Industeel

ArcelorMittal

Mecasteel 90

Mecasteel 90: prehardened forged rolled steel

Mecasteel 90 is a steel grade delivered in prehardened condition (YS ≥ 90 KSI - 620 MPa) and available in a very large dimensional program (width ~ 78" - 2 m, thickness up to 37.4" - 950 mm).

It can be used in substitution to conventional engineering steels, such as AISI 4130 for example in the manufacture of massive steel components (machines, hydraulic systems...).

Its original chemistry and heat treatment process enable to obtain, in delivery condition, very consistent mechanical properties throughout the whole blocks, even for the heaviest gage.

Consequently, and unlike 4130 type steels, **this material doesn't need any further hardening after machining,** allowing substantial cost savings.

Although it is delivered in prehardened condition, Mecasteel 90 provides outstanding machinability. Its low carbon leads also to excellent weldability and toughness compared to conventional steels.

PROPERTIES

CHEMICAL ANALYSIS - GUARANTEED% WEIGHT

C	S max	P max	Cr	Mn	Mo	Boron max
0.23 - 0.28	0.010	0.01	1.2 - 1.6	1.2 - 1.6	0.35 - 0.55	0.003

PHYSICAL PROPERTIES

Density = 7.85 kg/dm^3

Thermal conductivity W.m^{-1}.°K^{-1}	Thermal expansion coefficient 10^{-6}°K^{-1}			
at 68°F	68 - 212°F	68 - 392°F	68 - 572°F	68 - 752°F
40	11.9	12.4	12.8	13.1

GUARANTEED MECHANICAL PROPERTIES (IN DELIVERY CONDITION)

Hardness

Hardness ≥ 240 HB.

Tensile properties

	YS 0.2	UTS	Elongation (%)	Red of area (%)
KSI	≥ 90	≥ 110	≥ 15	≥ 30
MPa	≥ 620	≥ 758		

Guaranteed values in length and transverse direction.

Impact properties

	- 4°F	- 20°F	- 40°F
	- 20°C	- 29°C	- 40°C
Ft.lb	≥21 (single value) ≥31 (average of 3 specimen)		
J	≥28 (single value) ≥42 (average of 3 specimen)		
Lat. expension	≥0.015" - 0.38 mm		
Guaranteed in length direction according to ASTM A370 Guaranteed on a QTC (Qualification Test Coupon) or on prolongation at 2.5" (63.5 mm) from the skin of the solid block			

(for hardness within 240/270 HB) Slightly different properties may be achieved on request - Please consult.

TYPICAL MECHANICAL PROPERTIES (IN DELIVERY CONDITION)

Hardness

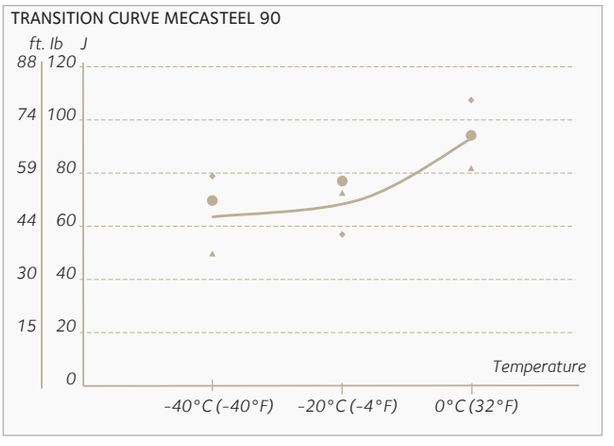
Typical value: 260 HB.

Tensile properties

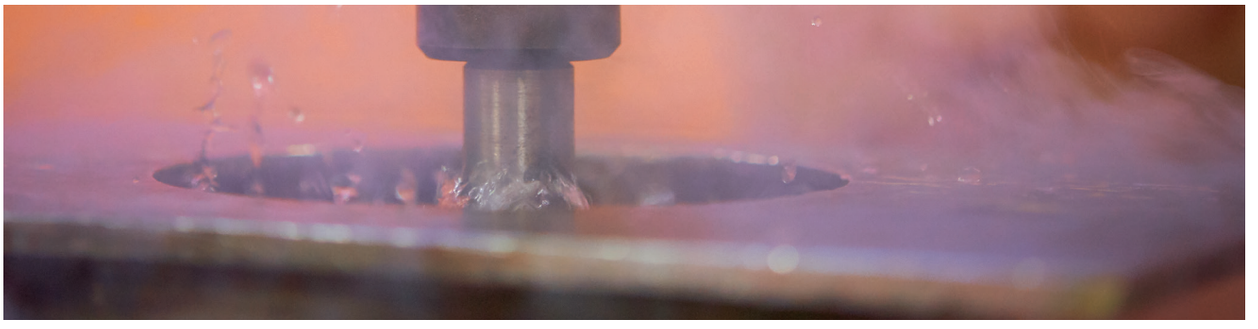
		YS 0.2 KSI (MPa)	UTS KSI (- MPa)	Elongation (%)	Red. of area (%)
Lengh direction	Skin - 2.5"	95.0 (655)	116.2 (801)	23	66
	¼ th.	93.1 (642)	115.0 (793)	24	63
	½ th.	95.0 (655)	117.5 (810)	18	43
Transverse direction	Skin - 2.5"	97.6 (680)	117.4 (823)	22	64
	¼ th.	94.9 (654)	116.2 (801)	18	46
	½ th.	95.0 (655)	116.5 (803)	19	50

Typical value measured on a block 30.7 (780 mm) thick.

