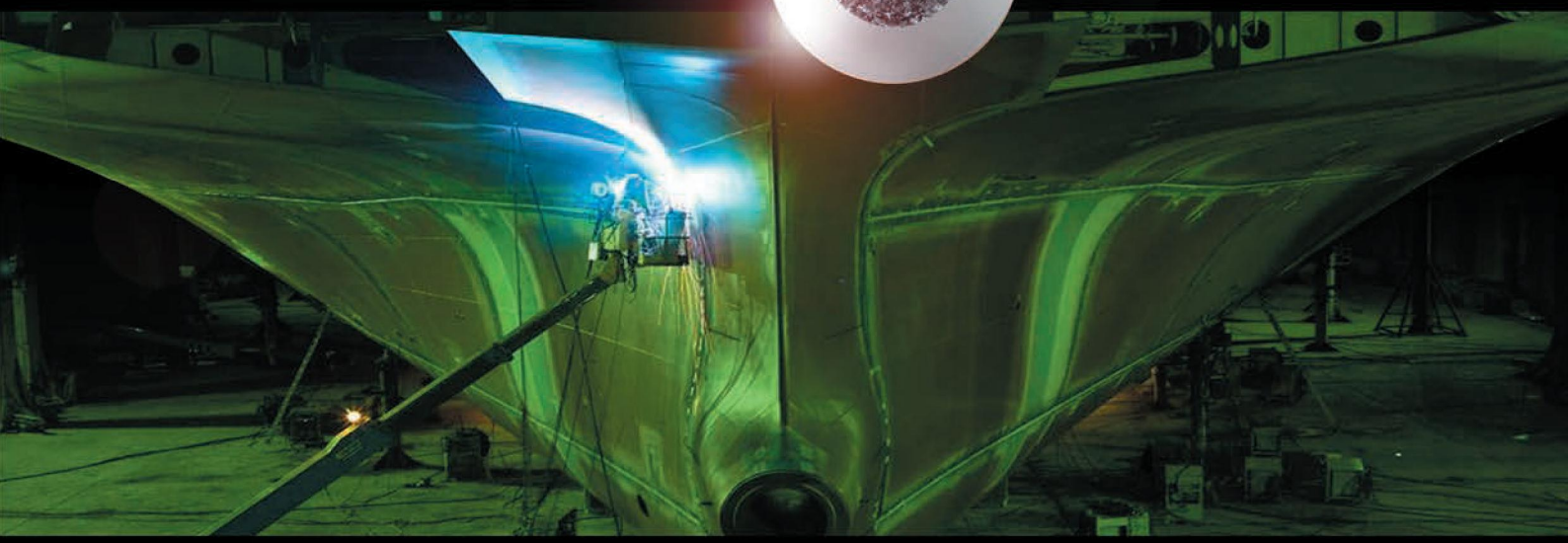
NIPPON STEEL

Seamless Flux Cored Wire,

SF-SM wire



NIPPON STEEL WELDING & ENGINEERING CO.,LTD.

TMR SUPPLIES

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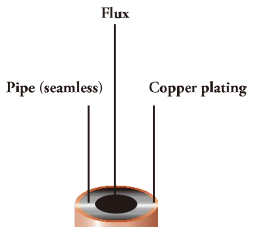


Seamless Flux Cored Wire,

SF-SM wire

Since sales started in 1981 up until now,
our seamless flux cored wires have
developed as SF-SM wires through
receiving your favor.

