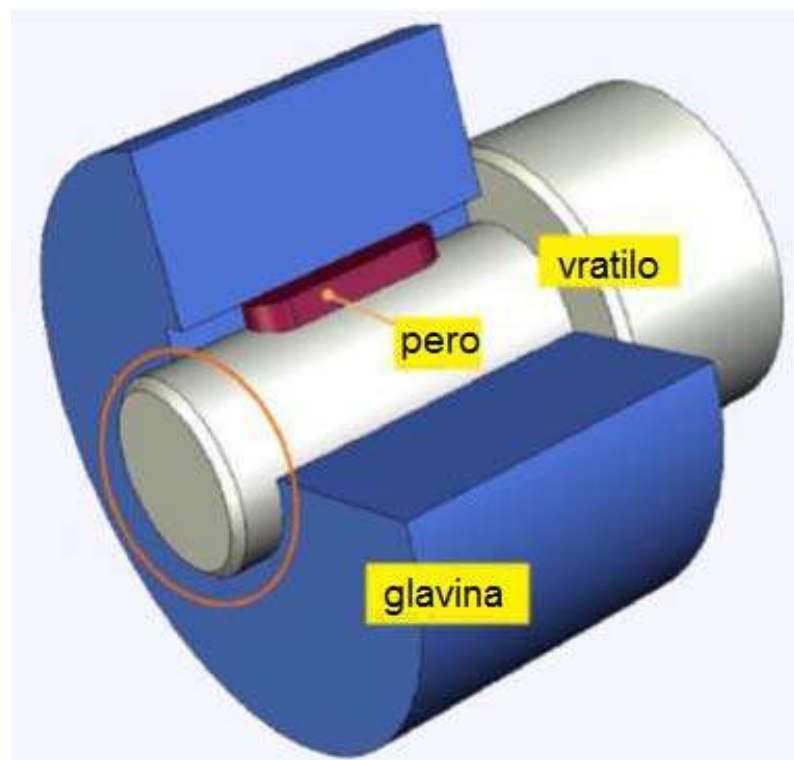




**Glavina** – dio strojnog elementa koji naliježe na vratilo

***Spojevi oblikom*** – uglavnom prenose okretni moment oblikom preko površinskog pritiska neposredno između vratila i glavine (žlijebljeni i zupčasti spojevi, poligonski spojevi), odnosno posredno preko dodatnih elemenata (poprečni klinovi i pera).

***Spojevi trenjem*** – prenose okretni moment isključivo trenjem koje nastaje neposredno između vratila i glavine zbog međusobnog pritiska (spoj steznom glavinom, rastavljivi i nerastavljivi stezni spojevi).  
- za ove spojeve mora biti ispunjen uvjet:

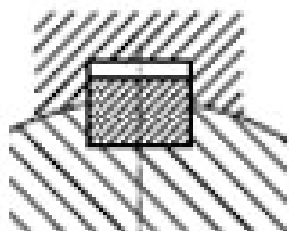
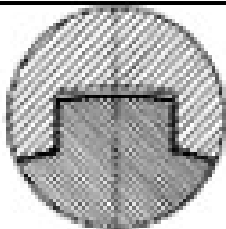
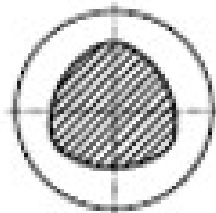
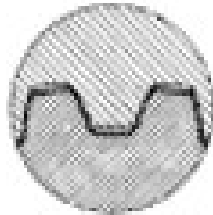
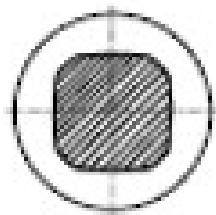
$$F_{tr} = F_N \cdot \mu_o \geq F \cdot v_k$$

$F_{tr}$  - sila trenja,  $F_N$  - normalna sila,  $\mu_o$  - statički koef. trenja

$F$  - rezultanta aktivnih sila,  $v_k$  - sigurnost protiv klizanja (1,0...2,5)

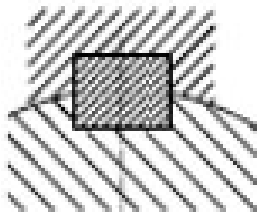
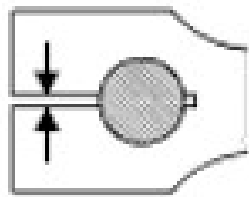
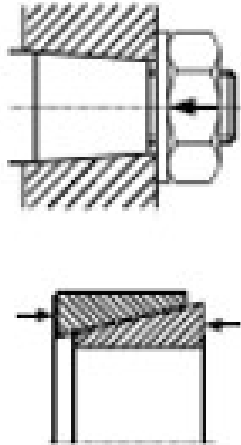
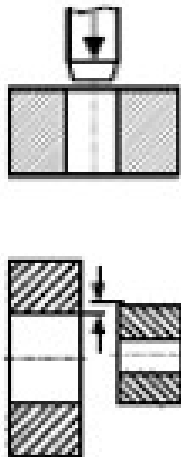
# SPOJEVI GLAVINE

