



Steels for Hot Stamping

Product Characteristics

The Usibor® and Ductibor® family of steels along with 22MnB5 have very high mechanical strength after hot stamping. These steels are included in the suite of products developed by ArcelorMittal to meet vehicle weight reduction requirements. Usibor®, Ductibor® and 22MnB5 are intended for use in automobile structural and safety components. These steels are designed to be heat treated and then die-quenched during the hot stamping process. The mechanical properties of the final part make significant weight savings possible (up to 50 percent compared to standard high yield strength steel). The very high yield strength of these steels after heat treatment and hot stamping make them suitable for anti-intrusion and safety cage components, including bumper beams, door beams, B-pillars, A-pillars, roof rails, cross-bows and traverse and longitudinal members.

The manufacturing process of these steels, and the thermo-mechanical treatment they undergo during hot rolling, result in good structural uniformity and quenchability, ensuring good response to heat treatment and hot stamping.

The main advantages to Usibor®, Ductibor® and 22MnB5 are:

- Separation of forming and service properties
- High hot formability allowing relatively complex geometries
- Absence of part springback

ArcelorMittal was the first steelmaker to offer the automotive industry a coated press hardened steel: Usibor® 1500 and Ductibor® 500. Further developments have now introduced Usibor® 2000 and Ductibor® 1000.

Usibor® and Ductibor® have aluminum-silicon pre-coating and was developed to protect the metal from oxidation (scale) and decarburization during hot stamping. The pre-coating is applied to the coils in a continuous process, similar to zinc coatings.

Usibor® 1500-GI galvanized Zn (for process of indirect stamping only) and Usibor® 1500 and USIBOR®2000-GA galvanized ZnFe (for direct and indirect stamping process) are also available to order.

Usibor® and Ductibor® hot stamped parts do not require corrosion protection prior to assembly. The additional advantages of Usibor® and Ductibor® (above and beyond those of 22MnB5) are:

- Elimination of the shot-blasting step required for conventional uncoated hot forming steels (no scale)
- Very good final part geometric tolerance (no shot-blasting, hence no deformation)
- Excellent final part corrosion resistance
- No decarburization
- Simplified process and cost savings (no shot-blasting, no inert atmosphere in ovens)

Applications

Because of their high mechanical strength after hot stamping, Usibor®, Ductibor® and 22MnB5 are particularly well suited for the entire range of structural parts in a vehicle's Body in White (BIW) and especially for safety parts.

Ductibor® is a high-strength press hardenable steel that offers good energy absorption capacity. Typical applications for Ductibor® include energy absorption parts such as front and rear rails and lower B-pillars/door rings.

Most of the current applications are intrusion resistant passenger safety cage and engine compartment components:

Chemistry - Typical

	C	Mn	Si	Other
22MnB5/modified	0.24	1.2	0.2	Cr, Mo, B

Chemistry - Max

	C	Mn	Si	Other
Usibor® 1500	0.23	1.2	0.25	Cr, Ti, B
Usibor® 2000	0.34	0.6	0.5	Cr, Mo, Ti, Nb, Ni, B
Ductibor® 500	0.08	1.7	0.35	Nb, Ti
Ductibor® 1000	0.1	1.8	0.6	Nb, Ti, B



Mechanical Properties (ASTM-L) - Typical

	Yield strength (MPa)	Ultimate tensile strength (MPa)	Total elongation (per cent)
As delivered - before hot stamping (information only)			
22MnB5	400	600	≥10
Usibor®1500	400	600	≥10
Usibor®2000	550	700	≥10
Ductibor®500	580	650	≥10
Ductibor®1000	500	750	≥10
After Hot Stamping - according to best practices - with and without Paint Bake cycle - 170 degrees C for 20 minutes			
22MnB5	1100	1500	6
Usibor®1500	1100 (HT only)	1500 (HT only)	6
	1160 (HT +PB)	1480 (HT +PB)	6
Usibor®2000	1300 (HT only)	1900 (HT only)	5
	1450 (HT +PB)	1850 (HT +PB)	5
Ductibor®500	380 (HT only)	620 (HT only)	13
	400 (HT +PB)	620 (HT +PB)	13
Ductibor®1000	850 (HT only)	1050 (HT only)	6
	900 (HT+PB)	1050 (HT+PB)	6

Size Availability

22MnB5

THICKNESS (MM)	nominal											
		HR	HR	HR	HR	HR	HR	HR	HR			
25.5		HR	HR	HR	HR	HR	HR	HR	HR			
6.0		HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO			
5.6		HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO			
5.2		HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO			
4.6		HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO			
4.2		HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO			
3.6		HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO			
3.2		HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO			
2.6		HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO	HR/HRPO			
1.0-2.3					CR	CR	CR	CR	CR	CR		
0.8-0.9					CR	CR	CR	CR				
		900	1000	1100	1200	1300	1400	1500	1600	1700	1800	

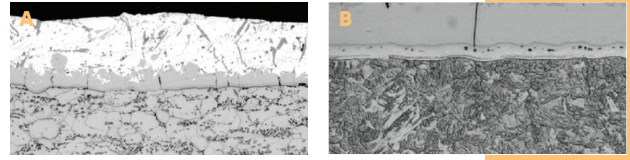
Available dimensionally Inquire for dimensional availability

Usibor® 1500

THICKNESS (MM)	nominal										
2.4											
2.2											
2.0											
1.8											
1.6											
1.4											
1.2											
1.0											
0.8											
		900	1000	1100	1200	1300	1400	1500	1600	1700	

Available dimensionally Inquire for dimensional availability

Metallography



A Prior to heat treatment
ferrite pearlite as delivered coating

B After heat treatment
100 percent martensite with alloyed coating

Usibor® 2000

THICKNESS (MM)	nominal										
2.6											
2.4											
2.2											
2.0											
1.8											
1.6											
1.4											
1.2											
1.0											
0.8											
0.6											
		900	1000	1100	1200	1300	1400	1500	1600	1700	

Available dimensionally Inquire for dimensional availability

Ductibor® 500

THICKNESS (MM)	nominal										
2.6											
2.4											
2.1											
2.0											
1.8											
1.6											
1.4											
1.2											
1.0											
0.8											
0.6											
		900	1000	1100	1200	1300	1400	1500	1600	1700	

Available dimensionally Inquire for dimensional availability

Ductibor® 1000

THICKNESS (MM)	nominal										
2.6											
2.4											
2.2											
2.0											
1.8											
1.6											
1.4											
1.2											
1.0											
0.9											
0.6											
		900	1000	1100	1200	1300	1400	1500	1600	1700	

Available dimensionally Inquire for dimensional availability

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