Impact properties



Typical value measured 2,5" below the skin of a block 30.7" (780 mm) thick



STRUCTURE

Mecasteel 90 is melted in an electric arc furnace and refined using either a VOD or DH process. These processes ensure a stringent control of the chemical analysis and an extremly low level of residual oxygen. Cleanliness of the steel is consequently enhanced. Optimized chemical analysis and accurate control of solidification parameters contribute to a more homogeneous microstructure.

Cleanliness

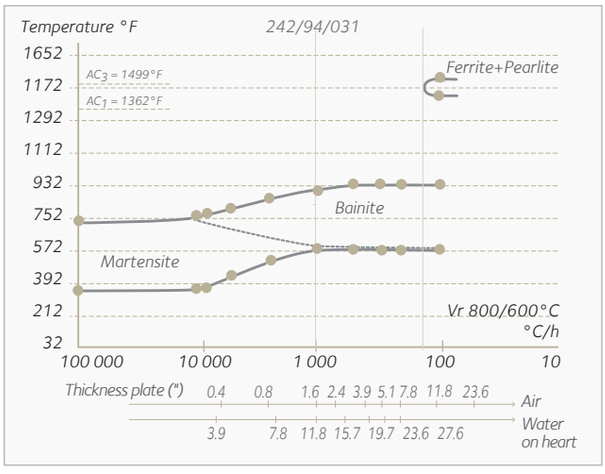
Mecasteel 90 quality offers improved cleanliness (close to ESR quality), over conventional grades. Guaranteed cleanliness per ASTM E45 method A (worst field).

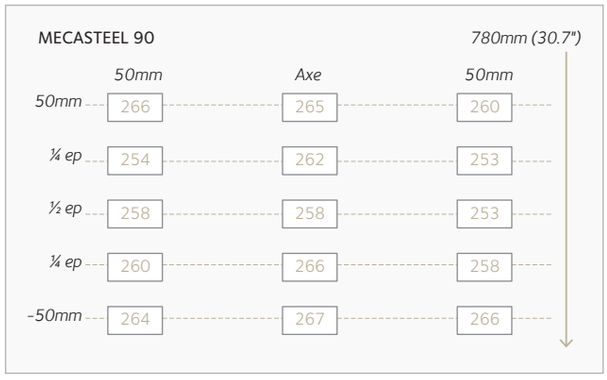
A	B	C	D
≤ 1.5	≤ 1.5	≤ 1.0	≤ 1.5

Transformation points

	AC_1 °F	AC_3 °F	M_s °F
Mecasteel 90	1362	1499	716

CCT Diagramm





Hardness homogeneity of a 780 mm / 30.7" thick block Mescasteel 90.

Compared with standard grades, the optimized chemical analysis of Mecasteel 90 allows the homogeneity to be improved throughout the thickness (reduction of the critical speed of ferrite/pearlite formation and extension of bainitic zone). This improved chemical analysis also avoids the formation of retained austenite, which is the major cause of hard spots.

COMPACTNESS

All blocks are UT according to ASTM A388 (1/8" FBH).

MAGNETIC PARTICLE INSPECTION

MECASTEEL 90 is capable of AMS 2301.

DELIVERY CONDITIONS

MANUFACTURING PROGRAM

Quenched and tempered.

For specific sizes, please ask us.

Thicknesses	Widths
from 5" to 37.4"	from 40" to 80"
from 127 mm to 950 mm	from 1016 mm to 2032 mm

WELDING

The welding of Mecasteel 90 requires a preheating at least 225°C / 437°F whereas interpass temperature should remain below 300°C / 572°F. After the welding, the PWHT should be done at ≈ 580°C to remove welding stress. Mecasteel 90 can be welded using SAW and SMAW process. Consumables used for the welding of Mecasteel 90 should meet following standards:

Standards	SMAW	SAW
EN	EN ISO 18275 E 69 5 (or 6) Mn2NiCrMo H5	EN ISO (wire/flux comb): S 69 6 FB 3Ni2CrMo SA FB 1 65 DC H5
AWS	A5.5 E11018 - M (or - G)	A5.23 F11A8 - EM4

	SMAW	SAW (Wire/Flux)
OERLIKON	TENAX 118	-
BÖHLER	FOX EV 85	-
ESAB	FILARC 118	-
METRODE	E11018-M	3 NiCrMo 2.5-UP / BB24

YOUR CONTACTS

Perrine Lavalley
Tel. +33 3 85 80 52 56
perrine.lavalley@arcelormittal.com

https://industeel.arcelormittal.com

Industeel France
Le Creusot Plant
56 rue Clemenceau
F - 71201 Le Creusot Cedex