Prepisati i precrtati sve

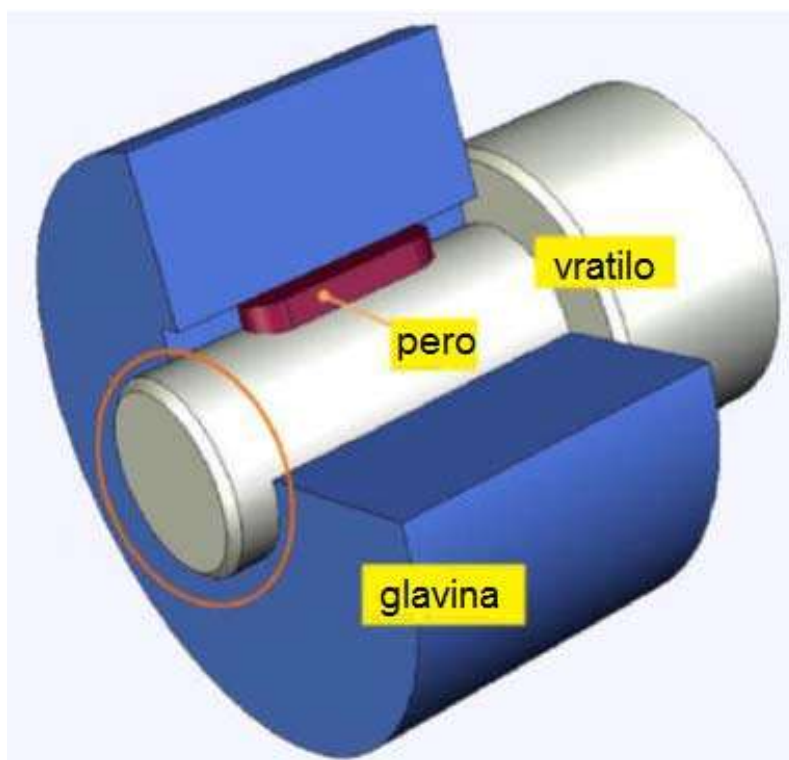
| SPOJEVI OBLIKOM                                                                    |                                                                                     |                                                                                      |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| PERA                                                                               | ŽLIJEBLJENI<br>I ZUPCASTI<br>SPOJEVI                                                | POLIGONSKI<br>SPOJEVI                                                                |
|  |   |   |
|                                                                                    |  |  |

# SPOJEVI GLAVINE

Prepisati zaokruženo

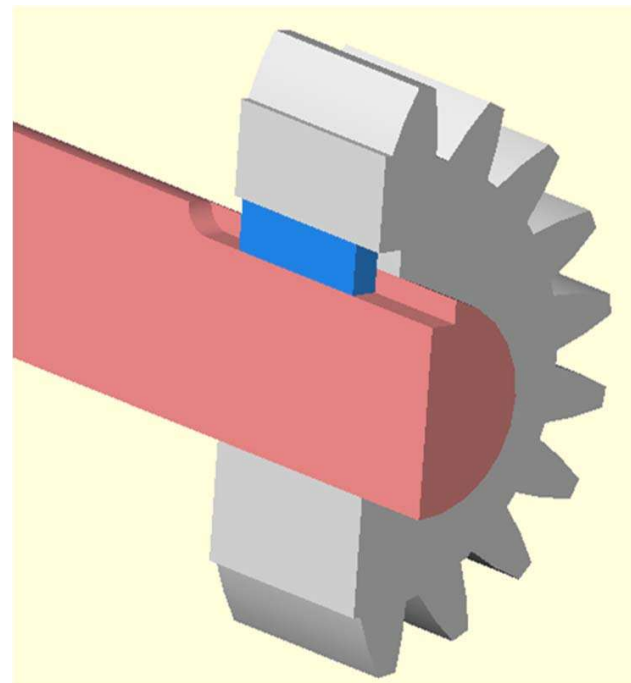
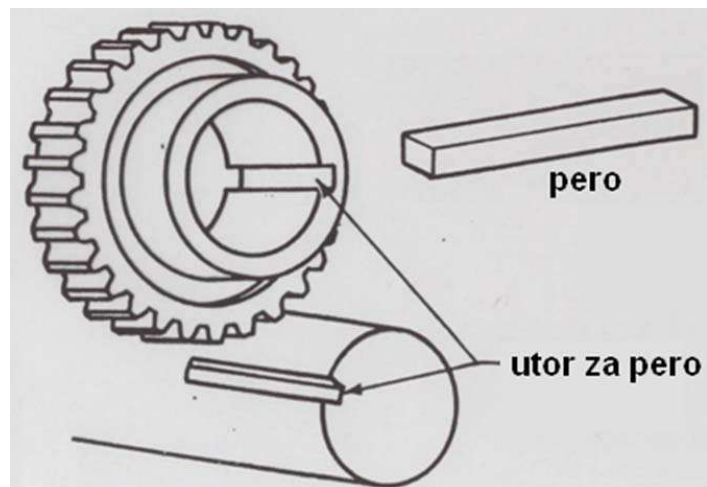
| SPOJEVI TRENJEM                                                                    |                                                                                    |                                                                                      |                                                                                      |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| KLINOVI                                                                            | SPOJ<br>STEZNOM<br>GLAVINOM                                                        | RASTAVLJIVI<br>STEZNI<br>SPOJEVI                                                     | NERASTAVLJIVI<br>STEZNI<br>SPOJ                                                      |
|  |  |  |  |

