9.1

ACME Power Screw

N	5.00	TPI		
OD	1.2500	in		
Dmean	1.1400	in	=OD-0.5/N-0.01	=Dpitch
Droot	1.0300		=OD-Lead-0.02	
MuCollar	0.15			
RCollar	0.25	in		
Mu	0.20			
F	10,000.00	LB		
Lead	0.2000	in	=1/N	
Beta	29	Degrees	Thread Angle	

Lead Angle	3.196	Degrees	=ATAN(Lead/(PI()*Dmean))*180/PI()	
Tan(Lead Angle)	0.056		=(Lead/(PI()*Dmean))	

Actual Thread

MuEff	0.20658	=Mu*1/COS(Beta*PI()/180/2)		
Loading:	1888.27	in*lb	Dornfeld Eq	=F*(Dmean/2*(MuEff+Tan_Lead_Angle)/(1-MuEff*Tan_Lead_Angle)+RCollar*MuCollar)
Loading:	1888.27	in*lb	Eqn. 16.13	=F*((Dmean/2)*(Lead+PI()*Mu*Dmean/COS(Beta*PI()/360))/(PI()*Dmean-Mu*Lead/COS(Beta*PI()/360))+MuCollar*RCollar)
Unloading:	1224.40	in*lb	Eqn. 16.16	=F*((Dmean/2)*(PI()*Mu*Dmean/COS(TwoAlfa*PI()/360)-Lead)/(PI()*Dmean+Mu*Lead/COS(TwoAlfa*PI()/360))+MuCollar*RCollar)

CriticalMu	0.0541	=COS(RADIANS(Beta/2))*Tan_Lead_Angle	

Table 16.2

Tensile Area	0.8831	in^2	
TensileStress	11,323.75	psi	=F/TensileArea

Eqn. 16.3

TensileArea	0.925	in^2	=(PI()/4)*(0.5*(Droot+Dmean))^2
TensileStress	10,815.60	psi	=F/TensileArea

Note that the Tensile Stress Areas calculated by Eqn. 16.3 do not exactly match the values in Table 16.2. The Table values are based on minimum toleranced pitch and root diameters and are therefore smaller than the Eqn. 16.3 numbers using nominal diameters.

