

# MECHANICAL OR PHYSICAL PROPERTIES (ISO 898-1)

NO.	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 ≤	d ≥	d ≤				
							16mm <sup>a</sup>	16mm <sup>b</sup>	16mm				
1	Tensile strength, R <sub>m</sub> , Mpa	nom. <sup>c</sup>	400		500		600		800		900	1000	1200
		min.	400	420	500	520	600	800	830	900	1040	1220	
2	Lower yield strength, Rel <sup>d</sup> , Mpa	nom. <sup>c</sup>	240	-	300	-	-	-	-	-	-	-	-
		min.	240	-	300	-	-	-	-	-	-	-	-
3	Stress at 0.2% non-proportional elongation R <sub>p0.2</sub> , Mpa	nom. <sup>c</sup>	-	-	-	-	-	640	640	720	900	1060	
		min.	-	-	-	-	-	640	660	720	940	1100	
4	Stress at 0.0048d non-proportional elongation for full-size fasteners, R <sub>p</sub> f, Mpa	nom. <sup>c</sup>	-	320	480	-	-	-	-	-	-	-	
		min.	-	340 <sup>e</sup>	480 <sup>e</sup>	-	-	-	-	-	-	-	
5	Percentage elongation after fracture for machined test pieces, A, %	min.	22	-	20	-	-	12	12	10	9	8	
6	Percentage reduction of area after fracture for machined test pieces, Z, %	min.	-					52		48	48	44	
7	Vickers hardness, HV F ≥ 98 N	min.	120	130	155	160	190	250	255	290	320	385	
		max.	220 <sup>g</sup>					250	320	335	360	380	435
8	Brinell hardness, HBW F = 30 D <sup>2</sup>	min.	114	124	147	152	181	245	250	286	316	380	
		max.	209 <sup>g</sup>					238	316	331	355	375	429
9	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	

<sup>a</sup> Values do not apply to structural bolting.

<sup>b</sup> For structural bolting d ≥ M12.

<sup>c</sup> Nominal values are specified only for the purpose of the designation system for property classes. See clause 5.

<sup>d</sup> In cases where the lower yield strength, Rel, cannot be determined. It is permissible to measure the stress at 0.2% non-proportional elongation R<sub>p0.2</sub>

<sup>e</sup> For the property classes 4.8, 5.8 and 6.8, the values for R<sub>p</sub>f 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

<sup>g</sup> Hardness determined at the end of a fastener shall be 250 Hv, 238 HB or 99.5 HRB maximum.

# CHEMICAL PROPERTIES OF BOLTS, SCREWS AND STUDS (ISO 898-1)

PROPERTY CLASS	MATERIAL AND HEAT TREATMENT	CHEMICAL COMPOSITION LIMIT (CAST ANALYSIS, %) <sup>f</sup>					TEMPERING TEMPERATURE °C, min.
		C		P	S	B <sup>b</sup>	
		min.	max.	max.	max.	max.	
<b>4.6<sup>d</sup></b>	Carbon steel or carbon steel with additives	-	0.55	0.05	0.06	Not specified	-
<b>4.8<sup>d</sup></b>							
<b>5.6<sup>g</sup></b>		0.13	0.55	0.05	0.06		
<b>5.8<sup>d</sup></b>		-	0.55	0.05	0.06		
<b>6.8<sup>d</sup></b>		0.15	0.55	0.05	0.06		
<b>8.8<sup>e</sup></b>	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered	0.15 <sup>e</sup>	0.40	0.025	0.025	0.003	425
	Carbon steel quenched and tempered	0.25	0.55	0.025	0.025		
	Alloy steel quenched and tempered <sup>g</sup>	0.20	0.55	0.025	0.025		
<b>9.8<sup>e</sup></b>	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered	0.15 <sup>e</sup>	0.40	0.025	0.025	0.003	425
	Carbon steel quenched and tempered	0.25	0.55	0.025	0.025		
	Alloy steel quenched and tempered <sup>g</sup>	0.20	0.55	0.025	0.025		
<b>10.9<sup>e</sup></b>	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered	0.20 <sup>e</sup>	0.55	0.025	0.025	0.003	425
	Carbon steel quenched and tempered	0.25	0.55	0.025	0.025		
	Alloy steel quenched and tempered <sup>g</sup>	0.20	0.55	0.025	0.025		
<b>12.9<sup>eHI</sup></b>	Alloy steel quenched and tempered <sup>g</sup>	0.30	0.50	0.025	0.025	0.003	425
<b>12.9<sup>eHI</sup></b>	Carbon steel with additives (e.g. Boron or Mn or Cr) quenched and tempered	0.26	0.50	0.025	0.025	0.003	380