**Vratilo** - element koji nosi strojne elemente (remenica, lančanic),  
vrti se i prenosi okretni moment.



**Glavina** - dio okretnog elementa  
(remenice, lančanika),  
preko kojeg se element  
spaja s vratilom.

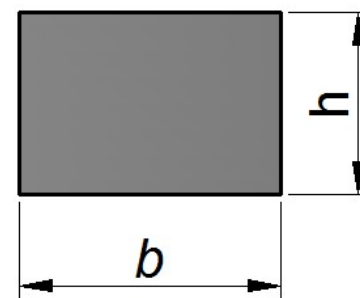
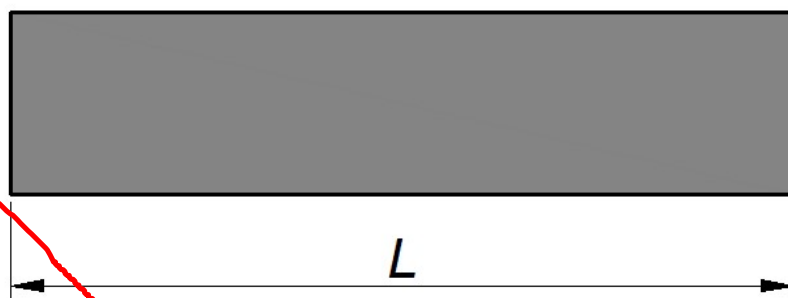
# PERA



# PERA

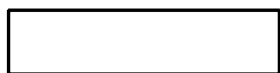
Prepisati i precrtati zaokruženo

- strojni element koji ima pravokutan poprečni presjek bez nagiba.

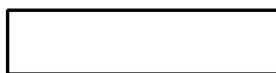


Oblici pera standardizirani po HRN M.C2.060-062 (DIN 6885)

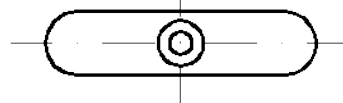
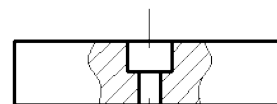
oblik **A**



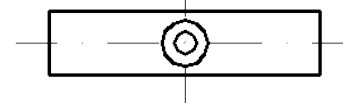
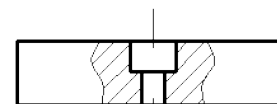
oblik **B**



oblik **C**



oblik **D**

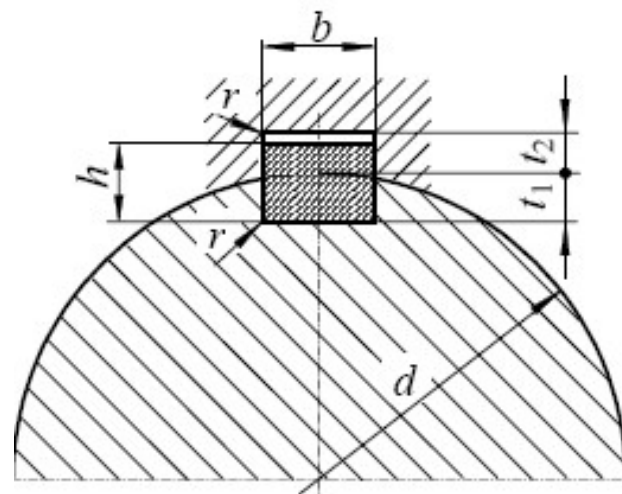


**Postoje:**

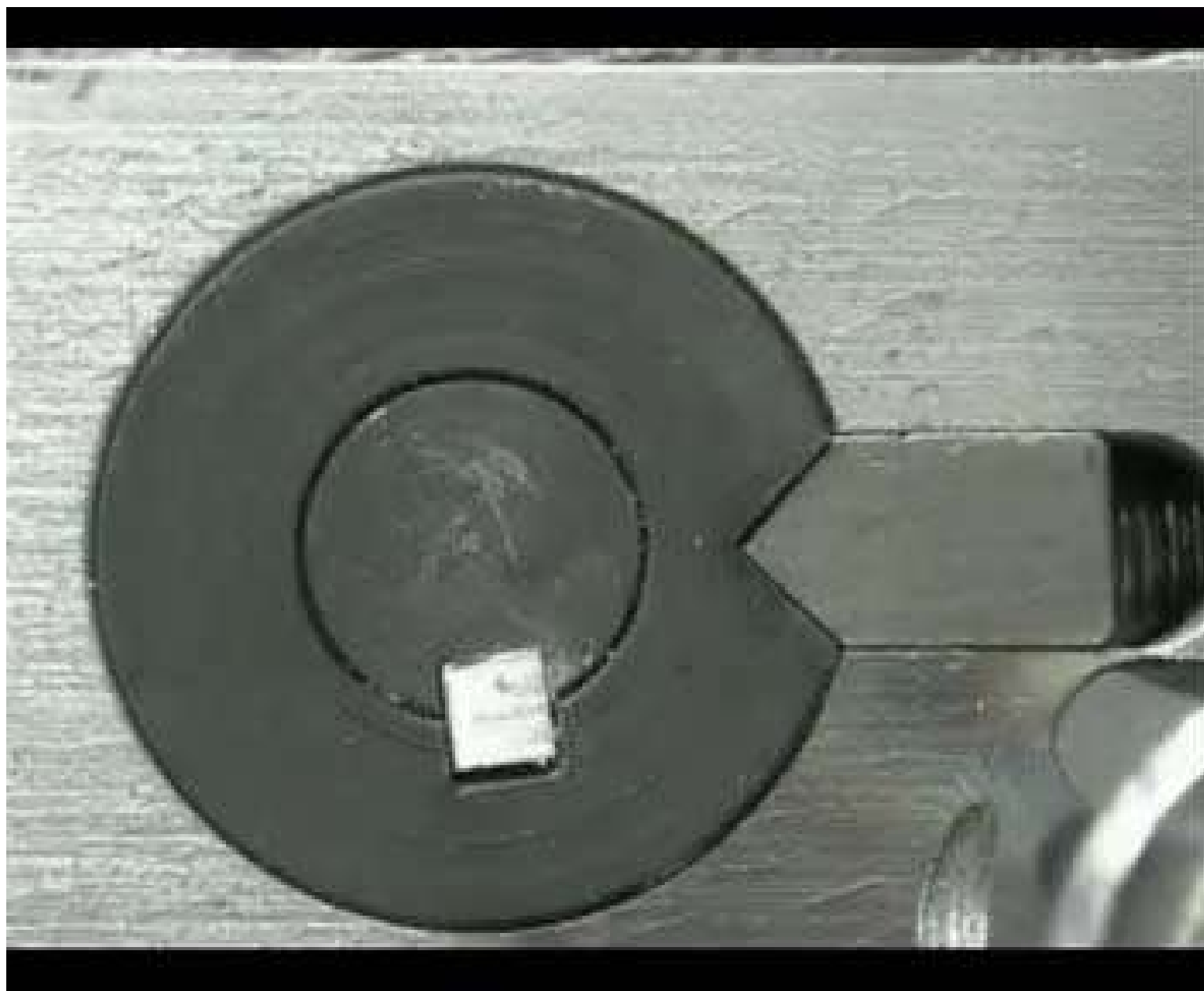
- *visoka pera* – standardizirana
- *niska pera* – standardizirana, upotreba kod tankih glavina, koje bi se upotrebom visokog pera previše oslabile.

