DAIKOWT 630

GTAW

FERRITIC - MARTENSITIC STAINLESS STEEL

630 (17-4-PH)

DESCRIPTION

Rod suitable for welding precipitation hardening stainless steels

Rod developed for welding Ni-Cr 17-4 and 17-7 steels, as well as similar precipitation hardening martensitic stainless steels such as 630. Widely used in components for hydraulic equipment, impellers, pump shafts, and valves subject to severe corrosion in the chemical and petrochemical industries. It is recommended to perform a solution treatment at 1050 °C (±30 °C), followed by quenching at 150-90 °C and a precipitation heat treatment between 480 and 630 °C for 4 hours, to ensure maximum strength, toughness, and resistance to corrosion and oxidation even at high temperatures.

SPECIFICATIONS

EN ISO 14343-B	SS630	**AWS A5.9**	ER630
Shielding	I1	**Positions**	PA, PB, PC, PD, PE, PF
Current	DC-	**Packaging Type**	5kg carton tube

ASME QUALIFICATIONS

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

PREN

16.96

CHEM. COMP. %

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

	1.6 mm	2.4 mm
Ampere	80A - 100A	110A - 160A
Voltage	-	-
Packaging	Ø 1,0÷4,0mm	Ø 1,0÷4,0mm
Packaging Type	5kg carton tube	5kg carton tube

DAIKO

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.