Autodesk Inventor Engineer s Handbook

هندبوک مهندسی نرم افزار Autodesk Inventor

انجمن اینونتور ایران

www.irinventor.com

Email: irinventor@chmail.ir
irinventor@hotmail.com

Tel: 09352191813 &

021-46088862

Joints / Fixed Joints

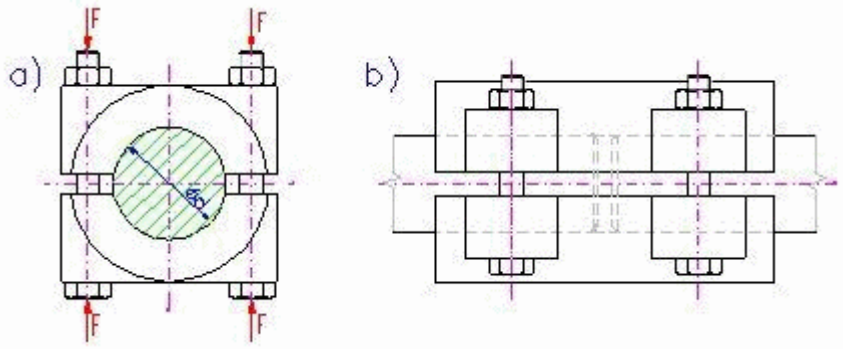
Clamping Joint Calculator

Separated hub joints

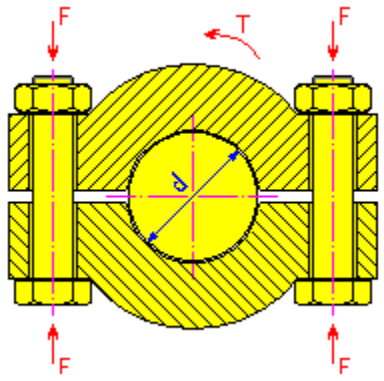
Fit with smaller interference H8/n7, H8/p7, H7/n6, H7/p6.

Hubs of clamping joints are either separated or slotted.

Clamping joints are suitable for transfer of small and medium torques. You can move and rotate a hub towards the shaft during an assembly. With separated hubs, you can fasten a wheel on a shaft without dismantling the shaft.



Separated hub - formulas for metric calculation



Contact pressure

$$p = \sqrt{\left(\frac{2 \cdot 1000 \cdot k_s \cdot T}{\pi \cdot d^2 \cdot L \cdot v}\right)^2 + \left(\frac{k_s \cdot F_a}{\pi \cdot d \cdot L \cdot v}\right)^2} \quad [MPa]$$

Minimum hub length

$$l_{min} = \sqrt{\left(\frac{2 \cdot 1000 \cdot k_s \cdot T}{\pi \cdot d^2 \cdot p_A \cdot v}\right)^2 + \left(\frac{k_s \cdot F_a}{\pi \cdot d \cdot p_A \cdot v}\right)^2} \quad [mm]$$

Recommended values: L = (0.6 - 3) d

Force carried by one bolt

$$F = \frac{F_s}{i} = \frac{p \cdot L \cdot d}{i} \quad [N]$$

Strength check

$p \leq p_A$

where:

F_a axial force [N]

T torque [Nm]

d shaft diameter [mm]

p contact pressure in a joint [MPa]

p_A allowable pressure [MPa]

L hub length [mm]

υ clamping factor υ = 0.008 to 0.1 [-]

k_s slip safety [-]

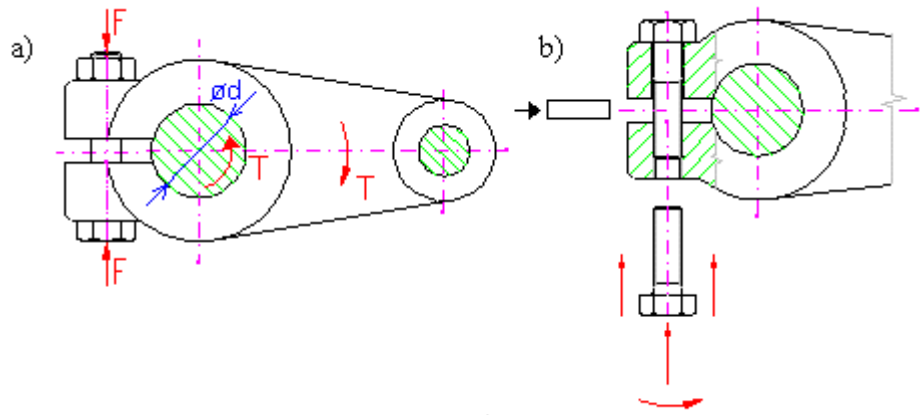
F force carried by one bolt [N]

F_s force carried by all bolts [N]

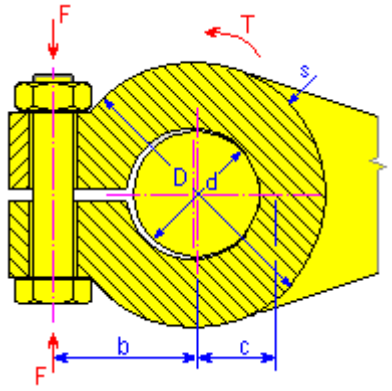
i total number of bolts [-]