# PERA

| Promjer<br>vratila<br>d [mm] | Dimenzije<br>pera<br>b x h [mm] | Širina<br>utora<br>b [mm] | Dubina utora u<br>vratilu<br>t <sub>1</sub> [mm] | Dubina utora u<br>glavini<br>t <sub>2</sub> [mm] |      |      |
|------------------------------|---------------------------------|---------------------------|--------------------------------------------------|--------------------------------------------------|------|------|
| Visoka pera (DIN 6885)       |                                 |                           |                                                  |                                                  |      |      |
| > 6 ... 8                    | 2x2                             | 2                         | 1,2                                              | +0,1                                             | 1,0  | +0,1 |
| > 8 ... 10                   | 3x3                             | 3                         | 1,8                                              |                                                  | 1,4  |      |
| > 10 ... 12                  | 4x4                             | 4                         | 2,5                                              |                                                  | 1,8  |      |
| > 12 ... 17                  | 5x5                             | 5                         | 3,0                                              |                                                  | 2,3  |      |
| > 17 ... 22                  | 6x6                             | 6                         | 3,5                                              |                                                  | 2,8  |      |
| > 22 ... 30                  | 8x7                             | 8                         | 4                                                | +0,2                                             | 3,3  | +0,2 |
| > 30 ... 38                  | 10x8                            | 10                        | 5                                                |                                                  | 3,3  |      |
| > 38 ... 44                  | 12x8                            | 12                        | 5                                                |                                                  | 3,3  |      |
| > 44 ... 50                  | 14x9                            | 14                        | 5,5                                              |                                                  | 3,8  |      |
| > 50 ... 58                  | 16x10                           | 16                        | 6                                                |                                                  | 4,3  |      |
| > 58 ... 65                  | 18x11                           | 18                        | 7                                                |                                                  | 4,4  |      |
| > 65 ... 75                  | 20x12                           | 20                        | 7,5                                              |                                                  | 4,9  |      |
| > 75 ... 85                  | 22x14                           | 22                        | 9                                                |                                                  | 5,4  |      |
| > 85 ... 95                  | 25x14                           | 25                        | 9                                                |                                                  | 5,4  |      |
| > 95 ... 110                 | 28x16                           | 28                        | 10                                               |                                                  | 6,4  |      |
| > 110 ... 130                | 32x18                           | 32                        | 11                                               |                                                  | 7,4  |      |
| > 130... 150                 | 36x20                           | 36                        | 12                                               | +0,3                                             | 8,4  | +0,3 |
| >150 ... 170                 | 40x22                           | 40                        | 13                                               |                                                  | 9,4  |      |
| >170...200                   | 45x25                           | 45                        | 15                                               |                                                  | 10,4 |      |
| >200...230                   | 50x28                           | 50                        | 17                                               |                                                  | 11,4 |      |
| >230...260                   | 56x32                           | 56                        | 20                                               |                                                  | 12,4 |      |
| >260...290                   | 63x32                           | 63                        | 20                                               |                                                  | 12,4 |      |
| >290...330                   | 70x36                           | 70                        | 22                                               |                                                  | 14,4 |      |
| >330...380                   | 80x40                           | 80                        | 25                                               |                                                  | 15,4 |      |
| >380...440                   | 90x45                           | 90                        | 28                                               |                                                  | 17,4 |      |
| >440...500                   | 100x50                          | 100                       | 31                                               |                                                  | 19,5 |      |

