RHFAUT

The example concerns a case of a couple subjected to a one load level and the verification have adopted particular choices for the load distribution factors for example. Is possible to deal with the case of a couple subject to multiple levels of load (up to 8 possible) for the required life time . Is possible to diversify various choices in particular the factors of misalignment and dynamic choices which are given information and clarification on the output video and print.
The test was performed according to ISO 6336 but you can also run it according to AGMA and in both cases in their original form and / or with variations of the author.

Elaboration N° 29
TEST PRINT - IPAR/IDIS - NORMAL SOFTWARE

GENERAL DATA - Helical External Gear Pair

Operating Center Distance	A' = 200
Net Face Width	Bu = 90
Normal Metric Module, Nominal	Mn = 5
Normal Standard Pressure Angle	αn = 20
Standard Helix Angle	ß = 13
Transverse Operating Pressure Angle	αt' = 22.276587
Pinion Operating Pitch Diameter	D1' = 72.727
Gear Operating Pitch Diameter	D2' = 327.273
Operating Addendum Contact Ratios of Gear and Pinion	ε 2 = 0.509 , ε 1 = 0.897
Transverse and Face Contact ratios	$\varepsilon\,\alpha$ = 1.406 , ε ß = 1.289

PINION 1

Tooth Number	Z = 14
Coefficient of Addendum Modification	X = 0.49499
Tooth Outside Diameter	Da = 86.7
Tool Addendum	Ha0 = 1.3355 · Mn
Radius of the Tip Edge Rounding of the Tool: mean	ρa0 = 0.2 · Mn

Tool profile: III DIN 3972 - Grinding or skiving.
LEFT HELIX

Material: Case hardened steel.

GEAR 2 : EXTERNAL

Tooth Number	Z = 63
Coefficient of Addendum Modification	X = 0.01299355
Tooth Outside Diameter	Da = 333.4
Tool Addendum	Ha0 = 1.3355 · Mn
Radius of the Tip Edge Rounding of the Tool: mean	ρa0 = 0.2 · Mn

Tool profile: III DIN 3972 - Grinding or skiving.
RIGHT HELIX

Material: Case hardened steel.

Elasticity Data of the Gear Pair:

Mean Young's Module	Em = 206000
Elastic Coefficient for Hertzian pressure ratings	ZE = 190

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TEST PRINT - IPAR/IDIS - NORMAL SOFTWARE

RHF - LOADING CONDITION

Pinion Torque	T1 = 2132 Nm
Power at Pinion	P1 = 70.33 kW
Pinion Rotation Speed	n1 = 315 r.p.m.
Required Life	L = 25000 hours
Tangential Load	Ft' = 58631 N
Load per millimeter of face width	Ft'/Bu = 651.5 N/mm
Tangential Velocity	v = 1.2 m/s

RHF - OVERLOAD FACTORS

Mean Accuracy Grade of the two gears, ISO 1328: 5

Base of dynamic condition according to ISO 6336:
Factor $A = (v\ Z1/100) \cdot \sqrt{[U^2/(1+U^2)]}$ A = 0.16

Power Sharing Factor	Ksh = 1
Application Factor	Ka = 1
Tooth Load Distribution Factor	Km = 1,25

(For RHI: $KH\beta\ KH\alpha$ = Km. For RFI: $KF\beta\ KF\alpha$ = Km with margin.)

R H F - I

Dynamic Factor met. C ISO 6336 2nd ed. 2006, accur. 5	KvI = 1.006
Overall Overload Factor	VI = 1.258

