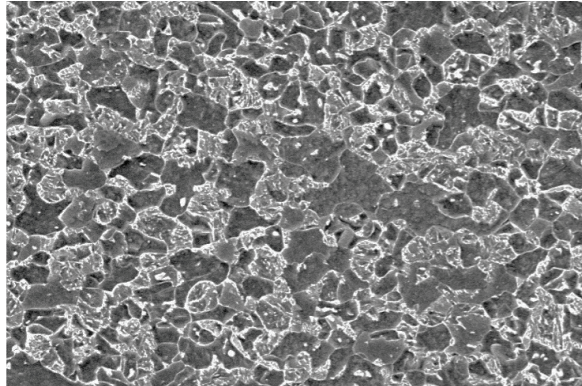
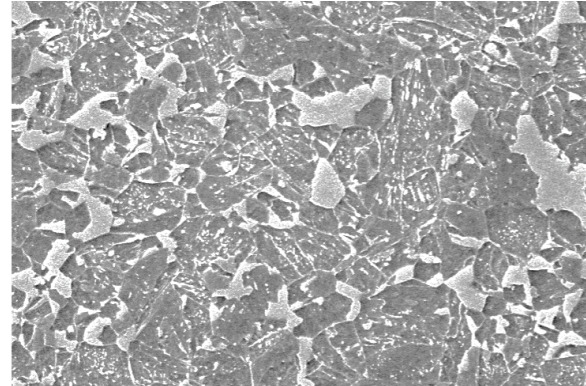


Metallography

For comparison, let's examine products at the 980 MPa tensile strength level, in order of increasing formability.

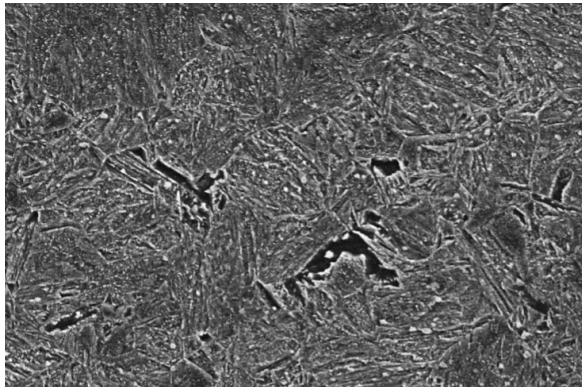


980DP: ferrite, bainite, fresh martensite

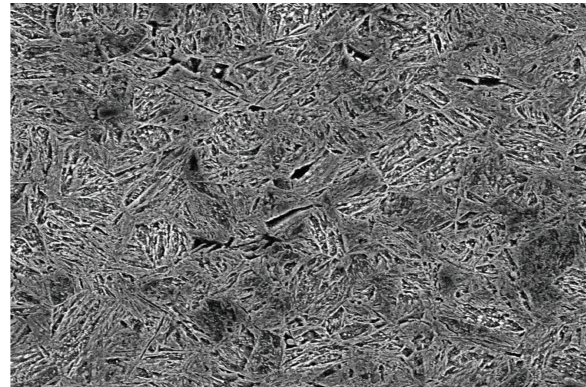


MartInsite® MP980: bainite, tempered martensite, fresh martensite

The microstructure for CR MartInsite® MP1300 and CR MartInsite® MP1500 were provided below:



CR MartInsite® MP1300: tempered martensite, bainite, ferrite



CR MartInsite® MP1500 : tempered martensite, bainite, ferrite



North American Automotive

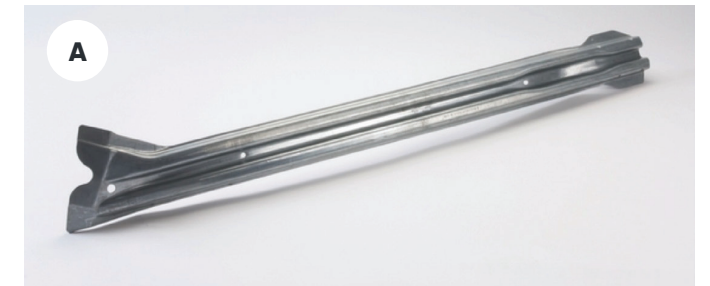


Multi-Phase Steels

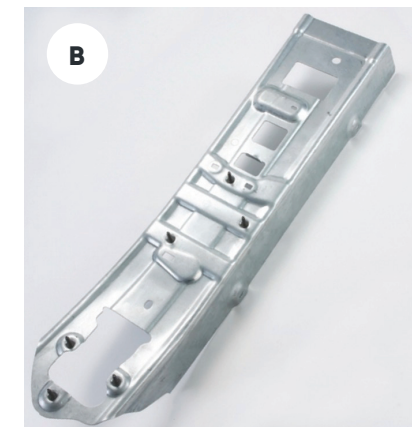
Grade Availability

ArcelorMittal's multi-phase MartInsite® MP cold roll (CR) and hot dip galvanize (HDG) grade offerings currently include products from 980MPa to 1500MPa, as shown in the table below.

