PŘÍLOHA č. 1

Návrh planetového soukolí v programu KISSsoft

KISSsoft

KISSsoft Release 2020 A.1

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File

Name : Unnamed
Changed by: kajag on: 30.04.2021 at: 14:16:56

Calculation of a spur planetary gear stage

Drawing or article number:					
Gear 1:		0.000.0			
Gear 2:		0.000.0			
Gear 3:		0.000.0			
Calculation method		DIN 3990:1987 Method B (YF Method C)			
		------- Sun ----------	Planets	---------- Internal gear ---	
Number of planets	[p]	1	3	1	
Power (kW)	[P]	12828.170			
Speed (1/min)	[n]	282.7		-0.0	
Speed planet carrier (1/min)	[nSteg]	70.0			
Power (kW)	[P]	12828.170		0.000	
Planet carrier performance (kW)	[PSteg]	12828.170			
Torque (Nm)	[T]	433333.3	0.0	1316666.7	
Torque Pl.-Carrier (Nm)	[TSteg]	1750000.000			
Application factor	[KA]	2.25			
Distribution factor	[Kγ]	1.15			
Required service life (h)	[H]	50000.00			
Gear driving (+) / driven (-)		-	+/-	+	
Gear 1 direction of rotation:		Clockwise			
Planet carrier direction of rotation:		clockwise			

Tooth geometry and material

Center distance (mm)	[a]	849.400			
Normal module (mm)	[mn]	32.0000			
Normal pressure angle (°)	[αn]	20.0000			
Helix angle at reference circle (°)	[β]	0.0000			
Number of teeth	[z]	26	25	-79	
Facewidth (mm)	[b]	360.00	360.00	360.00	
Hand of gear		Spur gear			
Surface hardness		HRC 61	HRC 61		HRC 56
Fatigue strength. tooth root stress (N/mm²)	[σFlim]	500.00	500.00	370.00	

Fatigue strength for Hertzian pressure (N/mm²)	[σHlim]	1500.00	1500.00	1220.00

Gear reference profile 1:

Reference profile	1.25 / 0.38 / 1.0 ISO 53:1998 Profil A	
Dedendum coefficient	[hfP*]	1.250
Root radius factor	[ρfP*]	0.380 (ρfPmax*=0.472)
Addendum coefficient	[haP*]	1.000
Tip radius factor	[ρaP*]	0.000
Protuberance height coefficient	[hprP*]	0.000
Protuberance angle	[αprP]	0.000
Tip form height coefficient	[hFaP*]	0.000
Ramp angle	[αKP]	0.000
	not topping	

Gear reference profile 2:

Reference profile	1.25 / 0.38 / 1.0 ISO 53:1998 Profil A	
Dedendum coefficient	[hfP*]	1.250
Root radius factor	[ρfP*]	0.380 (ρfPmax*=0.472)
Addendum coefficient	[haP*]	1.000
Tip radius factor	[ρaP*]	0.000
Protuberance height coefficient	[hprP*]	0.000
Protuberance angle	[αprP]	0.000
Tip form height coefficient	[hFaP*]	0.000
Ramp angle	[αKP]	0.000
	not topping	

Gear reference profile 3:

Reference profile	1.25 / 0.38 / 1.0 ISO 53:1998 Profil A	
Dedendum coefficient	[hfP*]	1.250
Root radius factor	[ρfP*]	0.380 (ρfPmax*=0.472)
Addendum coefficient	[haP*]	1.000
Tip radius factor	[ρaP*]	0.000
Protuberance height coefficient	[hprP*]	0.000
Protuberance angle	[αprP]	0.000
Tip form height coefficient	[hFaP*]	0.000
Ramp angle	[αKP]	0.000
	not topping	

Lubrication type	Oil injection lubrication	
Oil nominal kinematic viscosity at 40°C (mm²/s)	[v40]	320.00
Oil temperature (°C)	[TS]	70.000

Overall transmission ratio	[itot]	0.248

Transverse contact ratio	[εα]	1.472	
Overlap ratio	[εβ]	0.000	
Total contact ratio	[εγ]	1.472	
Overall transmission ratio	[itot]	0.248	

Transverse contact ratio	[εα]	1.550	
Overlap ratio	[εβ]	0.000	
Total contact ratio	[εγ]	1.550	
Profile shift coefficient	[x]	0.4919	
Tooth thickness, arc, in module	[sn*]	1.9289	
Reference diameter (mm)	[d]	832.000	
Base diameter (mm)	[db]	781.824	
Tip diameter (mm)	[da]	927.482	
Root diameter (mm)	[df]	783.482	
Profile shift coefficient	[x]	0.6942	
Tooth thickness, arc, in module	[sn*]	2.0761	
Reference diameter (mm)	[d]	800.000	
Base diameter (mm)	[db]	751.754	
Tip diameter (mm)	[da]	908.428	
Root diameter (mm)	[df]	764.428	
Profile shift coefficient	[x]	-0.2690	
Tooth thickness, arc, in module	[sn*]	1.3750	
Reference diameter (mm)	[d]	-2528.000	
Base diameter (mm)	[db]	-2375.543	
Tip diameter (mm)	[da]	-2481.214	
Root diameter (mm)	[df]	-2625.214	
Operating pitch diameter (mm)	[dw]	866.055	
Specific sliding at the tip	[ζa]	0.517	
Specific sliding at the root	[ζf]	-1.402	
Operating pitch diameter (mm)	[dw]	832.745	
Specific sliding at the tip	[ζa]	0.584	
Specific sliding at the root	[ζf]	-1.070	
Operating pitch diameter (mm)	[dw]	786.481	
Specific sliding at the tip	[ζa]	0.374	
Specific sliding at the root	[ζf]	-0.044	
Operating pitch diameter (mm)	[dw]	-2485.281	
Specific sliding at the tip	[ζa]	0.042	
Specific sliding at the root	[ζf]	-0.597	

General influence factors

Nominal circum. force at pitch circle (N)	[Ft]	347222.222	347222.222
Nominal circumferential force (N)	[Ftw]	333568.794	353190.487
Circumferential speed reference circle (m/s)	[v]	9.27	(Planet)

Meshing stiffness (N/mm/µm)	[cγ]		16.758	18.971
Resonance ratio (-)	[N]		0.103	0.177
Dynamic factor	[Kv]		1.00	1.00
Face load factor - flank	[KHβ]		1.25	1.25
- Tooth root	[KFβ]		1.20	1.20
- Scuffing	[KBβ]		1.25	1.25
Transverse load factor - flank	[KHα]		1.00	1.00
- Tooth root	[KFα]		1.00	1.00
- Scuffing	[KBα]		1.00	1.00

Tooth root load capacity

Calculation of Tooth form coefficients according method: C				
Tooth form factor	[YF]	2.14		
	[YF]		2.02	/2.02
	[YF]			1.73
Stress correction factor	[YS]	1.82		
	[YS]		1.89	/1.89
	[YS]			2.09
Contact ratio factor	[Yε]		0.76	0.73
Helix angle factor	[Yβ]		1.00	1.00
Tooth root stress (N/mm²)	[σF]	276.49		
(N/mm²)	[σF]		270.48	/261.38
(N/mm²)	[σF]			247.26
Notch sensitivity factor	[YdrelT]	1.001		
Notch sensitivity factor	[YdrelT]		1.004 /	1.004
Notch sensitivity factor	[YdrelT]			1.008
Surface factor	[YRrelT]	0.957	0.957	0.957
Size factor, tooth root	[YX]	0.800	0.800	0.800
Finite life factor	[YNT]	1.000	1.000	1.000
Alternating bending factor, mean stress influence coefficient				
	[YM]	1.000	0.700	1.000
Limit strength tooth root (N/mm²)	[σFG]	766.46		
Limit strength tooth root (N/mm²)	[σFG]		537.95	/537.95
Limit strength tooth root (N/mm²)	[σFG]			570.68
Safety for tooth root stress	[SF=σFG/σF]	2.77		
	[SF=σFG/σF]		1.99	/2.06
	[SF=σFG/σF]			2.31

Flank safety

Zone factor	[ZH]		2.18	2.71

Elasticity factor (√N/mm²)	[ZE]	189.81	189.81		
Contact ratio factor	[Zε]	0.918	0.904		
Helix angle factor	[Zβ]	1.000	1.000		
Contact stress at operating pitch circle (N/mm²)	[σHw]	1050.52	760.11		
Contact stress (N/mm²)	[σHB, σHD]	1062.59	1058.13	/760.11	760.11
Lubrication factor for NL	[ZL]	1.047	1.047 /	1.047	1.047
Speed factor for NL	[ZV]	0.998	0.998 /	0.998	0.998
Roughness factor for NL	[ZR]	1.020	1.020 /	1.038	1.038
Material hardening factor for NL	[ZW]	1.000	1.000 /	1.000	1.000
Finite life factor	[ZNT]	1.000	1.000	1.000	
Size factor (flank)	[ZX]	0.900	0.900	0.900	
Pitting stress limit (N/mm²)	[σHG]	1438.69	1438.69	/1464.05	1190.76

Safety factor for contact stress at operating pitch circle	[SHw]	1.37	1.37	/1.93	1.57
Safety for stress at single tooth contact	[SHBD=σHG/σHBD]	1.35	1.36	/1.93	1.57

Micropitting according to **ISO/TS 6336-22:2018**

Pairing Gear 1 -2 :
Calculation has not been carried out, lubricant: Load stage micropitting test not known

Pairing Gear 2 -3 :
Calculation has not been carried out, lubricant: Load stage micropitting test not known

