



E35

## Steels with Magnelis® zinc-aluminium- magnesium coating



*This product is ideal for use in construction and civil engineering applications, where good corrosion resistance in very aggressive environments (e.g. chloride or highly alkaline) is required.*

Last update: 2014-6-24

### Properties

Magnelis® is a flat carbon steel product coated on both sides with a zinc-aluminium-magnesium alloy. This alloy, composed of 93.5% zinc, 3.5% aluminium and 3% magnesium, is applied by means of a continuous hot dip galvanising process. This optimum chemical composition has been selected to provide the best results in terms of corrosion resistance.

Magnelis® is available in a very wide range of steel grades: steels for cold forming and deep drawing applications, structural steels and high strength low alloy steels.

### Advantages

Thanks to its 3% magnesium content, Magnelis® offers self-healing on cut edges and superior corrosion resistance in chloride and ammonia atmospheres. This high corrosion resistance means that less metallic coating is required (weight reduction), which facilitates processing steps such as welding.

The zinc-rich metallic coating composition permits all the conventional processing operations possible with standard hot dip galvanised steel: bending, drawing, clinching, profiling, stamping, welding etc. The friction coefficient of Magnelis® coated steel is lower than the one of standard hot dip galvanised steel and stable during forming operations.

### Applications

Magnelis® can be used in numerous industrial applications, such as:

- Construction: profiles, structural material, roofing & cladding, cable trays, expanded metal, concrete moulds
- Public works & civil engineering: decks for car parks, sound insulation wall panels, walls providing protection against hail
- Agricultural & farming: barns, greenhouse structures
- Road & railway applications: safety & protection equipment

### Technical approvals for civil construction

Magnelis® is approved for use in Civil Construction® by different national bodies:

- Germany: DIBt Z-30.11-51 Magnelis® ZM250 and ZM310 for KIII, and Magnelis® ZM120 for KII in accordance

with DIN 55928-8

- France: CSTB Magnelis® ZM195, ZM250 and ZM310 for use in exterior applications, and Magnelis® ZM90, ZM120 and ZM310 for use in interior applications

## Recommendations for use

### Storage

Magnelis® is supplied passivated and/or oiled to temporarily limit any risk of white rust formation. During transport and storage, all necessary precautions must be taken to keep the material dry and to prevent the formation of condensation.

### Forming and joining

The forming and joining techniques currently used for galvanised steel are also available for Magnelis®. Magnelis® behaves very well during profiling operations. The coating thickness must be compatible with both the desired degree of corrosion protection and the requirements of the forming and welding processes envisaged.

## Weldability

In electrical resistance welding, the welding current must be suitably regulated and regularly adjusted. Electrode life can be extended by regularly stepping up the welding current and periodically dressing (machining) the electrodes.

## Brand correspondence

### Steels for cold forming and deep drawing applications

DX51D +ZM

DX52D +ZM

DX53D +ZM

DX54D +ZM

DX56D +ZM

DX57D +ZM

### Structural steels

S220GD +ZM

S250GD +ZM

S280GD +ZM

S320GD +ZM

S350GD +ZM

*S390GD AM FCE +ZM*

*Grades in italics: not included in the standard*

### High strength low alloy steels

HX260LAD +ZM

HX300LAD +ZM  
 HX340LAD +ZM  
 HX380LAD +ZM  
 HX420LAD +ZM

## Dimensions

### Steels for cold forming and deep drawing applications

Thickness (mm)	Min width	DX51D +ZM, DX52D +ZM	DX53D +ZM, DX54D +ZM	DX56D +ZM, DX57D +ZM
		Max width	Max width	Max width
$0.45 \leq th < 0.50$	850	1300	-	-
$0.50 \leq th < 0.70$	600	1560	1500	1560
$0.70 \leq th < 1.40$		1630	1620	1610
$1.40 \leq th < 1.60$				1500
$1.60 \leq th < 1.80$		1580		1470
$1.80 \leq th < 2.00$		1530		1300
$2.00 \leq th < 2.50$		1650	1350	-
$2.50 \leq th < 3.00$				
$3.00 \leq th < 4.60$		1580	-	
$4.60 \leq th < 4.80$				
$4.80 \leq th < 5.00$				
$5.00 \leq th < 5.20$				
$5.20 \leq th < 5.40$				
$5.40 \leq th < 5.60$				
$5.60 \leq th < 5.80$				
$5.80 \leq th < 6.00$				

For product thicknesses of  $5.0 \text{ mm} < th \leq 6.0 \text{ mm}$ , please contact us.