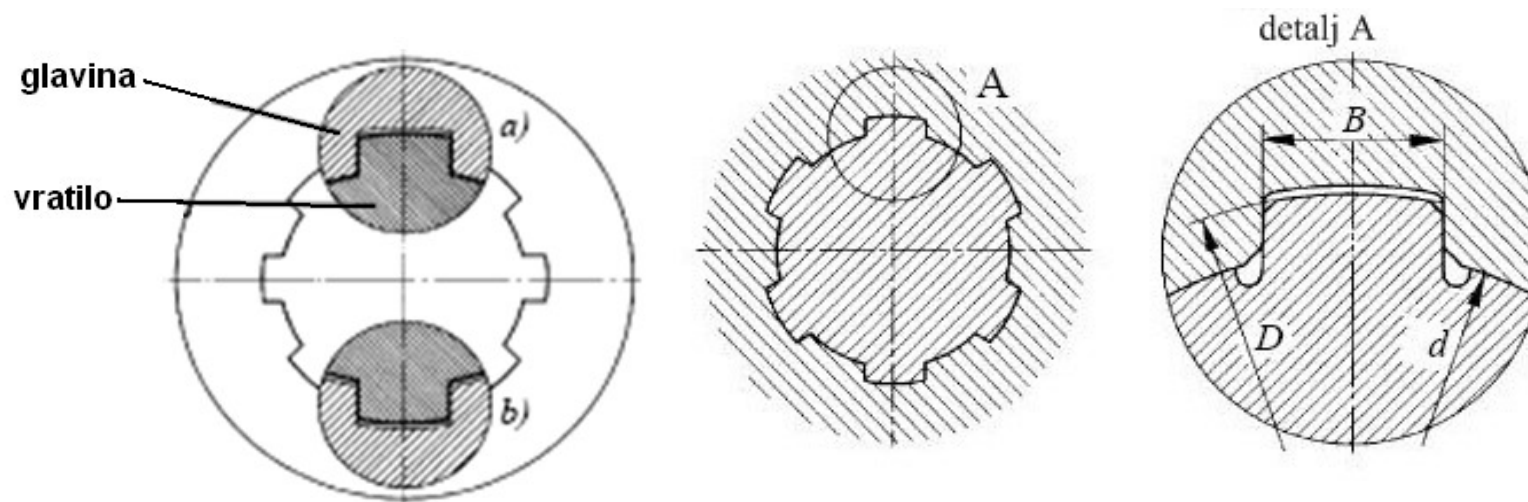


| Promjer<br>vratila<br>d [mm] | Dimenzije<br>pera<br>bxh [mm] | Širina<br>utora<br>b [mm] | Dubina utora u<br>vratilu<br>t <sub>1</sub> [mm] | Dubina utora u<br>glavini<br>t <sub>2</sub> [mm] |      |
|------------------------------|-------------------------------|---------------------------|--------------------------------------------------|--------------------------------------------------|------|
| Niska pera (DIN 6885)        |                               |                           |                                                  |                                                  |      |
| > 12 ... 17                  | 5x3                           | 5                         | 1,8                                              | +0,1                                             | +0,1 |
| > 17 ... 22                  | 6x4                           | 6                         | 2,5                                              |                                                  |      |
| > 22 ... 30                  | 8x5                           | 8                         | 3                                                |                                                  |      |
| > 30 ... 38                  | 10x6                          | 10                        | 3,5                                              |                                                  |      |
| > 38 ... 44                  | 12x6                          | 12                        | 3,5                                              |                                                  |      |
| > 44 ... 50                  | 14x6                          | 14                        | 3,5                                              | +0,2                                             | +0,2 |
| > 50 ... 58                  | 16x7                          | 16                        | 4                                                |                                                  |      |
| > 58 ... 65                  | 18x7                          | 18                        | 4                                                |                                                  |      |
| > 65 ... 75                  | 20x8                          | 20                        | 5                                                |                                                  |      |
| > 75 ... 85                  | 22x9                          | 22                        | 5,5                                              |                                                  |      |
| > 85 ... 95                  | 25x9                          | 25                        | 5,5                                              |                                                  |      |
| > 95 ... 110                 | 28x10                         | 28                        | 6                                                |                                                  |      |
| > 110 ... 130                | 32x11                         | 32                        | 7                                                |                                                  |      |
| > 130... 150                 | 36x12                         | 36                        | 7,5                                              |                                                  |      |



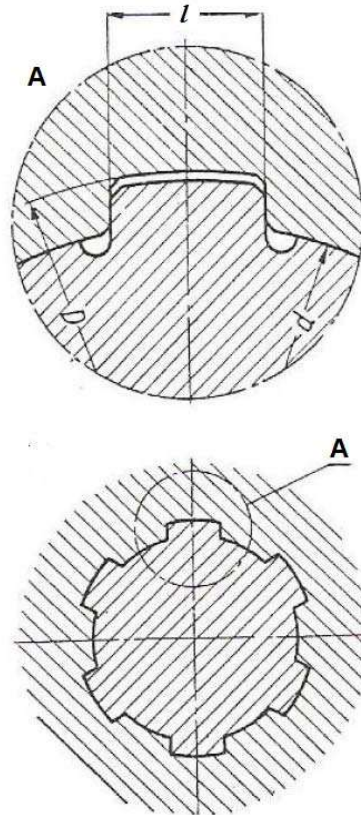
# ŽLIJEBLJENI SPOJEVI Prepisati sve, ne treba crtati

- za prijenos većih okretnih momenata, te izmjeničnih i udarnih opterećenja
- postoje: a) unutarnje centriranje  
b) vanjsko centriranje

