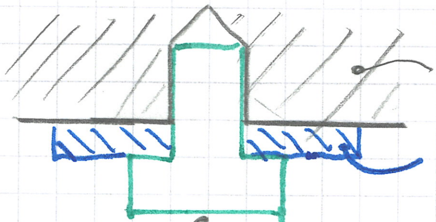
Thread : M6 x 1
Length Engagement : 31 mm (Le)
Axial Load : 15.6 N
Torque Applied : 16 Nm
= 16 000 Nmm




Applied Preload (simple k Factor)

k factor = 0.52 => confirm w/ test / source, this val ref
Table 7.1 Bickford Aluminium coat on Alloy steel

$\therefore F_p = \dfrac{T}{kD} = \dfrac{16000}{0.52 \times 6} = 5128\ N$

Axial Load = $\dfrac{15.6\,N}{5128\,N} \times 100 = 0.3\%$ Applied preload!

∴ Preload looks OK => Note No torque scatter / relaxation / etc

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Thread Shear Area ($mm^2$/mm Le) = Internal = 12.2
External = 8.65

Thread TSA = 20.1 $mm^2$ Force for tensile failure (bolt) ≠ 20.1 x 1965 = 39497 N
∴ Bolt will not fail due to applied preload
↳ Even account preload scatter

Thread Shear Area Internal = 12.2 x 31 = 378 $mm^2$
External = 8.65 x 31 = 268 $mm^2$

Thread strip force Internal (6061) = 378 x 310 x 0.6 = 70308 N
External (440C) = 268 x 1965 x 0.6 = 315972 N
Shear Area UTS Tensile => Shear

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Things to consider:

① Additional contributors to preload req = Shear? / Embedment / Thermal Expansion
Stress relaxation

② Reduction in UTS / YS due to operating T

③ Bearing strength surface under nut head

④ Torque scatter Associated with tightening method: 1.8 w/ Clicker + Theoretical Torque

Useful references: Bickford : An Introduction to the design and behaviour of Bolted Joints
B. Eccles : Bolt science.com
VDI 2230