



# Hot Roll Grades

## Grade Availability

ArcelorMittal offers the following hot roll products with tensile strength levels ranging from 540 to 980 MPa

	Uncoated	Hot Dipped Galvanize (GI)	Hot Dipped Galvanneal (GA)
HR540	Commercial		
HR540-HHE			
HR590	Commercial		
HR590-HHE			
HR780	Commercial		
HR780-HHE			
HR980	Commercial		

Commercial

## Product Characteristics

This family of hot roll steels includes products combining high tensile strength (UTS) with excellent formability and hole expansion (stretch flangeability) based on their largely ferrite-bainite microstructures. The primary advantage of ferrite-bainite steels over HSLA and Dual Phase steels is the improved stretchability of sheared edges as measured by the hole expansion test. Compared with HSLA steels with the same level of tensile strength, ferrite=bainite steels generally also have a higher strain hardening exponent (n-value and increased total elongation.

## Applications

These steels are suitable for cold drawing with edge stretch or hole expansion requirements.



Main applications are:

- Structural parts (cross members, chassis and suspension systems)
- Wheels
- Mechanical parts (suspension system components, gear box components, etc.)

## Chemistry - Typical

	C	Mn	Si	Other
HR540	0.800	1.50	0.10	Nb
HR540-HHE	0.085	1.25	0.65	
HR590	0.065	1.50	0.30	
HR590-HHE	0.065	1.50	0.30	
HR590-HHE GI/GA	0.060	1.50	0.30	Nb, Ti
HR780	0.040	1.50	0.55	
HR780-HHE	0.040	1.50	0.55	
HR780-HHE GI/GA	0.060	1.50	0.20	Cr, Mo, Nb, Ti
HR980	0.070	2.50	1.20	Nb, Ti, B

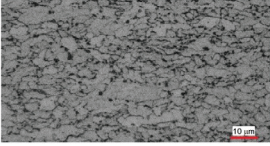
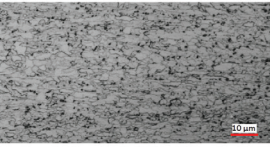
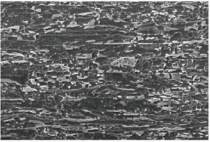
## Mechanical properties - Typical

	Test Direction	Yield Strength (MPa)	Ultimate Tensile Strength (MPa)	Total Elongation	Hole Expansion	Bend Ratio
HR540	JIS-T	510	590	26 percent		
HR540-HHE	JIS-T	500	570	27 percent	80 percent min	
HR590	JIS-T	575	640	24 percent		
FHR590-HHE	JIS-T	575	640	24 percent	75 percent min	
FHR590-HHE GI/GA	ASTM-L	560	620	20 percent	75 percent min	
	JIS-T	570	630	24 percent	75 percent min	
HR780	ASTM-L	690	815	16 percent		
HR780-HHE	ASTM-L	690	815	16 percent	45 percent min	
	JIS-T	760	840	16 percent	45 percent min	
HR780-HHE GI/GA	ASTM-L	760	820	16 percent	45 percent min	
	JIS-T	800	850	17 percent	45 percent min	
HR980	JIS-T	870	1040	13 percent		≤ 2.0

## Size Availability

	Thickness Range	Maximum Width
HR540	1.8 - 5.8 mm	1840 mm
HR540-HHE	1.8 - 5.8 mm	1840 mm
HR590	2.1 - 6.0 mm	1600 mm
HR590-HHE	2.1 - 6.0 mm	1600 mm
HR590-HHE GI/GA	2.1 - 4.2 mm	1450 mm
HR780	2.6 - 4.0 mm	1290 mm
HR780-HHE	2.6 - 4.0 mm	1290 mm
HR780-HHE GI/GA	2.4 - 4.2 mm	1450 mm
HR980	2.3 - 4.0 mm	1249 mm

## Metallography

HR540 HR540-HHE HR590 HR590-HHE	 <p>Approximately 85 percent ferrite and 15 percent bainite</p>
HR780 HR780-HHE	 <p>Predominately bainite with finely dispersed martensite/austenite islands and small amounts of polygonal ferrite</p>
HR980	 <p>Ferrite, bainite, tempered and fresh martensite, and carbides</p>

### ArcelorMittal North America

833 W. Lincoln Hwy Suite 200E, Schererville, Indiana 43675

T +1 800 422 9422 | [automotiveNA@arcelormittal.com](mailto:automotiveNA@arcelormittal.com) | [automotive.arcelormittal.com](http://automotive.arcelormittal.com) | [northamerica.arcelormittal.com](http://northamerica.arcelormittal.com) | [dofasco.arcelormittal.com](http://dofasco.arcelormittal.com)

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