

# Low-Carbon Steel: Continuous hot dip coating. Galvanised.

## Chemical Composition

Classification of symbols	Numerical classification	European Standard (EN)	Types of coatings available	Chemical Composition							
				Max. C	Max. Si	Max Mn	Max. P	Max. S	Max. Ti	Total Al.	Max. Nb
DX51D	1.0226	EN 10346	+Z +ZA +AZ	0.18	0.50	1.20	0.12	0.045	0.30	-	-
DX52D	1.0350	EN 10346	+Z +ZA +AZ	0.12	0.50	0.60	0.10	0.045	0.30	-	-
DX53D	1.0355	EN 10346	+Z +ZA +AZ	0.12	0.50	0.60	0.10	0.045	0.30	-	-
DX54D	1.0306	EN 10346	+Z +ZA +AZ	0.12	0.50	0.60	0.10	0.045	0.30	-	-
DX56D	1.0322	EN 10346	+Z +ZA +AZ	0.12	0.50	0.60	0.10	0.045	0.30	-	-
HX300LAD	1.0932	EN 10346	+Z +ZA +AZ	0.11	0.50	1.00	0.030	0.025	0.15	≤ 0.1	0.09
HX420LAD	1.0935	EN 10346	+Z +ZA +AZ	0.11	0.50	1.40	0.030	0.025	0.15	≥ 0.015	0.09

Type of coating	Description
+Z	Galvanised Products (Zinc)
+ZA	Products coated with zinc-aluminium alloy
+AZ	Products coated with aluminium-zinc alloy

Note: We can supply strips with +ZF (zinc-iron) and +AS (aluminium-silicon) coatings.

## Equivalents

Classification of symbols	Numerical classification	European Standard (EN)	Approximate international equivalents					
			US (AISI)		JAPAN (JIS)		CHINA (GB)	
DX51D +Z	1.0226	EN 10346	CS Types A, B, C	A653	-	-	DX51D +Z	GB/T 2518
DX52D +Z	1.0350	EN 10346						
DX53D +Z	1.0355	EN 10346						
DX54D +Z	1.0306	EN 10346						
DX56D +Z	1.0322	EN 10346						
HX300LAD +Z	1.0932	EN 10346						
HX420LAD +Z	1.0935	EN 10346						

## Mechanical properties

Classification of symbols	Numerical classification	European Standard (EN)	Mechanical properties and hardness requirements		
			Yield strength	Tensile strength	Elongation
			ReL Mpa	Rm MPa	A <sub>80</sub> <sup>1)</sup> % min.
DX51D	1.0226	EN 10346	-	270 - 500	22
DX52D	1.0350	EN 10346	140 - 300	270 - 420	26
DX53D	1.0355	EN 10346	140 - 260	270 - 380	30
DX54D	1.0306	EN 10346	120 - 220	260 - 350	36
DX56D	1.0322	EN 10346	120 - 180	260 - 350	39

1) The minimum elongation values are decreased by 4 units for thicknesses  $t \leq 0.50$  mm and 2 units for thicknesses between  $0.50 \text{ mm} < t \leq 0.70$  mm.

Classification of symbols	Numerical classification	European Standard (EN)	Mechanical properties and hardness requirements		
			Conventional limit at Rp <sub>0.2</sub> , MPa	Tensile strength Rm Mpa	Elongation A <sub>80</sub> <sup>2)</sup> , min.
HX300LAD	1.0932	EN 10346	300 - 380	380 - 480	23
HX420LAD	1.0935	EN 10346	420 - 520	470 - 590	17

2) The minimum elongation values are decreased by 4 units for thicknesses  $t \leq 0.50$  mm and 2 units for thicknesses between  $0.50 \text{ mm} < t \leq 0.70$  mm.

## Finishes

## SURFACE QUALITY

## PROPERTIES OF THE COATINGS

GALVANISED STEEL according to EN 10142

## COATING DENSITY

Designation of the coating	Total minimum coating density, both surfaces g/m <sup>2</sup>		Theoretical reference values for the surface coating thickness in the one-point test (µm)		Density g/cm <sup>3</sup>
	Three-point test	One-point test	Normal value	Range	
Z100	100	85	7	5-12	7.1
Z140	140	120	10	7-15	7.1
Z275	275	235	20	15-27	7.1
Z450	450	385	32	24-42	7,1
ZA095	95	80	7	5-12	6,9
ZA185	185	155	14	10-20	6,9
AZ100	100	85	13	9-19	3.8
AZ150	150	130	20	15-27	3.8

