

NOTES:

1. PROVIDE INSPECTION REPORTS OR PROOF ACCORDING TO THE PROVISIONS EN-10204-3.1. MATERIAL: SAE E9310: ALT. E9310H, 4320, 4820, 4320H, 4820H, 18 CrNiMo 6-7, 17 CrNiMo 7 STEEL BAR OR FORGING, MATERIAL SHALL CONFORM TO EN-10084 AND ISO 6336-5 GRADE MQ, OR AGMA 2001-D04-GRADE 2 WITH MATERIAL CLEANLINESS CERTIFIED TO ASTM E45 METHOD 'A' TO MEET

A		B		C		D	
Thin	Heavy	Thin	Heavy	Thin	Heavy	Thin	Heavy
3	3	2.5	1.5	2.5	1.5	2	1.5

2. HEAT TREAT:
 GEAR TEETH: CARBURIZE TEETH TO AN EFFECTIVE CASE DEPTH (FINISHED PART) OF 2.03/2.67mm MEASURED TO 52 HRC. TEMPER AT 170°C MIN. SURFACE HARDNESS 58/61 HRC AND CORE HARDNESS 28/40 HRC AT MID-TOOTH ROOT DIAMETER. THICK DASH-DOTTED AREAS.
 SPLINE TEETH: CASE HARDEN TO AN EFFECTIVE CASE DEPTH OF 0.76/1.27mm MEASURED TO 52 HRC. TEMPER AT 170°C MIN. SURFACE HARDNESS 57/62 HRC AND CORE HARDNESS 28/40 HRC AT MID-TOOTH ROOT DIAMETER. THREADS TO BE MASKED FREE FROM CARBURISATION.

3. IDENTIFY WITH PART NUMBER, REV LEVEL, SUPPLIER INITIALS, JOB NUMBER, AND SHOP ORDER NUMBER

4. ULTRASONIC TESTING: TESTING OF FORGINGS MUST FOLLOW THE PROVISIONS OF EN-10228-3 LEVEL (AGMA A-388 TO AN EQUIVALENT 3mm FLAT BOTTOMED HOLE IS AN ACCEPTABLE ALTERNATIVE)

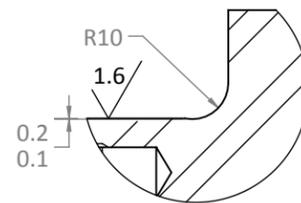
5. CRACK TESTING: MAGNETIC PARTICLE TEST GROUND SURFACES TO ISO 6336-5 GRADE MQ (ALT: AGMA 2001-D04-GRADE 2) NO CRACKS ALLOWED

6. GROUND TOOTH FLANKS AND FULL ROOT FILLET MUST BLEND WITHOUT GRIND NOTCH. UNLESS SPECIFIED OTHERWISE, 3.2µm Ra MAX FOR ALL GEAR PROFILES

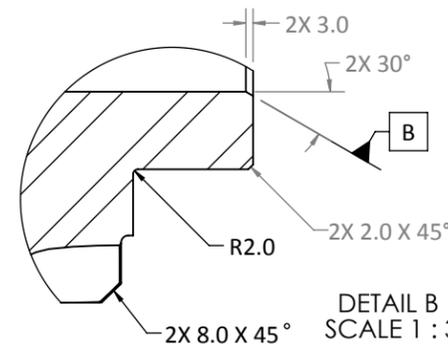
7. INSPECTION OF FINISHED GEAR SURFACES FOR TEMPER BURN TO AGMA 2007 GRADE FB1 USING ETCH TECHNIQUES OR BARKHAUSEN NOISE

8. RADIAL ALIGNMENT OF GEAR TEETH TO OTHER FEATURES NOT REQUIRED

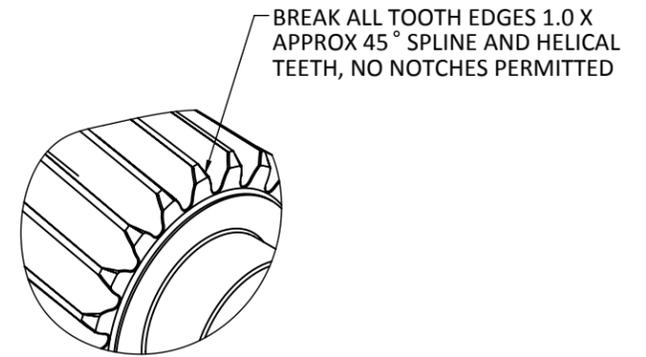
9. NON SPECIFIED FILLETS - R3, NON SPECIFIED CHAMFERS - 1x45°



