

Database of Steel and Alloy (Marochnik)

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Characteristics for grade 12MKH (12MX).

Grade :	12MKH (12MX)
Classification :	Low alloy high-temperature steel
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Chemical composition in % for grade 12MKH (12MX)

C	Si	Mn	Ni	S	P	Cr	Mo	W	V	Ti	Cu
0.09 - 0.16	0.17 - 0.37	0.4 - 0.7	max 0.3	max 0.025	max 0.03	0.4 - 0.7	0.4 - 0.6	max 0.2	max 0.05	max 0.03	max 0.2

Temperature of critical points for grade 12MKH (12MX).

$Ac_1 = 723$, $Ac_3(Ac_m) = 885$, $Ar_3(Arc_m) = 803$, $Ar_1 = 715$

Mechanical properties under T=20°C for grade 12MKH (12MX)

Assortment	Dimension	Direct.	σ_B	σ_T	δ_5	ψ	KCU	Heat treatment
-	mm	-	MPa	MPa	%	%	kJ / m ²	-
Pipe hot strain, GOST 550-75			412	245	21	45	690	
Bar, GOST 20072-74	Ø 90		410	235	21	45	590	Normalizing 910 - 930°C, air, Drawing 670 - 690°C,

Brinell hardness for 12MKH (12MX) (quenching, tempering) ,	HB 10 ⁻¹ = 182 MPa
Brinell hardness for 12MKH (12MX) (hot-rolled, annealing) , GOST 20072-74	HB 10 ⁻¹ = 217 MPa
Brinell hardness for 12MKH (12MX) , Pipe GOST 550-75	HB 10 ⁻¹ = 156 MPa

Technological properties for grade 12MKH (12MX)

Weldability:	without limitations.
Flakes :	predisposed
Temper brittleness:	not predisposed

Physical properties for grade 12MKH (12MX)

T	E 10 ⁻⁵	α 10 ⁶	λ	ρ	C	R 10 ⁹
Grade	MPa	1/Grade	Watt/(m·Grade)	kg/m ³	J/(kg·Grade)	Ohm·m
20	2.12			7850		
100	2.06	11.2	50	7830	473	240
200	2	12.5	50	7800	519	330
300	1.95	12.7	50	7760	565	410
400	1.89	12.9	49	7730	594	540

500	1.79	13.2	47	7690	653	640
600	1.7	13.5	46	7650	733	740
700	1.6	13.8	44	7610	888	900
T	$E 10^{-5}$	$\alpha 10^6$	λ	ρ	C	$R 10^9$

Equivalent steels for grade 12MKH (12MX)

Warning! Indicated both exact and nearest equivalents.

USA	Germany	Japan	France	England	European	Sweden
-	DIN, WNr	JIS	AFNOR	BS	EN	SS
11562	13CrMo4-4	STPA20	13CrMo4-5	13CrMo4-5	13CrMo4-5	2216
11564	13CrMo4-5	STPA22	15CD3.5	620-440		

Specification :**Mechanical properties :**

- σ_B - Tensile strength , [MPa]
 σ_T - Yield stress , [MPa]
 δ_5 - Specific elongation at fracture , [%]
 ψ - Reduction of area , [%]
KCU - Impact strength , [kJ / m²]
HB - Brinell hardness , [MPa]

Physical properties :

- T** - Test temperature , [Grade]
E - Young modulus , [MPa]
 α - Coefficient of linear expansion (range 20° - T) , [1/Grade]
 λ - Thermal (heat) condition coefficient , [Watt/(m·Grade)]
 ρ - Density , [kg/m³]
C - Specific heat (range 20° - T) , [J/(kg·Grade)]
R - Electrical resistance , [Ohm·m]

Weldability :

- without limitations** - welding is done without heating and subsequent heat treating
limited weldability - welding is possible under heating up to 100-120 grade and subsequent heat treating
hard weldability - obtaining the quality welding needs the additional operations: heating up to 200-300 grade; the heat treating is annealing

Database of steels and alloys (Marochnik) contains information about chemical composition and properties more than 2500 steels and alloys (stainless steel, alloy steel, carbon steel, structural steel, tool steel, cast iron, aluminum alloy, titanium alloy, copper alloy, nickel alloy, magnesium alloy and others).
 Helpfull for specialists in grade technology, structural engineer, mechanical engineer, metallurgy and metal trader

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