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## COATING FINISH

Product	Type	Description
Galvanised products (Z)	Normal spangle (N)	This finish is the result of the natural solidification of the zinc coating. Depending on the conditions under which galvanising occurs, spangle may not be obtained or zinc crystals of a different size and spangle may be obtained. This does not affect the quality of the coating. If you want a pronounced spangle, this must be explicitly stated when requesting the quote and placing the order.
	Minimum spangle (M)	This finish is obtained by adequately controlling the solidification process. The spangle on the surface will be reduced, sometimes invisible to the naked eye. You can request this finish if normal spangle (N) does not meet the surface appearance requirements.
	Spangle-Free (SF)	We are able to supply spangle-free, which is not subject to any standards
Products coated with zinc-aluminium (ZA)		The finish of this coating has a metallic sheen which is the result of the free growth of zinc-aluminium crystals during normal solidification. Crystals of different sizes and with different spangles may appear, depending on the manufacturing conditions. This does not affect the clarity of the coating.
	Products coated with aluminium-zinc (AZ) alloy	The products must be supplied with normal spangle. Normal spangle is a surface finish, it has a metallic sheen which is the result of the free growth of aluminium-zinc crystals during normal solidification.

## SURFACE QUALITY

Quality	Description
Normal finish (A):	Imperfections such as a grainy surface, marks, grooves, pitting, variations in the surface appearance, dark spots, scratch marks and small passivation defects are allowed. Defects may appear due to tension gradient or local excess thickness. Ribbing may also appear on the coils and yield lines.
Improved finish (B):	The B surface quality is obtained through skin passing. For this surface finish, small imperfections such as defects due to tension gradient, skin-pass marks, light scratches, surface structure defects, excess thickness and small passivation defects may be allowed. NOTE: for special applications, subject to an agreement when requesting the quote and placing the order, cold-dipped aluminium-silicon coated products (AS) can be supplied with a bright appearance. The surface is type "B" in this case.
Superior quality (C):	The C surface quality is obtained through skin passing. The controlled surface should make it possible to apply a high-quality paint finish. The other surface must have the surface properties of a B quality finish at a minimum.
<b>Roughness</b>	When requesting the quote and placing the order, a surface roughness range (Ra values) must be agreed and verified. This is not applicable to the skin-pass condition (surface quality A).

## PROTECTIVE SURFACE TREATMENT

Finish	Description
Chemical passivation (C)	Chemical passivation protects the surface against humidity and reduces the risk of corrosion products forming during storage and transportation. The local variations in colour resulting from this treatment are permitted and do not affect the quality.
Oiled (O)	This treatment also reduces the risk of corrosion products forming. It should be possible to remove the layer of oil with suitable degreasing solvents which do not have an adverse effect on the coating.
Chemical passivation and oiled (CO)	An agreement can be signed to combine these surface treatments if it is necessary to increase the protection against the risk of corrosion products forming.
Phosphated (P)	This treatment improves the adhesion and protective effect of the coating applied by the process manager. It also reduces the risk of corrosion during transportation and storage.
Phosphated and oiled (PO)	The combination of phosphating and oiling (PO) can improve formability
Sealed (S)	Subject to an agreement, the application of a transparent organic film coating, on one or both sides, of approximately 1 g/m <sup>2</sup> . This treatment offers additional protection against corrosion, depending on the type, and increased protection against fingerprint marks. It can improve sliding properties during forming processes and can be used as a primer for a subsequent painting process. The S-type coating must be agreed when requesting the quote and placing the order.
Untreated (U)	

If the customer does not require the surfaces to be oiled and/or chemically passivated, this must be clearly indicated when requesting the quote and placing the order.

## Tolerances

### THICKNESS TOLERANCES

Thickness tolerances according to EN 10143 for nominal widths.

Nominal thickness t	DX51D		DX53D, DX54D, DX56D		HX300LAD		HX420LAD	
	Normal tolerances for nominal width w	Close tolerances (S) for a nominal width w	Normal tolerances for nominal width w	Close tolerances (S) for a nominal width w	Normal tolerances for nominal width w	Close tolerances (S) for a nominal width w	Normal tolerances for nominal width w	Close tolerances (S) for a nominal width w
	1200 < w ≤ 1500	1200 < w ≤ 1500	1200 < w ≤ 1500	1200 < w ≤ 1500	1200 < w ≤ 1500	1200 < w ≤ 1500	1200 < w ≤ 1500	1200 < w ≤ 1500
0,20 < t ≤ 0,35	± 0,06	± 0,04	± 0,5	± 0,035	-	-	-	-
0,35 < t ≤ 0,40	± 0,06	± 0,04	± 0,5	± 0,035	± 0,06	± 0,045	± 0,07	± 0,050
0,40 < t ≤ 0,60	± 0,06	± 0,045	± 0,5	± 0,040	± 0,07	± 0,050	± 0,08	± 0,060
0,60 < t ≤ 0,80	± 0,07	± 0,05	± 0,6	± 0,045	± 0,08	± 0,060	± 0,09	± 0,070
0,80 < t ≤ 1,00	± 0,08	± 0,06	± 0,7	± 0,050	± 0,09	± 0,070	± 0,11	± 0,080
1,00 < t ≤ 1,20	± 0,09	± 0,07	± 0,8	± 0,060	± 0,11	± 0,080	± 0,13	± 0,090
1,20 < t ≤ 1,60	± 0,13	± 0,08	± 0,11	± 0,070	± 0,14	± 0,090	± 0,16	± 0,110
1,60 < t ≤ 2,00	± 0,15	± 0,09	± 0,13	± 0,080	± 0,17	± 0,110	± 0,19	± 0,120
2,00 < t ≤ 2,50	± 0,17	± 0,12	± 0,15	± 0,100	± 0,20	± 0,130	± 0,22	± 0,150
2,50 < t ≤ 3,00	± 0,20	± 0,14	± 0,17	± 0,120	± 0,22	± 0,150	± 0,25	± 0,180
3,00 < t ≤ 5,00	± 0,24	± 0,18	± 0,20	± 0,16	± 0,24	± 0,18	± 0,27	± 0,24
5,00 < t ≤ 6,50	± 0,25	± 0,20	± 0,22	± 0,18	± 0,25	± 0,20	± 0,29	± 0,26

