Mechanical Properties of Bolts, Screws and Studs

ISO 898-1

	Mechanical Properties			3.6	4.6	4.8	5.6	5.8	6.8	8.8 (1)		9.8 (3)	10.9	12.9
										≤ M16	> M16 (2)	≤ M16		
1	Tensile strength (4) Rm MPa	nom.		300	400		500		600	800	800	900	1000	1200
		min.		330	400	420	500	420	600	800	830	900	1040	1220
2	Vickers hardness HV (F/98N)	min.		95	120	130	155	160	190	250	255	290	320	385
		max.		250						320	335	360	380	435
3	Brinell hardness HB (F= 30 D^2)	min.		90	114	124	147	152	181	238	242	276	304	366
		max.		238						304	318	342	361	414
4	Rockwell hardness HR	min.	HRB	52	67	71	79	82	89	-	-	-	-	-
			HRC	-	-	-	-	-	-	22	23	28	32	39
		max.	HRB	99.5					-	-	-	-	-	
			HRC	-						32	34	37	39	44
5	Surface hardness HV 0.3 max.			-						see footnote (5)				
6	Lower yield stress Rel N/mm^2 (6)	min.		190	240	340	300	420	480	-	-	-	-	-
7	0.2% yield strength Rp 0.2 N/mm^2	nom.		-						640	640	720	900	1080
		min.		-						640	660	720	940	1100
8	Proof strength ratio	SPr/Rel 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
9	Proof load value Sp in N/mm^2			180	225	310	280	380	440	580	600	650	830	970
10	Elongation after fracture, A 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 shown in 2										
12	Impact strength, J	min.					25			30	30	25	20	15
13	Head soundness			no fracture										
14	Minimum height of non-decarburised thread zone, E			-						1/2 H1			2/3 H1	3/4 H1
15	Maximum depth of complete decarburisation, G mm			-						0.015				

1. For class 8.8 in diameter d = 16mm there is an increased risk of nut stripping in the case of inadvertent over-tightening inducing a load in excess of proofing load. Reference to ISO 898-2 is recommended.
2. For structural bolting the limit is 12mm.
3. Applies only to nominal thread diameter d = 16mm.
4. Minimum tensile properties apply to products of nominal length l = 2,5 d. Minimum hardness applies to products of l < 2,5 d and other products, which cannot be tensile-tested (e.g. due to head configuration).
5. Surface hardness shall not be more than 30 Vickers points above the measured core hardness on the product readings of both surface and core are carried out at HV 0,3. For class 10.9 maximum surface hardness = 390 HV.
6. In cases where the lower yield stress Rel cannot be determined, it is permissible to measure the proof stress Rp0,2.

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