

KISSsoft evaluation

File

Name : Splines 1 (DIN 5480)  
Description: KISSsoft example  
Changed by: kspl on: 07.03.2016 at: 10:54:34

**SPLINED JOINTS      DIN 5480:2006**

Shaft                    DIN5480 - W 70.00\*3.00\*22\*6f  
Hub                     DIN5480 - N 70.00\*3.00\*22\*7H

Drawing or article number:

Shaft:                 0.000.0  
Hub:                    0.000.0

**1. TOOTH GEOMETRY AND MATERIAL**

Normal module (mm)	[mn]	3.0000	
Nominal diameter DIN (mm)	[dB]	70.00	
Pressure angle at normal section (°)	[alfn]	30.000	
		----- SHAFT -----	HUB -----
Number of teeth	[z]	22	-22
Helix angle at reference circle (°)	[beta]	0.0000	
Facewidth (mm)	[b]	100.00	100.00
Hand of gear	Spur gear		

Material

Gear 1:                    18CrNiMo7-6, Case-carburized steel, case-hardened  
ISO 6336-5 Figure 9/10 (MQ), core strength >=25HRC Jominy

J=12mm<HRC28

Gear 2:                    34 CrMo 4, Through hardened steel, alloyed, through hardened  
ISO 6336-5 Figure 5/6 (MQ)

		----- SHAFT -----	HUB ----
Surface hardness		HRC 61	HBW 238

Gear reference profile    1 :  
Reference profile         DIN 5480:2006 0.60 / 0.16 / 0.45 Hobbing

Dedendum coefficient	[hfP*]	0.600
Root radius factor 0.760)	[rhofP*]	0.160 (rhofPmax*=
Addendum coefficient	[haP*]	0.450
Tip radius factor	[rhoaP*]	0.000
Protuberance height factor	[hprP*]	0.000
Protuberance angle	[alfprP]	0.000
Tip form height coefficient	[hFaP*]	0.000
Ramp angle	[alfKP]	0.000

not topping

Gear reference profile 2 :

Reference profile DIN 5480:2006 0.65 / 0.16 / 0.45 Shaping

Dedendum coefficient	[hfP*]	0.650
Root radius factor 0.710)	[rhofP*]	0.160 (rhofPmax*=
Addendum coefficient	[haP*]	0.450
Tip radius factor	[rhoaP*]	0.000
Protuberance height factor	[hprP*]	0.000
Protuberance angle	[alfprP]	0.000
Tip form height coefficient	[hFaP*]	0.000
Ramp angle	[alfKP]	0.000

not topping

Summary of reference profile gears:

Dedendum reference profile	[hfP*]	0.600	0.650
Tooth root radius Refer. profile	[rofP*]	0.160	0.160
Addendum Reference profile	[haP*]	0.450	0.450
Protuberance height factor	[hprP*]	0.000	0.000
Protuberance angle (°)	[alfprP]	0.000	0.000
Tip form height coefficient	[hFaP*]	0.000	0.000
Ramp angle (°)	[alfKP]	0.000	0.000

Transverse module (mm)	[mt]	3.000
Pressure angle at pitch circle (°)	[alft]	30.000
Base helix angle (°)	[betab]	0.000
Sum of profile shift coefficients	[Summexi]	0.0000

		----- SHAFT -----	HUB -----
Profile shift coefficient	[x]	0.1167	-0.1167
Profile shift (x*m) (mm)	[x*m]	0.3501	-0.3501
Reference diameter (mm)	[d]	66.000	-66.000
Base diameter (mm)	[db]	57.158	-57.158
Tip diameter (mm)	[da]	69.400	-64.000
Effective tip diameter (mm)	[da.e/i]	69.400 / 69.210	-64.000 / -64.190

Tip diameter allowances (mm)	[Ada.e/i]	0.000 / -0.190	0.000 / -0.190
Root diameter (mm)	[df]	63.100	-70.600
Effective root diameter (mm)	[df.e/i]	63.040 / 63.008	-70.626 / -70.669
Root diameter allowances (mm)	[Adf.e/i]	-0.061 / -0.092	-0.026 / -0.069
Root diameter allowances	Adf.e/i and df.e/i	only as indication.	
In accordance to DIN5 480 other allowances are valid according to the manufacturing process..			
Generating Profile shift coefficient	[xE.e/i]	0.1066 / 0.1014	-0.1210 / -0.1282
Root form diameter (mm)	[dFf.e/i]	63.665 / 63.637	-69.719 / -69.790
(dFf2 calculated with virtual pinion type cutter (circa): z= 14 x= 0.300 rhoaP0*=0.1)			
Tooth height (mm)	[H]	3.150	3.300
Theoretical tip clearance (mm)	[c]	0.600	0.450
Effective tip clearance (mm)	[c.e/i]	0.730 / 0.613	0.591 / 0.480
Normal-tooth thickness at tip circle (mm)	[san]	3.171	3.112
(mm)	[san.e/i]	3.256 / 3.115	3.203 / 3.073
Normal space width at root circle (mm)	[efn]	2.634	2.370
(mm)	[efn.e/i]	2.637 / 2.638	2.368 / 2.365
Pitch on reference circle (mm)	[pt]		9.425
Base pitch (mm)	[pbt]		8.162
Transverse pitch on contact-path (mm)	[pet]		8.162