9.2

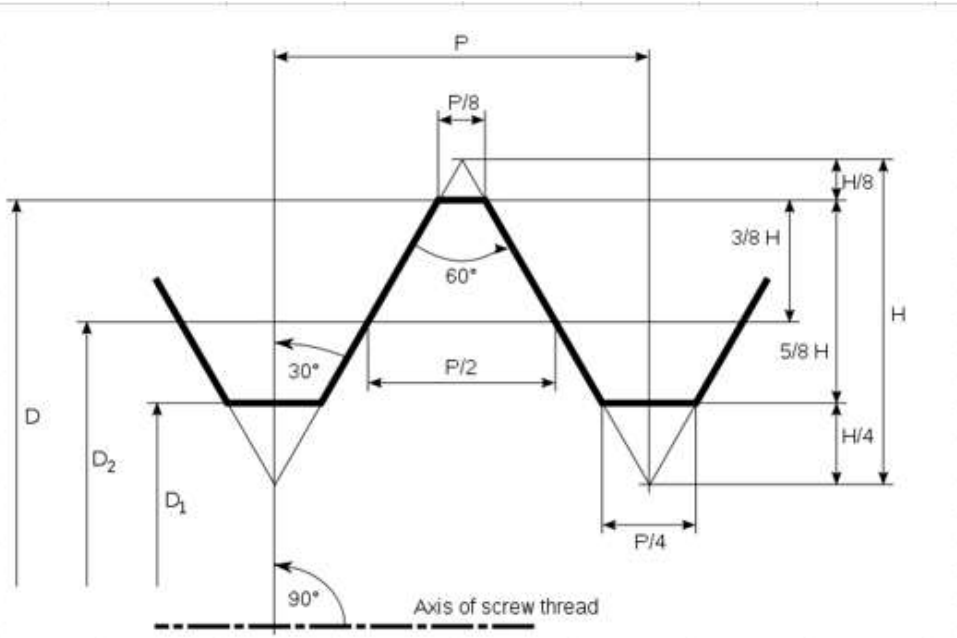
Power Screw

Lead	10.00	mm		Crest	12	mm	
Dpitch	25.00	mm		Pitch	9	mm	
MuCollar	0.00			Ht	7.794	mm	=0.866*Pitch
RCollar	10.00	mm		PitchDia	4.206	mm	=Crest-Ht
Mu	0.15						
Load Mass	1500.00	kg					
F	14,715.00	N	=Load_Mass*9.81				
Beta	30	Degrees	Thread Angle				
	Lead Angle	7.256	Degrees	=ATAN(Lead/(PI()*Dmean))*180/PI()			
Tan(Lead Angle)		0.127		=(Lead/(PI()*Dmean))			
Actual Thread							
	MuEff	0.1553	=Mu*1/COS(Beta*PI()/180/2)				
	Loading:	53032.14	Nmm	53.03	N*m	Dornfeld Eqn.	=F*(Dmean/2*(MuEff+Tan_Lead_Angle)/(1-MuEff*Tan_Lead_Angle)+RCollar*MuCollar)
	Loading:	53032.14	Nmm	53.03	N*m	Eqn. 16.13	=F*((Dmean/2)*(Lead+PI()*Mu*Dmean/COS(Beta*PI()/360))/(PI()*Dmean-Mu*Lead/COS(Beta*PI()/360))+MuCollar*RCollar)
	Unloading:	866.08	Nmm	0.87	N*m	Eqn. 16.16	=F*((Dmean/2)*(PI()*Mu*Dmean/COS(TwoAlfa*PI()/360)-Lead)/(PI()*Dmean+Mu*Lead/COS(TwoAlfa*PI()/360))+MuCollar*RCollar)

9.3

Crest	10	mm		
Pitch	1.5	mm	**From Table 16.9**	
Lead	1.5	mm	=Pitch	
Ht	1.299	mm	=0.866*Pitch	
PitchDia	9.02575	mm	=Crest-0.75*Ht	
Dpitch	9.02575	mm	=PitchDia	
MuCollar	0.00			
RCollar	10.00	mm		
Mu	0.15			
Torque	45,000	Nmm		
Beta	60	Degrees	Thread Angle	

Lead Angle	3.028	Degrees	=ATAN(Lead/(PI()*Dmean))*180/PI()	
Tan(Lead Angle)	0.0529		=(Lead/(PI()*Dmean))	



Actual Thread

	MuEff	0.1732051			=Mu*1/COS(Beta*PI()/180/2)
F	Loading:	43,696.91	N	Dornfeld Eqn.	=Torque/(Dmean/2*(MuEff+Tan_Lead_Angle)/(1-MuEff*Tan_Lead_Angle)+RCollar*MuCollar)
					=Torque / 1.030
	Loading:	43,696.91	N	Eqn. 16.13	=Torque/((Dmean/2)*(Lead+PI()*Mu*Dmean/COS(Beta*PI()/360))/(PI()*Dmean-Mu*Lead/COS(Beta*PI()/360))+MuCollar*RCollar)

Tensile Area	57.990	mm^2	=0.7854*(Crest-0.9382*Pitch)^2
Axial stress	753.53	MPa	=F/Tensile_Area

Minimum strength grade = 10.9, with a Yield Strength of 940MPa. **From Table 16.7**

CriticalMu	0.045813	=COS(RADIANS(Beta/2))*Tan_Lead_Angle

$$W = T_{raise} \Big/ \left[\frac{r_m}{1 - \mu \tan \alpha} + \mu_c r_c \right]$$