Industeel

ArcelorMittal

Mecasteel 75

Mecasteel 75: prehardened forged rolled steel

Mecasteel 75 is a steel grade delivered in prehardened condition (YS ≥ 75 ksi - 517 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 steels, such as AISI 4130 or F22 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 75 provides outstanding machinability. Its low carbon leads also to excellent weldability and toughness compared to conventional steels.

Mecasteel 75 steel is suitable for sour gas service (H_2S environment).

PROPERTIES

CHEMICAL ANALYSIS - GUARANTEED% WEIGHT

C	S Max	P max	Cr	Mn	Boron max
0.23 - 0.28	0.010	0.01	1.2 - 1.6	1.2 - 1.6	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

Maximum hardness 237 HB.

Tensile properties

	YS 0.2	UTS	Elongation (%)	Reduction of area (%)
ksi	≥ 75	≥ 95	≥ 18	≥ 50
MPa	≥ 517	≥ 655		

Guaranteed values in length and transverse direction .

Impact properties

	- 4°F	- 20°F	- 40°F	- 75°F
	- 20°C	- 29°C	- 40°C	- 60°C
Ft.lb	≥ 15(single value) ≥ 20(average of 3 specimen)			
J	≥ 20(single value) ≥ 27(average of 3 specimen)			

Guaranteed in length direction Sampling according to API 16A, on a QTC (Qualification Test Coupon) or a prolongation at 2.5" (63.5 mm) from the skin of the solid block.

Slightly different properties may be achieved on request - Please consult.

TYPICAL MECHANICAL PROPERTIES (IN DELIVERY CONDITION)

Hardness:

Typical value: 225 HB.

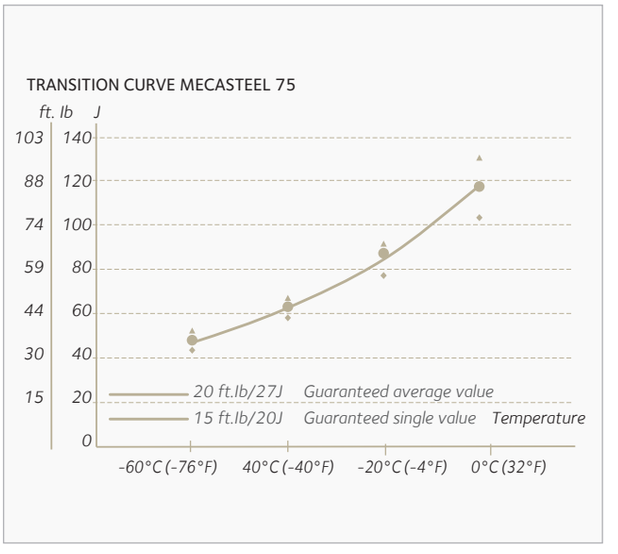
Tensile properties:

		YS 0.2 ksi (MPa)	UTS ksi (- MPa)	Elongation (%)	Red. of area (%)
Lengh direction	Skin - 2.5 "	80.1 (552)	103.6 (714)	26	68
	¼ th.	76.9 (530)	101.4 (699)	24	62
	½ th.	77.6 (535)	102.5 (707)	24	65
Transverse direction	Skin - 2.5 "	79.8 (550)	102.8 (709)	26	65
	¼ th.	77.3 (533)	101.2 (698)	24	58
	½ th.	78.3 (540)	103.0 (710)	25	63

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

Impact properties

Typical value measured 2.5" below the skin of a block 37.4 (950 mm) thick.