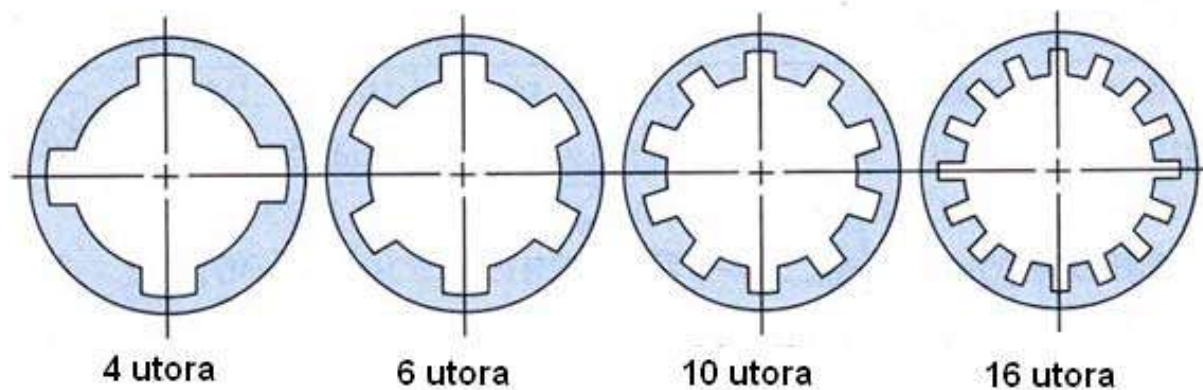


## ŽLIJEBLJENI SPOJEVI Prepisati sve, ne treba crtati

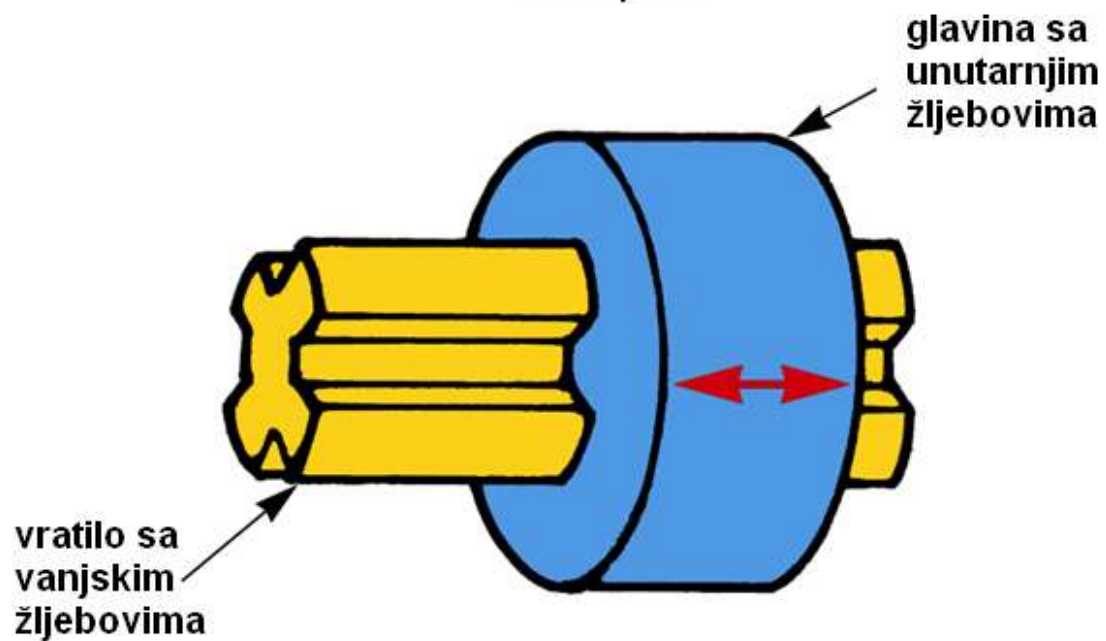
- to su žljebovi najčešće pravokutnog presjeka urezani na vratilu, koji odgovaraju obliku žljebova u glavini.
- prenose snagu i okretni moment sa vratila na glavinu i obratno, slično kao i pera.