## **2. MEASUREMENTS FOR TOOTH THICKNESS**

		----- SHAFT -----	HUB -----
Accuracy grade		6	7
Tooth thickness deviation		DIN 5480 f	DIN 5480 H
Number of teeth spanned	[k]	4.0000	-4.0000
Base tangent length (no backlash) (mm)	[Wk]	31.9898	-31.9898
Diameter of contact point (mm)	[dMWk.m]	65.4880	-65.5039
Theoretical diameter of ball/pin (mm)	[dm]	5.8253	5.3305
Eff. Diameter of ball/pin (mm)	[DMeff]	6.0000	5.5000
Theor. dimension over two balls (mm)	[MRe/Mri-ball]	76.1835	-58.2371
Diametral measurement over rolls without clearance (mm)	[MRe/Mri-pin]	76.1835	-58.2371

### **Data for Actual Dimensions ( DIN 5480:2005)**

Tooth thickness / Spacewidth (mm)	[Smax/Smin, Emax/Emin]	5.0816 / 5.0636	5.1566 / 5.1316
Tooth thickness tolerance, normal section (mm)	[Tol.Smax/min]	-0.0350 / -0.0530	
Tooth space tolerance, normal section (mm)	[Tol.Emax/min]		0.0400 / 0.0150
Base tangent length (mm)	[Wk.Smax/Smin]	31.9594 / 31.9439	-32.0244 / -32.0027
Diametral two ball measure (mm)	[MRe/Mri-ball]	76.1313 / 76.1044	58.3152 / 58.2664

Diametral measurement over rolls (mm) [MRe/Mri-pin] 76.1313 / 76.1044 58.3152 / 58.2664

**Data for Effective Dimensions ( DIN 5480:2005)**

Tooth thickness / Spacewidth (mm) [Svmax/min, Evmax/min] 5.0916 / 5.0816 5.1316 / 5.1166  
 Tooth thickness tolerance, normal section (mm) [Tol.Svmax/min] -0.0250 / -0.0350  
 Tooth space tolerance, normal section (mm) [Tol.Evmax/min] 0.0150 / 0.0000  
 Base tangent length (mm) [Wk.Svmax/min](31.9681 / 31.9594) (-32.0027 / -31.9898)  
 Diametral two ball measure (mm) [MRe/Mri-ball]( 76.1462 / 76.1313) (-58.2664 / -58.2371)  
 Diametral measurement over rolls (mm) [MRe/Mri-pin] ( 76.1462 / 76.1313) (-58.2664 / -58.2371)

Circumferential backlash (transverse section):

-Theoretical (without form errors) (mm) [jt.th] 0.0930 / 0.0500  
 -Effective (with form errors) (mm) [jt.eff] 0.0500 / 0.0250  
 Normal backlash theoretical (mm) [jn.th] 0.0805 / 0.0433  
 Normal backlash (mm) [jn.eff] 0.0433 / 0.0217  
 Theoretical radial clearance (mm) [jr.th] 0.0778 / 0.0412  
 Radial clearance (mm) [jr.eff] 0.0406 / 0.0196

Notice: When controlling splines with individual measurements (base tangent length/pin diameter) respect the values in 'Actual dimensions'.

**3. GEAR ACCURACY**

----- SHAFT ----- HUB -----

According to DIN 5480:2005:

Accuracy grade	[Q-DIN5480]	6	7
Total profile deviation (µm)	[Fa]	10.0	13.0
Total helix deviation (µm)	[Fb]	10.0	12.0
Single pitch deviation (µm)	[fp]	8.0	11.0
Total cumulative pitch deviation (µm)	[Fp]	18.0	25.0
Runout (µm)	[Fr]	50.0	50.0

**5. ADDITIONAL DATA**

Moment of inertia (System referenced to wheel 1):  
 calculation without consideration of the exact tooth shape

single gears	((da+df)/2...di) (kg*m <sup>2</sup> )	[TraeghMom]	0.00147	0.00206
System	((da+df)/2...di) (kg*m <sup>2</sup> )	[TraeghMom]	0.00354	

Remark regarding mounting with clamping using small helix angle on shaft

(Clamping at the earliest at  $0.33 \cdot b$ , spätestens bei  $0.66 \cdot b$ )

Helix angle difference (°) [beta.min/max] 0.0217... 0.0868

## **6. TOOTH FORM DEFINITION**

Data for the tooth form calculation :

Data not available.

End of Report

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lines: