

# Low-Carbon Steel strip: Cold-rolled

## Chemical Composition

Classification of symbols	Numerical classification	European Standard (EN)	Types of coatings available	Chemical Composition									
				C	Si	Mn	p	S	N max.	Ti	Cu	Al	Nb
DC01	1.0330	EN 10130 / EN 10139	- / +ZE	≤ 0.12	-	≤ 0.60	≤ 0.045	≤ 0.045	-	-	-	-	-
DC03	1.0347	EN 10130 / EN 10139	- / +ZE	≤ 0.1	-	≤ 0.45	≤ 0.035	≤ 0.035	-	-	-	-	-
DC04	1.0338	EN 10130 / EN 10139	- / +ZE	≤ 0.08	-	≤ 0.4	≤ 0.03	≤ 0.03	-	-	-	-	-
DC05	1.0312	EN 10130 / EN 10139	-	≤ 0.06	-	≤ 0.35	≤ 0.025	≤ 0.025	-	-	-	-	-
DC06	1.0873	EN 10130 / EN 10139	-	≤ 0.02	-	≤ 0.25	≤ 0.02	≤ 0.02	-	≤ 0.3	-	-	-
HC260LA	1.0480	EN 10268	-	≤ 0.100	≤ 0.50	≤ 1	≤ 0.03	≤ 0.025	-	≤ 0.150	-	≥ 0.015	-
HC420LA	1.0556	EN 10268	-	≤ 0.14	≤ 0.50	≤ 1.60	≤ 0.03	≤ 0.025	-	≤ 0.150	-	≥ 0.015	≤ 0.090
11SMn30	1.0715	EN 10087	-	≤ 0.14	≤ 0.05	0.90 - 1.30	≤ 0.11	0.27 - 0.33	-	-	-	-	-

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## COLD ROLLED STRIP: COMPOSITION AND CHARACTERISTICS

### CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES OF COLD ROLLED STRIP

Within the category of cold rolled strips, VINCO offers you a selection of classifications of different types of steel with specific chemical

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compositions and properties:

- **DC01, DC03, DC04, DC05 and DC06 steels** are characterized by good formability and mechanical strength to a greater or lesser extent depending on their chemical composition. All of them comply with EN 10130 and EN 10139 standards that apply to cold-rolled low carbon steel strip for cold drawing or cold forming.
- The **HC260LA and HC420LA steels** differ in that the former has good formability, while the HC420LA steel is characterized by higher mechanical strength. Both are governed by the EN 10268 standard for cold-rolled flat steel products with high yield strength for cold forming.
- **11SMn30 steel** is used in applications that are not mechanically demanding. It complies with the EN 10087 standard, which indicates the technical conditions for the supply of steels that are easy to machine.

In the table of the data sheet you can consult all the chemical compositions of the types of cold-rolled strip in our catalog. The mechanical properties and hardness requirements will vary, for **DC01 to DC06** steels, depending on the supply conditions: skin-pass hardened or roll-hardened. For **11SMn30** steel, they must be agreed at the time of ordering.

## Cold rolled steel strip

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### FINISHES AND TOLERANCES

To determine the **finishes of cold-rolled strip**, it is necessary to differentiate between products subject to Standard EN 10139 and Standard EN 10268. In the first case, they can have up to four types of finishes: rough, matte, normal or glossy, depending on the surface appearance of the strip -MA, MB and MC-. However, those products complying with EN 10268 are supplied only with surface appearance A as detailed in EN 10130. In addition, for the surface finish, they must comply with the requirements for the width of lamination as set out in European Standards EN 10130 and EN 10139.

Cold-rolled strip tolerances are differentiated into: **thickness tolerances** which can be normal (A), reduced (B) or precision (C); **width tolerances** for sheared edge strip and **length tolerances**.

All information regarding finishes and tolerances can be found in the corresponding sections of the product data sheet.

