

# ZINC-IRON OR GALVANNEALED



Relevant steelmaking regulation

## Areas of use

- Welded parts
- Aesthetic details
- Automotive (especially painted parts)

## Zinc-coated steels - hot iron or Galvannealed (ZF) EN10346 : 2015

The particular name comes from the combination of the processes of: Galvanizing (**Gal**vanizing) followed by the process of Annealing (**An**nealing).

These products consist of a steel substrate to which a zinc coating is applied, the material is then annealed; this operation allows the zinc and iron layers to diffuse into each other forming a Zinc-Iron alloy, on average composed of 88-91% Zinc and 9-12% Iron.

## Technical supply conditions

*The finish of the coating is dark and uniform; unlike galvanized material, individual crystals cannot be identified.*

They can be supplied with special requirements for coating finish, surface appearance and surface protection

The surface appearance can be type A, B or C

*Whatever the type of protection, it is very important that during transportation and storage, galvanized materials avoid contact with moisture or water as much as possible and are kept in a dry environment.*

### SURFACE PROTECTION

<b>C</b>	Chemical passivation
<b>O</b>	Oiling
<b>CO</b>	Oiling and chemical passivation
<b>P</b>	Phosphating
<b>PO</b>	Phosphating and oiling
<b>S</b>	Organic passivation

### SURFACE FINISH TYPES

<b>A</b> <b>Coated surface</b>	Minor imperfections - such as small honeycombs, variations in grain size, dark spots, light scratches, and passivation spots - are possible
<b>B</b> <b>Improved surface</b>	It is obtained through skinpass. Small imperfections - such as scratches due to skinpass, streaks, irregularities (not cavities) - are possible with this kind of surface
<b>C</b> <b>Better quality surface</b>	It is obtained through skinpass. The best surface does not harm the apparent uniformity of a high color finish class; the other surface must be at least type B

Coating name	Surface appearance		
	A	B	C
<b>ZA095</b>	X	X	X
<b>ZA130</b>	X	X	X
<b>ZA185</b>	X	X	X
<b>ZA200</b>	X	X	X
<b>ZA255</b>	X	X	X
<b>ZA300</b>	X	-	-
° The surface appearance shown in parentheses is available by agreement			

Coating name	Minimum weight g/m <sup>2</sup>		Typical values of coating thickness per side in the single spot test μm		Density g/cm <sup>3</sup>
	Triple spot test	Single spot test	Typical value	Range	
Zinc-aluminum (ZA) coating weight					
ZA095	95	80	7	5 to 12	6.6
ZA130	130	110	10	7 to 15	
° 1 g/m2 include both surfaces					

## Available coatings, finishes and surface appearances for zinc-aluminum (ZA) coatings

Coating name	Surface appearance			
	A	B	C	
<b>ZA095</b>	X	X	X	X
<b>ZA130</b>	X	X	X	X
° The surface appearance shown in parentheses is available by agreement				

		MECHANICAL CHARACTERISTICS				
Name		Yield stress	Breaking	Elongation	Plastic deformation ratio	Hardening
Quality	Type of coating:	R <sup>e</sup> MPa <sup>9</sup>	R <sub>m</sub> MPa <sup>9</sup>	A <sub>80</sub> % min	r <sub>90</sub> min	n <sub>90</sub> min
<b>DX51D</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS	-	270 to 500	22	-	-
<b>DX52D</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS	140 to 300	270 to 420	26	-	-
<b>DX53D</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS	140 to 260	270 to 380	30	-	-
<b>DX54D</b>	+Z, +ZA	120 to 220	260 to 350	36	1.6	0.18
<b>DX54D</b>	+ZF, +ZM	120 to 220	260 to 350	34	1.4	0.18
<b>DX54D</b>	+AZ	120 to 220	260 to 350	36	-	-
<b>DX54D</b>	+AS	120 to 220	260 to 350	34	1.4	0.18
<b>DX55D</b>	+AS	140 to 240	270 to 370	30	-	-
<b>DX56D</b>	+Z, +ZA	120 to 180	260 to 350	39	1.9	0.21
<b>DX56D</b>	+ZF, +ZM	120 to 180	260 to 350	37	1.7	0.20
<b>DX56D</b>	+AZ, +AS	120 to 180	260 to 350	39	1.7	0.20
<b>DX57D</b>	+Z, +ZA	120 to 170	260 to 350	41	2.1	0.22
<b>DX57D</b>	+ZF, +ZM	120 to 170	260 to 350	39	1.9	0.21
<b>DX57D</b>	+AS	120 to 170	260 to 350	41	1.9	0.21
° 1 MPa = 1 N/mm <sup>2</sup>						

