

LAST NAME :
First name :

Duration: 30min
No documents authorized

FITS AND TOLERANCES EXAM

Description:

We study a revolute joint represented on following page in a cross-section. This revolute joint uses self-lubricated bush to ease the rotation of a wheel around the shaft. The shaft should be **embedded** into the base.

PART 1: FITS

Problem 1:

Choose appropriate fits between:

	Type of fit, reason for the fit	Maximum and minimum diameter clearance
shaft 2 and base 1		
shaft 2 and bush 3		
bush 3 and wheel 4		

Explain briefly why you would choose these fits, write down their standard form using symbols in the appropriate boxes on the drawing 1, and calculate the maximum and minimum clearances using the tables given below. The nominal diameters are given on the drawing.

PART 2: FUNCTIONAL CLEARANCES & CHAIN OF COTES

Problem 2: clearance c

Identify and draw the chain of cotes for the functional clearance c. Write down the equations corresponding to the functional clearance c:

A design engineer wants this clearance c to be between 0.25 and 0.5mm. Using the known dimension of the base 1, determine the tolerance cote to be used on the shaft. Place this cote on the drawing 2.

Problem 3: missing clearance "a"

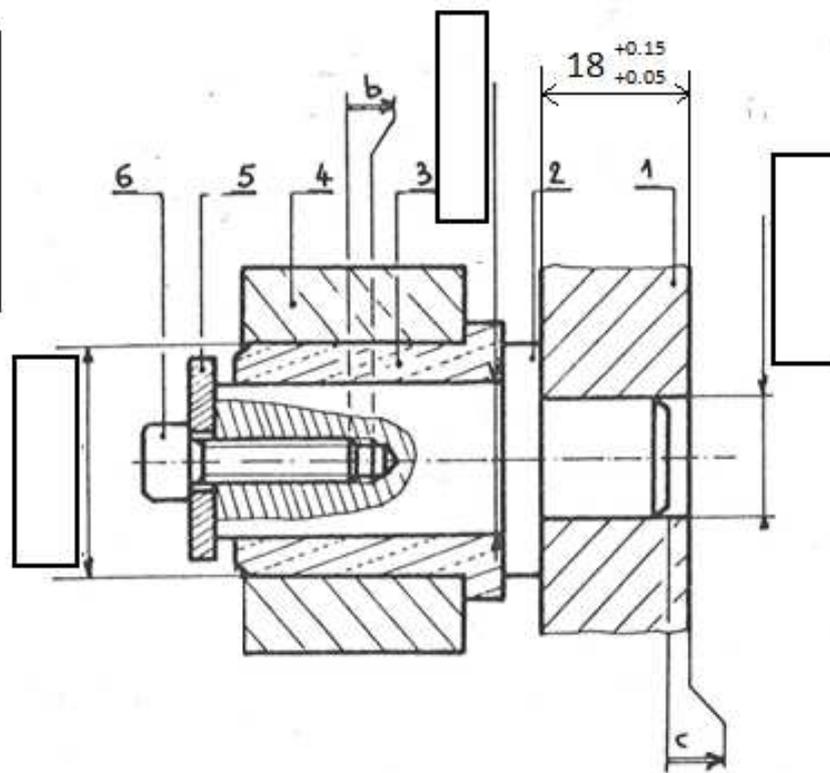
Identify the functional clearance "a" necessary for the functioning of the revolute joint. Place the clearance vector on the drawing 1 and draw a corresponding chain of cotes associated with this clearance.

BONUS QUESTIONS:

Problem 4: What is the reason for the clearance "b"?

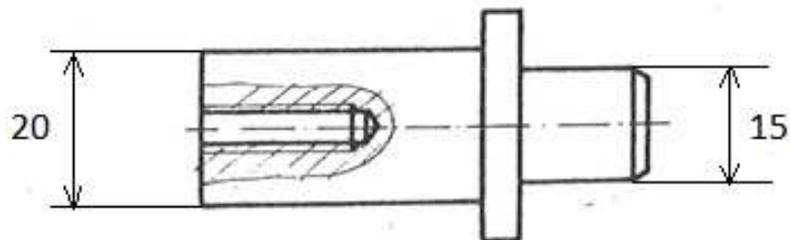
Problem 5: Let us suppose that the wheel turns back and forth during operation. What problem might arise with the fastening screw 6 and which remedy would you suggest?

- 1 : Base
- 2 : Shaft
- 3 : Self-lubricated bush
- 4 : Wheel
- 5 : Washer
- 6 : Screw CHc M6



Drawing 1
Scale 1:1

Drawing 2 (shaft)
Scale 1:1



Drawing 3 (bush)
Scale 1:1

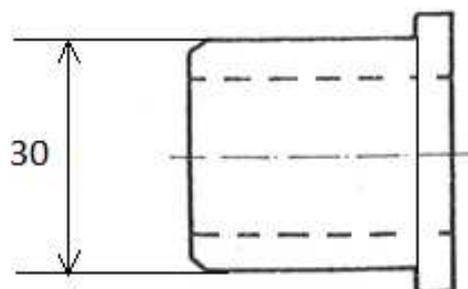


Table of the fundamental tolerances ISO

		DIMENSIONS (in mm)									
from		0	3	6	10	18	30	50	80	120	180
to (included)		3	6	10	18	30	50	80	120	180	250
quality	FUNDAMENTAL TOLERANCES TI (in μm)										
5	4	5	6	8	9	11	13	15	18	20	
6	6	8	9	11	13	16	19	22	25	29	
7	10	12	15	18	21	25	30	35	40	46	
8	14	18	22	27	33	39	46	54	63	72	
9	25	30	36	43	52	62	74	87	100	115	
10	40	48	58	70	84	100	120	140	160	185	
11	60	75	90	110	130	160	190	220	250	290	
12	100	120	150	180	210	250	300	350	400	460	
13	140	180	220	270	330	390	460	540	630	720	
14	250	300	360	430	520	620	740	870	1000	1150	
15	400	480	580	700	840	1000	1200	1400	1600	1850	
16	600	750	900	1100	1300	1600	1900	2200	2500	2900	

Fundamental deviations for shafts

Remark :

For bores, deviation are symmetrical around the nominal dimension.

Ex : Shaft : $10f7 = 10_{-28}^{-18}$

Bore : $10F7 = 10_{+28}^{-18}$

Shafts	from 0 to 3 included	from 3 to 6 included	from 6 to 10 included	from 10 to 18 included	from 18 to 30 included	from 30 to 50 included	from 50 to 80 included	from 80 to 120 included	from 120 to 180 included	from 180 to 250 included	from 250 to 315 included	from 315 to 400 included	from 400 to 500 included
d	-20	-30	-40	-50	-65	-80	-100	-120	-145	-170	-190	-210	-230
e	-14	-20	-25	-32	-40	-50	-60	-72	-85	-100	-110	-125	-135
f	-6	-10	-13	-16	-20	-25	-30	-36	-43	-50	-56	-62	-68
g	-2	-4	-5	-6	-7	-9	-10	-12	-14	-15	-17	-18	-20
h	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0
js	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$	$\pm IT/2$
k	+0	+1	+1	+1	+2	+2	+2	+3	+3	+4	+4	+4	+5
m	+2	+4	+6	+7	+8	+9	+11	+13	+15	+17	+20	+21	+23
n	+4	+8	+10	+12	+15	+17	+20	+23	+27	+31	+34	+37	+40
p	+6	+12	+15	+18	+22	+26	+32	+37	+43	+50	+56	+62	+68