Scuffing load capacity

Calculation method according to	DIN 3990:1987		
Helical load factor for scuffing	[KBγ]	1.00	1.00
Applicable circumferential force/facewidth (N/mm)	[wBt]	3119.575	3119.575
Flash temperature-criteria			
Tooth mass temperature (°C)	[θMB]	159.42	101.42
Scuffing temperature (°C)	[θS]	403.59	403.59
Margin of safety for scuffing, flash temperature	[SB]	1.345	3.829
Integral temperature-criteria			
Tooth mass temperature (°C)	[θMC]	119.27	101.06
Integral scuffing temperature (°C)	[θSint]	403.59	403.59
Integral tooth flank temperature (°C)	[θint]	207.24	156.54
Safety factor for scuffing (intg.-temp.)	[SSint]	1.95	2.58

Measurements for tooth thickness

		Gear 1	Gear 2	Gear 3	
Tooth thickness tolerance		Own Input	Own Input	Own Input	
Tooth thickness allowance (normal section) (mm)	[As.e/i]	-0.128 /	-0.192-0.192 /	-0.266-0.266 /	-0.426

Number of teeth spanned	[k]	4.000	4.000	-9.000		
Base tangent length (no backlash) (mm)	[Wk]	353.059	357.038	-844.273		
Base tangent length with allowance (mm)	[Wk.e/i]	352.938 /	352.878	356.858 /	356.788	-844.523 / -844.673
Effective diameter of ball/pin (mm)	[DMeff]	69.400	67.500	55.400		
Diametral measurement over two balls without clearance (mm)	[MdK]	977.254	946.076	-2465.371		
Diametral two ball measure (mm)	[MdK.e/i]	977.017 /	976.899	945.730 /	945.596	-2466.116 / -2466.564
Measurement over pins according to DIN 3960 (mm)	[MdR.e/i]	977.017 /	976.899	945.730 /	945.596	-2466.116 / -2466.564
Measurement over 3 pins, axial, according to AGMA 2002 (mm)	[dk3A.e/i]	977.017 /	976.899	945.730 /	945.596	-2466.116 / -2466.564

Circumferential backlash, transverse section (mm)	[jtw]	0.520 /	0.290	0.708 /	0.423
Normal backlash (mm)	[jnw]	0.461 /	0.270	0.681 /	0.400
Total torsional angle (°)	[j.tSys]	0.0392/	0.0265		

Service life, damage

Required safety for tooth flank	[SHmin]	1.00			
System service life (h)	[Hatt]	> 1000000			
Tooth root service life (h)	[HFatt]	1e+06	1e+06	1e+06	
Tooth flank service life (h)	[HHatt]	1e+06	1e+06	1e+06	

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PŘÍLOHA č. 2

Návrh ložisek satelitů v programu MITCalc

Valivá ložiska INA/FAG

i **Výpočet bez chyb.**

ii **Informace o projektu**

? **Kapitola vstupních parametrů**

1.0 ☑ Volba typu ložiska, zatížení ložiska

1.1 Jednotky výpočtu: SI Units (N, mm, kW…)

1.2 **Typ ložiska**

FAG : Soudečková ložiska s válcovou dírou

1.3 **Provedení ložiska**

1.4

1.5

1.6

1.7 **Zatížení ložiska**

1.8	Otáčky	n	256,9	[/min]
1.9	Radiální zatížení	Fr	140086,2	[N]
1.10	Axiální zatížení	Fa	0,0	[N]
1.11	Součinitel přídavných dynamických sil		1,92	

1.12 **Požadované parametry ložiska**

1.13	Trvanlivost ložiska	Lh	25000	[h]
1.14	Součinitel statické bezpečnosti	s0	2,00	

1.15 **Přídavné dynamické síly**

1.16 ○ **Žádné**

1.17 ◉ **Od ozubených převodů**

1.18 Běžná ozubená kola (úchylky tvaru a rozteče 0.02

1.19	Součinitel	fk	1,1 - 1,3	1,20 ☑

1.20 Válcovací stolice, kladiva, nůžky na plech, razící st

1.21	Součinitel	fd	1,3 - 2	1,60 ☑

1.22 ○ **Od řemenových převodů**

1.23 Klínové řemeny

1.24	Součinitel	fb	1,9 - 2,5	2,20 ☑

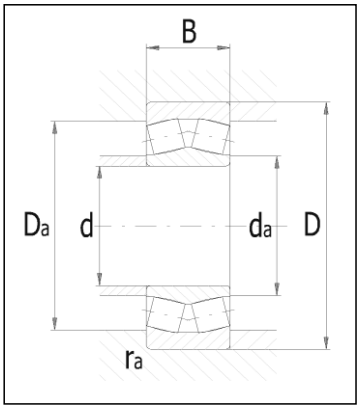
2.0 ☑ Volba rozměrů ložiska

2.1 **Rozměry ložiska**

ID	d	D	B	C	C0	nr	nmax	Ložisko
207	280,0	420,0	140,0	2000000	4000000	800	1100	24056-B-MB

2.2 **Parametry ložiska**

2.3	Základní dynamická únosnost	C	2000000	[N]	d	280
2.4	Dynamické ekvivalentní zatížení	P	268965,5	[N]	D	420
2.5	Základní trvanlivost	L10h	52063	[h]	B	140
2.6	Základní statická únosnost	C0	4000000	[N]	ramax	3
2.7	Statické ekvivalentní zatížení	P0	268965,5	[N]	Damax	405,4
2.8	Součinitel statické bezpečnosti	s0	14,87		damin	294,6
2.9	Dovolené radiální zatížení	Frmax	-	[N]		
2.10	Dovolené axiální zatížení	Famax	-	[N]		
2.11	Referenční otáčky	nr	800	[/min]		
2.12	Mezní otáčky	nmax	1100	[/min]		
2.13	Ztrátový výkon	NR	1823,43	[W]		
2.14	Váha ložiska	g	70,8	[kg]		



3.0 ☑ Provozní parametry, modifikovaná trvanlivost ložiska

3.1 **Kinematická viskozita maziva**

3.2	Vztažná viskozita	ν_1	24	[mm^2/s]
3.3	Provozní viskozita	ν	130,0	[mm^2/s]
3.4	Viskozní poměr	κ	5,42	

3.5 **Požadované minimální zatížení**

3.6	Minimální radiální zatížení	Frmin	-	[N]

3.7 **Výpočet modifikované trvanlivosti**

3.8	Mezní únavové zatížení	Pu	225000	[N]
3.9	Požadovaná spolehlivost		90 %	
3.10	Znečištění maziva		Typické znečištění	
3.11	Součinitel úrovně znečištění	η	0,4 - 0,2	0,30 ☑
3.12	Součinitel trvanlivosti	a1/a23	1	1,8
3.13	Modifikovaná trvanlivost	Lmh	93713	[h]

Kapitola doplňků

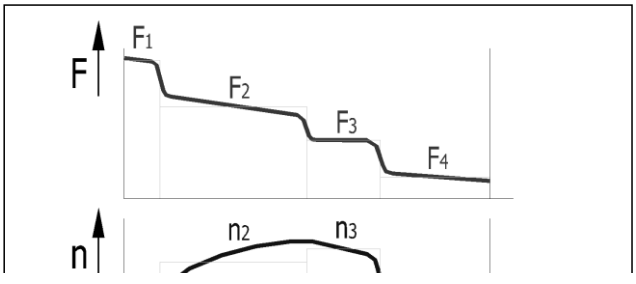
4.0 ☐ Pomocné výpočty

5.0 ☑ Proměnlivé zatížení ložiska

5.1 Počet různých podmínek zatížení: 3

5.2 Tabulka zatížení

i	Fri [N]	Fai [N]	ni [/min]	ti/t [%]
1	403976,1	0,0	221,2	3,4
2	40397,6	0,0	221,2	47,7
3	40397,6	0,0	294,0	49,0
4				
5				
6				



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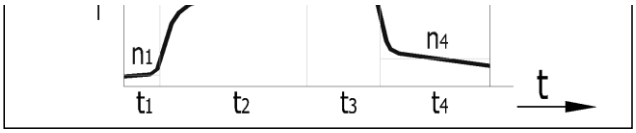

5.3 **Střední zatížení**

5.4	Otáčky	n	256,9	[/min]
5.5	Radiální zatížení	Fr	140086,2	[N]
5.6	Axiální zatížení	Fa	0	[N]

5.7 Přenos zatížení do hlavního výpočtu

6.0 ☐ **Výpočet ložisek s kosoúhlým stykem**

7.0 ☐ **Grafický výstup, CAD sytémy**

PŘÍLOHA č. 3

Návrh čelního ozubení korunového kola v programu KISSsoft

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File

Name : vnejsi_ozubeni
Changed by: kajag on: 30.04.2021 at: 14:24:19

Calculation of a spur-toothed cylindrical gear pair

Drawing or article number:			
Gear 1:		0.000.0	
Gear 2:		0.000.0	
Calculation method		ISO 6336:2019	
		------- Gear 1 --------	Gear 2 --
Power (mW)	[P]	3803.614	
Speed (1/min)	[n]	0.0	0.0
Torque (Nm)	[T]	363218.4	1316666.7
Application factor	[KA]	2.25	
Required service life (h)	[H]	25000.00	
Gear driving (+) / driven (-)		+	-
Gear 1 direction of rotation:		Clockwise	

Tooth geometry and material

Center distance (mm)	[a]	2298.000		
Normal module (mm)	[mn]	25.0000		
Normal pressure angle (°)	[αn]	20.0000		
Helix angle at reference circle (°)	[β]	0.0000		
Number of teeth	[z]	40	145	
Facewidth (mm)	[b]	200.00	200.00	
Hand of gear		Spur gear		
Surface hardness		HRC 61	HRC 61	
Fatigue strength. tooth root stress (N/mm²)	[σFlim]	430.00	430.00	
Fatigue strength for Hertzian pressure (N/mm²)	[σHlim]	1500.00	1500.00	

