HOT-ROLLED BY COLD FORMING

Areas of use

- Industria
- Construction
- Transportation
- Metal structures
- Carpentry in general
- Naval

Normativa siderurgica di riferimento
EUROPEAN STANDARD: EN 10111 : 2008

Bending and cold-rolling steels

These steels are characterised by maximum yield and ultimate tensile limits and guaranteed minimum elongations. They are ranked in ascending order of formability and can be used from the least critical stampings (DD11) to the deepest embeddings (DD14).

The material is supplied with pickled and oiled surface; **"black" hot rolled laminate is available.**

Technical supply conditions

The standard establishes the quality of mechanical properties inherent in continuously hot-rolled plates and coils of low carbon steel by cold forming.

CHEMICAL COMPOSITION

Quality	C (%)	Mn (%)	P (%)	S (%)
EN 10111 : 2008	**max**	**max**	**max**	**max**
DD11	0,12	0,60	0,045	0,045
DD12	0,10	0,45	0,035	0,035
DD13	0,08	0,40	0,030	0,030
DD14	0,08	0,35	0,025	0,025

MECHANICAL CHARACTERISTICS

Quality	ReL[d]		Rm	Minimal elongation after fracture			
				L0 = 80 mm			L0 = 5,65VSo
	1,0mm e < 2 mm MPa	2 mm e 11 mm MPa	Max MPa	1,0 mm e < 1,5 mm %	1,5 mm e < 2 mm %	2 mm e < 3 mm %	3 mm e 11 mm %
DD11	170 to 360	170 to 340	440	22	23	24	28
DD12	170 to 340	170 to 320	420	24	25	26	30
DD13	170 to 330	170 to 310	400	27	28	29	33
DD14	170 to 310	170 to 290	380	30	31	32	36
NOTE 1Mpa = 1 N/mm^2							

e = laminate thickness in mm

Tensile tests performed on transverse specimens

Tolerances by size and shape

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Relevant steelmaking regulation

EUROPEAN STANDARD: EN 10051 : 2011

The standard specifies tolerances on dimensions and shape of uncoated, continuously hot-rolled plates/sheets and strips with a maximum width of 2200 mm of non-alloy and alloy steels. **The standard also applies to hot-rolled strip intended for cold-rolling.**

ATTENTION:

The above standard does not apply to hot rolled strip in widths w less than 600 mm for which reference is made to UNI EN 10048. **All values are expressed in mm.**

Thickness tolerances of carbon steel in hot-rolled sheets and strips

1

Nominal thickness t	Normal tolerance for nominal width w			
	w ≤ 1200	1200 < w ≤ 1500	1500 < w 1800	w > 1800
t ≤ 2,00	± 0,13	± 0,14	± 0,05	-
2,00 < t ≤ 2,50	± 0,14	± 0,16	± 0,05	± 0,19
2,50 < t ≤ 3,00	± 0,15	± 0,17	± 0,06	± 0,20
3,00 < t ≤ 4,00	± 0,17	± 0,18	± 0,07	± 0,20
4,00 < t ≤ 5,00	± 0,18	± 0,20	± 0,08	± 0,22
5,0 0 < t ≤ 6,00	± 0,20	± 0,21	± 0,10	± 0,23
6,00 < t ≤ 8,00	± 0,22	± 0,23	± 0,12	± 0,26
8,00 < t ≤ 11,00	± 0,24	± 0,25	± 0,14	± 0,28

Thickness tolerances for strips and sheets of steel with a specified minimum yield strength: **Re 300 MPa** (category A)

2

Nominal thickness t	Normal tolerance for nominal width w			
	w ≤ 1200	1200 < w ≤ 1500	1500 < w ≤ 1800	w > 1800
t ≤ 2,00	± 0,17	± 0,19	± 0,21	-
2,00 < t ≤ 2,50	± 0,18	± 0,21	± 0,23	± 0,25
2,50 < t ≤ 3,00	± 0,20	± 0,22	± 0,24	± 0,26
3,00 < t ≤ 4,00	± 0,22	± 0,24	± 0,26	± 0,27
4,00 < t ≤ 5,00	± 0,24	± 0,26	± 0,28	± 0,29
5,0 0 < t ≤ 6,00	± 0,26	± 0,28	± 0,29	± 0,31
6,00 < t ≤ 8,00	± 0,29	± 0,30	± 0,31	± 0,35
8,00 < t ≤ 10,00	± 0,32	± 0,33	± 0,34	± 0,40
10,00 < t ≤ 12,50	± 0,35	± 0,36	± 0,37	± 0,43
12,50 < t ≤ 15,00	± 0,37	± 0,38	± 0,40	± 0,46
15,00 < t ≤ 25,00	± 0,40	± 0,42	± 0,45	± 0,50

Thickness tolerances for strips and sheets of steel with a specified minimum yield strength: **300 MPa < Re 360 MPa** (category B)

