what just about everyone does during the first three days of the New Year is to visit a shrine (or a temple) and pray for the coming year. This is called HATSUMOUDE – or “the first visit to a shrine.” On the grounds of most shrines, stalls, temporarily installed for the holiday, sell sweets, saloon (wheat noodles), yakisoba (stir-fried soba noodles), oden (vegetables, fish dumplings and other ingredients served in a hot soy broth) or even sake (Japanese rice wine). With lottery stands and cork ball shooting galleries, both children as well as adults can enjoy the visit, buying its delicacies and eating outdoors on the shrine grounds. I also visited a shrine at my hometown and enjoyed drinking together with my relatives.

In our Welding Business group, we spent the last year doing our jobs while focusing on the “three Ms” (Marketing, Monodzukuri (production system innovation) and Manpower) under the slogan, “aiming to be the most reliable welding business company in the world.” While the environment surrounding our welding business has been stagnant due to the worldwide slump of shipbuilding and offshore structure industries, we will continue to enhance marketing capability through product strategies and business plans tailored for each market in cooperation with all group members. The ideal welding solution is one that solves a customer’s welding problem and leads to our final goal of contributing to our clients’ monodzukuri through the use of KOBELCO products. In this way, our welding solutions go beyond automation by robotic welding systems.

The KOBELCO group is one of the few company groups in the world that supplies welding consumables, robotic welding systems and power sources in addition to IoT and AI technology and products. By developing arc welding technology in response to customers’ requests, from covered electrodes to state-of-the-art automation technology, we will contribute to development in respective regions, countries and environments. The environment surrounding the welding business changes day by day and so do customer needs. Capturing those changes with sensitivity, we’ll make proposals that align with the needs of our customers.

Thus, we differentiate our products from those of other companies and will strive to add more value to them in the future as well.

When KOBELCO representatives pay a visit to your country or area, please share your issues and let them know what’s on your mind.

Lastly, I wish all of you and your families good health and a successful year in 2019.

Akira Yamamoto
Managing Executive Officer
Head of the Welding Business
KOBELCO STEEL LTD.

![Image](https://via.placeholder.com/150)

NEW YEAR GREETING FROM THE HEAD OF THE WELDING BUSINESS

KOBELCO WELDING TODAY No.1 2019

KOBELCO – Your Best Partner on display

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FAMULARC™, TRUSTARC™ and PRIMARC™ respectively.

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Flux cored wires for heat resistant steels that conform to AWS specifications

1 Preface

Heat resistant steels, typically Cr-Mo steels, have been widely utilized under such high temperature and high-pressure environments as thermal power plant boilers (hereinafter called boilers).

These steels are classified in Japan by the Japanese Industrial Standard (JIS) and overseas by the standards of both American Society for Testing and Materials (ASTM) and American Society of Mechanical Engineers (ASME).

The classification of welding consumables for heat resistant steels is also regulated by JIS in Japan and by both AWS and ASME standards abroad.

Table 1 shows Kobe Steel’s line-up of heat resistant steels such as boiler fabrication in the near future.

In this article, FCWs for 1.25Cr-0.5Mo and 2.25Cr-1Mo heat resistant steels that conform to AWS specifications will be discussed.

(1) minimizing impurities such as P & S in raw materials;

(2) designing for low C and high Mn in order to provide moderate hardenability and to stabilize notch toughness;

Tables 3 and 4 show typical chemical compositions and mechanical properties after PWHT of the deposited metals, respectively. Both chemical compositions and tensile properties satisfy the AWS requirements, and the impact properties at room temperature (+20°C) are sufficient.

Kobe Steel’s selection of FCWs for heat resistant steels is shown in Table 2. They are classified according to the steels and shielding gases as specified by the AWS while also conforming to ASME’s F-No. and A-No.