e = laminate thickness in mm

Tensile tests performed on transverse specimens

# ZINC-IRON OR GALVANNEALED



Relevant steelmaking regulation  
EUROPEAN STANDARD: UNI EN 10346 : 2015

## Areas of use

- Welded parts
- Aesthetic details
- Automotive (especially painted parts)

## CHEMICAL COMPOSITION



Name		Chemical composition max %					
Quality	Type of coating:	C	Si	Mn	P	S	Ti
DX51D	+Z, +ZF, +ZA, +ZM, +AZ, +AS	0.18	0.12	1.20	0.12	0.045	0.030
DX52D	+Z, +ZF, +ZA, +ZM, +AZ, +AS						
DX53D	+Z, +ZF, +ZA, +ZM, +AZ, +AS						
DX54D	+Z, +ZF, +ZA, +ZM, +AZ, +AS						
DX55D	+AS						
DX56D	+Z, +ZF, +ZA, +ZM, +AZ, +AS						
DX57D	+Z, +ZF, +ZA, +ZM, +AS						

## MECHANICAL CHARACTERISTICS



Name		Yield stress $R_{p0.2}$ MPa <sup>d</sup>	Breaking $R_m$ MPa <sup>d</sup>	Elongation $A_{80}$ % min
Quality	Type of coating:			
<b>S220GD</b>	+Z, +ZF, +ZA, +ZM, +AZ	220	300	20
<b>S250GD</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS	250	330	19
<b>S280GD</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS	280	360	18
<b>S320GD</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS	320	390	17
<b>S350GD</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS	350	420	16
<b>S390GD</b>	+Z, +ZF, +ZA, +ZM, +AZ	390	460	16
<b>S420GD</b>	+Z, +ZF, +ZA, +ZM, +AZ	420	480	15
<b>S450GD</b>	+Z, +ZF, +ZA, +ZM, +AZ	450	510	14
<b>S550GD</b>	+Z, +ZF, +ZA, +ZM, +AZ	550	560	-

<sup>d</sup> 1MPa = 1N/mm<sup>2</sup>

## Construction steels

## CHEMICAL COMPOSITION



Name		Chemical composition max %				
Quality	Type of coating:	C	Si	Mn	P	S
<b>S220GD</b>	+Z, +ZF, +ZA, +ZM, +AZ	0.20	0.60	1.70	0.10	0.045
<b>S250GD</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS					
<b>S280GD</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS					
<b>S320GD</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS					
<b>S350GD</b>	+Z, +ZF, +ZA, +ZM, +AZ, +AS					
<b>S390GD</b>	+Z, +ZF, +ZA, +ZM, +AZ					
<b>S420GD</b>	+Z, +ZF, +ZA, +ZM, +AZ					
<b>S450GD</b>	+Z, +ZF, +ZA, +ZM, +AZ					
<b>S550GD</b>	+Z, +ZF, +ZA, +ZM, +AZ					