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

① Excellent Hygroscopic resistance

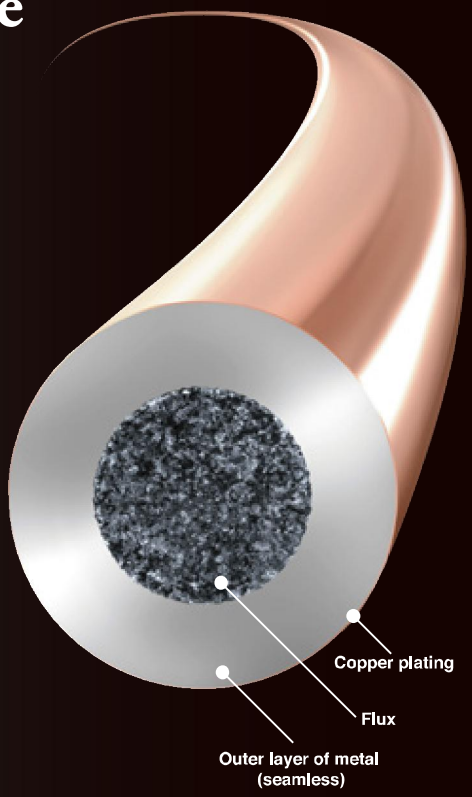
② Targeting point is extremely stable

③ Excellent contact tip abrasion resistance

④ Excellent rust prevention

Advanced Technology of our Seamless Flux Cored Wire

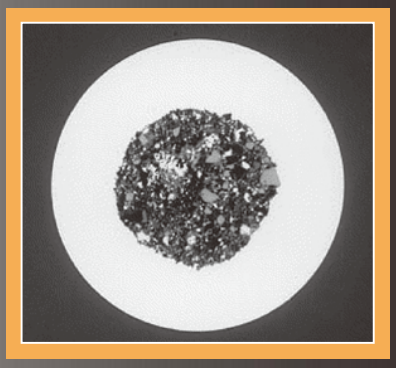
It is our company philosophy to keep improving product quality complying with customer's any needs from the period of company establishment.
We are pleased to introduce our innovative feature of Seamless Flux Cored Wire such as low hydrogen content, excellent resistance to moisture absorption, and good targeting properties etc.



Difference between our SF wire and conventional fold type FC wire

①Copper plated surface

②No seam (opening) in outer layer

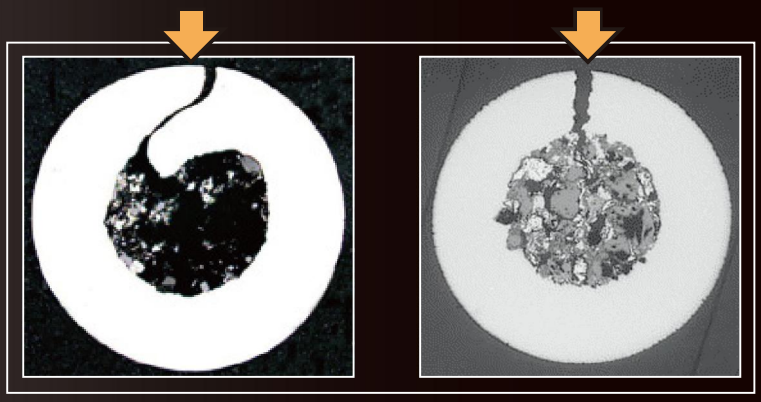


Our Seamless Flux Cored Wires

SF wire

Our Seamless Metal Cored Wires

SM wire



Conventional fold type Flux Cored Wires

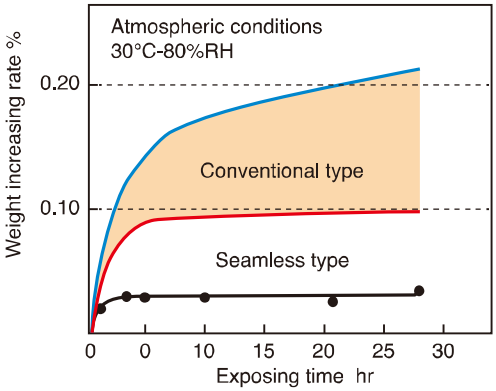
FC wire

Seam (Opening)

Superiority of our SF wire to conventional fold type FC wire

①Excellent Hygroscopic resistance

The largest advantage of our SF wires 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.



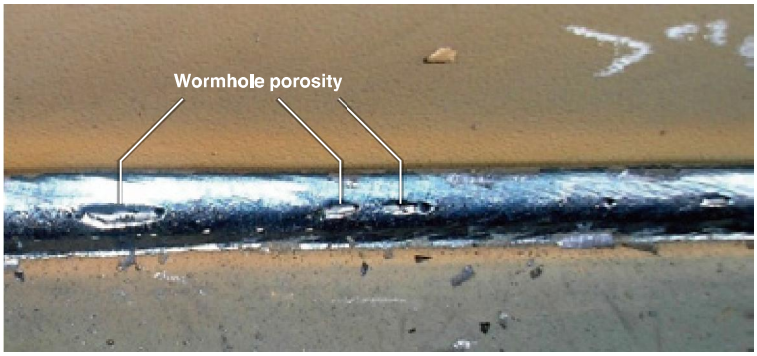


Fig. 1 shows the results of diffusible hydrogen test with various flux cored wires produced as a trial by changing total moisture amount in the wire, Fig.2 shows the relationship between the required preheating temperature determined by calculation and diffusible hydrogen in the wire. As shown,by application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