AWS also specifies Post Weld Heat Treatment (PWHT) at 690°C for 1 hour (690°Cx1h). Because PWHT is usually carried out in practice, it is necessary to design welding consumables that provide excellent mechanical properties after PWHT by taking the following points into consideration:

2 Line-up of FCWs for heat resistant steels

Table 2: FCWs for heat resistant steels

Table 3: Typical chemical compositions of deposited metals (mass%)

Table 4: Typical mechanical properties of deposited metals after PWHT (mass%)

Figure 1: Comparison of arc time by welding processes

Table 1: Heat resistant steel welding consumables for boilers

Table 2: FCWs for heat resistant steels

Table 3: Typical chemical compositions of deposited metals (mass%)

Table 4: Typical mechanical properties of deposited metals after PWHT (mass%)
3 Usability of FCWs for heat resistant steels

In Kobe Steel’s FCWs for heat resistant steels, slag forming agents like a rutile (TiO₂) are added in order to improve usability in all position welding. Figure 2 shows applicable ranges of welding current and arc voltage in horizontal fillet and vertical upward welding. Accordingly, welding current can be as high as about 300A in horizontal fillet welding and 240A in vertical upward welding. Also, a wide range of arc voltage can be used.

Figure 3 shows bead appearances and cross-sectional macrostructures in horizontal fillet and vertical upward welding, respectively. In addition to obtaining sufficient penetration and a sound weld toe, no large particle spatter adhesion appears, the bead shape shows little unevenness, and bead appearance is glossy.

4 Mechanical properties of FCWs for heat resistant steels under various PWHT conditions

Figures 4 and 5 indicate the mechanical properties under various PWHT conditions including the as-welded condition for reference.

With regard to 0.2% offset yield strength (0.2%YS) and tensile strength (TS), the FCWs fully satisfy the lower limits of those of the base metal even under such high temperature and long time PWHT conditions as 690°C x 4h. On the other hand, it is more effective to perform PWHT under higher temperature (650°C→690°C) and longer time (1h→4h) in order to get better impact properties.

5 Diffusible hydrogen contents of weld metals with FCWs for heat resistant steels

Figure 6 compares the diffusible hydrogen content of the weld metals with FCWs for heat resistant steels with that of a solid wire (GMAW) and a covered electrode (SMAW).

The FCWs’ diffusible hydrogen content is from 2 to 4ml/100g which is inferior to that of GMAW (M-G-S1CM) but, almost equivalent to that of CM-A96 (SMAW).

Each of the above tests was conducted right after the package of welding consumables was opened. However, because of moisture absorption by or adherence to the welding consumables, diffusible hydrogen content may increase if the welding consumables are left in the packages for long periods after unsealing. It is, therefore, recommended for the consumables to be used promptly once their packages are opened.
In welding, the PWHT condition should be determined by considering the required mechanical properties, even though FCWs for heat resistant steels show good mechanical properties within the range of 650-690°Cx4h as shown in point 4, above (Mechanical properties of FCWs for heat resistant steels under various PWHT conditions).

For example, under the high temperature and long time PWHT condition like 690°Cx4h, FCWs’ 0.2%YS and TS can fully satisfy the lower limit of those of the base metal, and it is advantageous to improve impact properties. On the other hand, if excessive high temperature and long time PWHT is performed, it will cause the formation of a soft structure called the ferrite band and may result in extreme decreases in TS and notch toughness.

In this article, the FCWs for 1.25Cr-0.5Mo and 2.25Cr-1Mo heat resistant steels that conform to AWS standard were discussed. They are designed to fulfill requirements not only for chemical compositions and tensile properties but also for impact properties. Furthermore, as they are aimed to decrease the SR crack susceptibility that is peculiar to heat resistant steels, it is hoped that these FCWs will contribute to the improvement of welding efficiency.

Upon reflecting on feedback from customers who apply these welding consumables onsite, Kobe Steel will make utmost efforts to further improve the properties of these FCWs.

References
2. AWS, April 12, Addendum 2, Annex B

Note: F, T and IP are the abbreviations of FAMILARC™, TRUSTARC™ and PREMARC™, respectively.
Established in 2008, KOBE WELDING OF QINGDAO CO., LTD. (KWQ) celebrated its 10-year anniversary at Wyndham Grand Qingdao Hotel in Huangdao District, Qingdao City on October 12, 2018. Among the subsidiaries managed by the Welding Business in overseas, KWQ is the youngest production company.

It was an honor to participate at this 10-year turning point in KWQ’s history and report on the anniversary ceremony and get-together party.

National staff members in charge of preparing the ceremony inspired themselves from the start. It seemed part of Chinese culture that they were fond of anniversary celebration. As a result, almost all employees, except for a few mothers who had to take care of their small children at home, took part in the anniversary celebration.