Elaboration N° 29

R H I ref. ISO 6336		Pinion	Gear
Corrective coefficient of profile relative curvature	Z	1	1
Factor of transverse and face contact ratios	$Z\varepsilon^2$	0.711	
Profile Geometry Factor	GH	0.259	0.259
Size Factor	ZX	1	1
Assumed Hardness Factor	ZW	1	1
Kinematic Viscosity, mm²/s	$\nu 40$	220	
Lubricant Factor	ZL	1.014	1.014
Mean arithm. aver. roughness for the gear pair, µm	Ra	0.8	
Roughness Factor	ZR	0.966	0.966
Velocity Factor	Zv	0.948	0.948
Overall Adaptation Factor AH = (ZX ZW ZL ZR Zv)²		0.863	0.863
Surface conventional fatigue limit. Surface Yielding.			
Hertz pressure, conventional fatigue limit, N/mm²	σHlim	1600	1600
Conventional Hertz pressure, N/mm²	σH	1386	1386
Synthetic Surface Factor, N/mm²	K	10.95	
Conventional fatigue limit of K	Klim	12.594	12.594
Safety factor for fatigue limit = √(Klim/K)	SH	1.073	1.073
Service Factor according to original Agma definition	fs	1.15	1.15
Surface Fatigue Limit Torque at Pinion, Nm	T1Hlim	2453	2453
Surface Yielding Torque at Pinion, Nm	T1Hy	7275	7275
Life Rating			
Cycle number at the beginning of the life curve	NLW	100000	100000
Cycle number at vertex of conventional fatigue limit	NLV	50000000	50000000
Cycle number per revolution	nL / n	1	1
Loading Factor at reduced safety limit	QS	0	0
Surface Yielding Loading Factor	Qw	2.966	2.966
Loading Factor	QH	0.869	0.869
Exponent «A» of the curve NLf = NLV / QH^A	A	16	16
Surface Damage	Dg	1	0.223
Life until failure, hours	Lf	24900	112000
For 25000 hours, with exponents 16 and 16 resp.:			
Stress cycle factor	ZN	0.932	0.977
Safety factor for the required Life	SH	1	1.05
Service factor according to present Agma definition	fs	1	1.1

Elaboration N° 29

R F I ref. ISO 6336		Pinion	Gear
Tools: Type or Tooth Number	Z0	Hob	Hob
Tools: tip edge rounding radius / Mn	ρa0/Mn	0.2	0.2
Helix Angle Factor	Yß	0.8917	
Angle defining the dangerous fillet point	δF	30	30
Form Factor	YF	1.362	1.561
Stress Correction Factor	YS	2.451	2.208
Corrective coefficient of YS for fillet steps	YSg/YS	1.111	1.111
Notch Sensitivity Factor	YδrelT	1	1
Tooth Root Roughness Factor	YRrelT	1	1
Conventional fatigue limit. Yielding Torque.			
RF resisting face width, mm	BF	100	90
Test Nominal Limit Stress, N/mm²	σFlimT	500	500
Nominal Limit Stress for specific application, N/mm²	σFlim	500	500
Load: unidirectional			
Size Factor	YX	1	1
Nominal Root Bending Stress, N/mm²	σb	181	231
Unit Load UL = Ft' / (Mn BF) , N/mm²	UL	117.3	130.3
Conventional fatigue limit of UL	ULlim	237.5	229.9
Safety factor for fatigue limit, SF = ULlim / UL	SF	2.025	1.765
Service Factor according to original Agma definition	fs	2.025	1.765
Fatigue Limit Torque at Pinion, Nm	T1Flim	4318	3762
Yielding Torque at Pinion, Nm	T1Fy	14400	11400
Life Rating			
Cycle number at the beginning of the life curve	NLW	1000	1000
Cycle number at vertex of conventional fatigue limit	NLV	3000000	3000000
Cycle number per revolution	nL / n	1	1
Loading Factor at reduced safety limit	QS	0	0
Max. allowable Loading Factor	Qw	3.329	3.032
Loading Factor	QF	0.494	0.567
Exponent of the curve NLf = NLV / QF^A	A	50	50
Tooth Root Damage	Dg	0	0
Life until failure, hours	Lf	unlimited	unlimited
For 25000 hours, with exponents 50 and 50 resp.:			
Life factor	YN	0.904	0.931
Safety factor for the required Life	SF	1.83	1.64
Service factor according to present Agma definition	fs	1.83	1.64