CR	MartInsite® MP980
	MartInsite® MP1300
	MartInsite® MP1500
GI	MartInsite® MP980
	MartInsite® MP1300



A



B

A 980TS door beam

B 780TS tunnel stiffener

Product Characteristics

MartInsite® MP steels are cold formed to make lightweight structural elements. When discussing MartInsite® MP steels, it is appropriate to consider dual phase grades as the baseline for comparison. The progression of value added by the physical properties of these products is: 1) dual phase (DP), 2) MartInsite® MP.

At a given tensile strength level:

- Dual phase steel provides a higher total elongation and lower yield strength. It has limitations of hole expansion and bendability.
- Complex phase steel (CP) provides a much higher yield strength, a much better hole expansion ratio and superior bendability as compared to the DP steel. It has lower total elongation than a DP steel.
- MartInsite® MP steel provides mechanical properties in between DP and CP steels.

Applications

Given their high energy absorption capacity and fatigue strength, these grades are particularly well suited for automotive safety components requiring good impact strength, and for suspension system components. MartInsite® MP and complex phase grades can meet forming requirements for applications where a dual phase grade may not be adequate. This would most likely be related to hole expansion and/or bendability needs.

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Chemistry – Typical (Bare)

Grade	Max C	Max Mn	Max Si	Other
MartInsite® MP980	0.18	2.7	1.0	Cr, Mo, Ti, Nb, B
MartInsite® MP1300	0.36	2.6	1.0	Cr, Mo, Ti, Nb, B
MartInsite® MP1500	0.36	2.6	1.0	Cr, Mo, Ti, Nb, B

Chemistry – Typical (GI)

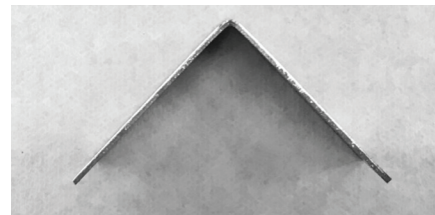
Grade	Max C	Max Mn	Max Si	Other
MartInsite® MP980	0.18	2.7	1.0	Cr, Mo, Ti, Nb, B
MartInsite® MP1300	0.36	2.6	1.0	Cr, Mo, Ti, Nb, B

Mechanical Properties - Ranges or Target Minimums as compared to DP grades at same tensile strength

Grade	Yield strength min, MPa	Tensile strength min, MPa	Minimum total elongation A50, %	Bend ratio r/t	Hole expansion %
CR980T/550Y-DP	550	980	8%	≤ 3.0	~ 20%
CR/ GI MartInsite® MP980	700	980	8%	≤ 2.5	≥ 35%
CR/ MartInsite® MP1300	1030	1300	6%	≤ 2.5*	≥ 20%
CR/ MartInsite® MP1500	1100	1500	6%	≤ 3.0*	≥ 20%



980DP Bend test

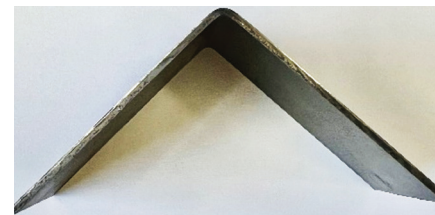


MartInsite® MP980 Bend test

The pictures to the left depict the hole expansion tests on 980DP and MartInsite® MP980 products. The photos reflect the completion of the test. Note that the high strength MP grades exhibit similar or better formability than 980DP.