Slotted hub joint

Transient fit H8/j7, H8/k7, H7/j6, H7/k6



Slotted hub - formulas for metric calculation



Contact pressure

$$p = \sqrt{\left(\frac{2 \cdot 1000 \cdot k_s \cdot T}{\pi \cdot d^2 \cdot L \cdot v}\right)^2 + \left(\frac{k_s \cdot F_a}{\pi \cdot d \cdot L \cdot v}\right)^2} \quad [MPa]$$

Minimum hub length

$$l_{min} = \sqrt{\left(\frac{2 \cdot 1000 \cdot k_s \cdot T}{\pi \cdot d^2 \cdot p_A \cdot v}\right)^2 + \left(\frac{k_s \cdot F_a}{\pi \cdot d \cdot p_A \cdot v}\right)^2} \quad [mm]$$

Recommended values: L = (0.6 - 3) d

Force carried by one bolt

$$F = \frac{p \cdot L \cdot d \cdot c}{i \cdot (c + b)} \quad [N]$$

Strength check

$p \leq p_A$

where:

F_a acting axial force [N]

T torque [Nm]

d shaft diameter [mm]

p contact pressure in a joint [MPa]

p_A allowable pressure [MPa]

L hub length [mm]

υ clamping factor υ = 0.008 to 0.1 [-]

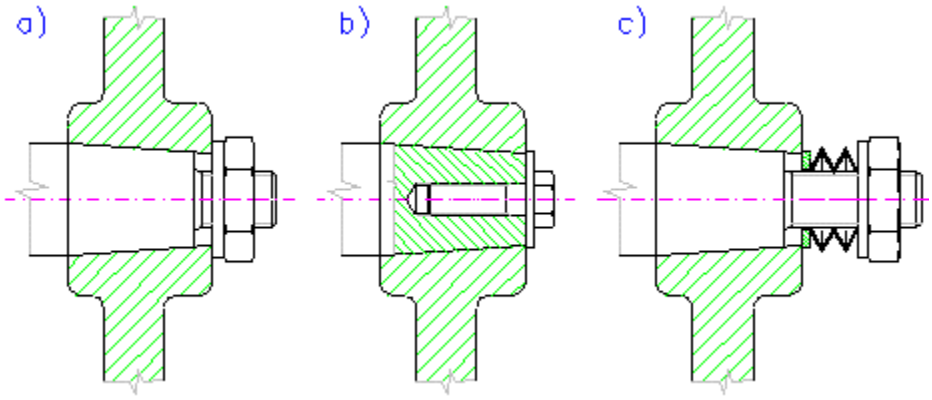
k_s slip safety [-]

F force carried by one bolt [N].

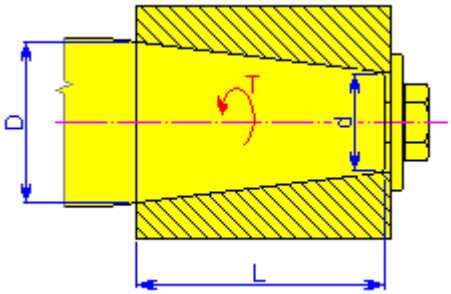
i total number of bolts [-].

Cone joint

In the cone joints, a hub is pressed on the shaft cone end.



Cone joint - formulas for metric calculation



Taper ratio

$$C = 1 : x = \frac{D - d}{L} = 2\mathrm{tg}\frac{\alpha}{2}$$

Cone gradient

$$\mathrm{tg}\frac{\alpha}{2} = \frac{D - d}{2L}$$

Cone medium diameter

$$d_s = \frac{d + D}{2} \quad [mm]$$

Required pressure in the joint

$$p = \frac{2 \cdot 1000 \cdot k_s \cdot T \cdot \cos\left(\alpha/2\right)}{\pi \cdot d_s^2 \cdot L \cdot \upsilon} \quad [MPa]$$

Required pressing force

$$F_s = \pi \cdot d_s \cdot L \cdot p \cdot \mathrm{tg}\left(\left(\alpha/2\right) + \varphi\right) = \pi \cdot d_s \cdot L \cdot p \cdot \frac{\mathrm{tg}\left(\alpha/2\right) + \upsilon}{1 - \mathrm{tg}\left(\alpha/2\right) \cdot \upsilon} \quad [N]$$

Force for releasing joint

$$F_{S1} = \pi \cdot d_S \cdot L \cdot p \cdot tg\left(\varphi - \left(\alpha/2\right)\right) = \pi \cdot d_S \cdot L \cdot p \cdot \frac{\upsilon - tg\left(\alpha/2\right)}{1 + \upsilon \cdot tg\left(\alpha/2\right)} \quad [N]$$

Strength check

$p \leq p_A$

where:

T torque [Nm]

d small shaft diameter [mm]

D greater shaft diameter [mm]

p contact pressure in a joint [MPa]

p_A allowable pressure [MPa]

L hub length [mm]

υ clamping factor υ = 0.008 to 0.1 [-]

k_s slip safety [-]

φ friction angle ϕ = arc tg υ

Web: www.irinventor.ir
Email: irinventor@chmail.ir
& irinventor@hotmail.com

Tel: 09352191813 & 021-46088862