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## Oscillate wound strip

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### Equivalents

Classification of symbols	Numerical classification	European Standard (EN)	Approximate international equivalents					
			US (AISI)		Japan (JIS)		China (GB)	
DC01	1.0330	EN 10139	DC01	A366	SPCC	G3141	1008	GB/T 5213
DC03	1.0347	EN 10139	DC03	A619	SPCD	G3141	1006	GB/T 5213
DC04	1.0338	EN 10139	DC04	A620	SPCE	G3141	1006	GB/T 5213
DC05	1.0312	EN 10139						
DC06	1.0873	EN 10139						
HC260LA	1.0480	EN 10268						
HC420LA	1.0556	EN 10268						
11SMn30	1.0715	EN 10087	Y15	A29	SUM 22	G 4804	1213	GB/T 8731

### Mechanical properties

#### MECHANICAL PROPERTIES AND HARDNESS REQUIREMENTS EN 10130 / EN 10139 <sup>2)</sup>

Symbolic classification	Numerical classification	Delivery condition	Symbol	Re N/mm <sup>2</sup>	Rm N/mm <sup>2</sup>	Elongation at break (min. %)	HV hardness	
						A <sub>80</sub>	min.	max.
DC01	1.0330	Skin-passed	LC	max. 280 <sup>3)</sup>	270 - 410 <sup>3)</sup>	28 <sup>1) 3)</sup>	-	115 <sup>3)</sup>
			C290	200 - 380	290 - 430	18	95	125
			C340	min. 250	340 - 490	-	105	155
			C390	min. 310	390 - 540	-	117	172

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Symbolic classification	Numerical classification	Delivery condition	Symbol	Re N/mm <sup>2</sup>	Rm N/mm <sup>2</sup>	Elongation at break (min. %)	HV hardness	
						A <sub>80</sub>	min.	max.
		Hardened by cold rolling	C440	min. 360	440 - 590	-	135	185
			C490	min. 420	490 - 640	-	155	200
			C590	min. 520	590 - 740	-	185	225
			C690	min. 630	min. 690	-	215	-
DC03	1.0347	Skin-passed	LC	max. 240 <sup>3)</sup>	270 - 370 <sup>3)</sup>	34 <sup>1) 3)</sup>	-	110 <sup>3)</sup>
		Hardened by cold rolling	C290	210 - 355	290 - 390	22	95	117
			C340	min. 240	340 - 440	-	105	130
			C390	min. 330	390 - 490	-	117	155
			C440	min. 380	440 - 540	-	135	172
			C490	min. 440	490 - 590	-	155	185
			C590	min. 540	min. 590	-	185	-
DC04	1.0338	Skin-passed	LC	max. 210 <sup>2)</sup>	270 - 350 <sup>3)</sup>	38 <sup>1) 3)</sup>	-	105 <sup>3)</sup>
		Hardened by cold rolling	C290	220 - 325	290 - 390	24	95	117
			C340	min. 240	340 - 440	-	105	130
			C390	min. 350	390 - 490	-	117	155
			C440	min. 400	440 - 590	-	135	172
			C490	min. 460	490 - 590	-	155	185
			C590	min. 560	590 - 690	-	185	215
DC05	1.0312	Skin-passed	LC	max. 180 <sup>3)</sup>	270 - 330 <sup>3)</sup>	40 <sup>1)</sup>	-	100 <sup>3)</sup>
DC06	1.0873	Skin-passed	LC	max. 180 <sup>3)</sup>	270 - 350 <sup>3)</sup>	38 <sup>1) 3)</sup>	-	-

NOTE 1) - For thicknesses of 0.5 mm < and ≤ 0.7 mm, the minimum elongation at break value may be decreased by 2 units. For thicknesses between 0.2 mm < and ≤ 0.5 mm, the minimum elongation at break value may be decreased by 4 units. For e ≤ 0.2 mm, the minimum elongation at break value may be decreased by 6 units.

NOTE 2) - For thicknesses below 1.5 mm, a maximum yield strength value of 235 N/mm<sup>2</sup> is permitted.

NOTE 3) - The values specified on the table are only applicable to surfaces with MA appearances. For surfaces with MB and MC appearances, the yield strength and tensile strength values increase by 20 N/mm<sup>2</sup> and the elongation at break values decrease by 2 units. Additionally, the HV value increases by 5 units.

