

Cylindrical Gear Pair Calculation

Input data

Geometry

Normal module	mn	8.0000	mm
Normal pressure angle	α_n	20.000	°
Helix direction		Spur gear	
Center distance	a	500.000	mm
Center distance upper tolerance	$\Delta a.s$	0.0000	mm
Center distance lower tolerance	$\Delta a.i$	0.0000	mm
		Gear 1	Gear 2
Number of teeth	z	17	108
Face width	b	100.0000	100.0000 mm
Profile shift coefficient	x	0.100	-0.100
Upper tooth thickness allowance	Esns	-0.1592	-0.1593 mm
Lower tooth thickness allowance	Esni	-0.1592	-0.1593 mm

Reference profile

Basic rack dedendum	hfP1	1.25 · mn
Basic rack root radius	pfP1	0.45 · mn
Basic rack addendum	haP1	1 · mn
Tip alteration	k1	0 · mn
Basic rack dedendum	hfP2	1.25 · mn
Basic rack root radius	pfP2	0.4 · mn
Basic rack addendum	haP2	1 · mn
Tip alteration	k2	0 · mn

Material

Material gear 1		Own Input
Youngs modulus	E1	206000 MPa
Poisson number	nu1	0.3
Thermal elongation coefficient	α_1	11.500 10 ⁻⁶ /°C
Material type		V (alloy)
Material quality		MQ
Case hardness	HV	310
Core hardness	HV	0
Limiting tooth root stress	sigFlim1	318.750 MPa
Limiting contact stress	sigHlim1	780.030 MPa
Material gear 2		Own Input
Youngs modulus	E2	206000 MPa
Poisson number	nu2	0.3

Change this text in mesys.ini

Thermal elongation coefficient	α_2	11.500 10 ⁻⁶ /°C
Material type	V (alloy)	
Material quality	MQ	
Case hardness	HV	260
Core hardness	HV	0
Limiting tooth root stress	sigFlim2	297.500 MPa
Limiting contact stress	sigHlim2	714.380 MPa

Loading

Required life	H	10000.0 h
Application factor	KA	1
Speed	n1	360.000 rpm
Torque	T1	1000.0 Nm
Power	P	37699.1 W

Strength calculation

Mesh load factor	Ky	1
Bearing span	l	125.000 mm
Offset of pinion center	s	0.0000 mm
Pinion shaft diameter	dsh	100.000 mm
Pinion shaft inner diameter	dshi	0.0000 mm

Stiffening by pinion	No
Profile modifications compensate deflections	No
Limited pitting allowable	No
Flank modification (fZCa)	None
Contact pattern	Unproven
Helix modification	None

Required safety factor root	SFmin	1
Required safety factor flank	SHmin	1

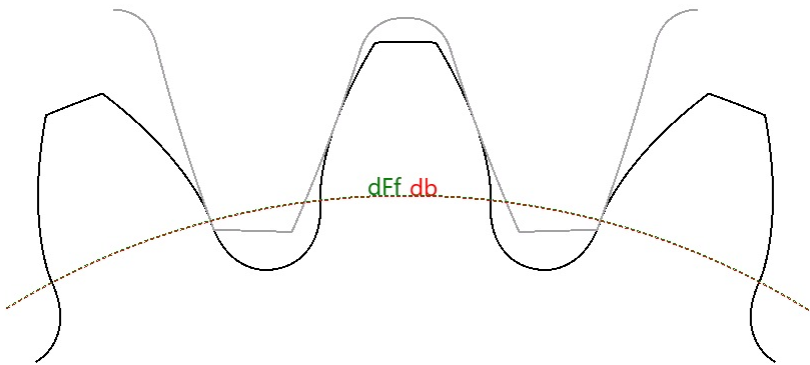
		Gear 1	Gear 2	
Tip relief	Ca	0.07	0.07	mm
Root relief	Cf	0	0	mm
Surface roughness flank	RzH	0.018	0.018	mm
Surface roughness root	RzF	0.018	0.018	mm
Web thickness	bs	0	0	mm
Number of meshes	NM	1	1	
Reversed bending		No	No	
Life factor limit root	YNTlim	0.85	0.85	
Life factor limit flank	ZNTlim	0.85	0.85	