MECHANICAL  
CHARACTERISTICS

## High-resistive steels

Name		Yield stress $R_{p0.2}$ MPa <sup>f</sup>	Hardening index $BH_2$ MPa <sup>f</sup> min	Breaking $R_m$ MPa <sup>f</sup>	Elongation $A_{80}$ % min	Plastic deformation ratio $r_{90}$ min	Hardening $n^{90}$ min
Quality	Type of coating:						
HX160YD	+Z, +ZF, +ZA +ZM, +AZ, +AS	160 to 220	-	300 to 360	37	1.9	0.20
HX180YD		180 to 240	-	330 to 390	34	1.7	0.18
HX180BD		180 to 240	30	290 to 360	34	1.5	0.16
HX220YD		220 to 280	-	340 to 420	32	1.5	0.17
HX220BD		220 to 280	30	320 to 400	32	1.2	0.15
HX260YD		260 to 320	-	380 to 440	30	1.4	0.16
HX260BD		260 to 320	30	360 to 440	28	-	-
HX260LAD		260 to 330	-	350 to 430	26	-	-
HX300YD		300 to 360	-	390 to 470	27	1.3	0.15
HX300BD		300 to 360	30	400 to 480	26	-	-
HX300LAD		300 to 380	-	380 to 480	23	-	-
HX340BD		340 to 400	30	440 to 520	24	-	-
HX340LAD		340 to 420	-	410 to 510	21	-	-
HX380LAD		380 to 480	-	440 to 560	19	-	-
HX420LAD		420 to 520	-	470 to 590	17	-	-
HX460LAD		460 to 560	-	500 to 640	15	-	-
HX500LAD		500 to 620	-	530 to 690	13	-	-

<sup>f</sup> 1 MPa = 1 N/mm<sup>2</sup>

e = laminate thickness in mm

Tensile tests performed on transverse specimens

CHEMICAL  
COMPOSITION

Name		C MAX	Si max	Mn max	P max	S max	Al <sub>total</sub>	Nb max	Ti max
Quality	Type of coating:								
HX160YD	+Z, +ZF, +ZA +ZM, +AZ, +AS	0.01	0.30	0.60	0.060	0.025	≥0.010	0.09	0.12
HX180YD		0.01	0.30	0.70	0.060	0.025	≥0.010	0.09	0.12
HX180BD		0.06	0.50	0.70	0.060	0.025	≥0.015	0.09	0.12
HX220YD		0.01	0.30	0.90	0.080	0.025	≥0.010	0.09	0.12
HX220BD		0.08	0.50	0.70	0.085	0.025	≥0.015	0.09	0.12
HX260YD		0.01	0.30	1.60	0.10	0.025	≥0.010	0.09	0.12
HX260BD		0.10	0.50	1.00	0.10	0.030	≥0.010	0.09	0.12
HX260LAD		0.11	0.50	1.00	0.030	0.025	≥0.015	0.09	0.15
HX300YD		0.015	0.30	1.60	0.10	0.025	≥0.010	0.09	0.12
HX300BD		0.11	0.50	0.80	0.12	0.025	≥0.010	0.09	0.12
HX300LAD		0.12	0.50	1.40	0.030	0.025	≥0.015	0.09	0.15
HX340BD		0.11	0.50	0.80	0.12	0.025	≥0.010	0.09	0.12
HX340LAD		0.12	0.50	1.4	0.030	0.025	≥0.015	0.10	0.15
HX380LAD		0.12	0.50	1.5	0.030	0.025	≥0.015	0.10	0.15
HX420LAD		0.12	0.50	1.6	0.030	0.025	≥0.015	0.10	0.15
HX460LAD		0.15	0.50	1.7	0.030	0.025	≥0.015	0.10	0.15
HX500LAD		0.15	0.50	1.7	0.030	0.025	≥0.015	0.10	0.15

## Tolerances by size and shape

The standard applies to flat products with a coating applied by continuous hot dipping of zinc (Z), zinc-iron alloy (ZF), zinc-aluminum alloy (ZA), aluminum-zinc alloy (AZ), and aluminum-silicon alloy (AS), of cold-forming high-strength low-carbon steels, and of structural steels with a minimum thickness of 0.20 mm and a maximum thickness of 6.50 mm

Thickness tolerances for steels with minimum specified yield strength  $R_e$  or  $R_{p0.2} < 260$  MPa

1

Thickness tolerances for steels with minimum specified yield strength  $260 \text{ MPa} \leq R_{p0.2} \leq 360$  MPa and for DX51D and S550GD qualities

2

## ZINC-IRON OR GALVANNEALED



Relevant steelmaking regulation  
**EUROPEAN STANDARD: UNI EN 10143 : 2006**

### ATTENTION:

They come in the form of thin metal sheets, wide strips, sheared wide strips, or cut-to-length strips (bands) made from sheared wide strips or thin sheets. **The standards involved are UNI EN 10292, UNI EN 10326, UNI EN 10327, and hot dip-coated products are according to prEN 10336.**

