DAIKOWS 630

SAW

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

ISO 14343-B	SS630	AWS A5.9	ER630
DIN	-	Werkstoff Number	-
Certifications	-	Shielding	DAIKOFLUX 493-W
Positions	PA, PB, PC	Current	DC/AC

ASME QUALIFICATIONS

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

FERRITE

-

PREN

16.96

HARDNESS

-

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	VARIANT
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	2.4 mm
Ampere	250A - 420A
Voltage	28V - 32V
Packaging	Ø 2,0÷4,0mm
Packaging Type	K415 spool and drums.

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APPLICATION

Employed for the welding of exceptionally high-strength martensitic stainless steels, these alloys undergo precipitation hardening facilitated by copper additions. The resultant strength outpaces that of standard 300 series austenitic stainless steels by up to threefold. Notably, the FV520/450 alloys showcase corrosion resistance on par with 304 stainless steel. Conversely, the 630/17-4PH variants, distinguished by their lack of molybdenum and heightened carbon content, fall short in providing equivalent resistance to intergranular and pitting corrosion compared to their FV520/450 counterparts. This welding methodology proves indispensable in the manufacturing of crucial components like pump shafts, impellers, and hydraulic equipment. Its diverse applications span critical sectors, including the oil and gas industry, petrochemical realm, marine environments, and nuclear engineering.

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

Preheating is generally unnecessary for materials up to 15mm in thickness. However, in the case of thicker and more restrained sections, it is advisable to employ a preheating and interpass temperature range of 100-200°C. Temperatures surpassing 200°C may hinder martensite transformation, leading to microstructural coarsening. When utilizing matching composition consumables for welding, it becomes imperative to undergo a Post Weld Heat Treatment (PWHT). The standard procedure involves utilizing materials in the over-aged condition. The PWHT for over-ageing follows a specific sequence: 750°C for 2 hours, air-cooled to 15°C, followed by 550°C for 2 hours and air cooling. During the cooling process, the weld metal undergoes transformation from austenite to martensite (Ms) below approximately 250°C. However, a significant fraction of austenite persists at ambient temperature. Since achieving sub-zero cooling is impractical, this retained austenite is destabilized through annealing at 750-850°C. Carbide precipitation in the austenite raises its Ms temperature, ensuring complete transformation upon cooling. This approach promotes more effective tempering and ageing during the second cycle of PWHT. It's crucial to note that omitting the initial PWHT cycle may result in properties with greater batch variability, highlighting the importance of adhering to the complete heat treatment regimen.