Title (en)

Hot-rolled steel flat product and method for its production

Title (de)

Warmgewalztes Stahlflachprodukt und Verfahren zu seiner Herstellung

Title (fr)

Produit plat en acier laminé à chaud et son procédé de fabrication

Publication

EP 2690183 B1 20170628 (DE)

Application

EP 12178330 A 20120727

Priority

EP 12178330 A 20120727

Abstract (en)

[origin: EP2690183A1] Hot-rolled flat steel product comprises 0.1-0.6 wt.% carbon, 0.4-2 wt.% silicon, up to 2 wt.% aluminum, 0.4-2.5 wt.% manganese, up to 1 wt.% nickel, up to 2 wt.% copper, up to 0.4 wt.% molybdenum, up to 2 wt.% chromium, up to 0.2 wt.% titanium, up to 0.2 wt.% niobium, up to 0.5% vanadium, iron and unavoidable impurities. The structure of the flat steel product comprises optionally up to 5 vol.% ferrite, up to 10 vol.% martensite, at least 60 vol.% bainite and balance of residual austenite. At least a part of the residual austenite is present in block form. Hot-rolled flat steel product comprises 0.1-0.6 wt.% carbon, 0.4-2 wt.% silicon, up to 2 wt.% aluminum, 0.4-2.5 wt.% manganese, up to 1 wt.% nickel, up to 2 wt.% copper, up to 0.4 wt.% molybdenum, up to 2 wt.% chromium, up to 0.2 wt.% titanium, up to 0.2 wt.% niobium, up to 0.5% vanadium, iron and unavoidable impurities. The structure of the flat steel product comprises optionally up to 5 vol.% ferrite, up to 10 vol.% martensite, at least 60 vol.% bainite and balance of residual austenite. At least a part of the residual austenite in block form and blocks of the austenite present in block form to at least 98% exhibits an average diameter of less than 5 mu m. The flat steel product exhibits a product of tensile strength and elongation of at least 18000 Mpa.%. An independent claim is also included for producing the flat steel product, comprising providing an intermediate product in the form of a slab, thin slab or cast strip, which comprises 0.1-0.6 wt.% carbon, 0.4-2 wt.% silicon, up to 2 wt.% aluminum, 0.4-2.5 wt.% manganese, up to 1 wt.% nickel, up to 2 wt.% copper, up to 0.4 wt.% molybdenum, up to 2 wt.% chromium, up to 0.2 wt.% titanium, up to 0.2 wt.% niobium, up to 0.5% vanadium, iron and unavoidable impurities, hot rolling the intermediate product to form a hot strip in at least one roll stitch, accelerating cooling of the resulting hot strip at a cooling rate of at least 5[deg] C/second to a coiling temperature, which lies in the region between the martensite starting temperature and 600[deg] C, coiling the hot strip to form a coil, and cooling the coils, where (a) the temperature of the coil during cooling to form bainite is maintained at a temperature range with upper limit and lower limit until at least 60 vol.% structure of the hot strip is made of bainite, (b) the upper limit is equal to the bainite starting temperature for producing bainite in the structure of the hot strip, and lower limit is equal to the martensite starting temperature for producing martensite in the structure of the hot strip, and (c) the resulting hot strip on leaving the last roll stitch, exhibits a final hot-rolling of at least 880[deg] C.

IPC 8 full level

C21D 1/20 (2006.01); **C22C 38/04** (2006.01); **C22C 38/28** (2006.01); **C22C 38/50** (2006.01)

CPC (source: CN EP KR US)

C21D 1/20 (2013.01 - CN EP KR US); **C21D 6/004** (2013.01 - CN EP US); **C21D 6/005** (2013.01 - CN EP US); **C21D 6/008** (2013.01 - CN EP US); **C21D 8/0226** (2013.01 - CN EP US); **C21D 8/0263** (2013.01 - CN EP US); **C21D 8/0463** (2013.01 - CN EP KR US); **C22C 38/00** (2013.01 - EP US); **C22C 38/02** (2013.01 - CN KR US); **C22C 38/04** (2013.01 - CN EP KR US); **C22C 38/06** (2013.01 - CN EP US); **C22C 38/16** (2013.01 - CN EP US); **C22C 38/18** (2013.01 - CN EP US); **C22C 38/22** (2013.01 - CN EP US); **C22C 38/28** (2013.01 - CN EP KR US); **C22C 38/34** (2013.01 - CN US); **C22C 38/42** (2013.01 - CN US); **C22C 38/46** (2013.01 - CN US); **C22C 38/50** (2013.01 - CN US); **C22C 38/58** (2013.01 - CN KR US); C21D 2211/001 (2013.01 - CN EP US); C21D 2211/002 (2013.01 - CN EP US)

Citation (opposition)

Opponent : ArcelorMittal

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Opponent : Tata Steel Ijsmuiden

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Designated contracting state (EPC)

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

DOCDB simple family (publication)

EP 2690183 A1 20140129; **EP 2690183 B1 20170628**; BR 112015001456 A2 20170704; CN 104662179 A 20150527; CN 104662179 B 20180112; JP 2015528064 A 20150924; JP 6154010 B2 20170628; KR 20150038426 A 20150408; US 2015203946 A1 20150723; WO 2014016420 A1 20140130

DOCDB simple family (application)

EP 12178330 A 20120727; BR 112015001456 A 20130726; CN 201380049258 A 20130726; EP 2013065836 W 20130726; JP 2015523568 A 20130726; KR 20157005074 A 20130726; US 201314417685 A 20130726