Gear reference profile 1:			
Reference profile	1.25 / 0.38 / 1.0 ISO 53:1998 Profil A		
Dedendum coefficient	[hfP*]	1.250	
Root radius factor	[ρfP*]	0.380	(ρfPmax*=0.472)
Addendum coefficient	[haP*]	1.000	
Tip radius factor	[ρaP*]	0.000	
Protuberance height coefficient	[hprP*]	0.000	
Protuberance angle	[αprP]	0.000	
Tip form height coefficient	[hFaP*]	0.000	
Ramp angle	[αKP]	0.000	
	not topping		

Gear reference profile 2:			
Reference profile	1.25 / 0.38 / 1.0 ISO 53:1998 Profil A		
Dedendum coefficient	[hfP*]	1.250	
Root radius factor	[ρfP*]	0.380	(ρfPmax*=0.472)
Addendum coefficient	[haP*]	1.000	
Tip radius factor	[ρaP*]	0.000	
Protuberance height coefficient	[hprP*]	0.000	
Protuberance angle	[αprP]	0.000	
Tip form height coefficient	[hFaP*]	0.000	
Ramp angle	[αKP]	0.000	
	not topping		

Lubrication type	Grease lubrication	
Base oil nominal kinematic viscosity at 40°C (mm²/s)	[v40]	120.00
Overall transmission ratio	[itot]	-3.625
Transverse contact ratio	[εα]	1.843
Overlap ratio	[εβ]	0.000

Total contact ratio	[εγ]	1.843	
Profile shift coefficient	[x]	-0.0040	
Tooth thickness, arc, in module	[sn*]	1.5679	
Reference diameter (mm)	[d]	1000.000	
Base diameter (mm)	[db]	939.693	
Tip diameter (mm)	[da]	1049.098	
Root diameter (mm)	[df]	937.300	
Profile shift coefficient	[x]	-0.5620	
Tooth thickness, arc, in module	[sn*]	1.1617	
Reference diameter (mm)	[d]	3625.000	
Base diameter (mm)	[db]	3406.386	
Tip diameter (mm)	[da]	3646.200	
Root diameter (mm)	[df]	3534.402	
Operating pitch diameter (mm)	[dw]	993.730	
Specific sliding at the tip	[ζa]	0.392	
Specific sliding at the root	[ζf]	-0.845	
Operating pitch diameter (mm)	[dw]	3602.270	
Specific sliding at the tip	[ζa]	0.458	
Specific sliding at the root	[ζf]	-0.644	

General influence factors

Nominal circum. force at pitch circle (N)	[Ft]	726436.8	
Circumferential speed reference circle (m/s)	[v]	0.00	
Meshing stiffness (N/mm/µm)	[cγα]	22.927	
Resonance ratio (-)	[N]	0.000	
Load in accordance with Figure 13, ISO 6336-1:2006 0:a), 1:b), 2:c), 3:d), 4:e)	[-]	4	
Without stiffening			
Tooth trace deviation (active) (µm)	[Fβy]	78.00	
Tooth without tooth trace modification			
Position of contact pattern:		favorable	
Dynamic factor	[Kv]	1.000	
Face load factor - flank	[KHβ]	1.093	
- Tooth root	[KFβ]	1.067	
- Scuffing	[KBβ]	1.093	
Transverse load factor - flank	[KHα]	1.000	
- Tooth root	[KFα]	1.000	
- Scuffing	[KBα]	1.000	

Tooth root load capacity

Calculation of Tooth form coefficients according method: B			
Tooth form factor	[YF]	1.12	1.20
Stress correction factor	[YS]	2.12	2.05
Helix angle factor	[Yβ]	1.000	
Tooth root stress (N/mm²)	[σF]	827.76	857.23
Notch sensitivity factor	[YdrelT]	1.054	1.021
Surface factor	[YRrelT]	1.000	1.000
Size factor, tooth root	[YX]	1.000	1.000
Finite life factor	[YNT]	2.500	2.500
Alternating bending factor, mean stress influence coefficient	[YM]	1.000	1.000
Limit strength tooth root (N/mm²)	[σFG]	2265.75	2194.34
Safety for tooth root stress	[SF=σFG/σF]	2.74	2.56

Flank safety

Zone factor	[ZH]	2.566	
Elasticity factor (√N/mm²)	[ZE]	189.812	
Contact ratio factor	[Zε]	0.848	
Helix angle factor	[Zβ]	1.000	
Contact stress at operating pitch circle (N/mm²)	[σHw]	1394.27	
Contact stress (N/mm²)	[σHB, σHD]	1401.19	1394.27
Lubrication factor for NL	[ZL]	1.000	1.000
Speed factor for NL	[ZV]	1.000	1.000
Roughness factor for NL	[ZR]	1.000	1.000
Material hardening factor for NL	[ZW]	1.000	1.000

Finite life factor	[ZNT]	1.600	1.600
Size factor (flank)	[ZX]	1.000	1.000
Pitting stress limit (N/mm²)	[σHG]	2400.00	2400.00
Safety factor for contact stress at operating pitch circle	[SHw]	1.72	1.72
Safety against pressure, σHG/σHBD Single contact	[SHBD]	1.71	1.72

Micropitting according to **ISO/TS 6336-22:2018**

Calculation has not been carried out, lubricant: Load stage micropitting test not known

Scuffing load capacity

Calculation method according to	ISO/TS 6336-20/21:2017	
Helical load factor for scuffing	[KBγ]	1.000
Applicable circumferential force/facewidth (N/mm)	[wBt]	8932.414
Flash temperature-criteria		
Tooth mass temperature (°C)	[θMi]	70.46
Scuffing temperature (°C)	[θS]	301.13
Margin of safety for scuffing, flash temperature	[SB]	80.207
Integral temperature-criteria		
Tooth mass temperature (°C)	[θMC]	70.22
Integral scuffing temperature (°C)	[θSint]	312.10
Integral tooth flank temperature (°C)	[θint]	70.62
Safety factor for scuffing (intg.-temp.)	[SSint]	4.420

Measurements for tooth thickness

Tooth thickness tolerance		DIN 3967 cd25	DIN 3967 cd25	
Tooth thickness allowance (normal section) (mm)	[As.e/i]	-0.175 /	-0.255	-0.430 / -0.590
Base tangent length (no backlash) (mm)	[Wk]	346.052	1185.111	
Base tangent length with allowance (mm)	[Wk.e/i]	345.887 /	345.8121184.707 /	1184.557
(mm)	[ΔWk.e/i]	-0.164 /	-0.240 -0.404 /	-0.554
Effective diameter of ball/pin (mm)	[DMeff]	45.000	45.000	
Diametral measurement over two balls without clearance (mm)	[MdK]	1066.806	3665.347	
Diametral two ball measure (mm)	[MdK.e/i]	1066.387 /	1066.1953664.153 /	3663.708
Diametral measurement over pins without clearance (mm)	[MdR]	1066.806	3665.347	
Measurement over pins according to DIN 3960 (mm)	[MdR.e/i]	1066.387 /	1066.1953664.153 /	3663.708
Measurement over 3 pins, axial, according to AGMA 2002 (mm)				
	[dk3A.e/i]	1066.387 /	1066.1953664.153 /	3663.708
Circumferential backlash (transverse section) (mm)	[jtw.e/i]	0.900 /	0.541	
Normal backlash (mm)	[jn.e/i]	0.854 /	0.509	
Total torsional angle (°)	[j.tSys]	0.1038/	0.0624	

Service life, damage

Required safety for tooth flank	[SHmin]	1.00	
System service life (h)	[Hatt]	>	1000000
Tooth root service life (h)	[HFatt]	1e+06	1e+06
Tooth flank service life (h)	[HHatt]	1e+06	1e+06

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PŘÍLOHA č. 4

Návrh řemenu v programu Design Flex Pro

Návrh řemenového převodu - Detaily pohonu

Design Flex

Navrženo pro:

Zajišťuje: Karel Glatz
ZCU
karelg@students.zcu.cz
775619602 Telefon

Aplikace: **Konstrukce #1**
Soubor: vypocet.sdf

VSTUP

Info. o pohonu			Hnací	Hnaný
Poměr otáček:	5,25 Do pomala	Otáčky za minutu:	1485	282,7 +4%/-4%
Výkon motoru:	75 kW, Účinnost: 95,00 %			
Provozní faktor:	2,0			
Konstr. výkon:	150 kW			
Středová vzdálenost:	2175 mm +/-3%	Kontrolovaná pouzdra:	QD, Bez provedení s min dírou	
Stand. motoru:	Elektrický motor	Kontrolované řemeny:	Predator	
			Jednotlivé řemeny, Pásma,	

ZVOLENÝ POHON

Typ řemene: **Predator - 8VP**

	Řemen	Hnací	Hnaný
Počet drážek / žeber:	3		
Poměr otáček: **5,43 Do pomala**	Díl č.:	1-3/8VP3000	**QD4/8V12.50**	**1700 mm Vnější**
Rychlost hnaná: **273,7**	Produkt č.:	9182-3300	7876-4125	Neskladová položka
Nominální výkon: **163,81 kW**	Roztečný průměr:	--	312,4 mm	1694,9 mm
Předimanzování: **1,09**	Otáčky za minutu:	191,3	1485	273,7
Na hřídel: **5301 N**	Obv. rychl. m/s:	24,3 m / s	24,7 m / s	24,4 m / s
Středová vzdálenost: 2111,3 mm	Horní šířka:	--	123,8 mm	--
Instalační tolerance: **2019,8 mm až 2187,8 mm**	**Pouzdro položka č.:**	--	**F**	**--**
	Díra:	--	25,4 mm - 101,6 mm	--
	Bolt točivého momentu	--	149 Nm	--
	Hmotnost:	14 kg	34 kg	--