### MECHANICAL PROPERTIES AND HARDNESS REQUIREMENTS EN 10268

Classification of symbols	Numerical classification	Direction											
		L						T					
		Thickness (mm)		Re (MPa)	Rm (MPa)	A <sub>80</sub> (%)		Thickness (mm)		Re (MPa)	Rm (MPa)	A <sub>80</sub> (%)	
HC260LA	1.0480	0.5 - 0.7	0.7 - 3	240 - 310	340 - 420	≥ 25	≥ 27	0.5 - 0.7	0.7 - 3	260 - 330	350 - 430	≥ 24	≥ 26
HC420LA	1.0556	0.5 - 0.7	0.7 - 3	400 - 500	460 - 580	≥ 16	≥ 18	0.5 - 0.7	0.7 - 3	420 - 520	470 - 590	≥ 15	≥ 17

### MECHANICAL PROPERTIES AND HARDNESS REQUIREMENTS EN 10087

11SMn30

1.0715

Mechanical properties to be agreed when placing the order or requesting the quote.

### Finishes

#### EN 10139:2016+A1 APRIL 2020

The surface finish can be "rough", "matt", "normal" or "bright".

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Products with MA and MB surface appearances are generally supplied with a "normal" surface finish (RL). If a "rough" (RR) or "matt" (RM) surface finish is requested, the respective symbol must be indicated in the description.

The MC surface appearance must be supplied with a "bright" surface finish (RN).

For delivery conditions C290 to C690, the possible impact on the product's mechanical properties of stress relaxation or recrystallization due to the action of high temperatures must be taken into account.

Surface appearance			Special Surface Finish	Suitability for chrome plating and other coatings
Symbol	Properties	Field of application		
MA	Bright surface, metallicly clean. Pores, small defects and scratches are allowed.	All thicknesses and all heat treatments.	RR, RM, RL	-
MB	Bright surface, metallicly clean. Pores, small defects and scratches are allowed, provided that no change to the smooth and even appearance is visible to the naked eye.	Thicknesses ≤ 2.0 mm.	RM, RL	Medium / High
MC	Bright surface, metallicly clean. Pores, small defects and scratches are allowed, provided that they do not affect the bright appearance of the surface.	Thicknesses ≤ 1.0 mm.	RN	High

The different surface finishes are characterised by the following average roughness (Ra) reference values:

Finish	Roughness
Rough	RR
	Ra ≥ 1.5 µm

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Finish	Roughness	
Matt	RM	$0.6 \mu\text{m} > \text{Ra} \leq 1.8 \mu\text{m}$
Normal	RL	$\text{Ra} \leq 0.6 \mu\text{m}$
Bright	RN	$\text{Ra} \leq 0.2\mu\text{m}$ .

### EN 10268:2006+A1:2013

Surface appearance: The products covered by this European standard can only be supplied with surface appearance A, as defined in European Standard EN 10130. - some defects are allowed such as pores, light scratches, small marks or slight discolouration when they do not affect the formability or adhesion of surface coatings.

Surface finish: The surface finish of products covered by this European standard must meet the requirements of European Standard EN 10130 for products with a rolling width  $\geq 600$  mm, and the requirements of the EN 10139 European Standard for products with a rolling width  $< 600$  mm.

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## Tolerances

### THICKNESS TOLERANCES

The thickness tolerances are: normal (A), fine (B) or precision (C ).

