

Database of Steel and Alloy (Marochnik)

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Characteristics for grade U12 (Y12).

Grade :	U12 (Y12)
Substitute:	Y10, Y11
Classification :	Carbon tool steel
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Chemical composition in % for grade U12 (Y12)

C	Si	Mn	Ni	S	P	Cr	Cu
1.1 - 1.29	0.17 - 0.33	0.17 - 0.33	max 0.25	max 0.028	max 0.03	max 0.2	max 0.25

Temperature of critical points for grade U12 (Y12).

$Ac_1 = 730$, $Ac_3(Ac_m) = 820$, $Ar_1 = 700$, $Mn = 200$

Mechanical properties under T=20°C for grade U12 (Y12)

Assortment	Dimension	Direct.	σ_B	σ_T	δ_5	ψ	KCU	Heat treatment
-	mm	-	MPa	MPa	%	%	kJ / m ²	-
Band annealed	0.08 - 3		750		10			
Steel			590-690	325	28	50	270	Annealing

Brinell hardness for U12 (Y12) (annealing), GOST 1435-99	HB 10 ⁻¹ = 217 MPa
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Technological properties for grade U12 (Y12)

Weldability:	is not used.
Flakes :	not predisposed
Temper brittleness:	not predisposed

Physical properties for grade U12 (Y12)

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	2.09			7830		
100	2.05	10.5	45	7809	469	252

200	2	11.8	43	7781	503	333
300	1.93	12.6	40	7749	519	430
400	1.85	13.4	37	7713	536	540
500	1.78	13.1	35	7675	553	665
600	1.66	14.8	32	7634	720	802
700		15.3	28	7592	611	964
800		15	24	7565	712	1152
900		16.3	25	7489	703	1196
1000		16.8			699	
T	$E \cdot 10^{-5}$	$\alpha \cdot 10^6$	λ	ρ	C	$R \cdot 10^9$

Equivalent steels for grade U12 (Y12)

Warning! Indicated both exact and nearest equivalents.

USA	Germany	Japan	France	England	European	Italy	China	Bulgaria	Hungary	Poland	Czechia	Austria
-	DIN, WNr	JIS	AFNOR	BS	EN	UNI	GB	BDS	MSZ	PN	CSN	ONORM
W1-11-1/2	1.1654 C110W2	SK2	C120E3U Y2120	BW1C	CT120	C120KU	T11	U12	S121 S122	N12	19221	K990

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 in 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).
 Helpful for specialists in grade technology, structural engineer, mechanical engineer, metallurgy and metal trader

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