NAPĚTÍ

	Nový řemen	Použitý řemen
Statické napětí (na drážku/žebro):	1537 až 1647 N	1318 až 1428 N
Statický Belt Pull (Celková síla):	8716 až 9339 N	7471 až 8094 N
Průhyb na drážku/žebro:	31,00 mm	31,00 mm
Síla v průhybu na drážku/žebro:	13 kgf	11 až 12 kgf
Sonic - měřič napětí:	4612 až 4942 N	3953 až 4283 N
Frekvence řemene:	14 Hz	13 Hz
Powerband multiplikátor:	1,0020 až 1,0022	1,0017 až 1,0019

Nastavení Sonicu:
Hmota 527,85g / m,Šířka: 3 mm/#R, Rozpětí: 1995 mm

POZNÁMKY

- Motážní přesnost vychází ze zadaného rozsahu osových vzdáleností.
- Brány sériových řemenic a pouzder jsou navrženy tak, aby nesly vysoký točivý moment zatížení této aplikace.
- NEMA min dia doporučení neexistují pro HP / RPM vybraný. Obraťte se na výrobce motoru potvrdit, že tah řemenů je přijatelná.
- Hmotnost řemenice/pouzdra překračuje 20 kg. Během instalace buďte opatrní.
- Hnací řemenice je širší, než je nezbytné.
- Hnaná řemenice je předmětem zvláštní objednávky. Průměr řemenice a pouzdro nejsou známy.

PŘÍLOHA č. 5

Návrh ložisek setrvačníku v programu KISSsoft

ROLLING BEARING ANALYSIS

Calculation method: ISO 281:2007 and manufacturer's notes - With constant a23-factor (1.0)

General data:

Speed (1/min)	282.700
Axial force (N)	0.000
Required service life (h)	25000.000

Rolling bearing A:

Designation		SKF 618/560 MA
Type		Deep groove ball bearing (single row) SKF Popular Item
Bearing clearance:		C0
Radial and axial load		
Radial force (N)	[Fr]	1015.800
Axial force (N)	[Fa]	0.000
Inner diameter (mm)	[d]	560.000
External diameter (mm)	[D]	680.000
Width (mm)	[B]	56.000
Basic dynamic load rating (kN)	[C]	345.000
Basic static load rating (kN)	[C0]	695.000
Fatigue load limit (kN)	[Cu]	11.800
Dynamic equivalent load (N)	[P]	1015.800
Speed limit (oil) (1/min)	[n.max]	1300
Static equivalent load (N)	[P0]	1015.800
Rolling moment of friction (Nmm)	[Mrr]	2934.591
Sliding moment of friction (Nmm)	[Msl]	48.112
Moment of friction, seals (Nmm)	[Mseal]	0.000
Mseal according to SKF Main Catalog 17000/1 EN: 2018		
Moment of friction flow losses (Nmm)	[Mdrag]	0.000
Total moment of friction (Nmm)	[M]	2982.703
Basic rating life (h)	[Lnh]	1000000.000
Bearing rating life (h)	[Lnh]	1000000.000
Static safety factor	[S0]	684.190

Rolling bearing B:

Designation		SKF 618/530 MA
Type		Deep groove ball bearing (single row) SKF Popular Item
Bearing clearance:		C0
Radial and axial load		
Radial force (N)	[Fr]	43861.400
Axial force (N)	[Fa]	0.000
Inner diameter (mm)	[d]	530.000
External diameter (mm)	[D]	650.000
Width (mm)	[B]	56.000
Basic dynamic load rating (kN)	[C]	332.000
Basic static load rating (kN)	[C0]	655.000
Fatigue load limit (kN)	[Cu]	11.200
Dynamic equivalent load (N)	[P]	43861.400
Speed limit (oil) (1/min)	[n.max]	1400
Static equivalent load (N)	[P0]	43861.400
Rolling moment of friction (Nmm)	[Mrr]	10607.366
Sliding moment of friction (Nmm)	[Msl]	3375.258
Moment of friction, seals (Nmm)	[Mseal]	0.000

Mseal according to SKF Main Catalog 17000/1 EN: 2018

Moment of friction flow losses (Nmm)	[Mdrag]	0.000
Total moment of friction (Nmm)	[M]	13982.623
Basic rating life (h)	[Lnh]	25567.586
Bearing rating life (h)	[Lnh]	25567.586
Static safety factor	[S0]	14.933

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PŘÍLOHA č. 6

Kontrola duté centrální hřídele a návrh její ložisek v programu KISSsoft

Analysis of shafts, axle and beams

Input data

Coordinate system shaft:	see picture W-002	
Label	Duta hridel	
Drawing		
Initial position (mm)		0.000
Length (mm)		1479.000
Speed (1/min)		282.70
Direction of rotation:	clockwise	
Material		
Young's modulus (N/mm²)		206000.000
Poisson's ratio nu		0.300
Density (kg/m³)		7830.000
Coefficient of thermal expansion	(10^-6/K)	11.500
Temperature (°C)		20.000
Weight of shaft (kg)		1043.077
Note: the weight is only for the shaft. The gears are not considered.		
Weight of shaft, including additional masses (kg)		1043.077
Mass moment of inertia (kg*m²)		61.188
Momentum of mass GD2 (Nm²)		2401.014
Position in space (°)		0.000
Gears mounted with stiffness according to ISO		
Consider deformations due to shearing		
Shear correction factor		1.100
Contact angle of rolling bearings is considered		
Tolerance field:	Mean value	

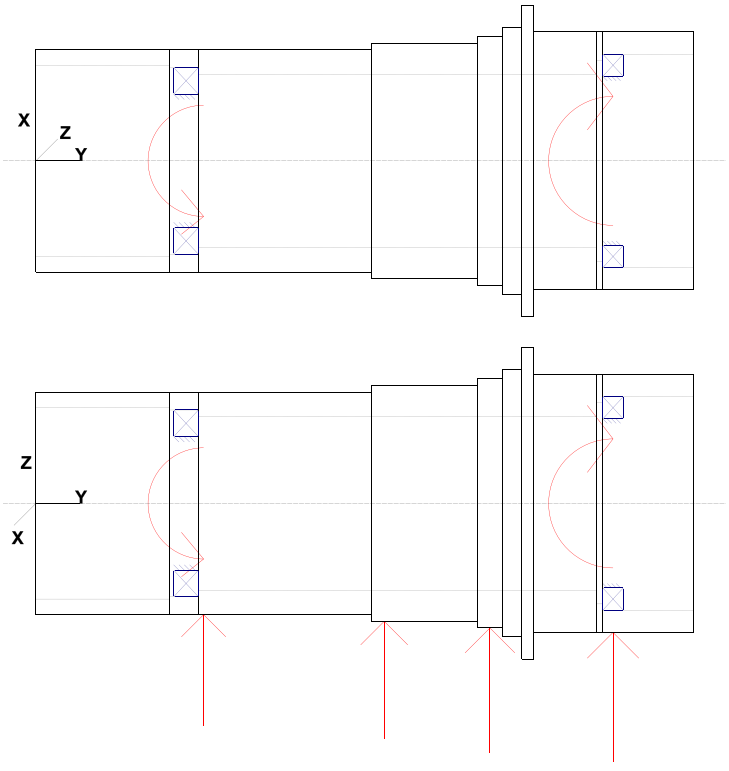


Figure: Load applications

Shaft definition **(Shaft 1)**

Outer contour

Cylinder (Cylinder)		**0.000 mm ... 755.000 mm**
Diameter (mm)	[d]	500.0000
Length (mm)	[l]	755.0000
Surface roughness (µm)	[Rz]	8.0000
Cylinder (Cylinder)		**755.000 mm ... 994.000 mm**
Diameter (mm)	[d]	530.0000
Length (mm)	[l]	239.0000
Surface roughness (µm)	[Rz]	8.0000
Cylinder (Cylinder)		**994.000 mm ...1050.000 mm**
Diameter (mm)	[d]	560.0000
Length (mm)	[l]	56.0000
Surface roughness (µm)	[Rz]	8.0000
Cylinder (Cylinder)		**1050.000 mm ...1094.000 mm**
Diameter (mm)	[d]	600.0000
Length (mm)	[l]	44.0000
Surface roughness (µm)	[Rz]	8.0000
Cylinder (Cylinder)		**1094.000 mm ...1119.000 mm**
Diameter (mm)	[d]	700.0000
Length (mm)	[l]	25.0000
Surface roughness (µm)	[Rz]	8.0000
Cylinder (Cylinder)		**1119.000 mm ...1479.000 mm**
Diameter (mm)	[d]	580.0000
Length (mm)	[l]	360.0000
Surface roughness (µm)	[Rz]	8.0000