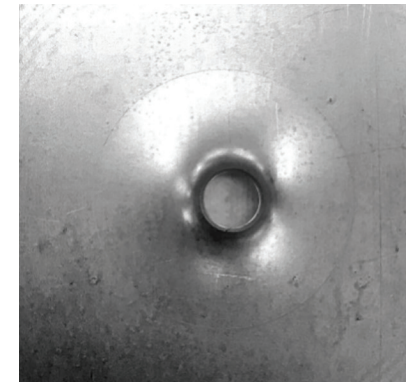


CR MartInsite® MP1300 Bend test

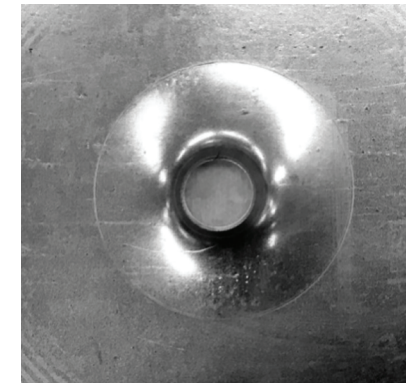


CR MartInsite® MP1500 Bend test

The pictures to the left depict the bend tests on CR MartInsite® MP1300 and CR MartInsite® MP1500 grades. The photos reflect the completion of the test. Note that the high strength MartInsite® MP grades exhibit similar or better formability than 980DP.

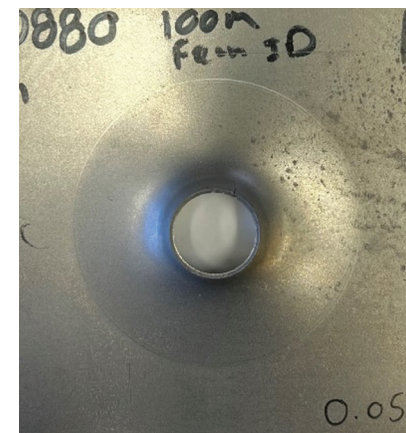


980DP Hole expansion test

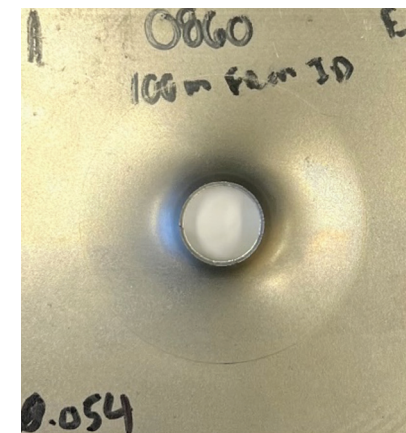


MartInsite® MP980 Hole expansion test

The pictures to the left depict the hole expansion tests on 980DP and MartInsite® MP980 products. The photos reflect the completion of the test. Note that the high strength MP grades exhibit similar or better formability than 980DP.



CR MartInsite® MP1300 Hole expansion test



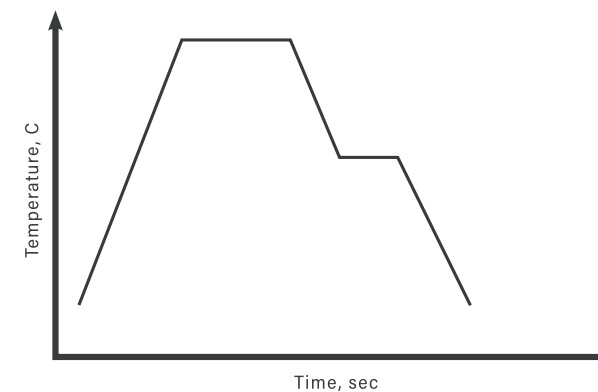
CR MartInsite® MP1500 Hole expansion test

The pictures to the left depict the hole expansion tests on CR MartInsite® MP1300 and CR MartInsite® MP1500 products. The photos reflect the completion of the test.

Mill Processing

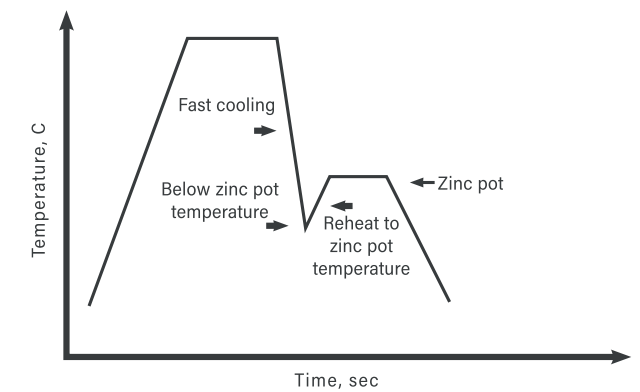
The mill processing necessary to achieve a MartInsite® MP microstructure is unique, requiring a process called low-end cooling. A traditional or typical continuous anneal process cannot achieve the necessary steel temperatures that would result in the formation of a multi-phase microstructure. A unique anneal practice with specialized equipment is necessary.

Traditional Hot Dip Thermal Profile



This traditional anneal process would produce, for example, 780DP.

Modified Hot Dip Thermal Profile



This anneal process produces MartInsite® MP.