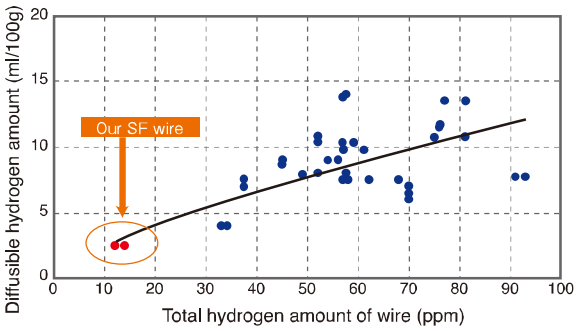


Fig. 1 Relation between total hydrogen amount and diffusible hydrogen amount of flux cored wire (JIS Z 3118 Hydrogen measuring method of steel welded parts)

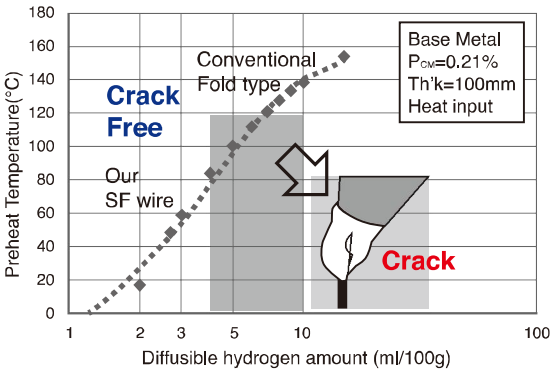
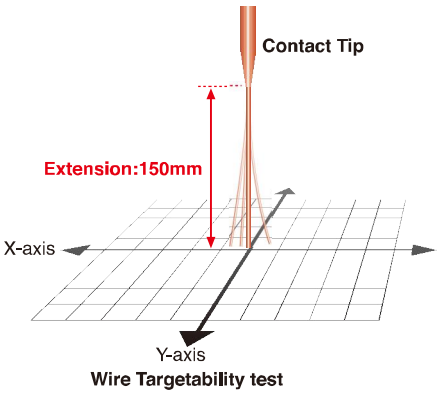


Fig. 2 Relationship between Diffusible hydrogen amount and Preheat temperature(calculated by Cen)
(*N. Yurioka and T.Kasuya: "A chart method to determine necessary preheat in steel welding" Welding in the World, vol.35(1995),p327-334)

Customers can used by easy storage for a long time

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 (rectilinear stability) is excellent.



Wire Targetability test

Welding conditions	Wire dia.: 1.2 mm (Palepack) Straight torch Ext: 150 mm

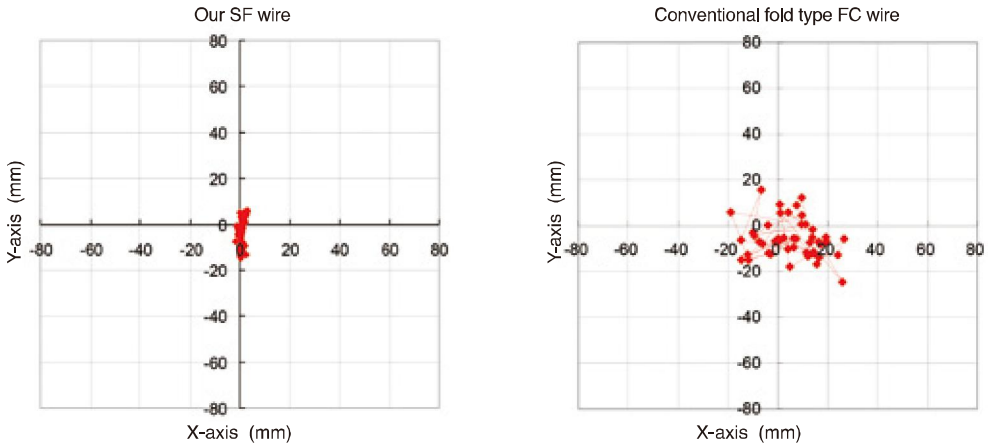
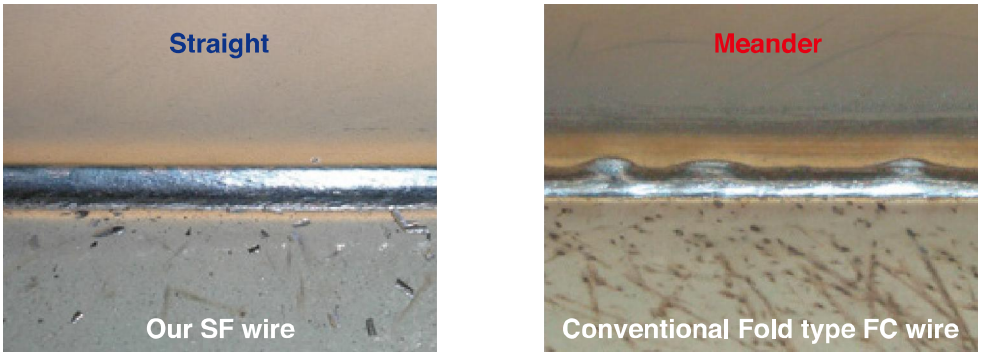


Fig. 3 Targeting property of wire

In all production sites of welded members such as high speed horizontal fillet 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 welding defects, etc.