Measurements in mm..

## WIDTH TOLERANCES

Tolerances on wide strips obtained by longitudinal cutting of a width of less than 600 mm.

Tolerance class	Nominal thickness $t$	Standard slitting tolerances for Metalle Schmidt <sup>1)</sup>				Width tolerances according to EN 10143 for nominal widths of:			
		3-15	15-50	50-150	>150	$w < 125$	$125 \leq w < 250$	$250 \leq w < 400$	$400 \leq w < 600$
Normal	$0,6 \leq t < 1,0$	-	-	-	-	0;+0,5	0;+0,6	0;+0,9	0;+1,2
	$1,0 \leq t < 2,0$	-	-	-	-	0;+0,6	0;+0,8	0;+1,1	0;+1,4
	$2,0 \leq t \leq 3,0$	-	-	-	-	0;+0,7	0;+1,0	0;+1,3	0;+1,6
	$3,0 < t \leq 5,0$	-	-	-	-	0;+0,8	0;+1,1	0;+1,4	0;+1,7
	$5,0 < t \leq 6,5$	-	-	-	-	0;+0,9	0;+1,2	0;+1,5	0;+1,8
Close (S)	$0,20 \leq t < 0,40$	0;+0,15	0;+0,15	0;+0,15	0;+0,2	0;+0,2	0;+0,2	0;+0,3	0;+0,5
	$0,40 \leq t < 0,60$	0;+0,17	0;+0,18	0;+0,20	0;+0,24	0;+0,2	0;+0,2	0;+0,3	0;+0,5
	$0,60 \leq t < 1,00$	0;+0,17	0;+0,18	0;+0,20	0;+0,24	0;+0,2	0;+0,3	0;+0,4	0;+0,6
	$1,00 \leq t < 1,50$	0;+0,20	0;+0,20	0;+0,20	0;+0,3	0;+0,3	0;+0,4	0;+0,5	0;+0,7
	$1,50 \leq t < 2,00$	on request	0;+0,26	0;+0,30	0;+0,32	0;+0,3	0;+0,4	0;+0,5	0;+0,7
	$2,00 \leq t < 2,50$	on request	0;+0,26	0;+0,30	0;+0,32	0;+0,4	0;+0,5	0;+0,6	0;+0,8
	$2,50 \leq t \leq 3,00$	on request	on request	0;+0,32	0;+0,35	0;+0,4	0;+0,5	0;+0,6	0;+0,8

$t < 0,6$	-	-	-	-	0;+0,4	0;+0,5	0;+0,7	0;+1,0
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Tolerance class	Nominal thickness t	Standard slitting tolerances for Metalle Schmidt <sup>1)</sup>				Width tolerances according to EN 10143 for nominal widths of:			
		3-15	15-50	50-150	>150	w < 125	125 ≤ w < 250	250 ≤ w < 400	400 ≤ w < 600
	5,0 < t ≤ 6,5	-	-	-	-	0;+0,6	0;+0,7	0;+0,8	0;+1,0

3,00 < t ≤ 5,00	on request	on request	0;+0,32	0;+0,35	0;+0,5	0;+0,6	0;+0,7	0;+0,9
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Measurements in mm.

1)Other, closer dimensional tolerances under a commercial agreement.

## SAG TOLERANCES

Nominal width (W)	Edge curve tolerances under commercial agreement	
	Maximum deviation 2000 mm Thickness (t)	
	t ≤ 1.20 mm	t > 1.20 mm
3 ≤ W < 6	10.00	15.00
6 < W ≤ 10	8.00	12.00
10 < W ≤ 20	4.00	6.00
20 < W ≤ 350	2.00	4.00

Measurements in mm.