Nominal thickness		Thickness tolerances according to EN 10140 for nominal widths (W) in mm. <sup>1)</sup>						EN 10131
		<125			≥ 125 Y < 600			1200 < W ≤ 1500
>	≤	A	B	C	A	B	C	A
		normal	fine	precision	normal	fine	precision	normal
-	0,10	± 0.008	± 0.006	± 0.004	± 0.010	± 0.008	± 0.005	-
0.10	0.15	±0.010	± 0.008	± 0.005	± 0.015	± 0.012	± 0.010	-
0.15	0.25	±0.015	± 0.012	± 0.008	± 0.020	± 0.015	± 0.010	-
0.25	0.35	± 0.020	± 0.015	± 0.010	± 0.025	± 0.020	± 0.012	-
0.35	0.40	± 0.020	± 0.015	± 0.010	± 0.025	± 0.020	± 0.012	± 0.040
0.40	0.60	± 0.025	± 0.020	± 0.012	± 0.030	± 0.025	± 0.015	± 0.040
0.60	0.80	± 0.030	± 0.025	± 0.015	± 0.035	± 0.030	± 0.020	± 0.050
0.80	1.00	± 0.030	± 0.025	± 0.015	± 0.035	± 0.030	± 0.020	± 0.060
1.00	1.20	± 0.035	± 0.030	± 0.020	± 0.040	± 0.035	± 0.025	± 0.070
1.20	1.50	± 0.035	± 0.030	± 0.020	± 0.040	± 0.035	± 0.025	± 0.090 <sup>2)</sup>
1.50	2.00	± 0.045	± 0.035	± 0.025	± 0.050	± 0.040	± 0.030	± 0.110 <sup>3)</sup>
2.00	2.50	± 0.045	± 0.035	± 0.025	± 0.050	± 0.040	± 0.030	± 0.130
2.50	3.00	± 0.050	± 0.040	± 0.030	± 0.060	± 0.050	± 0.035	± 0.150
3.00	4.00	± 0.050	± 0.040	± 0.030	± 0.060	± 0.050	± 0.035	-
4.00	6.00	± 0.060	± 0.050	± 0.035	± 0.070	± 0.055	± 0.040	-
6.00	8.00	± 0.075	± 0.060	± 0.040	± 0.085	± 0.065	± 0.045	-
8.00	10.00	± 0.090	± 0.070	± 0.045	± 0.100	± 0.075	± 0.050	-

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Measurements in mm.

- 1) Material hardened by cold rolling or under a commercial agreement
- 2) Nominal Thickness > 1.20 a 1.60
- 3) Nominal Thickness > 1.60 a 2.00

## WIDTH TOLERANCES

Width tolerances for strips with sheared edges		closer dimensional tolerances are possible under a commercial agreement <sup>1)</sup>				Width tolerances according to the EN 10140 Standard for nominal widths of:					
Nominal thickness		3-15	15-50	50-150	>150	<125		≥125 Y <250		≥250 Y <600	
≥	<					A	B	A	B	A	B
0,1	0,4	± 0,075 <sup>2)</sup>	± 0,075 <sup>2)</sup>	± 0,075 <sup>2)</sup>	± 0,10 <sup>2)</sup>	± 0,15	± 0,10	± 0,20	± 0,13	± 0,25	± 0,18
0,4	0,7	± 0,085	± 0,09	± 0,10	± 0,12	± 0,15	± 0,10	± 0,20	± 0,13	± 0,25	± 0,18
0,7	1,0	± 0,085 <sup>3)</sup>	± 0,09 <sup>3)</sup>	± 0,10 <sup>3)</sup>	± 0,12 <sup>3)</sup>	± 0,20	± 0,13	± 0,25	± 0,18	± 0,30	± 0,20
1,0	1,5	± 0,10 <sup>4)</sup>	± 0,10 <sup>4)</sup>	± 0,10 <sup>4)</sup>	± 0,15 <sup>4)</sup>	± 0,20	± 0,13	± 0,25	± 0,18	± 0,30	± 0,20
1,5	2,5	on request	± 0,13 <sup>5)</sup>	± 0,15 <sup>5)</sup>	± 0,16 <sup>5)</sup>	± 0,25	± 0,18	± 0,30	± 0,20	± 0,35	± 0,25
2,5	2,6	on request	on request	± 0,16	± 0,175	± 0,25	± 0,18	± 0,30	± 0,20	± 0,35	± 0,25
2,6	4,1	on request	on request	± 0,16	± 0,175	± 0,30	± 0,20	± 0,35	± 0,25	± 0,40	± 0,30
4,1	6,1	on request	on request	± 0,16	± 0,175	± 0,35	± 0,25	± 0,40	± 0,30	± 0,45	± 0,35

Measurements in mm.

- 1) Other, closer dimensional tolerances on request
- 2) Including the value t=0.4
- 3) Including the value t=1
- 4) Including the value t=1.5
- 5) Including the value t=2.5

## LENGTH TOLERANCES

Length tolerances	Closer tolerances are possible under a commercial agreement	Positive tolerance in relation to the nominal length, according to the EN 10140 Standard for the
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Nominal length L		Class A	Class B
L ≤ 1000	+ 2	+ 10	+ 6
1000 < L ≤ 2500	+0.002L	+ 0.01 L	+ 6
L > 2500	+0.002L	+ 0.01 L	+ 0.003 L

Measurements in mm.