



C10 - Cold rolled steels for conventional enamelling

Enamelled steel is eminently suitable for use in the sanitary ware industry, which has very rigorous requirements with regard to hygiene and bacteriological resistance.

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Properties

After drawing, cold rolled steels for conventional enamelling are used for:

- Ground-coat enamelling one coat / one fire
- Conventional enamelling two coats / two fires

Grades DC01EK, DC04EK, DC05EK and DC06EK comply with EN 10209. Grade DC05EK was developed for the manufacture of bathtubs. Grade DC07EK AM FCE is intended for very deep drawing applications.

It is worth noting that the DC06EK EN 10209:2013 and DC07EK AM FCE grades are also compatible with the two-coat / one-fire enamelling process.

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Advantages

These grades are suitable for light and deep drawing and two-side enamelling adapted to the client's process (wet or dry enamelling). They also offer excellent resistance to "fish scale" defects. We can guarantee a minimum TH of 100, in accordance with EN 10209 for grades DC01EK, DC03EK AM FCE, DC04EK and DC05EK.

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Applications

These steels have many applications:

- Domestic appliances (cooking, laundry)
- Sanitary ware (bathtubs, shower trays, sinks), in particular grade DC05EK EN 10209, which has improved mechanical properties for the manufacture of bathtubs
- Architectural panels (building interiors and exteriors, transport and infrastructure), signage
- Industry

Recommendations for use

Forming

The different grades are adapted to the difficulty of enamelling the given parts.

- Grades DC01EK EN 10209 and DC03EK AM FCE are intended for easy forming by bending or moderate drawing. Grade DC04EK EN 10209 is intended for more difficult deep drawing operations.
- Grade DC05EK EN 10209, which has superior mechanical properties compared with DC04EK EN 10209, is especially intended for forming bathtubs.
- Grades DC06EK EN 10209 and DC07EK AM FCE, interstitial free steel (IFS) with low carbon content and excellent rheological and mechanical properties, can be used for forming very complex parts.

Joining

Grades DC01EK EN 10209, DC03EK AM FCE, DC04EK EN 10209, DC05EK EN 10209, DC06EK EN 10209 and DC07EK AM FCE can be welded without any difficulty, whatever the welding process may be. Other joining processes (clinching, crimping) may also be used.

Enamelling

Surface preparation:

- If an additive-free ground-coat enamel is used (e.g. without adhesion oxides), light pickling is recommended after meticulous degreasing (targeting an iron loss of 5 g/m² per side), especially for grades DC06EK EN 10209 and DC07EK AM FCE, which have a lower surface reactivity. In this case, surface reactivity can be improved by a nickel flash
- Pickling can be avoided by using a ground-coat enamel with the addition of adhesion oxides (nickel or cobalt oxides)

Application of the enamel and firing:

- Grades DC01EK EN 10209, DC03EK AM FCE, DC04EK EN 10209, DC05EK EN 10209, DC06EK EN 10209 and DC07EK AM FCE are compatible with all the common enamelling processes: wet spraying, wet or dry electrostatic deposition
- These grades have a very good level of internal purity (few inclusions) and consistency. The risk of the appearance of defects such as black dots, lines or bubbles is minimal. A good resistance to "fish scale" defects is obtained through tight control of manufacturing conditions

Finally, firing is performed at a temperature of about 830°C.

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Brand correspondence

	EN 10209:2013	NFA 36401	DIN 1623/3	UNI 5866	BS 1449/1	ASTM 424	JIS 3141+3133	Old brand names
DC01EK EN 10209	DC01EK	EME	EK2	FeP02S	CR3VE		SPCD	
<i>DC03EK AM FCE</i>								
DC04EK EN 10209	DC04EK	EMES	EK4	FeP04S	CR1VE	Type 2		
DC05EK EN 10209	DC05EK							FeK4 B/DC04EK+
DC06EK EN 10209	DC06EK					Type 3		
<i>DC07EK AM FCE</i>								

Grades in italics: not included in the standard

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Dimensions

Thickness (mm)	Min width	DC01EK EN 10209, DC03EK AM FCE, DC04EK EN 10209		DC05EK EN 10209	DC06EK EN 10209, DC07EK AM FCE
		Max width		Max width	Max width
0.50 ≤ th < 0.55	600	1675		1660	1665
0.55 ≤ th < 0.60		1865			
0.60 ≤ th < 0.75		1865		1865	1865
0.75 ≤ th < 3.00		2069			

For thicknesses below 0.5 mm, please contact us.

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Mechanical properties

	Direction	Thickness (mm)	R _e (MPa)	R _m (MPa)	A ₈₀ (%)	r ₉₀	r average	n ₉₀
DC01EK EN 10209	T	0.4 - 0.5	140 - 310	270 - 390	≥ 26	-	-	-
		0.5 - 0.7	140 - 290		≥ 28			
		0.7 - 3	140 - 270		≥ 30			
<i>DC03EK AM FCE</i>	T	0.4 - 0.5	140 - 280	270 - 350	≥ 28	-	-	-
		0.5 - 0.7	140 - 260		≥ 30			
		0.7 - 3	140 - 240		≥ 32			
DC04EK EN 10209	T	0.4 - 0.5	140 - 260	270 - 350	≥ 32	-	-	-
		0.5 - 0.7	140 - 240		≥ 34			
		0.7 - 3	140 - 220		≥ 36			
DC05EK EN 10209	T	0.7 - 3	140 - 220	270 - 350	≥ 36	-	≥ 1.5	-
DC06EK EN 10209	T	0.4 - 0.5	120 - 230	270 - 350	≥ 36	-	-	-
		0.5 - 0.7	120 - 210		≥ 38		≥ 1.6	
		0.7 - 2	120 - 190				≥ 1.4	
		2 - 3					≥ 1.4	
<i>DC07EK AM FCE</i>	T	0.5 - 2	90 - 160	270 - 350	≥ 40	≥ 1.7	-	≥ 0.190
		2 - 3				≥ 1.5		

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Chemical composition

	C (%)	Mn (%)	P (%)	S (%)	Ti (%)
DC01EK EN 10209	≤ 0.080	≤ 0.60	≤ 0.045	≤ 0.050	-
<i>DC03EK AM FCE</i>	≤ 0.080	≤ 0.50	≤ 0.030	≤ 0.050	-
DC04EK EN 10209	≤ 0.080	≤ 0.50	≤ 0.030	≤ 0.050	-
DC05EK EN 10209	≤ 0.080	≤ 0.50	≤ 0.025	≤ 0.050	-
DC06EK EN 10209	≤ 0.020	≤ 0.50	≤ 0.020	≤ 0.050	≤ 0.200
<i>DC07EK AM FCE</i>	≤ 0.020	≤ 0.50	≤ 0.030	≤ 0.050	≤ 0.200

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Any questions?

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

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