

## Title (en)

Process for manufacturing steel flat products from silicon alloyed multi phase steel

## Title (de)

Verfahren zum Herstellen von Stahl-Flachprodukten aus einem mit Silizium legierten Mehrphasenstahl

## Title (fr)

Procédé pour la fabrication de produits plats à partir d'un acier à plusieurs phases allié en silice

## Publication

**EP 1918405 A1 20080507 (DE)**

## Application

**EP 06123141 A 20061030**

## Priority

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## Abstract (en)

The method for the production of flat steel products useful for automotive industry, comprises casting a steel into a cast strip having a thickness of 1-4 mm, hot-rolling the cast strip in-line into a hot-rolled strip having a thickness of greater than 1.5 mm in a continuous process at a final hot-rolling temperature at 850-1000[deg] C, and coiling the hot-rolled strip at a coiling temperature of 450-700[deg] C to obtain a hot-rolled strip, which has a minimum tensile strength R<sub>m</sub> of 880 MPa and a minimum breaking elongation A<sub>80</sub> of 5%. The steel forms a complex phase structure. The method for the production of flat steel products useful for automotive industry, comprises casting a steel into a cast strip having a thickness of 1-4 mm, hot-rolling the cast strip in-line into a hot-rolled strip having a thickness of greater than 1.5 mm in a continuous process at a final hot-rolling temperature at 850-1000[deg] C, and coiling the hot-rolled strip at a coiling temperature of 450-700[deg] C to obtain a hot-rolled strip, which has a minimum tensile strength R<sub>m</sub> of 880 MPa and a minimum breaking elongation A<sub>80</sub> of 5%. The steel forms a complex phase structure. The shaping degree is greater than 20%. The width of the hot-rolled strip is more than 1.600 mm. The hot-rolled strip is cold-rolled with a thickness of 0.5-1.4 mm at 750-805[deg] C to obtain a cold-rolled strip, which has a minimum tensile strength of more than 800 MPa and a minimum breaking elongation A<sub>50</sub> of 5%. The coiling temperature of the cold-rolled strip is 810-850[deg] C. The cold- or hot-rolled strip is provided with a metallic coating, which is galvanizing. The coiling temperature is 550-700[deg] C, when a minimum breaking elongation A<sub>80</sub> of the obtained hot-rolled strip is 10%. The hot-rolled temperature is 900-1000[deg] C and the coiling temperature is 450-550[deg] C, when a minimum tensile strength R<sub>m</sub> of the obtained hot-rolled strip is 1000 MPa.

## Abstract (de)

Die Erfindung betrifft ein Verfahren, mit dem sich hochfeste Stahl-Flachprodukte über eine große Bandbreite von geometrischen Abmessungen bei vermindertem Herstelleraufwand erzeugen lassen. Dazu wird erfindungsgemäß ein ein Mehrphasengefüge bildender Stahl, der (in Gew.-%) 0,10 - 0,15 % C, 0,80 - 1,20 % Mn, bis zu 0,030 % P, bis zu 0,004 % S, 1,10 - 1,30 % Si, 0,0 - 0,05 % Al, bis zu 0,0060 % N, 0,30 - 0,60 % Cr, 0,080 - 0,120 % Ti, 0,040 - 0,060 % Nb, 0,150 - 0,250 % Mo und als Rest Eisen und unvermeidbare Verunreinigungen enthält, zu einem gegossenen Band mit einer Dicke von 1 - 4 mm vergossen, das gegossene Band in einem kontinuierlichen Arbeitsablauf mit einem Umformgrad von mehr als 20 % in-Line bei einer im Bereich von 850 - 1000 °C liegenden Warmwalzendtemperatur zu einem Warmband mit einer Dicke von 0,5 - 3,2 mm warmgewalzt und das Warmband bei einer 450 - 700 °C betragenden Haspeltemperatur gehaspelt, so dass ein Warmband erhalten wird, dessen Zugfestigkeit R<sub>m</sub> mindestens 880 MPa bei einer Bruchdehnung A<sub>80</sub> von mindestens 5 % beträgt.

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## Citation (search report)

- [A] EP 1396550 A1 20040310 - THYSSENKRUPP STAHL AG [DE]
- [DA] EP 1072689 A1 20010131 - USINOR [FR]
- [DA] EP 1398390 A1 20040317 - THYSSENKRUPP STAHL AG [DE]
- [A] FR 2798871 A1 20010330 - USINOR [FR]
- [A] EP 0969112 A1 20000105 - NIPPON STEEL CORP [JP]
- [A] LINDENBERG H-U ET AL: "EUROSTRIP - STATE OF THE ART OF STRIP CASTING EUROSTRIP - STAND DER TECHNIK BEIM BANDGIESSEN", STAHL UND EISEN, VERLAG STAHL EISEN, DUSSELDORF, DE, vol. 121, no. 12, 14 December 2001 (2001-12-14), pages 97 - 104, XP001103986, ISSN: 0340-4803
- [A] SENK D ET AL: "UMFORMEN UND KUEHLEN VON DIREKTGEGOSSENEM STAHLBAND IN-LINE ROLLING AND COOLING OF DIRECT CAST STEEL STRIP", STAHL UND EISEN, VERLAG STAHL EISEN, DUSSELDORF, DE, vol. 120, no. 6, 16 June 2000 (2000-06-16), pages 65 - 69, XP001118293, ISSN: 0340-4803

## Cited by

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