3

Nominal thickness t	Normal tolerance for nominal width w			
	w ≤ 1200	1200 < w ≤ 1500	1500 < w ≤ 1800	w > 1800
t ≤ 2,00	± 0,20	± 0,22	± 0,24	-
2,00 < t ≤ 2,50	± 0,21	± 0,24	± 0,26	± 0,29
2,50 < t ≤ 3,00	± 0,23	± 0,25	± 0,28	± 0,30
3,00 < t ≤ 4,00	± 0,25	± 0,28	± 0,30	± 0,31
4,00 < t ≤ 5,00	± 0,28	± 0,30	± 0,32	± 0,33
5,0 0 < t ≤ 6,00	± 0,30	± 0,32	± 0,33	± 0,36
6,00 < t ≤ 8,00	± 0,33	± 0,35	± 0,36	± 0,40
8,00 < t ≤ 10,00	± 0,37	± 0,38	± 0,39	± 0,46
10,00 < t ≤ 12,50	± 0,40	± 0,41	± 0,43	± 0,49
12,50 < t ≤ 15,00	± 0,43	± 0,44	± 0,46	± 0,53
15,00 < t ≤ 25,00	± 0,46	± 0,48	± 0,52	± 0,58

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Thickness tolerances for strips and sheets of steel with a specified minimum yield strength: **360 MPa < Re 420 MPa** (category C)

4

Nominal thickness t	Normal tolerance for nominal width w			
	w ≤ 1200	1200 < w ≤ 1500	1500 < w ≤ 1800	w > 1800
t ≤ 2,00	± 0,22	± 0,25	± 0,27	-
2,00 < t ≤ 2,50	± 0,23	± 0,27	± 0,30	± 0,33
2,50 < t ≤ 3,00	± 0,26	± 0,29	± 0,31	± 0,34
3,00 < t ≤ 4,00	± 0,29	± 0,31	± 0,34	± 0,35
4,00 < t ≤ 5,00	± 0,31	± 0,34	± 0,36	± 0,38
5,0 0 < t ≤ 6,00	± 0,34	± 0,36	± 0,38	± 0,40
6,00 < t ≤ 8,00	± 0,38	± 0,39	± 0,40	± 0,46
8,00 < t ≤ 10,00	± 0,42	± 0,43	± 0,44	± 0,52
10,00 < t ≤ 12,50	± 0,46	± 0,47	± 0,48	± 0,56
12,50 < t ≤ 15,00	± 0,48	± 0,49	± 0,52	± 0,60
15,00 < t ≤ 25,00	± 0,52	± 0,55	± 0,59	± 0,65

Thickness tolerances for steel strips and sheets with a specified minimum yield strength: **420 MPa < Re 900 MPa**

5

Nominal thickness t	Normal tolerance for nominal width w			
	w ≤ 1200	1200 < w ≤ 1500	1500 < w ≤ 1800	w > 1800
t ≤ 2,00	± 0,24	± 0,27	± 0,29	-
2,00 < t ≤ 2,50	± 0,25	± 0,29	± 0,32	± 0,35
2,50 < t ≤ 3,00	± 0,28	± 0,31	± 0,34	± 0,36
3,00 < t ≤ 4,00	± 0,31	± 0,34	± 0,36	± 0,38
4,00 < t ≤ 5,00	± 0,34	± 0,36	± 0,39	± 0,41
5,0 0 < t ≤ 6,00	± 0,36	± 0,39	± 0,41	± 0,43
6,00 < t ≤ 8,00	± 0,41	± 0,42	± 0,43	± 0,49
8,00 < t ≤ 10,00	± 0,45	± 0,46	± 0,48	± 0,56
10,00 < t ≤ 12,50	± 0,49	± 0,50	± 0,52	± 0,60
12,50 < t ≤ 15,00	± 0,52	± 0,53	± 0,56	± 0,64
15,00 < t ≤ 25,00	± 0,56	± 0,59	± 0,63	± 0,70

Tolerance on the lenght of sheets

6

Nominal thickness l	Tolerances	
	Lower deviation	Upper deviation
l < 2000	0	+ 10
2000 ≤ l < 8000	0	+ 0,005 × l
l ≥ 8000	0	+ 40

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Tolerance on the lenght of sheets

7

Nominal width w	Tolerances			
	Raw edges		Trimmed edges[a]	
	Lower deviation	Upper deviation	Lower deviation	Upper deviation
w ≤ 1200	0	+ 20	0	+ 3
1200 < w ≤ 1850	0	+ 20	0	+ 5
w > 1850	0	+ 25	0	+ 6

[a]Tolerances for trimmed edges apply for products with a nominal thickness ≤ 10 mm; for nominal thicknesses > 10 mm higher deviation values must be agreed upon at the time of enquiry and order.

Flatness tolerances for steel with a specified minimum yield strength: **Re 300 MPa** (category A)

8

Nominal thickness t	Nominal width w	Tolerances of flatness	Tolerances of special flatness
t ≤ 2,00	w ≤ 1200	18	9
	1200 < w ≤ 1500	20	10
	w > 1500	25	13
2,00 < t ≤ 25	w ≤ 1200	15	8
	1200 < w ≤ 1500	18	9
	w > 1500	23	12

Flatness tolerances for steel with a specified minimum yield strength: **300 MPa < Re 900 MPa** (categories B, C and D)

9

Nominal thickness t	Nominal width w	Flatness tolerance per category[a]		
		B	C	D
t ≤ 25	w ≤ 1200	18	23	To be agreed upon when of the order request.
	1200 < w ≤ 1500	23	30	
	w > 1500	28	38	