Results

Geometry

MESYS Shaft and Rolling Bearing Calculation

Change this text in mesys.ini



		Gear 1	Gear 2
Profile shift coefficient	x.s	0.0727	-0.1273
Profile shift coefficient	x.i	0.0727	-0.1273
Reference diameter	d.nom	136.0000	864.0000 mm
Base diameter	db.nom	127.7982	811.8944 mm
Tip diameter	da.s	153.6000	878.4000 mm
Tip diameter	da.i	153.6000	878.4000 mm
Root diameter	df.s	117.1627	841.9625 mm
Root diameter	df.i	117.1627	841.9625 mm
Root form diameter	dFf.s	127.9076	847.5898 mm
Root form diameter	dFf.i	127.9076	847.5898 mm
Normal tooth thickness	sn.s	12.9896	11.8248 mm
Normal tooth thickness	sn.i	12.9896	11.8248 mm
Normal tooth thickness at tip	san.s	4.8733	6.3761 mm
Normal tooth thickness at tip	san.i	4.8733	6.3761 mm
Spanned teeth	k	2	12
Base tangent length	Wk.s	37.728	283.000 mm
Base tangent length	Wk.i	37.728	283.000 mm
Contact diameter for base tangent length	dMWk.s	133.25	859.80 mm
Contact diameter for base tangent length	dMWk.i	133.25	859.80 mm
Measurement ball diameter	DM	17.0000	14.0000 mm
Radial single ball distance	MrK.s	82.901	441.145 mm
Radial single ball distance	MrK.i	82.901	441.145 mm
Distance over two balls	MdK.s	165.168	882.291 mm
Distance over two balls	MdK.i	165.168	882.291 mm
Distance over two pins	MdR.s	165.168	882.291 mm
Distance over two pins	MdR.i	165.168	882.291 mm
Contact diameter for ball distance	dMBall.s	140.85	863.43 mm
Contact diameter for ball distance	dMBall.i	140.85	863.43 mm
Transverse contact ratio	εα.s	1.6613	

MESYS Shaft and Rolling Bearing Calculation

Change this text in mesys.ini

		Gear 1	Gear 2
Transverse contact ratio	$\epsilon_{\alpha.i}$	1.6613	
Overlap contact ratio	ϵ_{β}	0.0000	
Total contact ratio	$\epsilon_{\gamma.s}$	1.6613	
Total contact ratio	$\epsilon_{\gamma.i}$	1.6613	
Working center distance	$a_{w.s}$	500.0000	mm
Working center distance	$a_{w.i}$	500.0000	mm
Working transverse pressure angle	$\alpha_{wt.s}$	20.0000	°
Working transverse pressure angle	$\alpha_{wt.i}$	20.0000	°
Center distance for $\epsilon_{\alpha} = 1$	$a_{max.s}$	505.5549	mm
Center distance for $\epsilon_{\alpha} = 1$	$a_{max.i}$	505.5549	mm
Center distance for zero clearance	$a_{min.s}$	499.5611	mm
Center distance for zero clearance	$a_{min.i}$	499.5611	mm
Circumferential backlash at the reference circle	$j_{t.s}$	0.3184	mm
Circumferential backlash at the reference circle	$j_{t.i}$	0.3184	mm
Circumferential backlash at the working pitch circle	$j_{wt.s}$	0.3184	mm
Circumferential backlash at the working pitch circle	$j_{wt.i}$	0.3184	mm
Transverse backlash	$j_{bt.s}$	0.2992	mm
Transverse backlash	$j_{bt.i}$	0.2992	mm
Normal backlash	$j_{bn.s}$	0.2992	mm
Normal backlash	$j_{bn.i}$	0.2992	mm
Radial backlash	$j_{r.s}$	0.4374	mm
Radial backlash	$j_{r.i}$	0.4374	mm
Working pitch diameter	$d_{w.s}$	136.0000	864.0000 mm
Working pitch diameter	$d_{w.i}$	136.0000	864.0000 mm
Active root diameter	$d_{Nf.s}$	127.9757	851.5424 mm
Active root diameter	$d_{Nf.i}$	127.9757	851.5424 mm
Active tip diameter	$d_{Na.s}$	153.6000	878.4000 mm
Active tip diameter	$d_{Na.i}$	153.6000	878.4000 mm
Specific sliding at root	$\zeta_{f.s}$	-6.8324	-1.1079
Specific sliding at root	$\zeta_{f.i}$	-6.8324	-1.1079
Specific sliding at tip	$\zeta_{a.s}$	0.5256	0.8723
Specific sliding at tip	$\zeta_{a.i}$	0.5256	0.8723

Tolerances

		Gear 1	Gear 2
Tolerance class ISO 1328-1	A	8	6
Single pitch tolerance	f_pT	24	13 μm
Cumulative pitch tolerance	F_pT	69	50 μm
Profile slope tolerance	$f_{H\alpha}T$	21	11 μm
Profile form tolerance	$ff_{\alpha}T$	27	13 μm

		Gear 1	Gear 2
Profile tolerance, total	F α T	34	18 μ m
Helix slope tolerance	fH β T	23	13 μ m
Helix form tolerance	ff β T	26	15 μ m
Helix tolerance, total	F β T	35	20 μ m
Tolerance class ISO 1328-2	R	41	41
Tooth-to-tooth radial composite tolerance	fidT	67	117 μ m
Total radial composite tolerance	FidT	75	133 μ m

Strength

		Gear 1	Gear 2
Torque	T	1000.0000	6352.9412 Nm
Speed	n	360.0000	56.6667 rpm
Tip diameter	da	153.6000	878.4000 mm
Root diameter	df	117.6000	842.4000 mm
Root form diameter	dFf	127.9669	847.9580 mm
Transverse contact ratio	$\epsilon\alpha$	1.6613	
Overlap contact ratio	$\epsilon\beta$	0.0000	
Total contact ratio	$\epsilon\gamma$	1.6613	
Mean meshing stiffness	c $\gamma\alpha$	20.1417	N/mm/ μ m
Mean meshing stiffness	c $\gamma\beta$	17.1204	N/mm/ μ m
Misalignment due to deformations	fsh	1.9204	μ m
Misalignment due to manufacturing deviations	fma	26.4197	μ m
Dynamic factor	KV	1.0501	
Mesh load factor	K γ	1.0000	
Transverse load factor	KH α	1.2270	
Face load factor	KH β	1.9169	
Elasticity factor	ZE	189.8117	
Zone factor	ZH	2.4946	
Helix angle factor	Z β	1.0000	
Contact ratio factor	Z ϵ	0.8829	
Roughness factor	ZR	0.7915	0.8030
Velocity factor	Zv	0.9323	0.9364
Lubricant factor	ZL	1.0895	1.0837
Single pair tooth contact factor	ZB	1.0911	1.0000
Life factor for contact stress	ZNT	0.9561	1.0296
Nominal contact stress	σ H0	467.6957	MPa
Contact stress	σ H	801.9986	735.0438 MPa
Pitting stress limit	σ HG	599.5734	599.3792 MPa
Safety factor for pitting	SH	0.7476	0.8154
Transverse load factor	KF α	1.2270	
Face load factor	KF β	1.7104	

MESYS Shaft and Rolling Bearing Calculation

Change this text in mesys.ini

		Gear 1	Gear 2
Load distribution influence factor	f_{ϵ}	1.0000	
Helix angle factor	Y_{β}	1.0000	
Tooth form factor	Y_F	1.4974	1.3338
Stress correction factor	Y_S	1.8155	2.0557
Rim thickness factor	Y_B	1.0000	1.0000
Relative notch sensitivity factor	Y_{drelT}	0.9754	0.9929
Relative surface factor	Y_{RrelT}	0.9639	0.9639
Deep tooth factor	Y_{DT}	1.0000	1.0000
Size factor	Y_X	0.9820	0.9820
Life factor for tooth root stress	Y_{NT}	0.9179	0.9525
Nominal tooth root stress	σ_F0	49.9721	50.4024 MPa
Tooth root stress	σ_F	110.1336	111.0818 MPa
Tooth root stress limit	σ_{FG}	540.2628	532.6624 MPa
Safety factor for tooth breakage	SF	4.9055	4.7952