

# MARYLAND METRICS

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TECHNICAL INFORMATION and DATA

## Steels for low and high temperature applications

Temperatures from  $-253$  to  $-10$  °C

Designation	Material			Guideline for lower standard limit of temperature in continuous operation <sup>2)</sup>
	Material number	according to	Symbol	
26 CrMo 4	1.7219	steel-iron standard 680	KA	- 65 °C
12 Ni 19	1.5680		KB	- 140 °C
X 12 CrNi 18 9	1.6900		KC	- 253 °C
X 10 CrNiTi 18 10	1.6903		KD	- 253 °C
X 5 CrNi 18 9	1.4301	ISO 3506/part 1 resp. AD-W 10	A2 <sup>1)</sup>	- 196 °C
X 5 CrNi 19 11	1.4303		A2 <sup>1)</sup>	- 196 °C
X 10 CrNiTi 18 9	1.4541		A2 <sup>1)</sup>	- 196 °C
X 5 CrNiMo 18 10	1.4401		A4 <sup>1)</sup>	- 60 °C
X 10 CrNiMoTi 18 10	1.4571		A4 <sup>1)</sup>	- 60 °C

<sup>1)</sup>If there is space enough on the fastener, it has to be marked with the property class additionally to the steel grade A2 and A4: e.g. A2-70 (see ISO 3506/part 1). If a specific steel is required the fastener has to be marked with the standard number or the designation. This is valid also for fasteners larger than M 39 .

<sup>2)</sup>Refer to the DIN worksheet W 10 and the steel-iron-standard 680.

Temperatures from  $-10$  to  $+300$  °C

Hot yield-point (as information only, not subject to acceptance inspection)

Property classes	Mating nuts	Temperature				
		+ 20 °C	+ 100 °C	+ 200 °C	+ 250 °C	+ 300 °C
		Lower yield stress $R_{eL}$ or 0,2% permanent strain $R_p 0,2$ (as guideline only) N/mm <sup>2</sup>				
4.6-2 <sup>1)</sup>	5-2 <sup>1)</sup>	240	210	190	170	140
5.6	5-2 <sup>1)</sup>	300	270	230	215	195
8.8	8	640	590	540	510	480
10.9	10	940	875	790	745	705
12.9	12	1100	1020	925	875	825

Continuous stress at higher temperature may cause warm creep (e.g. 100 hours operation at 300° C may cause loss of preload up to 25%).

<sup>1)</sup>Index -2 states that "Thomas" steel is not accepted for this property class. For screws of property class 4.6-2 impact strength of min. 25 J is required (is equal as for 5.6 screws).