Nominal thickness $t$	Normal tolerance for nominal width $w$			Special tolerance (S) for nominal width $w$		
	$\leq 1200$	$1200 < w \leq 1500$	$> 1500$	$\leq 1200$	$1200 < w \leq 1500$	$> 1500$
$0.20 < t \leq 0.40$	$\pm 0.04$	$\pm 0.05$	$\pm 0.06$	$\pm 0.030$	$\pm 0.035$	$\pm 0.040$
$0.40 < t \leq 0.60$	$\pm 0.04$	$\pm 0.05$	$\pm 0.06$	$\pm 0.035$	$\pm 0.040$	$\pm 0.045$
$0.60 < t \leq 0.80$	$\pm 0.05$	$\pm 0.06$	$\pm 0.07$	$\pm 0.040$	$\pm 0.045$	$\pm 0.050$
$0.80 < t \leq 1.00$	$\pm 0.06$	$\pm 0.07$	$\pm 0.08$	$\pm 0.045$	$\pm 0.050$	$\pm 0.060$
$1.00 < t \leq 1.20$	$\pm 0.07$	$\pm 0.08$	$\pm 0.09$	$\pm 0.050$	$\pm 0.060$	$\pm 0.070$
$1.20 < t \leq 1.60$	$\pm 0.10$	$\pm 0.11$	$\pm 0.12$	$\pm 0.060$	$\pm 0.070$	$\pm 0.080$
$1.60 < t \leq 2.00$	$\pm 0.12$	$\pm 0.13$	$\pm 0.14$	$\pm 0.070$	$\pm 0.080$	$\pm 0.090$
$2.00 < t \leq 2.50$	$\pm 0.14$	$\pm 0.15$	$\pm 0.16$	$\pm 0.090$	$\pm 0.100$	$\pm 0.110$
$2.50 < t \leq 3.00$	$\pm 0.17$	$\pm 0.17$	$\pm 0.18$	$\pm 0.110$	$\pm 0.120$	$\pm 0.130$
$3.00 < t \leq 5.00$	$\pm 0.20$	$\pm 0.20$	$\pm 0.21$	$\pm 0.15$	$\pm 0.16$	$\pm 0.17$
$5.00 < t \leq 6.50$	$\pm 0.22$	$\pm 0.22$	$\pm 0.23$	$\pm 0.17$	$\pm 0.18$	$\pm 0.19$

Nominal thickness $t$	Normal tolerance for nominal width $w$			Special tolerance (s) for nominal width $w$		
	$\leq 1200$	$1200 < w \leq 1500$	$> 1500$	$\leq 1200$	$1200 < w \leq 1500$	$> 1500$
$0.20 < t \leq 0.40$	$\pm 0.05$	$\pm 0.06$	$\pm 0.07$	$\pm 0.035$	$\pm 0.040$	$\pm 0.045$
$0.40 < t \leq 0.60$	$\pm 0.05$	$\pm 0.06$	$\pm 0.07$	$\pm 0.040$	$\pm 0.045$	$\pm 0.050$
$0.60 < t \leq 0.80$	$\pm 0.06$	$\pm 0.07$	$\pm 0.08$	$\pm 0.045$	$\pm 0.050$	$\pm 0.060$
$0.80 < t \leq 1.00$	$\pm 0.07$	$\pm 0.08$	$\pm 0.09$	$\pm 0.050$	$\pm 0.060$	$\pm 0.070$
$1.00 < t \leq 1.20$	$\pm 0.08$	$\pm 0.09$	$\pm 0.11$	$\pm 0.060$	$\pm 0.070$	$\pm 0.080$
$1.20 < t \leq 1.60$	$\pm 0.11$	$\pm 0.13$	$\pm 0.14$	$\pm 0.070$	$\pm 0.080$	$\pm 0.090$
$1.60 < t \leq 2.00$	$\pm 0.14$	$\pm 0.15$	$\pm 0.16$	$\pm 0.080$	$\pm 0.090$	$\pm 0.110$
$2.00 < t \leq 2.50$	$\pm 0.16$	$\pm 0.17$	$\pm 0.18$	$\pm 0.110$	$\pm 0.120$	$\pm 0.130$
$2.50 < t \leq 3.00$	$\pm 0.19$	$\pm 0.20$	$\pm 0.20$	$\pm 0.130$	$\pm 0.140$	$\pm 0.150$
$3.00 < t \leq 5.00$	$\pm 0.22$	$\pm 0.24$	$\pm 0.25$	$\pm 0.17$	$\pm 0.18$	$\pm 0.19$
$5.00 < t \leq 6.50$	$\pm 0.24$	$\pm 0.25$	$\pm 0.26$	$\pm 0.19$	$\pm 0.20$	$\pm 0.21$