### Structural steels

Thickness (mm)	Min width	S220GD +ZM, S250GD +ZM, S280GD +ZM	S320GD +ZM, S350GD +ZM	S390GD AM FCE +ZM
		Max width	Max width	Max width
$0.45 \leq th < 0.50$	850	1300	1300	-
$0.50 \leq th < 0.70$	600	1500	1350	1500
$0.70 \leq th < 1.40$		1630	1630	1630
$1.40 \leq th < 1.60$		1600	1600	1580
$1.60 \leq th < 1.80$		1520	1570	1260
$1.80 \leq th < 2.00$		1580	1550	
$2.00 \leq th <$				

2.50	600		1420	1420
$2.50 \leq th < 3.00$		1650	1570	1380
$3.00 \leq th < 3.50$			1630	1580
$3.50 \leq th < 4.40$			1650	1650
$4.40 \leq th < 4.60$		1640	1640	1640
$4.60 \leq th < 4.80$		1580	1580	1580
$4.80 \leq th < 5.00$		1530	1530	1530
$5.00 \leq th < 5.20$		1460	1460	1460
$5.20 \leq th < 5.40$		1410	1410	1410
$5.40 \leq th < 5.60$		1360	1360	1360
$5.60 \leq th < 5.80$		1300	1300	1300
$5.80 \leq th < 6.00$		1250	1250	1250

For product thicknesses of  $5.0 \text{ mm} < th \leq 6.0 \text{ mm}$ , please contact us.

**High strength low alloy steels**

Thickness (mm)	Min width	HX260LAD +ZM, HX300LAD +ZM	HX340LAD +ZM	HX380LAD +ZM, HX420LAD +ZM	
		Max width	Max width	Max width	
$0.45 \leq th < 0.50$	850	1300	1300	-	
$0.50 \leq th < 0.70$	600	1560	1350	1500	
$0.70 \leq th < 1.40$		1630	1630	1630	
$1.40 \leq th < 1.60$		1580	1600	1580	
$1.60 \leq th < 1.80$		1520		1570	1260
$1.80 \leq th < 2.00$				1550	
$2.00 \leq th < 2.50$				1420	1420
$2.50 \leq th < 3.00$		1650		1570	1380
$3.00 \leq th < 3.50$				1630	1580
$3.50 \leq th < 4.40$				1650	1650
$4.40 \leq th < 4.60$		1640	1640	1640	
$4.60 \leq th < 4.80$		1580	1580	1580	
$4.80 \leq th < 5.00$		1530	1530	1530	
$5.00 \leq th < 5.20$		1460	1460	1460	
$5.20 \leq th < 5.40$		1410	1410	1410	
$5.40 \leq th < 5.60$		1360	1360	1360	
$5.60 \leq th < 5.80$		1300	1300	1300	
$5.80 \leq th < 6.00$		1250	1250	1250	

## Mechanical properties

### Steels for cold forming and deep drawing applications

	Notes	Direction	Thickness (mm)	R <sub>e</sub> (MPa)	R <sub>m</sub> (MPa)	A <sub>80</sub> (%)	r 90	n 90
DX51D +ZM		T	0.45 - 0.7	-	270 - 500	≥ 20	-	-
			0.7 - 6			≥ 22		
DX52D +ZM	1	T	0.45 - 0.7	140 - 300	270 - 420	≥ 24	-	-
			0.7 - 6			≥ 26		
DX53D +ZM		T	0.45 - 0.7	140 - 260	270 - 380	≥ 28	-	-
			0.7 - 3			≥ 30		
DX54D +ZM		T	0.45 - 0.7	120 - 220	260 - 350	≥ 34	≥ 1.6	≥ 0.180
			0.7 - 1.5			≥ 36		
			1.5 - 3			≥ 1.4		
DX56D +ZM		T	0.45 - 0.7	120 - 180	260 - 350	≥ 37	≥ 1.9	≥ 0.210
			0.7 - 1.5			≥ 39	≥ 1.7	
			1.5 - 2					
DX57D +ZM		T	0.45 - 0.7	120 - 170	260 - 350	≥ 39	≥ 2.1	≥ 0.220
			0.7 - 1.5			≥ 41	≥ 1.9	
			1.5 - 2					

1. For DX52D +ZM the R<sub>e</sub>-value only applies to skin-passed products (surface qualities B and C).

### Structural steels

	Notes	Direction	Thickness (mm)	R <sub>e</sub> (MPa)	R <sub>m</sub> (MPa)	A <sub>80</sub> (%)	r 90	n 90
S220GD +ZM		L	0.45 - 0.7	≥ 220	≥ 300	≥ 18	-	-
			0.7 - 6			≥ 20		
S250GD +ZM		L	0.45 - 0.7	≥ 250	≥ 330	≥ 17	-	-
			0.7 - 6			≥ 19		
S280GD +ZM		L	0.45 - 0.7	≥ 280	≥ 360	≥ 16	-	-
			0.7 - 6			≥ 18		
S320GD +ZM		L	0.45 - 0.7	≥ 320	≥ 390	≥ 15	-	-
			0.7 - 6			≥ 17		
S350GD +ZM		L	0.45 - 0.7	≥ 350	≥ 420	≥ 14	-	-
			0.7 - 6			≥ 16		
<i>S390GD AM FCE +ZM</i>		L	0.45 - 0.7	≥ 390	≥ 460	≥ 14	-	-
			0.7 - 6			≥ 16		

