# Low-Carbon Steel strip: Cold-rolled

## Chemical Composition

| | | | Chemical Composition | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Classification of symbols | Numerical classification | European Standard (EN) | C | Si | Mn | p | S | Ti | Al | Nb |
| DC01 | 1.0330 | EN 10130 / EN 10139 | ≤ 0.12 | - | ≤ 0.60 | ≤ 0.045 | ≤ 0.045 | - | - | - |
| DC03 | 1.0347 | EN 10130 / EN 10139 | ≤ 0.1 | - | ≤ 0.45 | ≤ 0.035 | ≤ 0.035 | - | - | - |
| DC04 | 1.0338 | EN 10130 / EN 10139 | ≤ 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 | ≤ 0.60 | ≤ 0.025 | ≤ 0.025 | ≤ 0.150 | ≥ 0.015 | - |
| HC420LA | 1.0556 | EN 10268 | ≤ 0.100 | ≤ 0.50 | ≤ 1.60 | ≤ 0.025 | ≤ 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 | - | - | - |

## Equivalents

| | | | Approximate international equivalents | | | | | |
|---|---|---|---|---|---|---|---|---|
| Classification of symbols | Numerical classification | European Standard (EN) | US (AISI) | | Japan (JIS) | | China (GB) | |
| DC01 | 1.0330 | EN 10139 | DC01 | A366 | SPCC | G3141 | 1008 | GB/T 5213 |

| | | | Approximate international equivalents | | | | | |
|---|---|---|---|---|---|---|---|---|
| Classification of symbols | Numerical classification | European Standard (EN) | US (AISI) | | Japan (JIS) | | China (GB) | |
| 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 2)

| Symbolic classification | Numerical classification | Delivery condition | Symbol | Re N/mm$^2$ | Rm N/mm$^2$ | Elongation at break (min. %) | HV hardness | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | $A_{80}$ | min. | max. |
| DC01 | 1.0330 | Skin-passed | LC | max. 280 | 270 - 410 3) | 28 1) 3) | - | 115 3) |
| | | Hardened by cold rolling | C290 | 200 - 380 | 290 - 430 | 18 | 95 | 125 |
| | | | C340 | min. 250 | 340 - 490 | - | 105 | 155 |
| | | | C390 | min. 310 | 390 - 540 | - | 117 | 172 |
| | | | 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 3) | 270 - 370 3) | 34 1) 3) | - | 110 3) |
| | | 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 |

| Symbolic classification | Numerical classification | Delivery condition | Symbol | Re N/mm$^2$ | Rm N/mm$^2$ | Elongation at break (min. %) | HV hardness | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | $A_{80}$ | min. | max. |
| | | | 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 3) | 270 - 350 3) | 38 1) 3) | - | 105 3) |
| | | 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 3) | 270 - 330 3) | 40 1) | - | 100 3) |
| DC06 | 1.0873 | Skin-passed | LC | max. 180 3) | 270 - 350 3) | 38 1) 3) | - | - |

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/mm² 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/mm² 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

| | | Direction | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | | | | | | T | | | | | |
| Classification of symbols | Numerical classification | Thickness (mm) | | Re (MPa) | Rm (MPa) | $A_{80}$ (%) | | Thickness (mm) | | Re (MPa) | Rm (MPa) | $A_{80}$ (%) | |
| 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 |

| | | Direction | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L | | | | | | T | | | | | |
| Classification of symbols | Numerical classification | Thickness (mm) | | Re (MPa) | Rm (MPa) | $A_{80}$ (%) | | Thickness (mm) | | Re (MPa) | Rm (MPa) | $A_{80}$ (%) | |
| 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 10139:1997**

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

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, metallically clean. Pores, small defects and scratches are allowed. | All thicknesses and all heat treatments. | RR, RM, RL | - |

| Surface appearance | | | Special Surface Finish | Suitability for chrome plating and other coatings |
|---|---|---|---|---|
| Symbol | Properties | Field of application | | |
| MB | Bright surface, metallically 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, metallically 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 |
| Matt | RM | 0.6 µm > Ra ≤ 1.8 µm |
| Normal | RL | Ra ≤ 0.6 µm |
| Bright | RN | Ra ≤ 0.2µm. |

**EN 10268:2006**

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 ≥ 600 mm, and the requirements of the EN 10139 European Standard for products with a rolling width < 600 mm.

# 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. [1] | | | | | | 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 [2] |
| 1,50 | 2,00 | ± 0,045 | ± 0,035 | ± 0,025 | ± 0,050 | ± 0,040 | ± 0,030 | ± 0,110 [3] |
| 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 | - |

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
4) Low carbon steel for deep drawing and cold forming included in EN 10130:2008. Rest of qualities under inquiry.

## WIDTH TOLERANCES

| Width tolerances for strips with sheared edges | | closer dimensional tolerances are possible under a commercial agreement [1] | | | | 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 [2] | ± 0,075 [2] | ± 0,075 [2] | ± 0,10 [2] | ± 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 [3] | ± 0,09 [3] | ± 0,10 [3] | ± 0,12 [3] | ± 0,20 | ± 0,13 | ± 0,25 | ± 0,18 | ± 0,30 | ± 0,20 |
| 1,0 | 1,5 | ± 0,10 [4] | ± 0,10 [4] | ± 0,10 [4] | ± 0,15 [4] | ± 0,20 | ± 0,13 | ± 0,25 | ± 0,18 | ± 0,30 | ± 0,20 |
| 1,5 | 2,5 | on request | ± 0,13 [5] | ± 0,15 [5] | ± 0,16 [5] | ± 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 |
|---|---|---|

| 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.