

## MECHANICAL PROPERTIES OF STEEL BOLTS & SCREWS

ISO 898-1:2013 TABLE 3 MECHANICAL OR PHYSICAL PROPERTY		PROPERTY CLASS									
		4.6	4.8	5.6	5.8	6.8	8.8		9.8	10.9	12.9
							$d \leq 16\text{mm}^a$	$d > 16\text{mm}^b$	$d \leq 16\text{mm}$		
Tensile strength, $R_m$ , MPa	nom. <sup>c</sup>	400		500		600	800		900	1000	1200
	min.	400	420	500	520	600	800	830	900	1040	1220
Lower yield strength, $R_{eL}^d$ , MPa	nom. <sup>c</sup>	240	---	300	---	---	---	---	---	---	---
	min.	240	---	300	---	---	---	---	---	---	---
Stress at 0,2 % non-proportional elongation, $R_{p0,2}$ , MPa	nom. <sup>c</sup>	---	---	---	---	---	640	640	720	900	1080
	min.	---	---	---	---	---	640	660	720	940	1100
Stress at 0,0048d non-proportional elongation for full-size fasteners, $R_{pf}$ , MPa	nom. <sup>c</sup>	---	320	---	400	480	---	---	---	---	---
	min.	---	340 <sup>e</sup>	---	420 <sup>e</sup>	480 <sup>e</sup>	---	---	---	---	---
Stress under proof load, $S_p^f$ , MPa	nom.	225	310	280	380	440	580	600	650	830	970
Proof strength ratio	$S_{p, \text{nom}} / R_{eL, \text{min}}$ or $S_{p, \text{nom}} / R_{p0,2, \text{min}}$ or $S_{p, \text{nom}} / R_{pf, \text{min}}$	0,94	0,91	0,93	0,90	0,92	0,91	0,91	0,90	0,88	0,88
Percentage elongation after fracture for machined test pieces, $A$ , %	min.	22	---	20	---	---	12	12	10	9	8
Percentage reduction of area after fracture for machined test pieces, $Z$ , %	min.	---					52		48	48	44
Elongation after fracture for full-size fasteners, $A_r$ (see also Annex C)	min.	---	0,24	---	0,22	0,20	---	---	---	---	---
Head soundness		No fracture									
Vickers hardness, HV $F \geq 98 \text{ N}$	min.	120	130	155	160	190	250	255	290	320	385
	max.	220 <sup>g</sup>				250	320	335	360	380	435
Brinell hardness, HBW $F = 30 \text{ D}^2$	min.	114	124	147	152	181	245	250	286	316	380
	max.	209 <sup>g</sup>				238	316	331	355	375	429
Rockwell hardness, HRB	min.	67	71	79	82	89	---				
	max.	95,0 <sup>g</sup>				99,5	---				
Rockwell hardness, HRC	min.	---					22	23	28	32	39
	max.	---					32	34	37	39	44
Surface hardness, HV 0,3	max.	---					---			390	435
Non-carburization, HV 0,3	max.	---					h			h	h
Height of non-decarburized thread zone, $E$ , mm	min.	---					$\frac{1}{2} H_1$			$\frac{3}{8} H_1$	$\frac{3}{4} H_1$
Depth of complete decarburization in the thread, $G$ , mm	max.	---					0,015				
Reduction of hardness after retempering, HV	max.	---					20				
Breaking torque, $M_b$ , Nm	min.	In accordance with ISO 898-7									
Impact strength, $K_v$ <sup>h, j</sup> , J	min.	---		27	---		27	27	27	27	k
Surface integrity in accordance with		ISO 6157 - 1 <sup>l</sup>									ISO 6157-3

(a) - Values do not apply to structural bolting. (b) - For structural bolting  $d \geq M12$ . (c) - Nominal values are specified only for the purpose of the designation system for property classes. Refer to clause 5 in the official standard. (d) - In cases where the lower yield strength  $R_{eL}$ , cannot be determined, it is permissible to measure the stress at 0,2% non-proportional elongation  $R_{p0,2}$ . (e) - For the property classes 4.8, 5.8 and 6.8, the values for  $R_{pf, \text{min}}$  are under investigation. The values at the time of publication of this part of ISO 898 are given for calculation of the proof stress ratio only. They are not test values. (f) - Proof loads are specified in Tables 5 (right) and 7 in the official standard. (g) - Hardness determined at the end of a fastener shall be 250 HV, 238 HB or 99,5 HRB maximum. (h) - Surface hardness shall not be more than 30 Vickers points above the measured base metal hardness of the fastener when the determination of both surface hardness and base metal hardness are carried out with HV 0,3. See 9.11 in official standard. (i) - Values are determined at a test temperature of  $-20^\circ\text{C}$ . See 9.14 in official standard. (j) - Applies to  $d \geq 16\text{mm}$ . (k) - Value for  $K_v$  is under investigation. (l) - Instead of ISO 6157-1, ISO 6157-3 may apply by agreement between the manufacturer and the purchaser.