



## A10 - Steels for cold forming and deep drawing applications

*The excellent deep drawing performance of these steels makes them suitable for a very wide range of applications.*

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## Properties

Steels for cold forming and deep drawing applications are characterised by guaranteed maximum yield and tensile strength and minimum elongation.

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## Advantages

Steels for cold forming and deep drawing applications are available for normal (DD11 AM FCE) to very demanding (DD14 AM FCE) forming applications. ArcelorMittal also offers DD15 AM FCE grade with forming characteristics superior to those prescribed by the standard EN 10111:2008. In addition, ArcelorMittal provides guarantees for thicknesses greater than 11 mm.

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## Applications

This range of steel grades for cold forming is widely used for bending and drawing applications in general industry, building, the automotive industry and related sectors (e.g. oil sumps for industrial vehicles etc).

ArcelorMittal's steels for cold forming and deep drawing applications display good or even excellent performance in all types of deep drawing processes, enabling the production of complex parts.

Uncoated hot rolled steels for bending and deep drawing applications are suitable under certain conditions for food contact, as specified in the Regulation (EC) No. 1935/2004 and French standard NF A 36-714. Please contact us for further information on this subject.

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## Weldability

The weldability (spot and arc welding) of ArcelorMittal's hot rolled steels for cold forming and deep drawing is equivalent to that of cold rolled steels of corresponding grades. For instance, the spot weldability of DD14 AM FCE grade (thickness 2.5 mm) ranges from 9.6 to 12.6 kA.

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# Brand correspondence

	EN 10111:2008	NF A 36-301:1992	DIN 1614-2:1986	UNI 5867:1973	UNE 36093:1991	SAE J403	ASTM A1011-01a
DD11 EN 10111	DD11						
DD11 AM FCE	DD11	1C	StW22	Fe P 11	AP11		
DD11-CL1 AM FCE	DD11-CL1	1C	StW22	Fe P 11	AP11	C1008	CS Type B
DD12 EN 10111	DD12						
DD12 AM FCE	DD12		RStW23				
DD13 EN 10111	DD13						
DD13 AM FCE	DD13	3C	StW24	Fe P 13	AP13		DS Type B
DD14 EN 10111	DD14						
DD14 AM FCE	DD14	3CT					
<i>DD15 AM FCE</i>							

Grades in italics: not included in the standard

	BS 1449	PN-89/H-84023/03:1989	ZN-96/0632-08/03:1996	CSN	Old brand names
DD11 EN 10111					
DD11 AM FCE	HR3	08J	08Al	11321-11331	Solstamp 25
DD11-CL1 AM FCE	HR3				Solstamp 25
DD12 EN 10111					
DD12 AM FCE				11325	
DD13 EN 10111					
DD13 AM FCE	HR1			11305	Solstamp 30
DD14 EN 10111					
DD14 AM FCE				11305	Solstamp 33
<i>DD15 AM FCE</i>					<i>Solstamp 37/Extra DD14</i>

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# Dimensions

## Mill finish

Thickness (mm)	Min width	DD11 EN 10111, DD11 AM FCE	DD11-CL1 AM FCE	DD12 EN 10111, DD12 AM FCE	DD13 EN 10111, DD13 AM FCE	DD14 EN 10111, DD14 AM FCE	DD15 AM FCE
		Max width	Max width	Max width	Max width	Max width	Max width
1.50 ≤ th < 1.70	1000	1560	1560	1560	1560	1340	-
1.70 ≤ th < 1.80	800	1620	1620	1620	1620	1460	1260
1.80 ≤ th < 1.90		1630	1630	1630	1630	1630	1330
1.90 ≤ th < 2.00		1780	1780	1780	1780	1780	1400
2.00 ≤ th < 2.20		1830	1830	1830	1830	1830	1470
2.20 ≤ th < 2.40							1620
2.40 ≤ th < 2.60		2000	2000	2000	1930	1940	1690
2.60 ≤ th < 2.80		2150	2150	2150	1980	1980	1800
2.80 ≤ th < 3.30					2030	2030	1860
3.30 ≤ th < 8.00					2130	2130	2030
8.00 ≤ th < 12.00		2150	-	-	-	-	-
12.00 ≤ th < 13.00							
13.00 ≤ th < 15.00							
15.00 ≤ th < 16.00							

Pickled

Thickness (mm)	Min width	DD11 EN 10111, DD11 AM FCE, DD11-CL1 AM FCE	DD12 EN 10111, DD12 AM FCE	DD13 EN 10111, DD13 AM FCE	DD14 EN 10111, DD14 AM FCE	DD15 AM FCE
		Max width	Max width	Max width	Max width	Max width
1.50 ≤ th < 1.70	800	1540	1540	1540	1530	1530
1.70 ≤ th < 1.90		1610	1600	1610	1610	1610
1.90 ≤ th < 2.00		1780	1780	1780	1780	1640
2.00 ≤ th < 2.20		1830	1830	1830	1830	1650
2.20 ≤ th < 2.40						1670
2.40 ≤ th < 2.60		2000	2000	1930	1940	1680
2.60 ≤ th < 2.80		2070	2070	1980	1980	
2.80 ≤ th < 3.30				1750		
3.30 ≤ th < 4.50				1880		
4.50 ≤ th < 5.00		2000	2000	2000	2000	1780
5.00 ≤ th < 6.30						1790
6.30 ≤ th < 7.00						
7.00 ≤ th < 8.00	900	1550	1550	1550	1550	
8.00 ≤ th < 12.00		1520	1520	-	-	-
12.00 ≤ th < 13.00			-	-	-	-

