

Title (en)  
R6 HIGH TOUGHNESS OFFSHORE MOORING CHAIN STEEL APPLICABLE TO ANCHOR MOORED POSITIONING CATHODIC PROTECTION FLOATING BODY AND MOORING CHAIN THEREOF

Title (de)  
HOCHZÄHER R6-STAHL FÜR OFFSHORE-FESTMACHKETTE FÜR KATHODISCHEN SCHUTZ EINES SCHWIMMKÖRPERS MIT VERANKERTER POSITION UND FESTMACHKETTE

Title (fr)  
ACIER DE CHAÎNE D'AMARRAGE MARINE À HAUTE RÉSISTANCE R6 APPLICABLE À UN CORPS FLOTTANT À PROTECTION CATHODIQUE À POSITIONNEMENT AMARRÉ PAR ANCRE ET SA CHAÎNE D'AMARRAGE

Publication  
**EP 3812479 B1 20211117 (EN)**

Application  
**EP 19925101 A 20190516**

Priority  
• CN 201910306407 A 20190416  
• CN 2019087168 W 20190516

Abstract (en)  
[origin: EP3812479A1] The present application relates to a steel for grade R6 high strength and high toughness offshore mooring chain with tensile strength 1100-1250Mpa for use in anchoring and mooring floating bodies with cathodic protection: the chemical composition are C 0.18~0.24%, N 0.006~0.024, P 0.005~0.025, S ≤0.005, Si 0.15~0.35, Mn 0.20~0.40, Cr 1.40~2.60, Ni 0.80~3.20, Mo 0.35~0.75, Cu ≤0.50, Al ≤0.02, Ti ≤0.005, V 0.04~0.12, Nb 0.02~0.05, Ca 0.0005~0.004, O ≤0.0015, H ≤0.00015, the balance is Fe and unavoidable impurity elements; the total content of alloy  $\sum M = (Si + Mn + Cr + Ni + Mo + Cu)$ ,  $3.4 < \sum M \leq 6.8$ ; the total content of microalloy  $\sum MM = (Ti + Al + Nb + V)$ ,  $0.065 \leq \sum MM \leq 0.194$ . The corrosion potential is adjusted to prevent hydrogen embrittlement caused by cathodic overprotection on the basic premise of maintaining the strength, toughness and low corrosion rate of the steel. Where V is only used for strengthening, and the content of N in VCN is increased, especially for the increase of the temperature for chain quenching to make M3C, M2C and VCN fully dissolved in solid solution and fully precipitated in tempering, which improves the precipitation strengthening effect and counteracts the weakening of mechanical properties that may be caused by limiting the total content of alloy, so as to produce a grade R6 complex bainitic chain steel which have low crack sensitivity and small difference between surface and internal microstructure and properties.

IPC 8 full level  
**C21D 1/18** (2006.01); **C21D 8/06** (2006.01); **C22C 38/02** (2006.01); **C22C 38/04** (2006.01); **C22C 38/06** (2006.01); **C22C 38/12** (2006.01); **C22C 38/16** (2006.01); **C22C 38/18** (2006.01); **C22C 38/22** (2006.01); **C22C 38/24** (2006.01); **C22C 38/26** (2006.01); **C22C 38/40** (2006.01); **C22C 38/42** (2006.01); **C22C 38/44** (2006.01); **C22C 38/46** (2006.01); **C22C 38/48** (2006.01); **C22C 38/50** (2006.01)

CPC (source: CN EP RU US)  
**C21D 1/18** (2013.01 - CN EP); **C21D 1/25** (2013.01 - EP); **C21D 1/26** (2013.01 - EP); **C21D 1/60** (2013.01 - EP); **C21D 6/004** (2013.01 - US); **C21D 6/005** (2013.01 - US); **C21D 6/008** (2013.01 - US); **C21D 8/005** (2013.01 - EP); **C21D 8/06** (2013.01 - RU); **C21D 8/065** (2013.01 - CN); **C21D 9/0087** (2013.01 - EP US); **C21D 9/505** (2013.01 - US); **C22C 38/001** (2013.01 - CN EP US); **C22C 38/002** (2013.01 - CN EP); **C22C 38/02** (2013.01 - CN US); **C22C 38/04** (2013.01 - CN US); **C22C 38/06** (2013.01 - CN US); **C22C 38/40** (2013.01 - EP); **C22C 38/42** (2013.01 - CN EP US); **C22C 38/44** (2013.01 - CN EP US); **C22C 38/46** (2013.01 - CN EP US); **C22C 38/48** (2013.01 - CN EP US); **C22C 38/50** (2013.01 - CN EP RU US); **C21D 9/50** (2013.01 - EP); **C21D 9/505** (2013.01 - EP); **C21D 2211/001** (2013.01 - CN US); **C21D 2211/002** (2013.01 - CN EP US); **C21D 2211/004** (2013.01 - EP); **C21D 2211/008** (2013.01 - CN EP US)

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