Materials, Heat Treatment, Chemical Compositions

according to ISO 898 - part 1

Property class	Material and heat treatment	Chemical composition limits (check analysis)% C min.	C max.	P max.	S max.	B[1] max.	Tempering temperature ℃ min.
3.6[2]	Carbon steel	--	0.20	0.05	0.06	0.003	--
4.6[2]		--	0.55	0.05	0.06	0.003	--
4.8[2]							
5.6		0.13	0.55	0.05	0.06	0.003	--
5.8[2]		--	0.55	0.05	0.06		
6.8[2]							
8.8[3]	Carbon steel with additives (e.g. Boron, Mn or Cr) quenched and tempered	0.15[4]	0.40	0.035	0.035	0.003	425
	or						
	carbon steel, quenched and tempered	0.25	0.55	0.035	0.035		
9.8	Carbon steel with additives (e.g. Boron, Mn or Cr) quenched and tempered	0.15[4]	0.35	0.035	0.035	0.003	425
	or						
	carbon steel, quenched and tempered	0.25	0.55	0.035	0.035		
10.9[5),6)]	Carbon steel with additives (e.g. Boron, Mn or Cr) quenched and tempered	0.15[4]	0.35	0.035	0.035	0.003	340
10.9[6]	Carbon steel, quenched and tempered	0.25	0.55	0.035	0.035	0.003	425
	or						
	Carbon steel with additives (e.g. Boron, Mn or Cr) quenched and tempered	0.20[4]	0.55	0.035	0.035		
	or						
	alloyed steel, quenched and tempered[7]	0.20	0.55	0.035	0.035		
12.9[6),8),9)]	Alloyed steel, quenched and tempered[7]	0.28	0.50	0.035	0.035	0.003	380

1) Boron content can reach 0.005% provided that non-effective boron is controlled by addition of titanium and /or aluminium.
2) Free cutting steel is allowed for these property classes with the following maximum sulfur, phosphorus and lead contents: sulfur 0.34%, phosphorus 0.11%, lead 0.35%
3) For nominal diameters above 20mm the steels specified for property class 10.9 may be necessary in order to achieve sufficient hardenability.
4) In case of plain carbon boron alloyed steel with a carbon content below 0.25% (ladle analysis), the minimum manganese content shall be 0.6% for property class 8.8 and 0.7% for 9.8,10.9 and 10.9
5) Products shall be additionally identified by underlining the symbol of the property class (see clause 9). All properties of 10.9 as specified in table 3 shall be met by 10.9,however, its lower tempering temperature gives it different stress relaxation characteristics at elevated temperatures (see annex A)
6) For the materials of these property classes, it is intended that there should be a sufficient hardenabiltity to ensure a structure consisting of approximately 90% martensite in the core of the threaded sections for the fasteners in the 《as-hardened》 condition before tempering.
7) This alloy steel shall contain at least one of the following elements in the minimum quantity given: chromium 0.30%, nickel 0.30%, molybdenum 0.20%, vanadium 0.10%. Where elements are specified in combination of two, three or four and have alloy contents less than those given above, the limit value to be applied for class determination is 70% of the sum of the individual limit values shown above for the two, three or four elements concerned.
8) A metallographically detectable white phosphorous enriched layer is not permitted for property class 12.9 on surfaces subjected to tensile stress.
9) The chemical composition and tempering temperature are under investigation.