

METRIC THREADED PRODUCTS

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TENSILE CHART

Technical Details :



Scope and Field of Application

The Property Classes and their mechanical properties apply to bolts, screws, and studs, with metric (ISO) thread, with nominal thread diameter $d \leq 39$ mm, made of carbon steel or alloy steel and when tested at room temperature.

They do not apply to set screws and similar or to specific requirements such as weld ability, corrosion resistance, ability to withstand temperatures above $+300^{\circ}\text{C}$ or below -50°C . The designation system may be used for sizes (e.g. $d > 39$ mm), provided that all mechanical requirements of the property classes are met.



Designation system of property classes

The property class symbols, indicating the most important mechanical properties, consist of two figures, one on either side of a dot: for example 10.9. The first figure indicates 1/100 of the nominal tensile strength in N/mm^2 (see R in the table) So property class 10.9 has a tensile strength of $10 \times 100 = 1000 \text{ N/mm}^2$ The second figure indicates 10 times the ratio between lower yield stress R (or proof stress R) and nominal tensile strength R (yield stress ratio). So at property class 10.9 the second figure 9 = $1/10 \times 900 \text{ N/mm}^2$.



Mechanical properties of bolts, screws and studs

		Property Class											
Mechanical property		3.6	4.6	4.8	5.6	5.8	6.8	8.8		9.8	10.9	12.9	
								d<16mm	d>16mm				
1	Tensile strength	nom.	300	400	500	600	800	800	900	1000	1200		
2	R N/mm^2	min.	330	400	420	500	520	600	800	830	900	1040	1220
3	Vickers hardness HB F>98n	min.	95	120	130	155	160	190	250	255	290	320	385
		max.	250						320	335	360	380	435

4	Burnell hardness HB $f = 30D^2$	min.	90	114	124	147	152	181	238	242	276	304	366	
		max.	238						304	318	342	361	414	
5	Rockwell hardness	min.	HRB	52	67	71	79	82	89	-	-	-	-	-
			HRC	-	-	-	-	-	-	22	23	28	32	39
	max.	HRB	99.5						-	-	-	-	-	
		HRC	-						32	34	37	39	44	
6	Surface hardness HV 0.3max.	-						51						
7	Lower yield stress R 6) N/mm ²	nom.	180	240	320	300	400	480	-	-	-	-	-	
		max.	190	240	340	300	420	480	-	-	-	-	-	
8	Proof stress Rp 0.2 N/mm ²	nom.	-						640	640	720	900	1080	
		min.	-						640	660	720	940	1100	
9	Stress under proofing load, Sp	Sp/R or Sp/Rp 0.2	0,94	0,94	0,91	0,93	0,90	0,92	0,91	0,91	0,90	0,88	0,88	
		N/mm ²	180	225	310	280	380	440	580	600	650	830	970	
10	Elongation after fracture A in % min.	min.	25	22	14	20	10	8	12	12	10	9	8	
11	Strength under wedge loading	The values for full size bolts and screws (not studs) shall not be smaller than the minimum values for tensile strength shown in 5.2												
12	Impact strength, J	min.	-			25	-		30	30	25	20	15	
13	Head soundness	no fracture												
14	Minimum height of non-decarbonized	-						$\frac{1}{2}H_1$		$\frac{2}{3}H_1$	$\frac{3}{4}H_1$			
15	Maximum depth of complete decarburization, G	-						0.015						



For class 8.8 in diameter $d \leq 16$ mm.



Min. tensile properties apply to products of nominal length $l \geq 2,5 d$. Min. Hardness applies to products of $l < 2, 5 d$ and other products which can not be tensile tested (e.g. due to head configuration).



Surface Hardness shall not be more than 30 Vickers points above the measured core hardness on the product when readings of both surface and core are carried out at HV 0,3 for class 10.9 max. Surface hardness = 390 HV



In cases where the lower yield stress R cannot be determined it is permissible to measure the proof stress R.



For Structural bolting the limit is 12 mm.



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