## Tolerances by size and shape

The standard applies to flat products with a coating applied by continuous hot dipping of zinc (Z), zinc-iron alloy (ZF), zinc-aluminum alloy (ZA), aluminum-zinc alloy (AZ), and aluminum-silicon alloy (AS), of cold-forming high-strength low-carbon steels, and of structural steels with a minimum thickness of 0.20 mm and a maximum thickness of 6.50 mm

Thickness tolerances for steels with minimum specified yield strength  $360 \text{ MPa} \leq R_{p0.2} \leq 420 \text{ MPa}$

3

Thickness tolerances for steels with minimum specified yield strength  $420 \text{ MPa} \leq R_{p0.2} \leq 900 \text{ MPa}$

4

## ZINC-IRON OR GALVANNEALED



Relevant steelmaking regulation  
**EUROPEAN STANDARD: UNI EN 10131 : 2006**

### ATTENTION:

They come in the form of thin metal sheets, wide strips, sheared wide strips, or cut-to-length strips (bands) made from sheared wide strips or thin sheets. **The standards involved are UNI EN 10292, UNI EN 10326, UNI EN 10327, and hot dip-coated products are according to prEN 10336.**

Nominal thickness t	Normal tolerance for nominal width w			Special tolerance (s) for nominal width w		
	≤ 1200	1200 < w ≤ 1500	>1500	≤ 1200	1200 < w ≤ 1500	>1500
0.35 < t ≤ 0.40	± 0.05	± 0.06	± 0.07	± 0.040	± 0.045	± 0.050
0.40 < t ≤ 0.60	± 0.06	± 0.07	± 0.08	± 0.045	± 0.050	± 0.060
0.60 < t ≤ 0.80	± 0.07	± 0.08	± 0.09	± 0.050	± 0.060	± 0.070
0.80 < t ≤ 1.00	± 0.08	± 0.09	± 0.11	± 0.060	± 0.070	± 0.080
1.00 < t ≤ 1.20	± 0.10	± 0.11	± 0.12	± 0.070	± 0.080	± 0.090
1.20 < t ≤ 1.60	± 0.13	± 0.14	± 0.16	± 0.080	± 0.090	± 0.110
1.60 < t ≤ 2.00	± 0.16	± 0.17	± 0.19	± 0.090	± 0.110	± 0.120
2.00 < t ≤ 2.50	± 0.18	± 0.20	± 0.21	± 0.120	± 0.130	± 0.140
2.50 < t ≤ 3.00	± 0.22	± 0.22	± 0.23	± 0.140	± 0.150	± 0.160
3.00 < t ≤ 5.00	± 0.22	± 0.24	± 0.25	± 0.17	± 0.18	± 0.19
5.00 < t ≤ 6.50	± 0.24	± 0.25	± 0.26	± 0.19	± 0.20	± 0.21

Nominal thickness t	Normal tolerance for nominal width w			Special tolerance (s) for nominal width w		
	≤ 1200	1200 < w ≤ 1500	>1500	≤ 1200	1200 < w ≤ 1500	>1500
0.35 < t ≤ 0.40	± 0.06	± 0.07	± 0.08	± 0.045	± 0.050	± 0.060
0.40 < t ≤ 0.60	± 0.06	± 0.08	± 0.09	± 0.050	± 0.060	± 0.070
0.60 < t ≤ 0.80	± 0.07	± 0.09	± 0.11	± 0.060	± 0.070	± 0.080
0.80 < t ≤ 1.00	± 0.09	± 0.11	± 0.12	± 0.070	± 0.080	± 0.090
1.00 < t ≤ 1.20	± 0.11	± 0.13	± 0.14	± 0.080	± 0.090	± 0.110
1.20 < t ≤ 1.60	± 0.15	± 0.16	± 0.18	± 0.090	± 0.110	± 0.120
1.60 < t ≤ 2.00	± 0.18	± 0.19	± 0.21	± 0.110	± 0.120	± 0.140
2.00 < t ≤ 2.50	± 0.21	± 0.22	± 0.24	± 0.140	± 0.150	± 0.170
2.50 < t ≤ 3.00	± 0.24	± 0.25	± 0.26	± 0.170	± 0.180	± 0.190
3.00 < t ≤ 5.00	± 0.26	± 0.27	± 0.28	± 0.23	± 0.24	± 0.26
5.00 < t ≤ 6.50	± 0.28	± 0.29	± 0.30	± 0.25	± 0.26	± 0.28