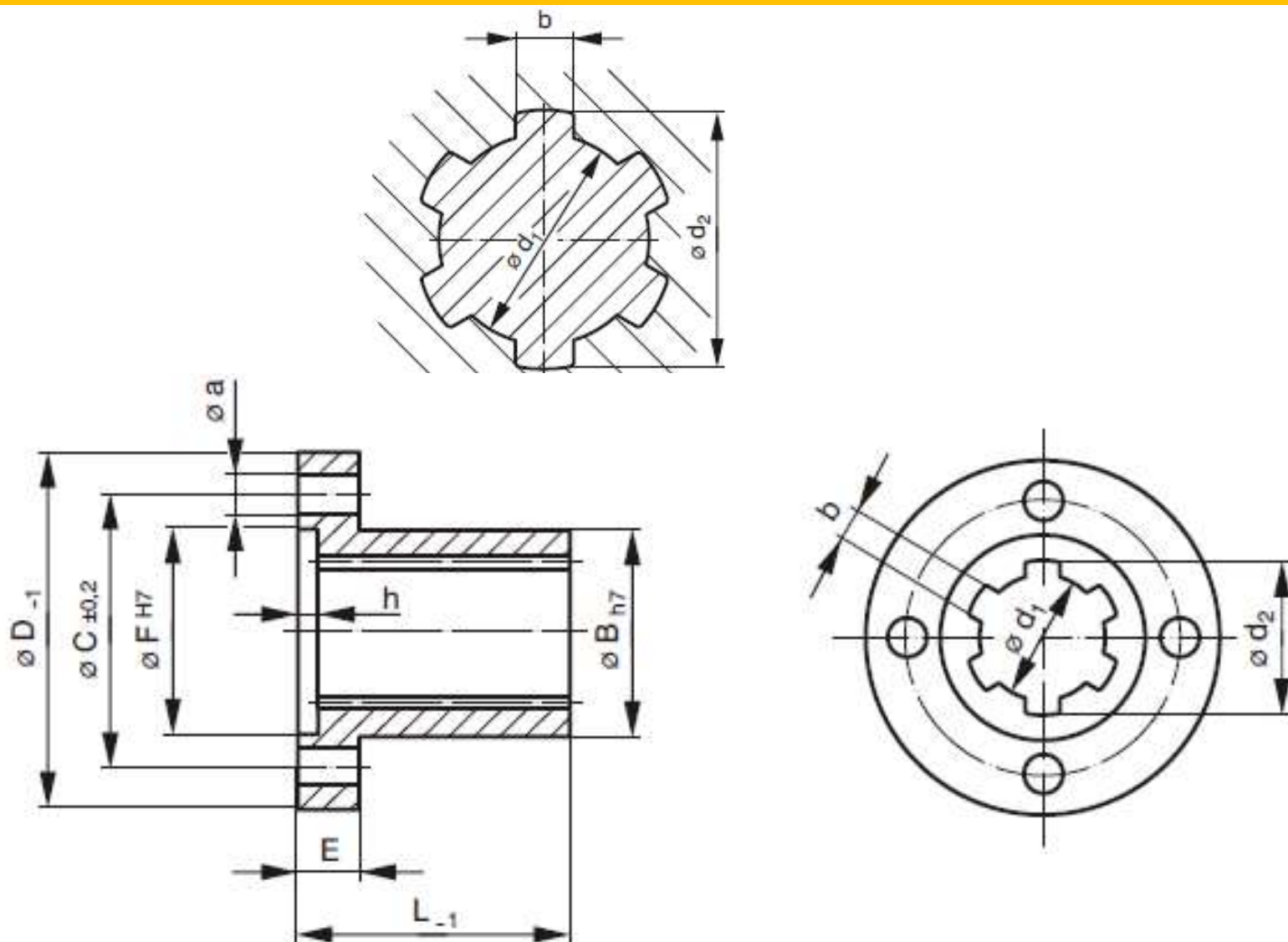
# ŽLIJEBLJENI SPOJEVI



Ravni profil

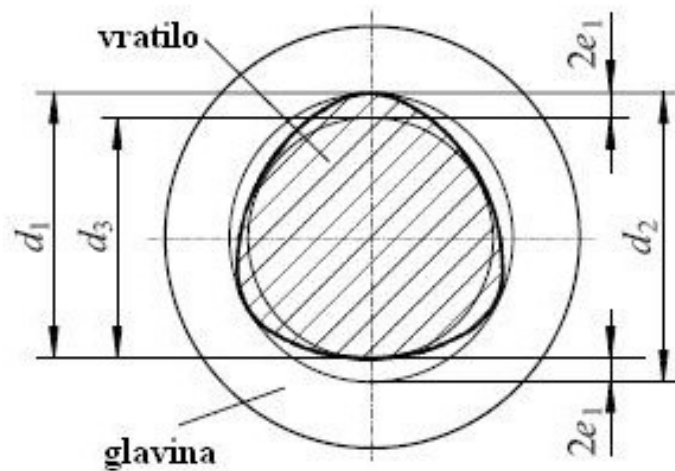


# ŽLIJEBLJENI SPOJEVI

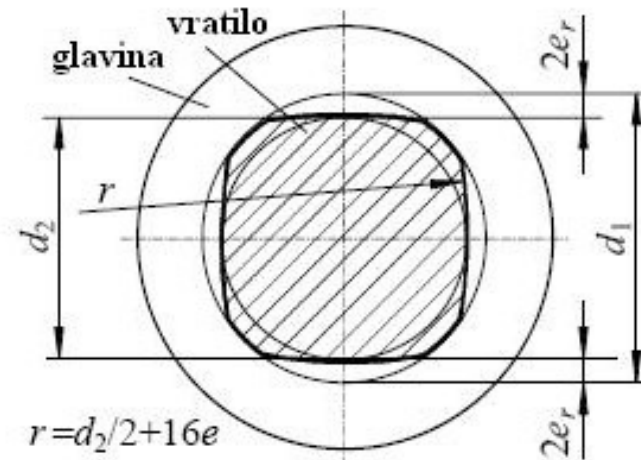


## POLIGONSKI SPOJEVI Prepisati prvu rečenicu

- okretni moment prenosi se oblikom preko odgovarajuće oblikovanog vratila i utora u glavini, koji su neokruglog oblika, čime je osigurano dobro centriranje i jednakomjeran prijenos vrtnje.



