G-TECH 410NiMo

SMAW

FERRITIC - MARTENSITIC STAINLESS STEEL
410NiMo

DESCRIPTION

Rutil basic coated electrode depositing a Cr-Ni-Mo alloy

Electrode developed for joining martensitic steels. Due to its structure it can be used for anti-wear surfacing against corrosion and cavitation. It is used in the construction and repair of hydraulic turbines, pumps, compressors etc. During application, use parameters of preheating and cooling after welding imposed by the base material. Excellent weldability with a spatter free arc, self-releasing slag producing a very smooth bead appearance.

SPECIFICATIONS

ISO 3581-A	E 13 4 R 32	AWS A5.4	E410NiMo-16
DIN	-	Werkstoff Number	-
Certifications	-	Shielding	-
Positions	PA, PB, PC, PD, PE, PF	Current	DC+, AC

ASME QUALIFICATIONS

F-No (QW432)	4
A-No (QW442)	-

FERRITE

-

PREN

14.65

HARDNESS

300HV

CHEM. COMP. %

	DEFAULT
C	0.05
Mn	0.6
Ni	4.7
Cr	13
Mo	0.5
Si	0.8

MECHANICAL PROPERTIES

	MIN	VARIANT
Tensile strength R_m MPa	750	780
Yield strength $R_{p0.2}$ MPa	500	600
Elongation A (L_0=5d_0) %	15	17
Impact Charpy ISO-V	-	50J @ 20°C
Impact Charpy ISO-V	-	-

WELDING PARAMETERS

	2.5 mm	3.2 mm	4 mm
Ampere	50A - 80A	80A - 110A	110A - 150A
Voltage	-	-	-
Packaging	53 pcs/kg	27 pcs/kg	19 pcs/kg
Packaging Type	Carton box	Carton box	Carton box

ANTI-WEAR CHARACTERISTICS

Adhesive wear	▲▲▲△△ (3/5)
Abrasive wear	▲▲△△△ (2/5)
Impact	▲▲▲△△ (3/5)
Corrosion	▲▲▲△△ (3/5)
Heat	▲▲▲△△ (3/5)

DAIKO®

410NiMo

DESCRIPTION

APPLICATION

Martensitic stainless steel with high strength (>760MPa) exhibits superior resistance to corrosion, hydro-cavitation, sulphide-induced stress corrosion cracking (SCC), and commendable sub-zero toughness in comparison to plain 12%Cr steels (e.g., type 410/CA15). The weld metal of this variant significantly surpasses the strength of the equivalent parent material and demonstrates exceptional resistance to softening during post-weld heat treatment (PWHT). These attributes can be advantageous when welding martensitic precipitation-hardening alloys, provided the corrosion conditions align with the compatibility of lower alloy weld metal. An additional benefit is the feasibility of a single PWHT at 450-620°C for tempering. These consumables find application not only in welding but also in overlaying mild and C-Mn steels. The 13%Cr-4%Ni alloys, available in cast or forged forms, play a vital role in various components such as hydraulic turbines, valve bodies, pump bowls, compressor cones, impellers, and high-pressure pipes. These applications span across power generation, offshore oil, and the chemical and petrochemical industries.

ALLOY TYPE

12%Cr-4.5%Ni-0.5%Mo (410NiMo) soft martensitic alloy.

MICROSTRUCTURE

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

MATERIALS

EN W.Nr.: 1.4313 (X3CrNiMo13-4).
ASTM: F6NM, CA6NM.
ANFOR: Z6 CND 1304-M.
UNS: S41500.

WELDING & PWHT

It is recommended to maintain a preheat-interpass temperature range of 100-200°C during welding to facilitate martensite transformation. Cooling the components to room temperature before Post Weld Heat Treatment (PWHT) is advised. Achieving a hardness level of <23HRc, as specified by NACE MR0175 for maximum resistance to sulphide-induced Stress Corrosion Cracking (SCC) in sour oil conditions, can be challenging. This is due to the inherent resistance of weld metal and Heat-Affected Zone (HAZ) to softening during PWHT. To address this, a double temper for 5-10 hours is deemed necessary. Common practice involves a two-step tempering process: 675°C/10h followed by 605ºC/10h with an intermediate air cool to ambient temperature. Recent research suggests that optimizing the tempering process involves temperatures of 620°C ÷ 650ºC, with intermediate air cooling to ambient or lower being an essential step. Another approach proposes elevating the first PWHT cycle for a full austenitization anneal at 770°C/2h before the final temper. It is noteworthy that distortion control may become more critical in this scenario. In the case of the Supercore 410NiMo flux-cored wire, reducing the hardness to 23HRC has proven challenging, regardless of the PWHT applied. When considering 410NiMo consumables for welding plain 12Cr martensitic stainless steels like type 410 or CA15, it is advisable not to exceed a PWHT temperature of about 650°C, unless a second temper at 590-620°C is applied.