An enormous display board for the ceremony, much larger than anything I’d seen in Japan, was signed by the employees and set in front of the ceremony. This got them even more excited ahead of the ceremony. Mr. Yamamoto, the Head of the Welding Business (Chairman of the KWQ Board), and the outside directors of KWQ also participated in the ceremony with congratulatory speeches and by extending encouraging words.

In a presentation, the 10-year path of KWQ was introduced, many of the employees became emotional while remembering their history.

The award for 10 years of service at KWQ was always promised, and this party did not disappoint. It started with karaoke singing of KWQ’s 10-year anniversary song, whose lyrics were written by KWQ’s group leader of equipment and electric power, and continued with Chinese acrobatics, games, dance performances and a magic show performed by professionals in cooperation with the All-China Federation of Trade Unions (ACFTU) in Qingdao. It was exciting. The final performance was a mixed chorus by KWQ employees who had practiced during their short lunch breaks and managed to perform with great success.

Such a get-together party provided me, a representative of the Welding Business in China, with a good opportunity to drink and talk with many Chinese national staff members and plant operators and build personal connections. Moving from one table to another in order to toast all the participants was a hard but enjoyable task.

Because competition among producers of flux cored wire (FCW) for carbon steel, KWQ’s main product, is severe in China as well as globally, it means that there is extensive need for FCWs in our societies. (The basis of our business shall be that on a timely basis, we keep supplying welding consumables of stable quality that enables our clients to utilize them with ease) We might not maintain the status quo; however, we will keep developing our presence by taking on new challenges that lead to further reinforcing the company’s foundation and employees’ happiness.

We do hope you may extend your support to us toward the next 20th or 30th year anniversary.

Reported by Eiju Yamauchi,
General Manager, Administration Department, KWQ

FABTECH is one of the largest annual exhibitions held in the USA — or outside it in Canada or Mexico. In the USA, the location alternates between Chicago and either Atlanta or Las Vegas).

In 2018, it was held in Atlanta from November 6 (Tuesday) to 8 (Thursday) and attracted over 33,000 visitors and about 1,500 exhibitors. Reflecting the recent active market situation, the show was extremely active for all three days, and the number of visitors did not drop until the last day.

FABTECH targets general fabricators in metal manufacturing and draws participants in such related industries as metal forming, processing, fabricating, welding and finishing industries. It also features spot sales, and quite a few companies aim to sell their displayed products on the spot at special, discounted prices.

30th exhibition at FABTECH of KOBELCO WELDING OF AMERICA INC. (KWAI) focused on the following points under the slogan “KOBELCO – Your Best Partner:”

1) establishing KOBELCO’s brand-image as the welding solution company. The combination of the ARCMAN™ MP welding robot and DW-50R MP metal type flux cored wire was on display, and a video showed the equipment in use at Beck Steel (USA) as well as an interview with the president of that company.

2) emphasizing technological capabilities for high-end products. DW-A62LSR, a new flux cored wire (FCW) for the energy industry and DW-S1LG, an FCW for electro-gas arc welding, shipbuilding and tank fabrication were exhibited.

3) introducing the extensive line-up of products and features. Stainless steel FCWs such as DW-TG-X series, DW-G series for thin-gauge sheet, and DW-XR series that reduce Cr(VI) emissions were introduced on video. Additionally, DW-50 (conforming to AWS D1.8 Structural Welding Code-Seismic Supplement), MX-50 for steel structures and a 15 lbs (6.8 kg) spool of DW-50 for ship building was also displayed.

The display of ARCMAN™ MP together with MX-50R attracted much attention from visitors, and many of them asked about the robot and the welding wire as well. We believe it successfully conveyed the KOBELCO brand-image as the welding solution company that can provide both welding and robot.

As an exhibition, FABTECH offers value because we can catch new market trends in the ideas, products and concepts emphasized by participating companies. In the case of KWAI, the sales people who work hard in their own territories around the USA join FABTECH as a team and talk business with customers. I felt as if the exhibition helped them become strongly united.

I’d like to take the opportunity and encourage myself to further cultivate the North American market as a member of the KOBELCO group. The next FABTECH will be held in Chicago from November 11 to 14 in 2019. Dear KWT readers, please join us there, and I’m looking forward to seeing you again.

Reported by Marie Ichikawa,
Staff Member of GOMU, Marketing Center, the Welding Business