*Grades in italics: not included in the standard*

### High strength low alloy steels

	Notes	Direction	Thickness (mm)	R <sub>e</sub> (MPa)	R <sub>m</sub> (MPa)	A <sub>80</sub> (%)	r 90	n 90
HX260LAD +ZM		T	0.45 - 0.7	260 - 330	350 - 430	≥ 24	-	-
			0.7 - 6			≥ 26		
HX300LAD +ZM		T	0.45 - 0.7	300 - 380	380 - 480	≥ 21	-	-
			0.7 - 6			≥ 23		

HX340LAD +ZM	T	0.45 - 0.7	340 - 420	410 - 510	≥ 19	-	-
		0.7 - 6			≥ 21		
HX380LAD +ZM	T	0.45 - 0.7	380 - 480	440 - 560	≥ 17	-	-
		0.7 - 6			≥ 19		
HX420LAD +ZM	T	0.45 - 0.7	420 - 520	470 - 590	≥ 15	-	-
		0.7 - 6			≥ 17		

## Chemical composition

### Steels for cold forming and deep drawing applications

	<b>C (%)</b>	<b>Mn (%)</b>	<b>P (%)</b>	<b>S (%)</b>	<b>Si (%)</b>	<b>Al (%)</b>	<b>Nb (%)</b>	<b>Ti (%)</b>
DX51D +ZM	≤ 0.180	≤ 1.20	≤ 1.200	≤ 0.045	≤ 0.50	-	-	≤ 0.300
DX52D +ZM	≤ 0.120	≤ 0.60	≤ 0.100	≤ 0.045	≤ 0.50	-	-	≤ 0.300
DX53D +ZM	≤ 0.120	≤ 0.60	≤ 0.100	≤ 0.045	≤ 0.50	-	-	≤ 0.300
DX54D +ZM	≤ 0.120	≤ 0.60	≤ 0.100	≤ 0.045	≤ 0.50	-	-	≤ 0.300
DX56D +ZM	≤ 0.120	≤ 0.60	≤ 0.100	≤ 0.045	≤ 0.50	-	-	≤ 0.300
DX57D +ZM	≤ 0.120	≤ 0.60	≤ 0.100	≤ 0.045	≤ 0.50	-	-	≤ 0.300

### Structural steels

	<b>C (%)</b>	<b>Mn (%)</b>	<b>P (%)</b>	<b>S (%)</b>	<b>Si (%)</b>	<b>Al (%)</b>	<b>Nb (%)</b>	<b>Ti (%)</b>
S220GD +ZM	≤ 0.200	≤ 1.70	≤ 0.100	≤ 0.045	≤ 0.60	-	-	-
S250GD +ZM	≤ 0.200	≤ 1.70	≤ 0.100	≤ 0.045	≤ 0.60	-	-	-
S280GD +ZM	≤ 0.200	≤ 1.70	≤ 0.100	≤ 0.045	≤ 0.60	-	-	-
S320GD +ZM	≤ 0.200	≤ 1.70	≤ 0.100	≤ 0.045	≤ 0.60	-	-	-
S350GD +ZM	≤ 0.200	≤ 1.70	≤ 0.100	≤ 0.045	≤ 0.60	-	-	-
<i>S390GD AM FCE +ZM</i>	≤ 0.200	≤ 1.70	≤ 0.100	≤ 0.045	≤ 0.60	-	-	-

*Grades in italics: not included in the standard*

### High strength low alloy steels

	<b>C (%)</b>	<b>Mn (%)</b>	<b>P (%)</b>	<b>S (%)</b>	<b>Si (%)</b>	<b>Al (%)</b>	<b>Nb (%)</b>	<b>Ti (%)</b>
HX260LAD +ZM	≤ 0.110	≤ 0.60	≤ 0.030	≤ 0.025	≤ 0.50	≥ 0.015	≤ 0.090	≤ 0.120
HX300LAD +ZM	≤ 0.110	≤ 1.00	≤ 0.030	≤ 0.025	≤ 0.50	≥ 0.015	≤ 0.090	≤ 0.150
HX340LAD +ZM	≤ 0.110	≤ 1.00	≤ 0.030	≤ 0.025	≤ 0.50	≥ 0.015	≤ 0.090	≤ 0.150
HX380LAD +ZM	≤ 0.110	≤ 1.40	≤ 0.030	≤ 0.025	≤ 0.50	≥ 0.015	≤ 0.090	≤ 0.150
HX420LAD +ZM	≤ 0.110	≤ 1.40	≤ 0.030	≤ 0.025	≤ 0.50	≥ 0.015	≤ 0.090	≤ 0.150

## Coating properties

Magnelis® Coating weight - double sided (g/m<sup>2</sup>) Coating thickness (µm per side)

ZM90	90	7
ZM120	120	9

ZM175	175	13
ZM195	195	16
ZM250	250	19
ZM310	310	24

For commercial information (quotations, deliveries, product availability):

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