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# Mechanical properties

	Direction	Thickness (mm)	R <sub>e</sub> (MPa)	R <sub>m</sub> (MPa)	A <sub>80</sub> (%)	A 5.65√S <sub>0</sub> (%)	MP guarantees (Months)
DD11 EN 10111	T	1.5 - 2	170 - 360	< 440	≥ 23	-	-
		2 - 3	170 - 340		≥ 24	-	
		3 - 11			-	≥ 28	
DD11 AM FCE	T	1.5 - 2	170 - 360	< 440	≥ 23	-	-
		2 - 3	170 - 340		≥ 24	-	
		3 - 11			-	≥ 28	
		11 - 16	<b>170 - 340</b>		-	≥ 28	
DD11-CL1 AM FCE	T	1.5 - 2	<b>200</b> - 360	<b>270</b> - 440	≥ 23	-	-
		2 - 3	<b>200</b> - 340		≥ 24	-	
		3 - 13			-	≥ 28	
DD12 EN 10111	T	1.5 - 2	170 - 340	< 420	≥ 25	-	≥ 6
		2 - 3	170 - 320		≥ 26	-	
		3 - 8			-	≥ 30	
		8 - 11			-	-	
DD12 AM FCE	T	1.5 - 2	<b>200</b> - 340	<b>290</b> - 420	≥ 25	-	≥ 6
		2 - 3	<b>200</b> - 320		≥ 26	-	
		3 - 11			-	≥ 30	
		11 - 15	<b>200 - 320</b>		-	≥ 30	
DD13 EN 10111	T	1.5 - 2	170 - 330	< 400	≥ 28	-	≥ 6
		2 - 3	170 - 310		≥ 29	-	
		3 - 11			-	≥ 33	
DD13 AM FCE	T	1.5 - 2	<b>200</b> - 330	<b>300</b> - 400	≥ 28	-	≥ 6
		2 - 3	<b>200</b> - 310		≥ 29	-	
		3 - 11			-	≥ 33	
		11 - 12	<b>200 - 310</b>		-	≥ 33	
DD14 EN 10111	T	1.5 - 2	170 - 310	< 380	≥ 31	-	≥ 6
		2 - 3	170 - 290		≥ 32	-	
		3 - 8			-	≥ 36	
DD14 AM FCE	T	1.5 - 2	<b>180</b> - 310	<b>290</b> - 380	≥ 32	-	≥ 12
		2 - 3	<b>180</b> - 290		≥ 33	-	
		3 - 8			-	≥ 37	

Values in bold: tighter than the standard

	Direction	Thickness (mm)	R <sub>e</sub> (MPa)	R <sub>m</sub> (MPa)	A <sub>80</sub> (%)	A 5.65√S <sub>0</sub> (%)	MP guarantees (Months)
<i>DD15 AM FCE</i>	T	1.8 - 2	180 - 290	270 - 350	≥ 33	-	≥ 12
		2 - 3	180 - 270		≥ 34		
		3 - 8			-	≥ 40	
Grades in italics: not included in the standard							



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# Chemical composition

	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Al (%)	C <sub>eq</sub> (%)	Galvanisation
DD11 EN 10111	≤ 0.120	≤ 0.60	≤ 0.045	≤ 0.045	-	-	-	No
DD11 AM FCE	≤ 0.120	≤ 0.60	≤ 0.045	≤ <b>0.030</b>	-	≥ <b>0.010</b>	≤ <b>0.19</b>	No
DD11-CL1 AM FCE	<b>0.020 - 0.100</b>	<b>0.15 - 0.50</b>	≤ <b>0.030</b>	≤ <b>0.030</b>	≤ <b>0.03</b>	-	-	Class 1
DD12 EN 10111	≤ 0.100	≤ 0.45	≤ 0.035	≤ 0.035	-	-	-	No
DD12 AM FCE	<b>0.020 - 0.100</b>	≤ 0.45	≤ <b>0.030</b>	≤ <b>0.030</b>	≤ <b>0.03</b>	≥ <b>0.020</b>	≤ <b>0.18</b>	Class 1
DD13 EN 10111	≤ 0.080	≤ 0.40	≤ 0.030	≤ 0.030	-	-	-	No
DD13 AM FCE	≤ 0.080	≤ 0.40	≤ <b>0.025</b>	≤ <b>0.025</b>	≤ <b>0.03</b>	≥ <b>0.020</b>	≤ <b>0.15</b>	Class 1
DD14 EN 10111	≤ 0.080	≤ 0.35	≤ 0.025	≤ 0.025	-	-	-	No
DD14 AM FCE	≤ 0.080	≤ 0.35	≤ <b>0.020</b>	≤ 0.025	≤ <b>0.03</b>	≥ <b>0.020</b>	≤ <b>0.15</b>	Class 1
<i>DD15 AM FCE</i>	≤ 0.060	≤ 0.35	≤ 0.020	≤ 0.020	≤ 0.03	≥ 0.020	≤ 0.15	Class 1

Grades in italics: not included in the standard

Values in bold: tighter than the standard

**Any questions?**

Ask them via our contact form on <https://industry.arcelormittal.com/getintouch>

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