DAIKOWM 630

GMAW

FERRITIC - MARTENSITIC STAINLESS STEEL

630 (17-4-PH)

DESCRIPTION

Solid wire suitable for welding precipitation hardening stainless steels

Wire rod for welding of 17-4 and 17-7 Cr Ni steels, 630 and similar precipitation hardening-martensitic stainless steels. Especially used in hydraulic equipment components, impellers, pump shafts, valves which are exposed to high corrosion in petrochemical industry, chemical plants. Solution heat treatment shall be done at 1050°C (±30°C) to have austenite matrix, then quenching to 150-90°C to transform the matrix to martensite and then precipitation heat treatment at 480-630°C for 4 hours, resulting in very high strength, toughness, and good corrosion and oxidation resistance.

SPECIFICATIONS

EN ISO 14343-B	SS630	**AWS A5.9**	ER630
Shielding	M12, M13	**Positions**	PA, PB, PC, PD, PE, PF, PG
Current	DC+	**Packaging Type**	Drums, B300, D200 and D100 spools.

ASME QUALIFICATIONS

F-No (QW432)	6
A-No (QW442)	-

PREN

16.96

CHEM. COMP. %	DEFAULT
C	0.03
Mn	0.6
Ni	4.8
Cr	16.3
Nb	0.2
P	0.02
S	0.005
Mo	0.2
Si	0.4
Cu	3.5

MECHANICAL PROPERTIES	MIN. PER STANDARD	PRODUCT
Tensile strength R_m MPa	930	930
Yield strength $R_{p0.2}$ MPa	725	740
Elongation A (L_0=5d_0) %	5	10
Impact Charpy ISO-V	-	-
Impact Charpy ISO-V	-	-

WELDING PARAMETERS	1.0 mm	1.2 mm
Ampere	160A - 220A	200A - 270A
Voltage	25V - 29V	26V - 30V
Packaging	Ø 0,8÷1,6mm	Ø 0,8÷1,6mm
Packaging Type	Drums, B300, D200 and D100 spools.	Drums, B300, D200 and D100 spools.

630 (17-4-PH)

DESCRIPTION

APPLICATION

The 630, also known as 17-4-PH, is used for welding high-strength martensitic stainless steels hardened by precipitation with the addition of copper. This material offers strength up to three times greater than standard austenitic stainless steels of the 300 series. Alloys, such as the FV520/450 type, offer corrosion resistance similar to 304 stainless steel. However, the 630/17-4PH types, lacking molybdenum and with high carbon content, display weaknesses in resistance to intergranular and pitting corrosion, unlike the FV520/450 types. Typical applications include pump shafts, impellers, and hydraulic equipment used in the petrochemical, marine engineering, and nuclear sectors.

ALLOY TYPE

High strength martensitic precipitation hardening stainless steels.

MICROSTRUCTURE

In the PWHT condition the microstructure consists of precipitation hardened tempered martensite with some retained austenite.

MATERIALS

EN W.Nr.: 1.4542 (X5CrNiCuNb 16-4), 1.4548 (X5CrNiCuNb17-4-4), 1.4549 (GX5CrNiCuNb1)
ASTM: A564, A693, A705, gr. XM-25, A564, gr. 630, A747, CB7Cu-1 (cast)
UNS: S45000, S17400
PROPRIETARY: FV520B (Firth Vickers), Custom 450, 630 (Carpenter), 17-4PH (AK Steel Steel)

WELDING & PWHT

For welding thicknesses up to 15 mm, preheat is generally not required. For thicker sections, a preheat and interpass temperature range of 100-200 °C is recommended. Temperatures exceeding 200 °C may inhibit martensitic transformation, causing a coarse microstructure. When using matching composition consumables, it is essential to perform Post-Weld Heat Treatment (PWHT). Normally, materials are employed in an over-aged condition. The PWHT for over-aging involves: at 750 °C for 2 hours, with air cooling to 15 °C; followed by a second stage at 550 °C for 2 hours, with further air cooling. During the cooling of the weld metal, austenite transforms into martensite (Ms) at temperatures below approximately 250 °C, maintaining a significant fraction of austenite at room temperature. Since sub-zero cooling is impractical, this austenite is destabilized through annealing at 750-850 °C. The precipitation of carbide in austenite raises the Ms temperature, allowing complete transformation during cooling, ensuring more effective tempering and aging in the second PWHT cycle. Skipping the first PWHT cycle can lead to properties with greater variability between batches.