Advanced Technology of our Seamless Flux Cored Wire

It is our company philosophy to keep improving product quality complying with customer’s any needs from the period of company establishment.

We are pleased to introduce our innovative feature of Seamless Flux Cored Wire such as low hydrogen content, excellent resistance to moisture absorption, and good targeting properties etc.

Superiority of our SF wire to conventional fold type flux cored wire

1. Excellent hygroscopic resistance
2. Targeting point is extremely stable
3. Excellent contact tip abrasion resistance
4. Excellent rust prevention

Difference between our SF wire and conventional fold type FC wire

1. Copper plated surface
2. No seam (opening) in outer layer

Our Seamless Flux Cored Wires
SF wire

Our Seamless Metal Cored Wires
SM wire

Conventional fold type Flux Cored Wires
FC wire
Superiority of our SF wire to conventional fold type FC wire

1. Excellent hygroscopic resistance

The largest advantage of our SF wire is that it is possible to make the hydrogen content of the wire itself extremely low. This can be achieved by (1) it is possible to decrease the amount of moisture (hydrogen source) by high temperature dehydrogenation treatment at the time of wire production and (2) even after the production of wire, moisture absorption from the atmosphere into the wire will not occur since the wire is of seamless structure with no gaps. Therefore, it is not necessary to worry about the wormhole porosity or pit, such as those generated by moisture absorption. As shown in the picture.

![Graph showing comparison of atmospheric conditions between conventional and seamless types](image)

Fig. 1 shows the results of diffusible hydrogen test with various flux cored wires produced as a trial by changing total moisture amount in the wire. Fig. 2 shows the relationship between the required preheating temperature determined by calculation and diffusible hydrogen in the wire. As shown, by application of SF wire is a low hydrogen, it will enable a significant reduction of the preheating operation.

![Graph showing diffusion hydrogen amount](image)

Fig. 1. Relation between total hydrogen amount and diffusible hydrogen amount of flux cored wire

![Graph showing relationship between diffusible hydrogen amount and preheat temperature](image)

Fig. 2. Relationship between diffusible hydrogen amount and preheat temperature (calculated by Gau)


2. Targeting point is extremely stable

The results of targeting property test is shown in Fig. 3. Aiming point is extremely stable even if wire is fed from a fixed torch and slippage amount of targeting point at the tip of wire is measured. Because the cross-sectional shape of our SF wire is symmetrical and twisting rigidity is high, the targeting property at the time of wire feeding (reliable stability) is excellent.

![Diagram showing wire targeting test](image)

In all production sites of welded members such as high speed horizontal line welding in shipbuilding and bridge construction, multi-layer welding in construction and off-shore structures, and so on; wire feeding property and targeting performance (accuracy in aiming position of wire tip) have a direct connection with the quality of welded parts such as bead shape, existence of wetting defects, etc.
3. Excellent contact tip abrasion resistance

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Our SF Wire</th>
<th>Conventional fold type FC wire</th>
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</thead>
<tbody>
<tr>
<td>Continuous welding 10 min x 10 times (accumulating total 100 min) Wire diameter: 1.2 mm</td>
<td>0.13mm</td>
<td>0.40mm</td>
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<tr>
<td>Welding current: 270 A</td>
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When our SF wire is used, the life of contact tip is about 3.5 times as long as the case where conventional fold type FC wire is used. (When our SF wire is used, abrasion of contact tip is about 1/3.5.)

The reason the long life of contact tip is long is as follows:

a) The surface of our SF wire is plated with copper, and, therefore, friction is small.
b) Cross-sectional shape of our SF wire is point symmetry. Therefore, the wire is fed out straight.

Less contact tip abrasion & life of tip is longer

4. Excellent rust prevention

Rust-free resistance of our SF wire is greater than the conventional fold type FC wire. Because the surface of our SF wire is copper coated. Therefore, storage control is easier even if at a coastal welding site and after the unpacking of wire.

Superiority of our SF wire to conventional fold type FC wire

Our SF wire is coated by Copper to prevent rust

Production process

Difference between our SF wire and other Seamless FC wire

a) Our SF wire filled with flux homogeneously

b) Other Seamless FC wire filled with flux by vibration from top to bottom.

Superiority of our SF wire to other Seamless FC wire

Although we produced SF wire by this Conventional Vibration method 20 years ago, after that we developed our filling method with flux, for stable quality of our SF wire.
The most remarkable features of SF wire when used with CO₂ or Mixed gas shielding are the following.

- Weldability in all positions are excellent
- Arc is stable, spatters are few and bead is smooth with good shape and appearance
- Easy slag removability
- Diffusible hydrogen content is as low as solid wire and crack resistance is excellent
- Adjusting once a certain proper welding current within a wide range of amperage and voltage for each size of wire shown in Figure 4, there is no need to re-adjust the current position by position in all-position welding.
- High deposition rates can save labor costs by reducing welding time - Figure 5.

![Diagram showing welding current and arc voltage for different wire diameters.](attachment:image.png)

Fig. 4 Proper ranges of welding current and arc voltage for each size SF wire.

![Comparison of deposition rates between SF wire, conventional solid wire and electrode.](attachment:image.png)

Fig. 5 A comparison on deposition rates between SF wire, conventional solid wire and electrode.
<table>
<thead>
<tr>
<th>Main Applicable steel materials</th>
<th>AWS Classification*</th>
<th>Shielding</th>
<th>Brand name</th>
<th>Wire diameter (mm)</th>
<th>Application</th>
<th>Chemical composition of deposited metal (%), Typical</th>
<th>Mechanical properties of deposited metal (Typical)</th>
<th>Absorbed energy kJ (J)</th>
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*AWS A5.20 and A5.24 wire replaced into AWS A5.24 at the end of 2015.