DETAIL A SCALE 1:2



DETAIL B SCALE 1:3



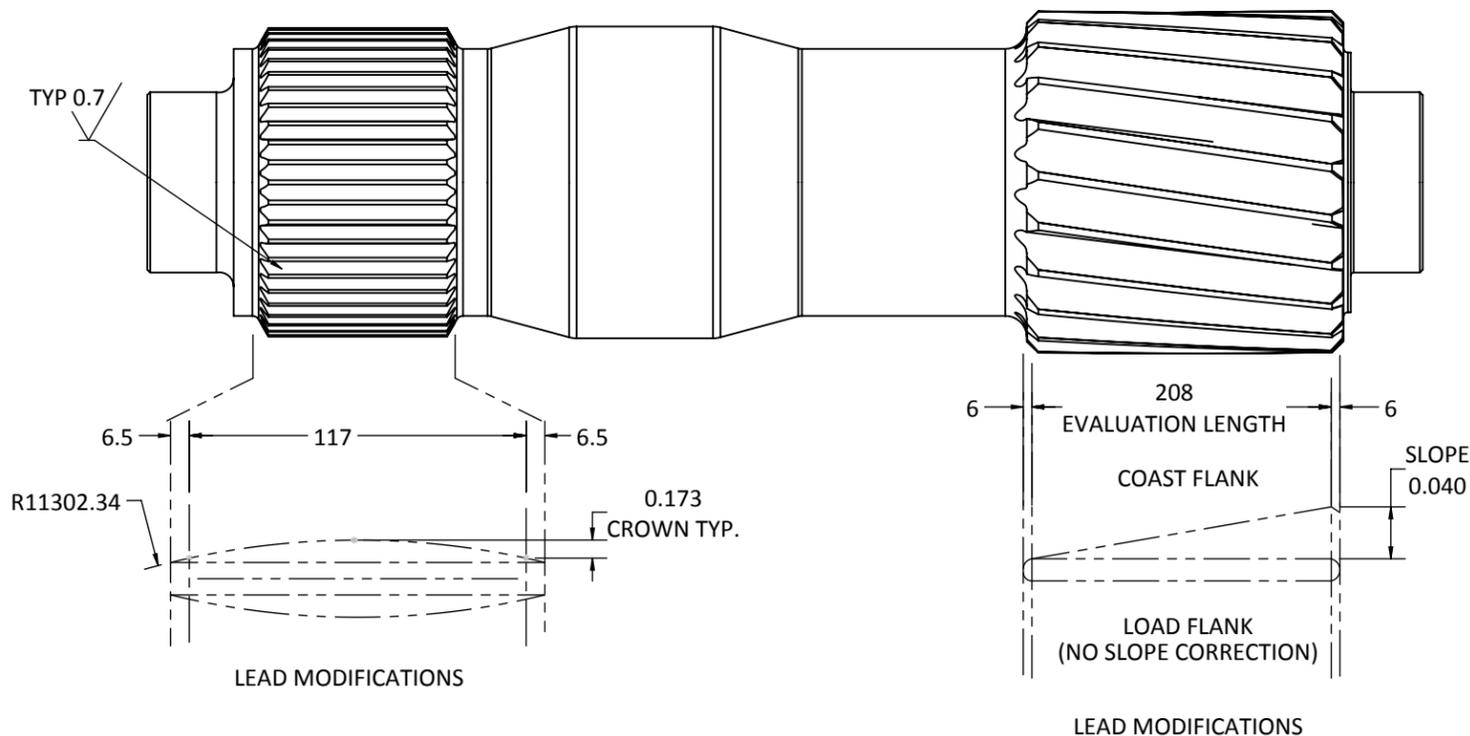
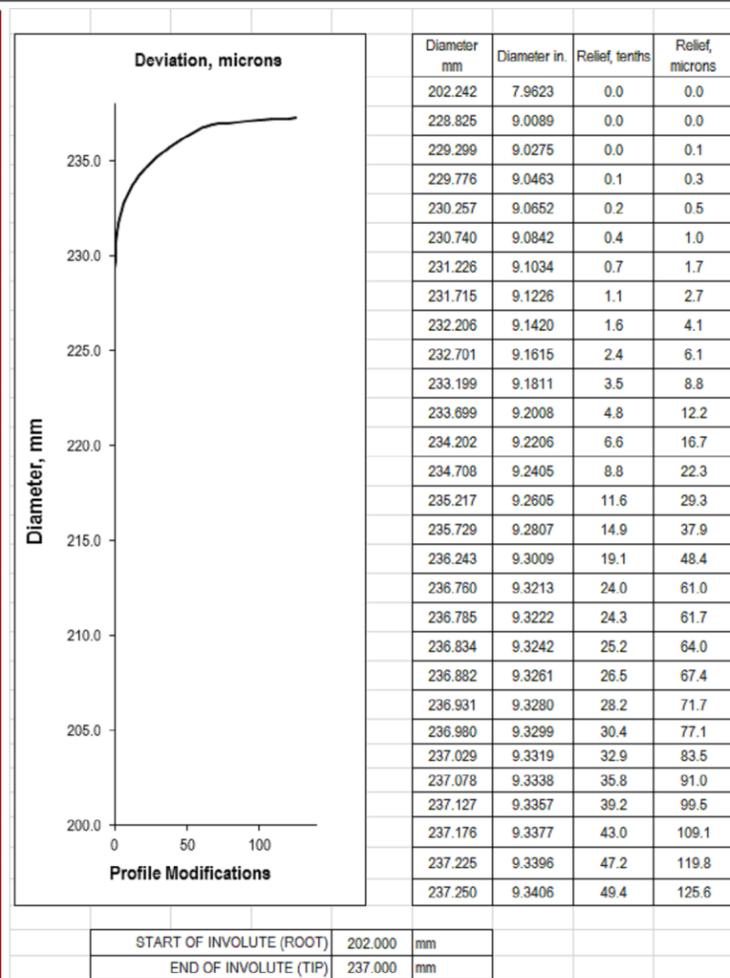
REV	CHANGED FROM	BY	DATE	APRD
B	CHANGED LOAD & COAST FLANK FINISH, UPDATE CHARTS ON P2	JFC	10/26/12	
C	REVIEW & UPDATE PER 1509-ECN-004	CPS	1/8/13	
D	UPDATE CHANGES PER CUSTOMER REQUEST	CPS	3/1/13	
E	UPDATE AS "NEW PART" NOT "MAKE FROM": RELEASE FOR PRODUCTION	CPS	4/11/13	
F	CHANGES REQUESTED PER MANUFACTURER DRW REVIEW	CPG	11/27/13	
G	CLARIFIED NOTE 1 WITH AGMA GRADE AND CLEANLINESS	CH	4/2/14	
H	CLARIFIED MPI NOTE	CH	4/4/14	
I	SUN MICRO LEAD DIAGRAM (ROMAX DOC 1509-ECN-025 REFERS)	CPG	7/9/14	

REPORT ERRORS & CHANGES REMOVE ALL BURRS AND SHARP EDGES DIMENSIONS ARE IN MILLIMETERS. UNSPECIFIED TOLERANCES:
 DECIMALS: FINISH: ANGLES:
 X. ±1.0 6.3 µm Ra < ±0.5°
 .X ±0.5
 .XX ±0.25
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 NOT TO BE REPRODUCED OR USED TO MAKE OTHER DRAWINGS OR MACHINERY
 DRAWN JFC DATE: 8/16/12
 CHECKED NJB THIRD ANGLE PRJ

National Renewable Energy Laboratory
 TITLE: GEAR, SUN
 SIZE **B** DWG. NO. 254495 REV **I**
 SCALE: 1:4 WEIGHT: 174.76 kgs SHEET 1 OF 2

EXTERNAL INVOLUTE SPLINE DATA, HS PINION	
SPUR GEAR DATA	
Number of Teeth	48
Normal Module	4.2333
Normal Pressure Angle	20.0000°
Whole Depth Constant (REF)	2.250
Operating Pitch Diameter	203.2000
Generating Pitch Diameter	203.2000
Profile Shift Coefficient (X1)	0.2500
Base Diameter	190.9455
Major Diameter (Max)	213.783
Form Diameter	198.110
Root Diameter	192.781
Tool Tip Radius (Min)	1.682
Number of Teeth in Mate	48
Center Distance	0.000
Normal Circular Backlash w/ Mate (Max/Min)	0.3 / 0.35
Quality per AGMA 2015-1 (Datum Surface)	A - B
Grade	7
Size Over 7.00 Pins (Max/Min)	217.38/217.323
Span Over 6 Teeth (Max/Min)	72.164/72.141
Trans Cir TT on Gen Dia, (Min)	7.245
Trans Cir TT on Gen Dia, (Max)	7.27

HELICAL GEAR DATA	
Number of Teeth	21
Normal Module	10.0000
Normal Pressure Angle	20.0000
Whole depth Constant (REF)	2.400
Oper pitch diameter (mm)	215.6000
Gen Pitch diameter (mm)	211.8095
Profile shift coefficient	0.186
Base diameter (mm)	198.8346
Major Diameter max (mm)	237.250
Form Diameter (mm)	202.243
Root Diameter (REF) (mm)	185.980
Tool Tip Radius min (mm)	4.25
Generating Helix Angle	7.4947
Hand of helix	RIGHT
Lead	5057.976
Number of teeth in Mate	39
Center Distance (mm)	308.000
Normal cir backlash with Mate (min/max) (mm)	.25/.29
Quality per ISO 1328-1, Datum Surface	A-B
Active flank grade	5
Trans Cir TT on Gen Dia, Min (mm)	16.804
Trans Cir TT on Gen Dia, Max (mm)	16.883
Size over 19.2 balls (max/min) (mm)	243.621/243.464
Span over 4 teeth (max/min) (mm)	107.307/107.234



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X. ±1.0 6.3 / $\sqrt{\mu\text{m Ra}}$ $\leq \pm 0.5^\circ$
.X ±0.5
.XX ±0.25
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OTHER DRAWINGS OR MACHINERY
DRAWN JFC DATE: 8/16/12
CHECKED NJB THIRD ANGLE PRJ

National Renewable Energy Laboratory
TITLE: GEAR, SUN
SIZE **B** DWG. NO. 254495 REV **I**
SCALE: 1:4 WEIGHT: 174.76 kgs SHEET 2 OF 2