

Cylindrical Gear Pair Calculation

Input data

Geometry

Normal module	mn	8.0000 mm
Normal pressure angle	αn	20.000 °
Helix direction	Helix left hand	
Helix angle	β	15.800 °
Center distance	a	500.000 mm
Center distance upper tolerance	Δa.s	0.0000 mm
Center distance lower tolerance	Δa.i	0.0000 mm

		Gear 1	Gear 2
Number of teeth	z	17	103
Face width	b	100.0000	100.0000 mm
Profile shift coefficient	x	0.145	0.000
Upper tooth thickness allowance	Esns	-0.1598	-0.1600 mm
Lower tooth thickness allowance	Esni	-0.1598	-0.1600 mm

Reference profile

Basic rack dedendum	hfP1	1.4 · mn
Basic rack root radius	pfP1	0.39 · mn
Basic rack addendum	haP1	1 · mn
Tip alteration	k1	-0.00022916 · mn
Tip alteration	k1	-0.0018 mm
Basic rack dedendum	hfP2	1.4 · mn
Basic rack root radius	pfP2	0.39 · mn
Basic rack addendum	haP2	1 · mn
Tip alteration	k2	-0.000300169 · mn
Tip alteration	k2	-0.0024 mm

Material

Material gear 1		Own Input
Youngs modulus	E1	206000 MPa
Poisson number	nu1	0.3
Thermal elongation coefficient	α1	11.500 10 <sup>-6</sup> /°C
Material type	Eh	
Material quality	MQ	
Case hardness	HRC	60
Core hardness	HRC	30
Limiting tooth root stress	sigFlim1	500.000 MPa
Limiting contact stress	sigHlim1	1500.0 MPa
Material gear 2		Own Input

Change this text in mesys.ini

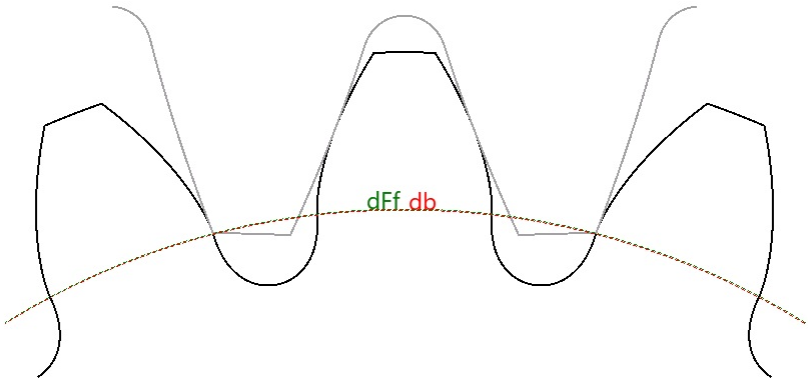
Youngs modulus	E2	206000 MPa
Poisson number	nu2	0.3
Thermal elongation coefficient	α2	11.500 10 <sup>-6</sup> /°C
Material type	Eh	
Material quality	MQ	
Case hardness	HRC	60
Core hardness	HRC	30
Limiting tooth root stress	sigFlim2	500.000 MPa
Limiting contact stress	sigHlim2	1500.0 MPa

Loading

Speed	n1	360.000 rpm
Torque	T1	9000.0 Nm
Power	P	339292 W
Application factor	KA	1
Required life	H	50000.0 h

Results

Geometry



		Gear 1	Gear 2
Profile shift coefficient	x.s	0.1178	-0.0275
Profile shift coefficient	x.i	0.1178	-0.0275
Reference diameter	d.nom	141.3401	856.3548 mm
Base diameter	db.nom	132.1986	800.9678 mm
Tip diameter	da.s	159.6600	872.3500 mm
Tip diameter	da.i	159.6600	872.3500 mm
Root diameter	df.s	120.8247	833.5151 mm
Root diameter	df.i	120.8247	833.5151 mm
Root form diameter	dFf.s	132.2482	839.0838 mm
Root form diameter	dFf.i	132.2482	839.0838 mm
Normal tooth thickness at tip	san.s	4.8871	6.3335 mm
Normal tooth thickness at tip	san.i	4.8871	6.3335 mm
Spanned teeth	k	2	13