METALLURGICAL PROPERTIES

Mecasteel 75 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

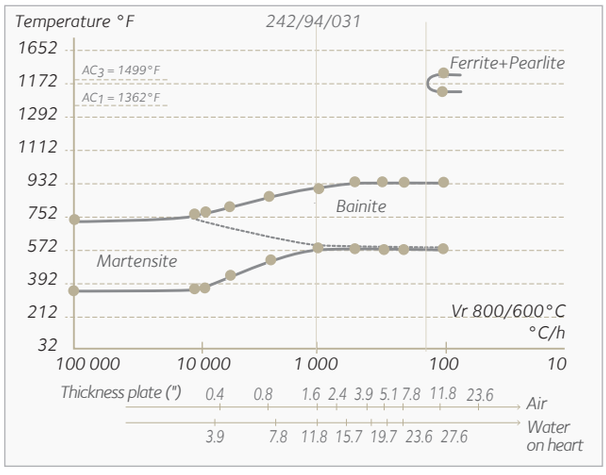
Mecasteel 75 quality offers improved cleanliness (close to ESR quality), over conventional grades. Guaranteed cleanliness per ASTM E45 method A (worst field).

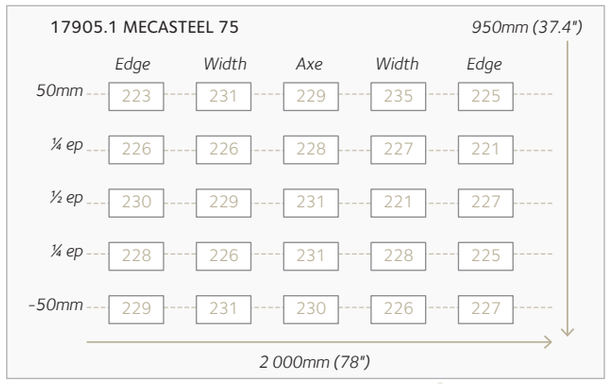
A	B	C	D
≤ 1.5	≤ 1.5	≤ 1.0	≤ 1.5

Transformation points

	AC_1 °F	AC_3 °F	M_s °F
MECASTEEL 75	1362	1499	716

CCT Diagramm





Hardness homogeneity through a 950 mm thick block Mecasteel 75 (237 HB max).

Compared with standard grades, the optimized chemical analysis of Mecasteel 75 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.

STRESS RELIEVING

Mecasteel 75 can be stress relieved. Stress relieving temperature should not exceed 1200°F - 650°C.

RESISTANCE TO H_2S EMBRITTLEMENT

MECASTEEL 75 is in accordance with NACE MR 0175
SSC Resistance: According to NACE TM 01 - 77. Mecasteel 75 threshold for failure is superior to 75% of Specified Minimum Yield Strength (SMYS).

COMPACTNESS

All blocks are UT according to ASTM A578 (1/8" FBH).

MAGNETIC PARTICLE INSPECTION

Mecasteel 75 is capable of AMS 2301.

DELIVERY CONDITIONS

MANUFACTURING PROGRAM

Prehardened: Normalized, 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

Mecasteel 75 can be welded using SAW and SMAW process. Consumables used for welding of Mecasteel 75 should meet following standards:

Standards	SMAW	SAW
EN	EN ISO 2560 or 18275 E 50 6 Mn1NiMo x H5 E 55 6 Mn1NiMo x H5	EN ISO (wire/flux comb): S 50 6 FB S3Ni1Mo EN ISO 14174 (flux): SA FB 55 AC H5
AWS	A5.5 E10018 - D2 (or M)	A 5.23: F9A8-F9P8-EF3

A non - exclusive list of suitable filler metals is given hereafter

Standards	SMAW	SAW (Wire/Flux)
OERLIKON	TENAX 118-D2	OE SD3 1Ni$_{1/2}$Mo / OP 121 TTW
BÖHLER	-	Union S3NiMo1 / UV 420 TTRC
ESAB	OK 74.86 Tensitrode	-
METRODE	E10018-D2	-

Nace specification (MR 0175/ISO 15156 - 2)

- welding consumable shall contain less than 1% Ni
- weld metal properties shall not be below the base metal specified minimum properties
- maximum weld zone hardness shall be 250HV$_{10}$ or 22 HRC

In order to ensure a good softening of HAZ, follow recommendations below:

> preheating 230°C/450°F minimum

> interpass temperature 315°C/600°F maximum

> PWHT 690°C/1280°F during 4 hours

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