Inner contour

Cylindrical bore (Cylindrical bore)	**0.000 mm ...**	**300.000 mm**
Diameter (mm)	[d]	430.0000
Length (mm)	[l]	300.0000
Surface roughness (µm)	[Rz]	8.0000
Cylindrical bore (Cylindrical bore)	**300.000 mm ...**	**366.000 mm**
Diameter (mm)	[d]	420.0000
Length (mm)	[l]	66.0000
Surface roughness (µm)	[Rz]	8.0000
Cylindrical bore (Cylindrical bore)	**366.000 mm ...**	**1262.000 mm**
Diameter (mm)	[d]	390.0000
Length (mm)	[l]	896.0000
Surface roughness (µm)	[Rz]	8.0000
Cylindrical bore (Cylindrical bore)	**1262.000 mm ...**	**1276.000 mm**
Diameter (mm)	[d]	452.0000
Length (mm)	[l]	14.0000
Surface roughness (µm)	[Rz]	8.0000
Cylindrical bore (Cylindrical bore)	**1276.000 mm ...**	**1479.000 mm**
Diameter (mm)	[d]	480.0000
Length (mm)	[l]	203.0000
Surface roughness (µm)	[Rz]	8.0000

Forces

Type of force element		**Centric force**
Label in the model		sila od centralniho kola
Position on shaft (mm)	[y_{local}]	1299.0000
Length of load application (mm)		359.0000

Power (kW)		12828.5190 driving (output)
Torque (Nm)		-433333.3300
Axial force (N)		0.0000
Shearing force X (N)		0.0000
Shearing force Z (N)		8556.4700
Bending moment X (Nm)		0.0000
Bending moment Z (Nm)		0.0000

Type of force element		**Centric force**
Label in the model		síla od spojky
Position on shaft (mm)	[y_{local}]	377.5000
Length of load application (mm)		700.0000
Power (kW)		12828.5190 driven (input)
Torque (Nm)		433333.3300
Axial force (N)		0.0000
Shearing force X (N)		0.0000
Shearing force Z (N)		13080.0600
Bending moment X (Nm)		0.0000
Bending moment Z (Nm)		0.0000

Type of force element		**Centric force**
Label in the model		RB
Position on shaft (mm)	[y_{local}]	784.0000
Length of load application (mm)		0.0000
Power (kW)		0.0000
Torque (Nm)		-0.0000
Axial force (N)		0.0000
Shearing force X (N)		0.0000
Shearing force Z (N)		43861.3500
Bending moment X (Nm)		0.0000
Bending moment Z (Nm)		0.0000

Type of force element		**Centric force**
Label in the model		RA
Position on shaft (mm)	[y_{local}]	1022.0000
Length of load application (mm)		0.0000
Power (kW)		0.0000
Torque (Nm)		-0.0000
Axial force (N)		0.0000
Shearing force X (N)		0.0000
Shearing force Z (N)		1015.8400
Bending moment X (Nm)		0.0000
Bending moment Z (Nm)		0.0000

Bearing

Label in the model		lozisko C
Bearing type		Deep groove ball bearing (single row)
Bearing position (mm)	[y_{lokal}]	338.000
Attachment of external ring		Set fixed bearing left
Basic static load rating (kN)	[C_0]	375.000
Basic dynamic load rating (kN)	[C]	270.000
Fatigue load limit (kN)	[C_u]	8.300

Label in the model		lozisko D
Bearing type		Deep groove ball bearing (single row)
Bearing position (mm)	[y_{lokal}]	1299.000
Attachment of external ring		Set fixed bearing right
Basic static load rating (kN)	[C_0]	390.000
Basic dynamic load rating (kN)	[C]	242.000
Fatigue load limit (kN)	[C_u]	8.000

Results

Shaft

Maximum deflection (µm)	51.286
Position of the maximum (mm)	1479.000
Mass center of gravity (mm)	852.354
Total axial load (N)	0.000
Torsion under torque (°)	-0.058

Bearing

Probability of failure	[n]	10.00	%		
Axial clearance (ISO 281)	[u_A]			10.00	µm
Lubricant	ISO-VG 320				
Lubricant - service temperature	[T_B]			70.00	°C

Rolling bearings, classical calculation (contact angle considered)

Shaft 'Shaft 1' Rolling bearing 'C'

Position (Y-coordinate)	[y]	338.00	mm		
Dynamic equivalent load	[P]	31.60	kN		
Static equivalent load	[P_0]			31.60	kN

Results according to ISO 281:

Basic bearing rating life	[L_{nh}]			36773.51	h
Static safety factor	[S_0]			11.87	
Bearing reaction force	[Fx]	-0.000	kN		
Bearing reaction force	[Fy]	0.000	kN		
Bearing reaction force	[Fz]	-31.600	kN		
Bearing reaction force	[Fr]	31.600	kN (-90°)		
Oil level	[H]	0.000	mm		
Rolling moment of friction	[M_{rr}]			3.842	Nm
Sliding moment of friction	[M_{sl}]			1.624	Nm
Moment of friction, seals	[M_{seal}]			0.000	Nm

Moment of friction for seals determined according to SKF main catalog 17000/1 EN:2018

Moment of friction flow losses	[M_{drag}]			0.000	Nm
Torque of friction	[M_{loss}]			5.466	Nm
Power loss	[P_{loss}]			161.817	W

The moment of friction is calculated according to the details in SKF Catalog 2018.
The calculation is always performed with a coefficient for additives in the lubricant µbl=0.15.

Shaft 'Shaft 1' Rolling bearing 'D'

Position (Y-coordinate)	[y]	1299.00	mm		
Dynamic equivalent load	[P]	24.68	kN		
Static equivalent load	[P_0]			24.68	kN

Results according to ISO 281:

Basic bearing rating life	[L_{nh}]			55576.99	h
Static safety factor	[S_0]			15.80	
Bearing reaction force	[Fx]	0.000	kN		
Bearing reaction force	[Fy]	0.000	kN		
Bearing reaction force	[Fz]	-24.681	kN		
Bearing reaction force	[Fr]	24.681	kN (-90°)		
Oil level	[H]	0.000	mm		
Rolling moment of friction	[M_{rr}]			5.051	Nm
Sliding moment of friction	[M_{sl}]			1.405	Nm
Moment of friction, seals	[M_{seal}]			0.000	Nm

Moment of friction for seals determined according to SKF main catalog 17000/1 EN:2018

Moment of friction flow losses	[M_{drag}]			0.000	Nm
Torque of friction	[M_{loss}]			6.456	Nm
Power loss	[P_{loss}]			191.127	W

The moment of friction is calculated according to the details in SKF Catalog 2018.
The calculation is always performed with a coefficient for additives in the lubricant µbl=0.15.

Damage (%) [Lreq] (20000.000)

Bin no	B1	B2
1	54.39	35.99

Σ 54.39 35.99

Utilization (%) [Lreq] (20000.000)
B1 B2
81.63 71.13
Note: Utilization = (Lreq/Lh)^(1/k)
Ball bearing: k = 3, roller bearing: k = 10/3

B1 : mensi lozisko
B2 : vetsi lozisko

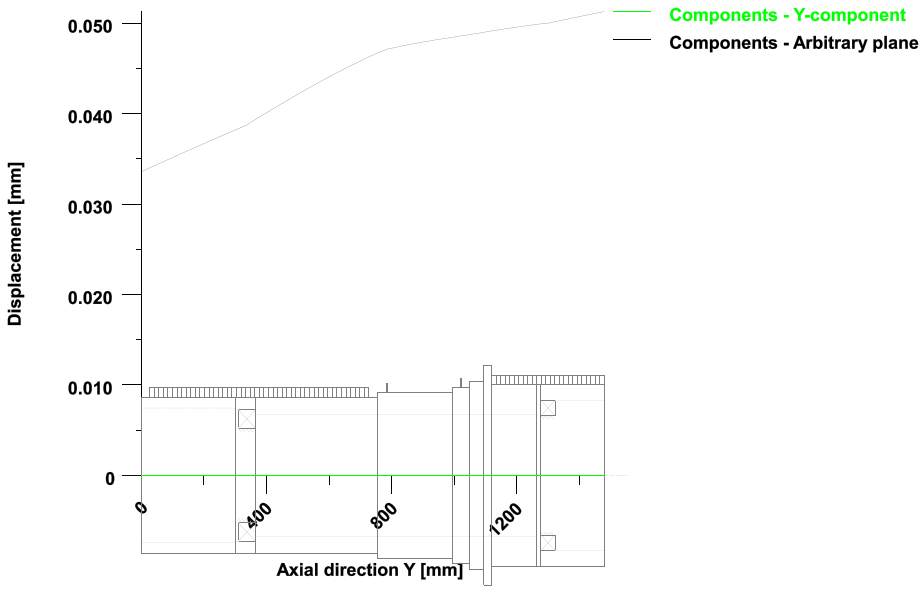
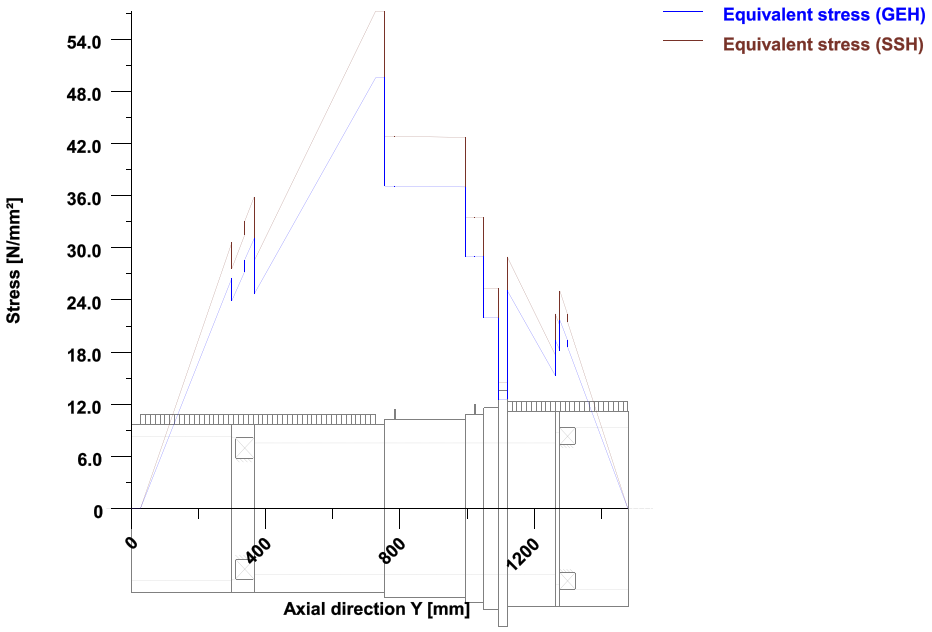


