

# Seamless Flux Cored Wire “SF SM SX Wire”

## 1. Introduction

In recent years, flux-cored wires (Fig. 1) that help improve welding performance have been increasingly applied in gas-shielded arc welding of steel structures, such as ships and bridges. Nippon Steel & Sumikin Welding Co., Ltd. is the only manufacturer of seamless flux-cored wires in Japan. The company has developed a wide variety of seamless flux-cored wires—including the NITTETSU SF-1, which was put on the market in 1981—best suited to the steel products of Nippon Steel.

## 2. Features of Seamless Flux-Cored Wires

The flux-cored wire consists of a metallic sheath filled with the prescribed flux. Ordinary flux-cored wires have a longitudinal seam (gap) in the sheath. In the case of seamless flux-cored wire, the seam is completely closed by welding in the manufacturing process so as to allow for high temperature dehydrogenation treatment and wet-type surface treatment, such as copper plating. The seamless flux-cored wire has the following outstanding features (Fig. 2).

- (1) Excellent resistance to moisture absorption and corrosion
- (2) Capability to produce weld metal almost devoid of hydrogen
- (3) Easy, accurate setting of wire

## 3. SX Wire for Deep Penetration Welding “NITTETSU SX-1F”

When it comes to penetration depth, conventional flux-cored wires are outperformed by solid wires. The SX wire is an entirely new type of seamless flux-cored wire developed to eliminate that disadvantage of conventional flux-cored wires. It allows for deep penetration and high welding performance by reducing the flux filling rate as much as possible and optimizing the slag removing agent and arc stabilizing agent. As shown in Fig. 3, NITTETSU SX-1F has a much higher penetration rate than conventional flux-cored wires. Therefore, even without edge preparation, it meets the penetration rate requirements ( $\geq 75\%$ ) (Fig. 4) for steel plate decks with U-shaped ribs that were added to the Specifications for highway bridges upon their revision in 2002.

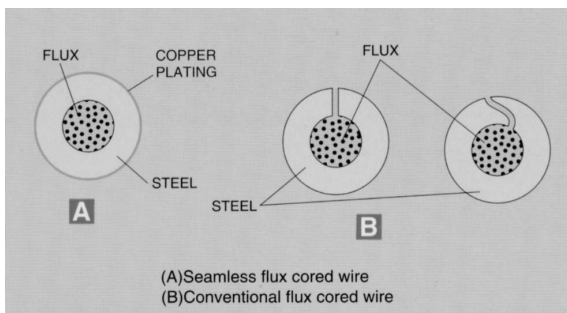


Fig. 1 Cross section of seamless flux cored wire

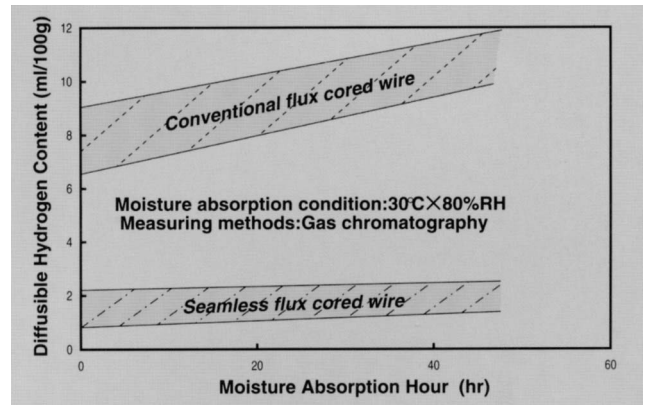


Fig. 2 Moisture absorption hours and diffusible hydrogen content

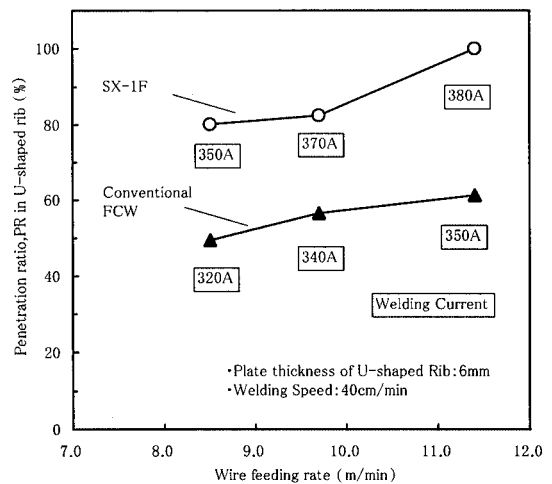


Fig. 3 Penetration rate of U-shaped rib without edge preparation

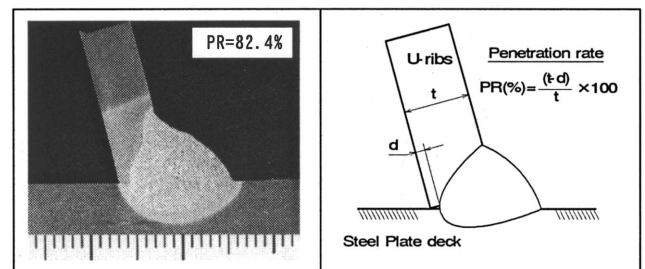


Fig. 4 Cross section of fillet weld and penetration rate

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Table 1 Typical products of seamless flux cored wire

Trade name	Flux type	Welding position	Feature
SF-1 · EX	Slag	All (F, V, O, H)	For all position welding    Less fumes and little spattering
SM-1F · EX	Low-slag (metal)	F-fillet, H-fillet	Little slag, high efficiency, primer resistant Less fumes and little spattering
SX-1F		F-fillet, H-fillet	Deep penetration    For non-edge preparing U-rib