Horizontal fillet welding bead

Best Choice for Automatic Welding

③ Excellent contact tip abrasion resistance

Conditions	Our SF Wire	Conventional fold type FC wire
Continuous welding 10 min × 10 times (accumulating total 100 min) Wire diameter: 1.2 mm Welding current: 270 A		
Abrasion amount of top of the contact tip※	0.13mm	0.40mm

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:

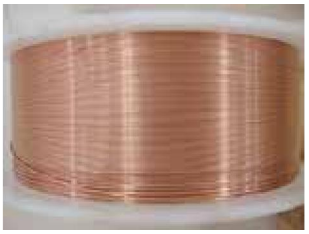
a)The surface of our SF wire is plated with copper, and, therefore, friction is small.
b)Cross-sectional shape of our SF wire is point symmetry. Therefore, the wire is fed out straight.

Less contact tip abrasion & life of tip is longer

④ Excellent rust prevention

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

Superiority of our SF wire to conventional fold type FC wire
Excellent rust prevention



Our SF Cored Wires
(Copper coating)

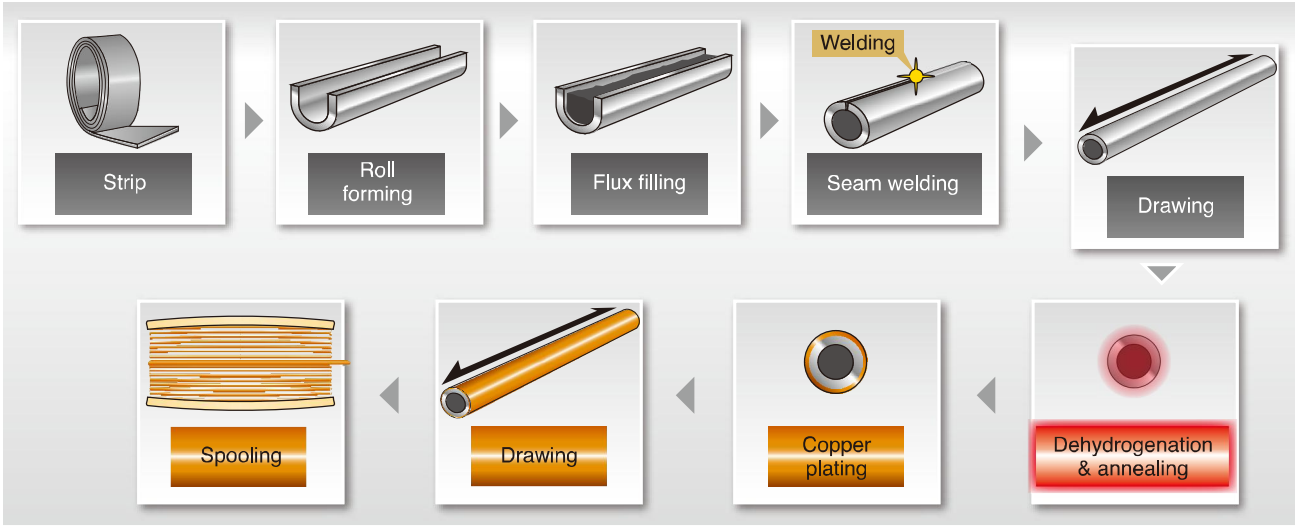
Conventional fold type FC wire

Our SF wire is coated by Copper to prevent rust

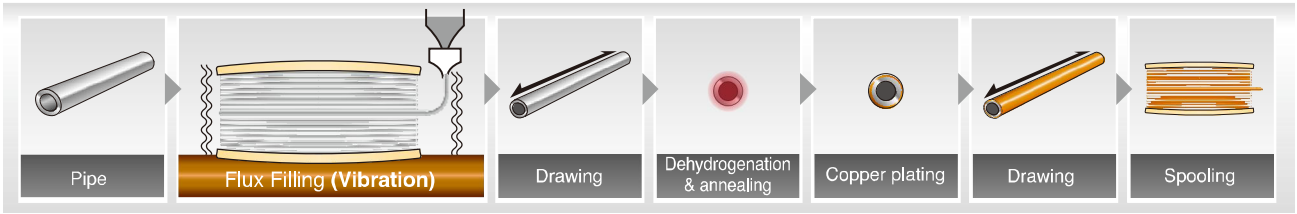
Production process

Difference between our SF wire and other Seamless FC wire

a) Our SF wire filled with flux homogeneously

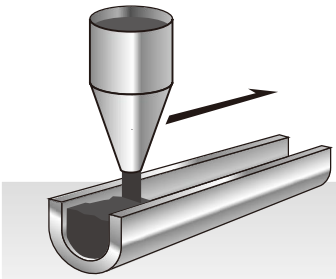


b) Other Seamless FC wire filled with flux by vibration from top to bottom.



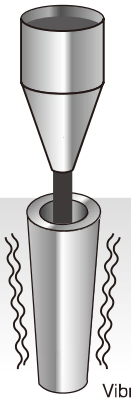
Superiority of our SF wire to other Seamless FC wire

Our SF wire
<Homogeneous of the composition of flux>



Composition of flux
Top of Wire = bottom of Wire

other Seamless FC Wire
<Conventional Vibration method>



Composition of flux
Top of Wire ≠ bottom of Wire
Heavy particles are often
at the bottom of Wire

Vibration

Although we produced SF wire by this Conventional Vibration method 20years ago, after that we developed our filling method with flux, for stable quality of our SF wire.

Seamless Flux Cored Wire, SF-SM wire

SF Series
All position welding for Carbon Steel

SF-1E Down to -20°C (for CO_2 welding)

SF-1A Down to -20°C (for Ar+20%CO_2 welding)

General purpose flux cored wire for shipbuilding and structures.

- Stable welding arc with low spatter and perfect bead surface
- Easy slag removability
- Excellent toughness obtainable down to -20°
- SF-1A now available in 1.0mm

SF-3M Down to -40°C (for CO_2 welding)

SF-3E Down to -40°C (for CO_2 welding)

SF-3A Down to -40°C (for Ar+20%CO_2 welding)

Flux cored wire for welding carbon steels with impact requirements down to -40°C.

- Stable welding arc with less spatter and perfect bead surface
- Easy slag removability
- Excellent toughness obtainable down to -40°

SF Series
All position for Low-Alloy Steel

SF-3AM Down to -60°C (for Ar+20%CO_2 welding)

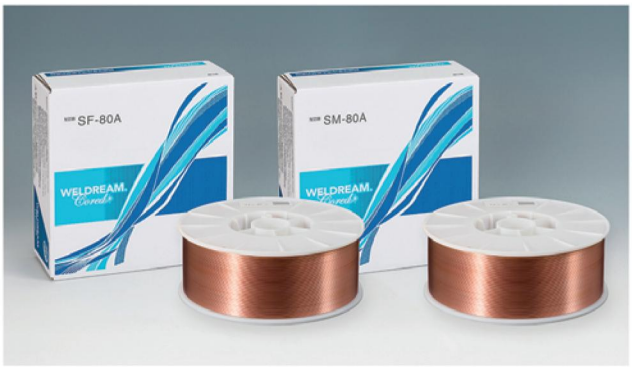
Flux cored wire for low-alloyed steels, offshore applications, piping etc.

- Significantly improved weldability in all positions
- Diffusible hydrogen content is as low as solid wire and excellent crack resistance
- Excellent toughness in low temperatures down to -60°
- Now available in 1.0mm

SF-80A Down to -40°C (for Ar+20%CO_2 welding)

Flux cored wire for extra high tensile steels.

- Stable welding arc with low spatter and perfect bead surface
- Excellent toughness down to -40°
- Extremely low hydrogen content
- Optimized yield, tensile and impact strength ratio



SM Series
Metal type flux cored wire

SM-3A Down to -40°C (for Ar+20%CO_2 welding)

Metal cored wire without slag for non-alloyed steels.

- High productivity wire mainly filled with metal powder
- Stable welding arc with low spatter and perfect bead surface
- Excellent toughness obtainable down to -40°

SM-47A Down to -60°C (for Ar+20%CO_2 welding)

Metal cored wire for low temperature pipe and steel applications down to -60°

- High productivity wire mainly filled with metal powder
- Stable welding arc with low spatter and perfect bead surface
- Excellent toughness in low temperatures down to -60°

SM-80A Down to -40°C (for Ar+20%CO_2 welding)

Metal cored wire for extra high tensile steels.

- Stable welding arc with low spatter and perfect bead surface
- Excellent toughness down to -40°
- Extremely low hydrogen content
- Optimized yield, tensile and impact strength ratio

TMR SUPPLIES

Perfect Welding by NST

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