## Tolerances by size and shape

The standard applies to flat products with a coating applied by continuous hot dipping of zinc (Z), zinc-iron alloy (ZF), zinc-aluminum alloy (ZA), aluminum-zinc alloy (AZ), and aluminum-silicon alloy (AS), of cold-forming high-strength low-carbon steels, and of structural steels with a minimum thickness of 0.20 mm and a maximum thickness of 6.50 mm

Tolerance on sheet and strip width  $\geq 600$  mm

5

Tolerance on belt width less than 600 mm

6

## ZINC-IRON OR GALVANNEALED



Relevant steelmaking regulation  
**EUROPEAN STANDARD: UNI EN 10143 : 2006**

### ATTENTION:

They come in the form of thin metal sheets, wide strips, sheared wide strips, or cut-to-length strips (bands) made from sheared wide strips or thin sheets. **The standards involved are UNI EN 10292, UNI EN 10326, UNI EN 10327, and hot dip-coated products are according to prEN 10336.**

Nominal width $w$	Normal tolerance	Special tolerance (s)
$600 \leq w \leq 1200$	+5 0	+2 0
$1200 < w \leq 1500$	+6 0	+2 0
$1500 < w \leq 1800$	+7 0	+3 0
$w > 1800$	+8 0	+3 0

Tolerance class	Nominal thickness $t$	Nominal width			
		$w < 125$	$125 \leq w < 250$	$250 \leq w < 400$	$400 \leq w < 600$
Normal	$t < 0.6$	+0.4 0	+0.5 0	+0.7 0	+1.0 0
	$0.6 \leq t < 1.0$	+0.5 0	+0.6 0	+0.9 0	+1.2 0
	$1.0 \leq t < 2.0$	+0.6 0	+0.8 0	+1.1 0	+1.4 0
	$2.0 \leq t \leq 3.0$	+0.7 0	+1.0 0	+1.3 0	+1.6 0
	$3.0 < t \leq 5.0$	+0.8 0	+1.1 0	+1.4 0	+1.7 0
	$5.0 < t \leq 6.5$	+0.9 0	+1.2 0	+1.5 0	+1.8 0
Special (s)	$t < 0.6$	+0.2 0	+0.2 0	+0.3 0	+0.5 0
	$0.6 \leq t < 1.0$	+0.2 0	+0.3 0	+0.4 0	+0.6 0
	$1.0 \leq t < 2.0$	+0.3 0	+0.4 0	+0.5 0	+0.7 0
	$2.0 \leq t \leq 3.0$	+0.4 0	+0.5 0	+0.6 0	+0.8 0
	$3.0 < t \leq 5.0$	+0.5 0	+0.6 0	+0.7 0	+0.9 0
	$5.0 < t \leq 6.5$	+0.6 0	+0.7 0	+0.8 0	+1.0 0

## Tolerances by size and shape

The standard applies to flat products with a coating applied by continuous hot dipping of zinc (Z), zinc-iron alloy (ZF), zinc-aluminum alloy (ZA), aluminum-zinc alloy (AZ), and aluminum-silicon alloy (AS), of cold-forming high-strength low-carbon steels, and of structural steels with a minimum thickness of 0.20 mm and a maximum thickness of 6.50 mm

### Length tolerances

7

Flatness tolerances for steels with minimum specified yield strength  $R_e$  or  $R_{p0.2} < 260 \text{ MPa}$

8

Flatness tolerance for steels with minimum specified yield strength  $260 \text{ MPa} \leq R_{p0.2} \leq 360 \text{ MPa}$  and for DX51D and S550GD degrees