Figure: Deformation (bending etc.) (Arbitrary plane 90 124)



Nominal stresses, without taking into account stress concentrations
GEH(von Mises): sigV = ((sigB+sigZ,D)^2 + 3*(tauT+tauS)^2)^1/2
SSH(Tresca): sigV = ((sigB-sigZ,D)^2 + 4*(tauT+tauS)^2)^1/2

Figure: Equivalent stress

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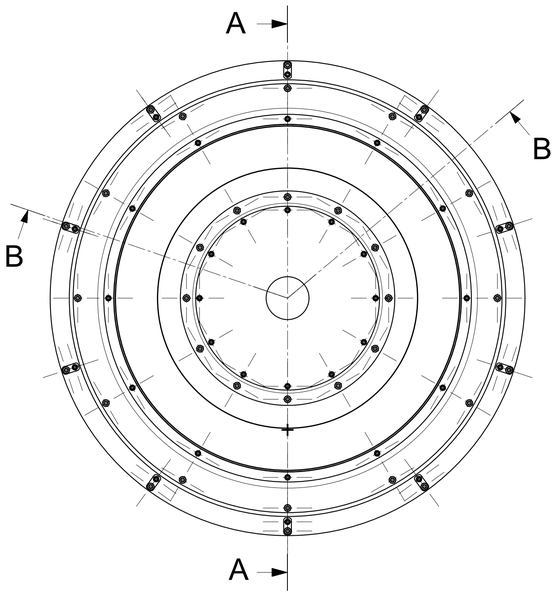
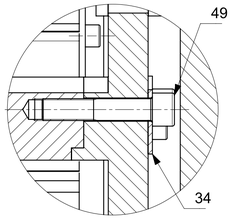
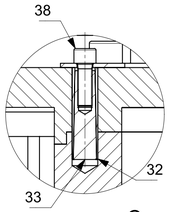
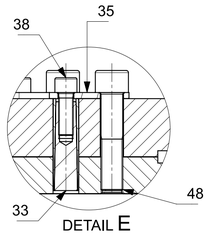