# MESYS Shaft and Rolling Bearing Calculation

Change this text in mesys.ini

		<b>Gear 1</b>	<b>Gear 2</b>
Base tangent length	Wk.s	38.196	307.943 mm
Base tangent length	Wk.i	38.196	307.943 mm
Contact diameter for base tangent length	dMWk.s	137.26	854.50 mm
Contact diameter for base tangent length	dMWk.i	137.26	854.50 mm
Measurement ball diameter	DM	16.0000	13.0000 mm
Radial single ball distance	MrK.s	84.420	436.181 mm
Radial single ball distance	MrK.i	84.420	436.181 mm
Distance over two balls	MdK.s	168.189	872.262 mm
Distance over two balls	MdK.i	168.189	872.262 mm
Distance over two pins	MdR.s	168.841	872.362 mm
Distance over two pins	MdR.i	168.841	872.362 mm
Contact diameter for ball distance	dMBall.s	145.69	854.89 mm
Contact diameter for ball distance	dMBall.i	145.69	854.89 mm
Transverse contact ratio	$\epsilon\alpha.s$	1.5491	
Transverse contact ratio	$\epsilon\alpha.i$	1.5491	
Overlap contact ratio	$\epsilon\beta$	1.0834	
Total contact ratio	$\epsilon\gamma.s$	2.6325	
Total contact ratio	$\epsilon\gamma.i$	2.6325	
Working center distance	aw.s	500.0000	mm
Working center distance	aw.i	500.0000	mm
Working transverse pressure angle	$\alpha_{wt.s}$	21.0661	°
Working transverse pressure angle	$\alpha_{wt.i}$	21.0661	°
Center distance for $\epsilon\alpha = 1$	amax.s	504.9769	mm
Center distance for $\epsilon\alpha = 1$	amax.i	504.9769	mm
Center distance for zero clearance	amin.s	499.5663	mm
Center distance for zero clearance	amin.i	499.5663	mm
Circumferential backlash at the reference circle	jt.s	0.3324	mm
Circumferential backlash at the reference circle	jt.i	0.3324	mm
Circumferential backlash at the working pitch circle	jwt.s	0.3331	mm
Circumferential backlash at the working pitch circle	jwt.i	0.3331	mm
Transverse backlash	jbt.s	0.3109	mm
Transverse backlash	jbt.i	0.3109	mm
Normal backlash	jbn.s	0.3005	mm
Normal backlash	jbn.i	0.3005	mm
Radial backlash	jr.s	0.4324	mm
Radial backlash	jr.i	0.4324	mm
Working pitch diameter	dw.s	141.6667	858.3333 mm
Working pitch diameter	dw.i	141.6667	858.3333 mm
Active root diameter	dNf.s	132.9207	845.2252 mm
Active root diameter	dNf.i	132.9207	845.2252 mm
Active tip diameter	dNa.s	159.6600	872.3500 mm
Active tip diameter	dNa.i	159.6600	872.3500 mm

		<b>Gear 1</b>	<b>Gear 2</b>
Specific sliding at root	$\zeta_{f.s}$	-3.1226	-1.0096
Specific sliding at root	$\zeta_{f.i}$	-3.1226	-1.0096
Specific sliding at tip	$\zeta_{a.s}$	0.5024	0.7574
Specific sliding at tip	$\zeta_{a.i}$	0.5024	0.7574

**Tolerances**

		<b>Gear 1</b>	<b>Gear 2</b>
Tolerance class ISO 1328-1	A	5	5
Single pitch tolerance	$f_p T$	8.5	9 $\mu\text{m}$
Cumulative pitch tolerance	$F_p T$	24	35 $\mu\text{m}$
Profile slope tolerance	$f_{H\alpha} T$	7.5	8 $\mu\text{m}$
Profile form tolerance	$ff_{\alpha} T$	9.5	9.5 $\mu\text{m}$
Profile tolerance, total	$F_{\alpha} T$	12	12 $\mu\text{m}$
Helix slope tolerance	$f_{H\beta} T$	8	9 $\mu\text{m}$
Helix form tolerance	$ff_{\beta} T$	9.5	11 $\mu\text{m}$
Helix tolerance, total	$F_{\beta} T$	12	14 $\mu\text{m}$
Tolerance class ISO 1328-2	R	41	41
Tooth-to-tooth radial composite tolerance	$f_{id} T$	67	117 $\mu\text{m}$
Total radial composite tolerance	$F_{id} T$	75	133 $\mu\text{m}$

**Strength**

		<b>Gear 1</b>	<b>Gear 2</b>
Torque	T	9000.0000	54529.4118 Nm
Speed	n	360.0000	59.4175 rpm
Tip diameter	$d_a$	159.6600	872.3500 mm
Root diameter	$d_f$	121.2637	833.9548 mm
Root form diameter	$d_{Ff}$	132.2881	839.4550 mm
Transverse contact ratio	$\epsilon_{\alpha}$	1.5491	
Overlap contact ratio	$\epsilon_{\beta}$	1.0834	
Total contact ratio	$\epsilon_{\gamma}$	2.6325	
Mean meshing stiffness	$c_{\gamma\alpha}$	17.4656	N/mm/ $\mu\text{m}$
Mean meshing stiffness	$c_{\gamma\beta}$	14.8458	N/mm/ $\mu\text{m}$
Misalignment due to deformations	$f_{sh}$	14.7052	$\mu\text{m}$
Misalignment due to manufacturing deviations	$f_{ma}$	12.0416	$\mu\text{m}$
Dynamic factor	KV	1.0029	
Mesh load factor	K $_{\gamma}$	1.0000	
Transverse load factor	KH $_{\alpha}$	1.0000	
Face load factor	KH $_{\beta}$	1.1561	
Elasticity factor	ZE	189.8117	
Zone factor	ZH	2.3953	
Helix angle factor	Z $_{\beta}$	1.0194	
Contact ratio factor	Z $_{\epsilon}$	0.8035	
Roughness factor	ZR	0.9660	0.9660
Velocity factor	Zv	0.9691	0.9691

# MESYS Shaft and Rolling Bearing Calculation

Change this text in mesys.ini

		<b>Gear 1</b>	<b>Gear 2</b>
Lubricant factor	ZL	1.0474	1.0474
Single pair tooth contact factor	ZB	1.0000	1.0000
Life factor for contact stress	ZNT	0.9101	0.9618
Nominal contact stress	$\sigma_{H0}$	1206.5821	MPa
Contact stress	$\sigma_H$	1299.2332	1299.2332 MPa
Pitting stress limit	$\sigma_{HG}$	1338.4805	1414.5255 MPa
Safety factor for pitting	SH	1.0302	1.0887
Transverse load factor	$KF_\alpha$	1.0000	
Face load factor	$KF_\beta$	1.1253	
Load distribution influence factor	$f_\epsilon$	0.7767	
Helix angle factor	$Y_\beta$	0.9747	
Tooth form factor	YF	1.2609	1.0673
Stress correction factor	YS	1.7884	2.0460
Rim thickness factor	YB	1.0000	1.0000
Relative notch sensitivity factor	$Y_{drelT}$	0.9918	0.9986
Relative surface factor	$Y_{RrelT}$	0.9639	0.9639
Deep tooth factor	YDT	1.0000	1.0000
Size factor	YX	0.9700	0.9700
Life factor for tooth root stress	YNT	0.8888	0.9214
Nominal tooth root stress	$\sigma_{F0}$	349.8758	338.8343 MPa
Tooth root stress	$\sigma_F$	394.8601	382.3991 MPa
Tooth root stress limit	$\sigma_{FG}$	824.1726	860.3132 MPa
Safety factor for tooth breakage	SF	2.0873	2.2498