9

## ZINC-IRON OR GALVANNEALED



Relevant steelmaking regulation

EUROPEAN STANDARD: UNI EN 10143 : 2006

### ATTENTION:

They come in the form of thin metal sheets, wide strips, sheared wide strips, or cut-to-length strips (bands) made from sheared wide strips or thin sheets. **The standards involved are UNI EN 10292, UNI EN 10326, UNI EN 10327, and hot dip-coated products are according to prEN 10336.**

Nominal length	Normal tolerance	Special tolerance (s)
< 2000	+6 0	+3 0
$\geq 2000$ and $\leq 8000$	+0.3 of the length 0	+0.15% of the length 0
> 8000	by agreement	

Tolerance class	Nominal width w	Maximum wave height for nominal thickness t			
		$t < 0.7$	$0.7 \leq t < 1.6$	$1.6 \leq t < 3.0$	$3.0 \leq t \leq 6.5$
Normal	$w < 1200$	10	8		15
	$1200 \leq w < 1500$	12	10		18
	$w \geq 1500$	17	15		23
Special (FS)	$w < 1200$	5	4	3	8
	$1200 \leq w < 1500$	6	5	4	9
	$w \geq 1500$	8	7	6	12

Tolerance class	Nominal width w	Maximum wave height for nominal thickness t			
		$t < 0.7$	$0.7 \leq t < 1.6$	$1.6 \leq t < 3.0$	$3.0 \leq t \leq 6.5$
Normal	$w < 1200$	13	10		18
	$1200 \leq w < 1500$	15	13		25
	$w \geq 1500$	20	19		28
Special (FS)	$w < 1200$	8	6	5	9
	$1200 \leq w < 1500$	9	8	6	12
	$w \geq 1500$	12	10	9	14



## Tolerances by size and shape

The standard applies to flat products with a coating applied by continuous hot dipping of zinc (Z), zinc-iron alloy (ZF), zinc-aluminum alloy (ZA), aluminum-zinc alloy (AZ), and aluminum-silicon alloy (AS), of cold-forming high-strength low-carbon steels, and of structural steels with a minimum thickness of 0.20 mm and a maximum thickness of 6.50 mm

### Out-of-square tolerance

10



Relevant steelmaking regulation  
**EUROPEAN STANDARD: UNI EN 10131 : 2006**

#### ATTENTION:

They come in the form of thin metal sheets, wide strips, sheared wide strips, or cut-to-length strips (bands) made from sheared wide strips or thin sheets. **The standards involved are UNI EN 10292, UNI EN 10326, UNI EN 10327, and hot dip-coated products are according to prEN 10336.**

**The out-of-square (u)** is the orthogonal projection of the transverse side along the longitudinal side (see Figure 1).

Out-of-square must not exceed 1% of the sheet width.

### Lapping tolerance

11

**The lapping (q)** is the maximum distance between the longitudinal edge and a reference straight side (see Figure 1).

The lapping should be measured on the concave side. The base of the measurement should be 2 meters, taken on any point on the concave edge.

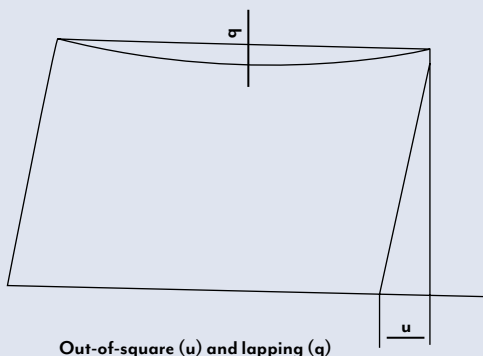
If the metal sheet has a length of less than 2 meters, the base of the measurement should be equal to its length.

Lapping should not exceed 5 mm over a length of 2 meters. For lengths of less than two meters, the lapping should not exceed 0.25 percent of the length itself.

For strips less than 600 mm wide, a special lapping tolerance (CS) of maximum 2 mm on a length of 2 meters can be specified.

**This special tolerance is not applicable to strips with minimum yield strength  $R_{p0.2} \geq 280$  MPa.**

Figure 1



Out-of-square (u) and lapping (q)