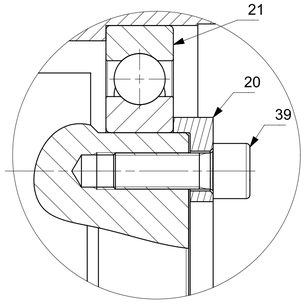
DETAIL F
SCALE 1:5



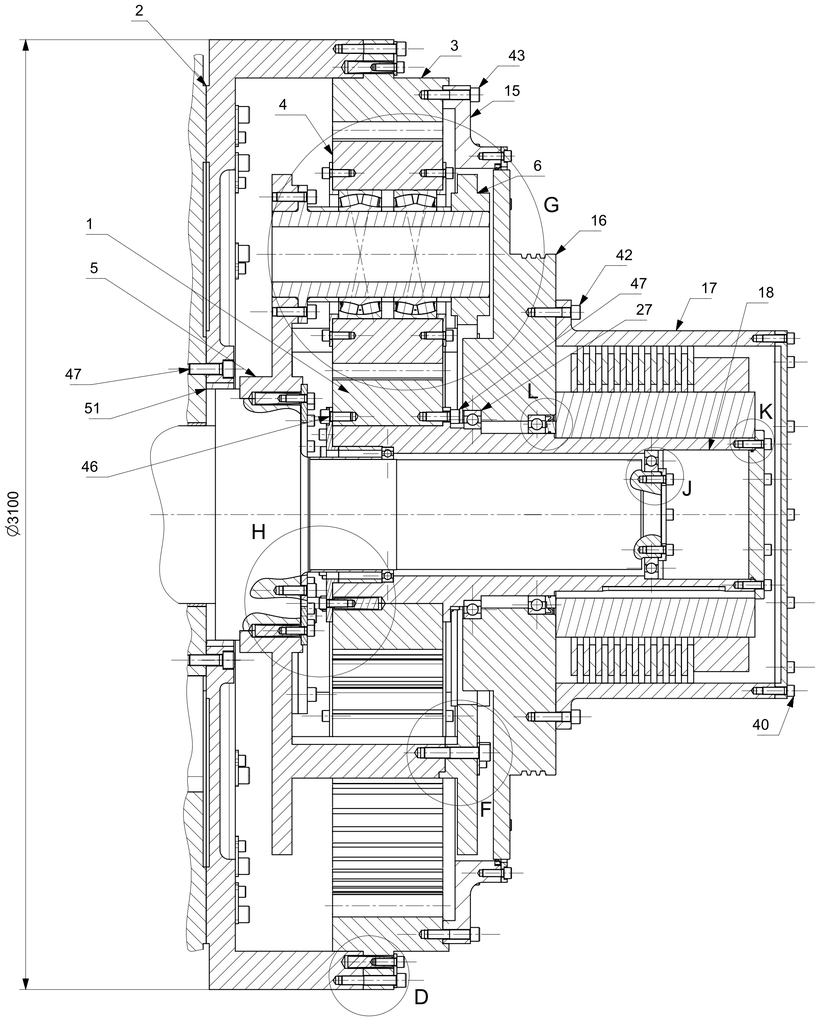
DETAIL C
SCALE 1:5



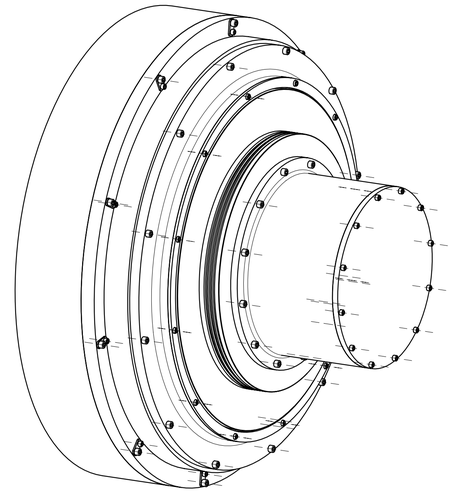
DETAIL E
SCALE 1:5

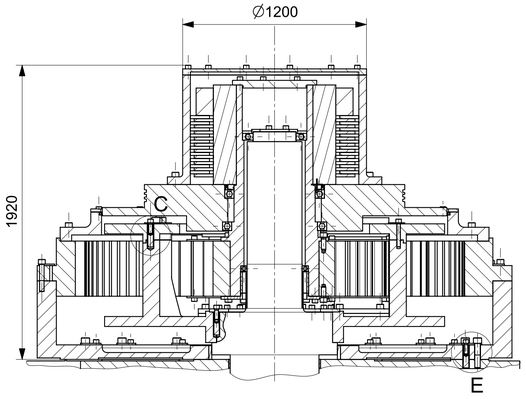


DETAIL J
SCALE 1:2

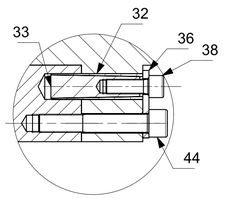


SECTION A-A
SCALE 1:10

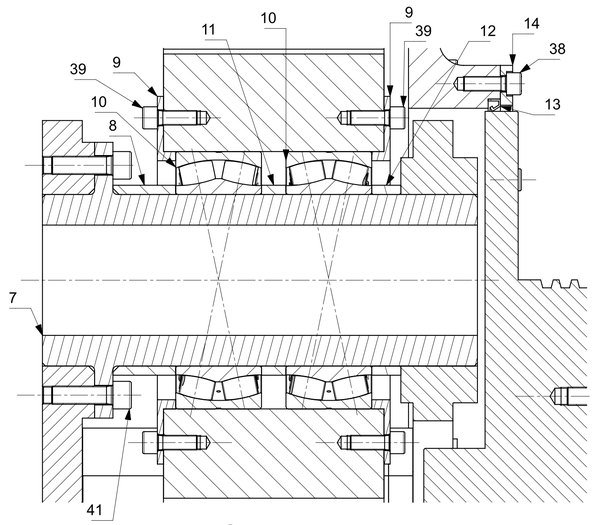




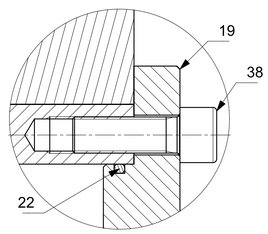
SECTION B-B



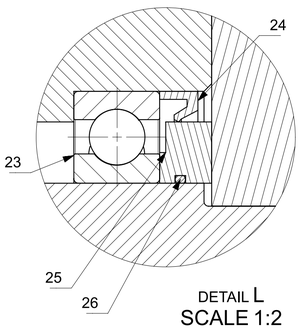
DETAIL D
SCALE 1:5



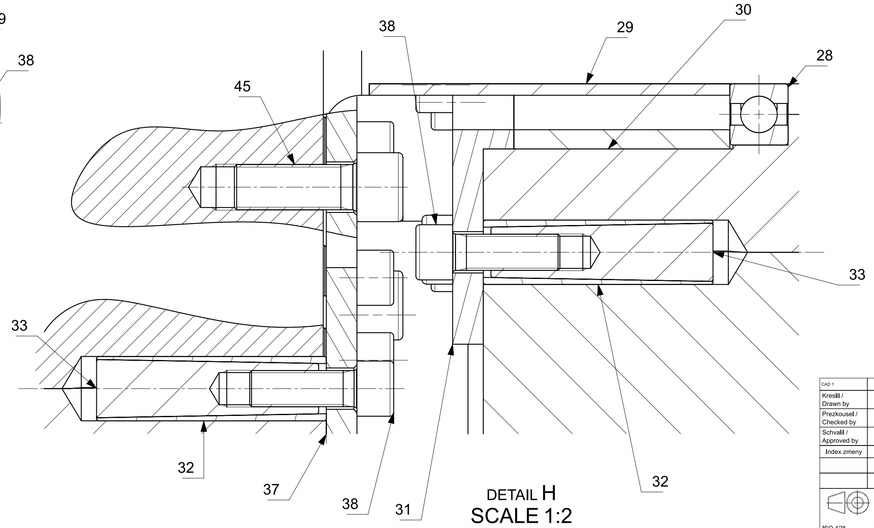
DETAIL G
SCALE 1:5



DETAIL K
SCALE 1:2



DETAIL L
SCALE 1:2



DETAIL H
SCALE 1:2

51	Vymezovací bronzová vložka ∅860x90	-	-	-	-	-	-	1
49	Šroub M36x180	DIN 4762 - 8.8	-	-	-	-	-	9
48	Šroub M36x140	DIN 4762 - 8.8	-	-	-	-	-	12
47	Šroub M36x110	DIN 4762 - 8.8	-	-	-	-	-	4
46	Šroub M30x70	DIN 4762 - 8.8	-	-	-	-	-	7
45	Šroub M30x80	DIN 4762 - 8.8	-	-	-	-	-	12
44	Šroub M30x180	DIN 4762 - 8.8	-	-	-	-	-	10
43	Šroub M30x140	DIN 4762 - 8.8	-	-	-	-	-	12
42	Šroub M30x120	DIN 4762 - 8.8	-	-	-	-	-	12
41	Šroub M30x100	DIN 4762 - 8.8	-	-	-	-	-	12
40	Šroub M24x80	DIN 4762 - 8.8	-	-	-	-	-	12
39	Šroub M24x65	DIN 4762 - 8.8	-	-	-	-	-	4
38	Šroub M24x70	DIN 4762 - 8.8	-	-	-	-	-	79
37	Přiložka kolíku u hřídele ∅425x20	ČSN EN 10051	S235JR+N		41,1		KKS-DP-01-27	1
36	Přiložka kolíku korunového kola 110x50x10	ČSN EN 10 051	S235JRC+N		0,3		KKS-DP-01-27	10
35	Přiložka kolíku u rámu 130x60x10	ČSN EN 10 051	S235JRC+N		0,5		KKS-DP-01-26	12
34	Přiložka kolíku unašeče 411x105x10	EN 10 025		ČSN 11 443	1,9		KKS-DP-01-25	61
33	Vnitřní kuželová část kolíku ∅38x145	ČSN 42 6510	ČSN 11 700	-	0,9	-	KKS-DP-01-24	61
32	Vnější dutá část kolíku ∅42x150	ČSN 42 5715	ČSN 11 700	-	0,5	-	KKS-DP-01-23	1
31	Víko centrálního kola ∅700x40	ČSN EN 10029	S235JR+N	-	38,8	-	KKS-DP-01-22	1
30	Vymezovací vložka ložiska ∅445x141	DIN 1629	ČSN 11 373	-	18,8	-	KKS-DP-01-21	1
29	Vložka centrálního kola ∅375x235	DIN 1629	ČSN 11 373	-	15,9	-	KKS-DP-01-20	1
28	Ložisko SKF 61872 MA ∅440x38	-	-	-	12	-	-	1
27	Ložisko SKF 618/560 MA ∅680x56	-	-	-	42	-	-	1
26	O-kroužek Hennlich ∅540x5	-	NBR 70	-	-	-	-	1
25	Vymezovací vložka ložiska ∅610x34	ČSN EN 10029	S235JR+N	-	17,4	-	KKS-DP-01-19	1
24	Gufero Hennlich ∅2290x20	-	-	-	-	-	-	1
23	Ložisko SKF 618/530 MA ∅650x56	-	-	-	39,5	-	-	1
22	O-kroužek Hennlich ∅425x5	-	NBR 70	-	-	-	-	1
21	Ložisko SKF 16056 MA ∅420x44	-	-	-	23,6	-	KKS-DP-01-18	1
20	Víko výstředníkové hřídele ∅300x25	ČSN EN 10029	S235JR+N	-	5,5	-	KKS-DP-01-17	1
19	Víko duté centrální hřídele ∅550x50	ČSN EN 10029	S235JR+N	-	76,4	-	KKS-DP-01-16	1
18	Dutá centrální hřídel ∅700x1379	EN 10 297-1	ČSN 11 523	-	989,9	-	KKS-DP-01-15	1
17	Spojka Ortlinghause ∅1200x755	-	-	-	2000,0	-	-	1
16	Setrvačník ∅2250x304	Odlitek	ČSN 42 2303	-	4398,5	-	KKS-DP-01-14	1
15	Víko korunového kola ∅2800x125	-	ČSN 11 443	-	1437,0	-	KKS-DP-01-13	1
14	Víko gufera ∅2400x20	ČSN EN 10029	S355J2+N	-	72,9	-	KKS-DP-01-12	1
13	Gufero Hennlich ∅2290x20	-	-	-	-	-	-	1
12	Vymezovací vložka kratší ∅310x47	DIN 1629	ČSN 11 373	-	5,14	-	KKS-DP-01-11	3
11	Vymezovací vložka vnitřní ∅310x40	DIN 1629	ČSN 11 373	-	4,35	-	KKS-DP-01-10	3
10	Ložisko SKF 24056-B-MB ∅420x140	-	-	-	69,0	-	-	6
9	Víko satelitu ∅600x30	ČSN EN 10029	S235JR+N		15,6	-	KKS-DP-01-09	6
8	Vymezovací vložka delší ∅310x102	DIN 1629	ČSN 11 373	-	8,2	-	KKS-DP-01-08	3
7	Čep ∅450x710	EN 10 297-1	ČSN 11 523	-	223,8	-	KKS-DP-01-07	3
6	Protějšek unašeče ∅2220x125	Svařenec	ČSN 11 523	-	1377,2	-	KKS-DP-01-06	1
5	Unašeč ∅2220x670	Svařenec	ČSN 11 523	-	2513,1	-	KKS-DP-01-05	1
4	Satelit ∅908x360	Výkovek	18CrNiMo7-6	-	1158,0	-	KKS-DP-01-04	1
3	Korunové kolo ∅3100x380	Výkovek	36 CrNiMo 4	-	4540,2	-	KKS-DP-01-03	1
2	Rám korunového kola ∅3100x534	Odlitek	ČSN 42 2425	-	7437,7	-	KKS-DP-01-02	1
1	Centrální kolo ∅927,5x360	Výkovek	18CrNiMo7-6	-	871,4	-	KKS-DP-01-01	1
Poz.	**Název - rozměr**	**Polotovar**	**Materiál**	**T. O.**	**Hmotnost**	**Hr.hmot.**	**Číslo výkresu**	**Počet ks.**
Pos.	**Title - size**	**Blank**	**Material**	**C. W.**	**Weight**	**R.weight**	**Model No.**	**Quant.**

CAD =	Datum / Date	Jmeno / Name
Kreslil / Drawn by	30.3.2021	KAREL GLATZ
Prezkoused / Checked by		
Schválil / Approved by		

FAKULTA STROJNI
ZAPADOCESKE
UNIVERZITY
V PLZNI

Index zmeny	Popis zmeny / change description	Schval. / APP	Datum / Date	Podpis / Signature

Poznamka / Note:

Celková váha sestavy: 34 159.9 kg

Tolerance / Tolerovani
ISO 128 ISO 8015 ISO 2768mK

Soubor-modul / ASM-file: planetova_prevodovka_SKL2500

Soubor-vykres / DRW-file: planetova_prevodovka_SKL2500_vykres

Projekt / Project: DIPLOMOVÁ PRÁCE

C.sestavy / Assembly No.: 02-01

Meritko / Scale: 1:20

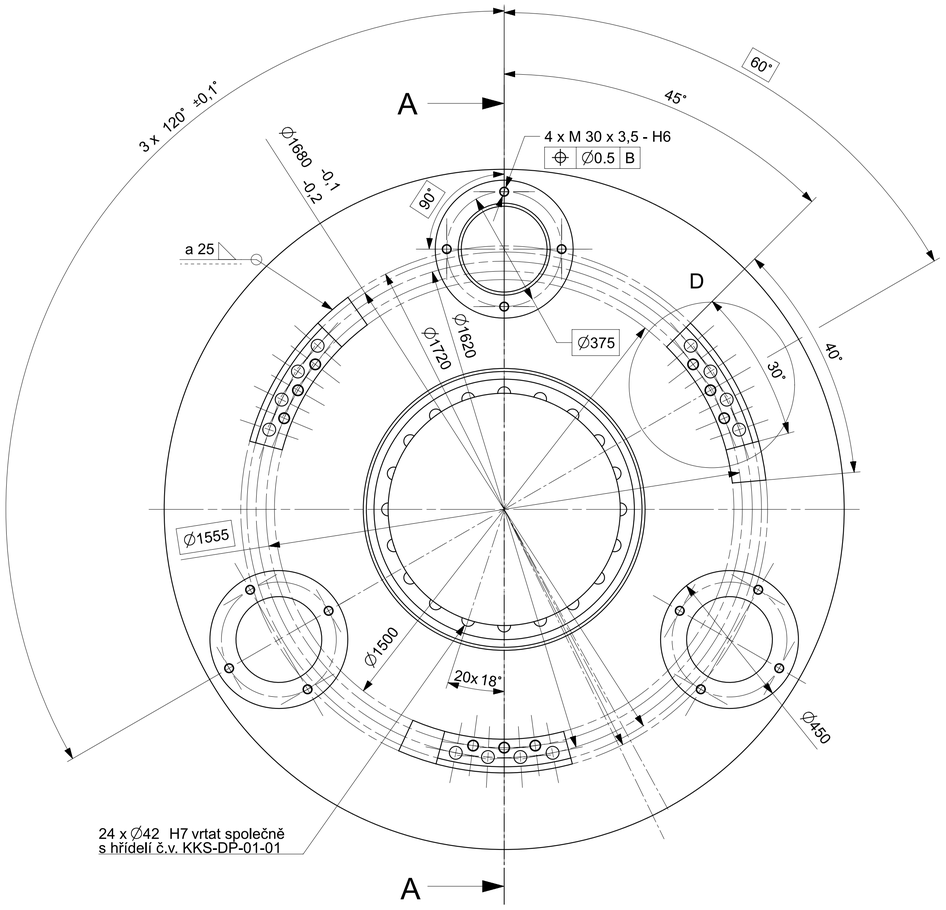
Nazev / Title: PLANETOVÁ PŘEVODOVKA

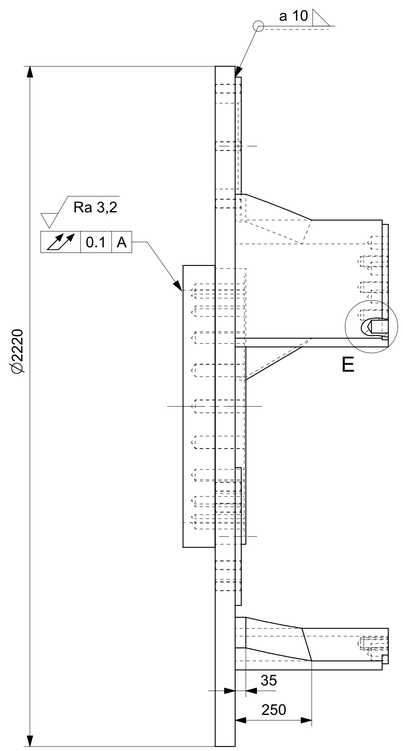
Rev.: —

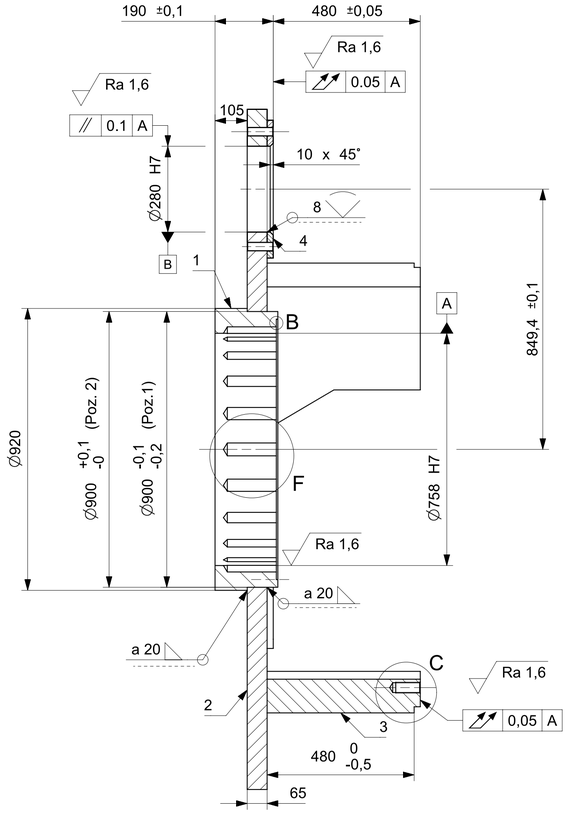
Cislo vykresu / Drawing No.: KKS-DP-02-01

List / sheet no. 1 Pocet listu / sheets 1

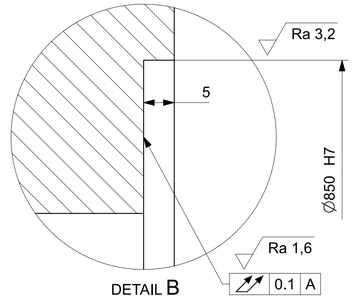
Format: A1



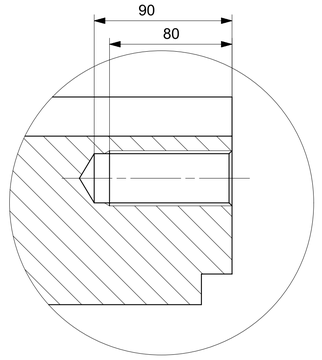




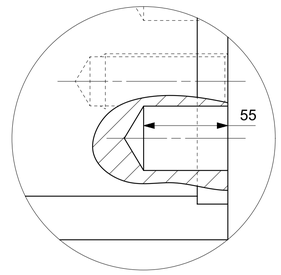
SECTION A-A



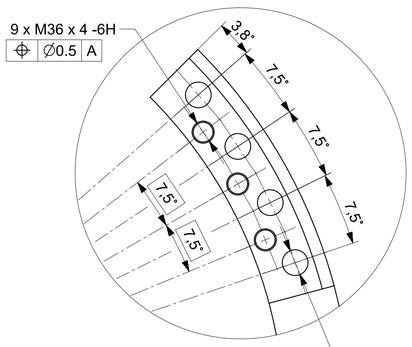
DETAIL B
SCALE 2:1



DETAIL C
SCALE 1:2

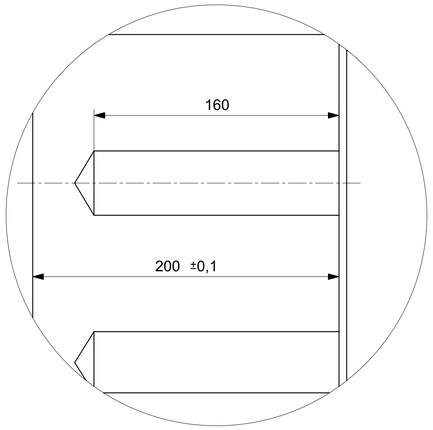


DETAIL E
SCALE 1:2

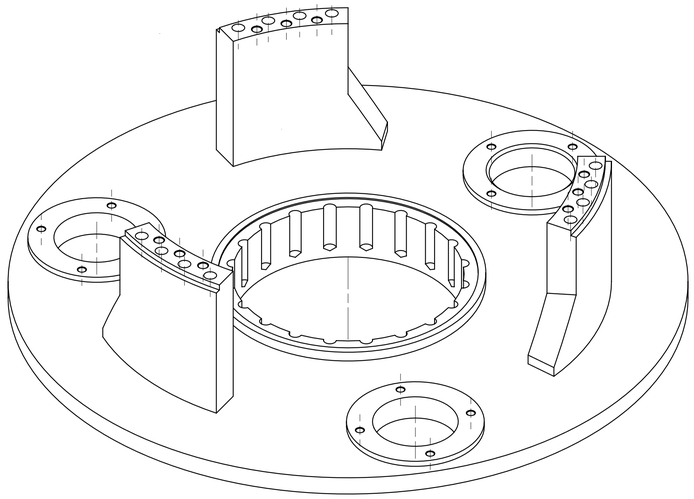


DETAIL D
SCALE 1:5

12 x ∅ 42 H7 vrtat společně s protějškem č. v. KKS-DP-01-06



DETAIL F
SCALE 1:2



Ra 6,3 Ra 3,2 Ra 1,6

+0,5 -0,5 -0,3

Poz.	Název - rozměr	Polotovar	Materiál	T.O.	Hmotnost	Hr.hmot.	Číslo výkresu	Počet ks.
Pos.	Title - size	Blank	Material	C.W.	Weight	R.Weight	Model No.	Quant.
4	Kroužek unašeče ∅450x20	EN 10 029	ČSN 11 523	-	13,8	-	-	3
3	Žebro unašeče 586x480x116	EN 10 029	ČSN 11 523	-	205,7	-	-	3
2	Kotouč unašeče ∅920x205	EN 10 029	ČSN 11 523	-	312,2	-	-	1
1	Střed unašeče ∅2220 x 65	EN 10 029	ČSN 11 523	-	1542,4	-	-	1

CAD ! | Datum / Date | Jmeno / Name

Kreslil / Drawn by: 31.3.2021 KAREL GLATZ

Prezkoušel / Checked by:

Schválil / Approved by:

FAKULTA STROJNI ZAPADOCESKE UNIVERZITY V PLZNI

Index zmeny	Popis zmeny / change description	Schvál. / APP	Datum / Date	Podpis / Signature

Poznamka / Note:

Celková hmotnost: 2513,1 kg

Tolerance / Tolerovani: ISO 128, ISO 8015, ISO 2768mK

Soubor-model / ASM-file: unasec

Soubor-vykres / DRW-file: unasec_vykres

Projekt / Project: DIPLOMOVÁ PRÁCE

C.sestavy / Assembly No.: 02-01

Meritko / Scale: 1:10

Nazev / Title: UNAŠEČ

Rev.: —

Cislo vykresu / Drawing No.: KKS-DP-01-05

List / sheet no.: 1 Pocet listu / sheets: 1

Format: A1