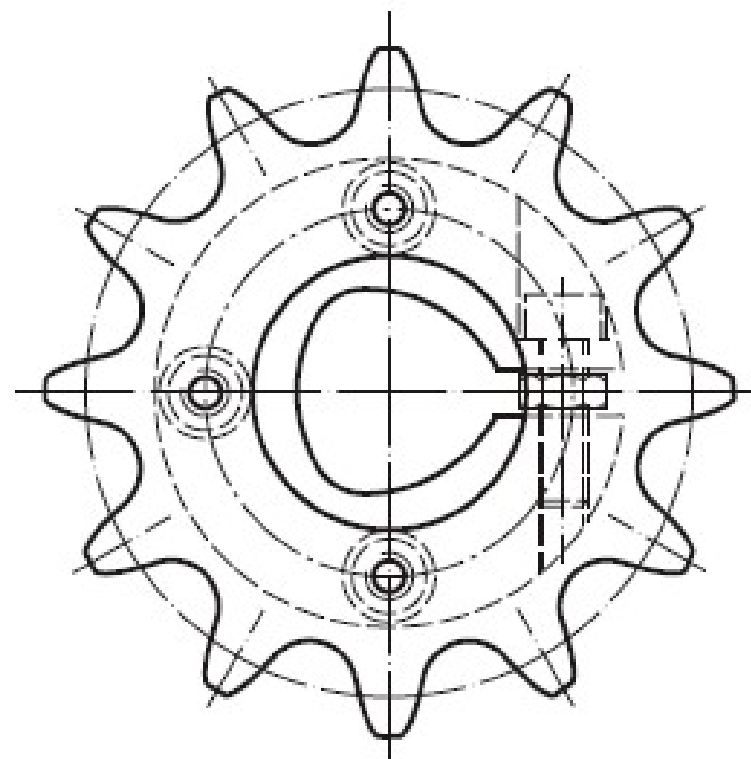
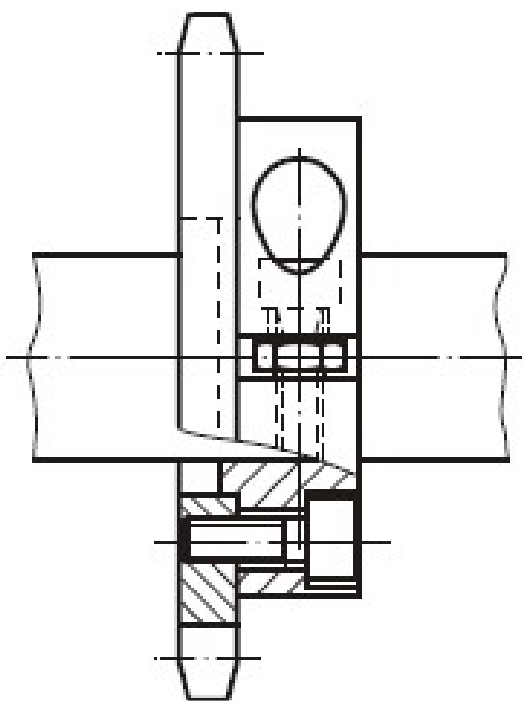
aksijalno nepomične glavine



aksijalno pomične ili  
nepomične glavine



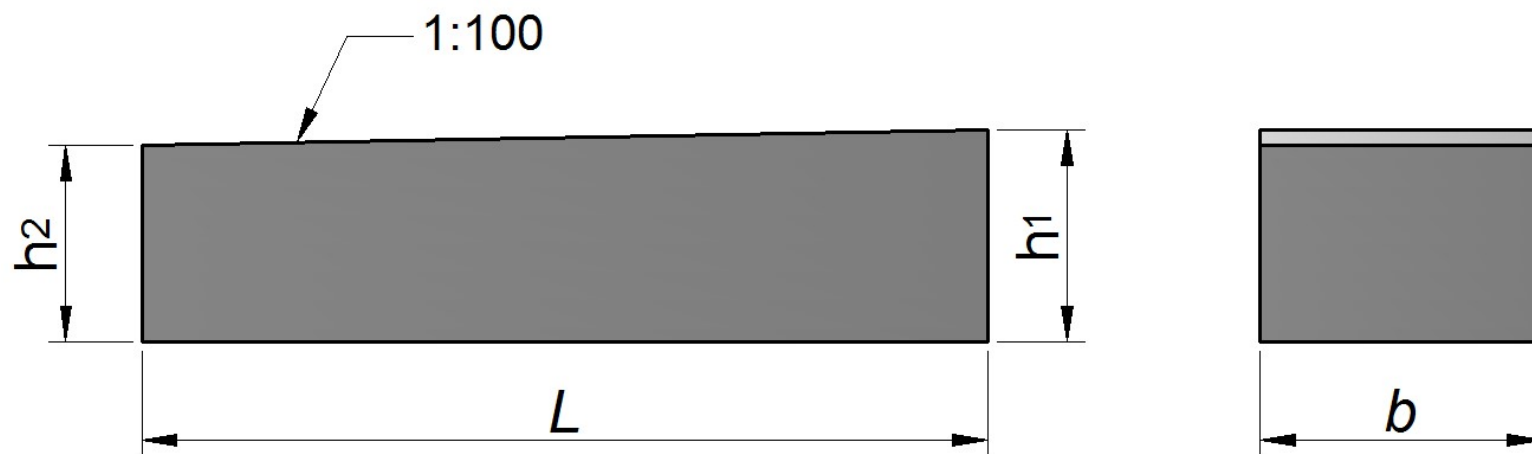
## POLIGONSKI SPOJEVI



## KLINOV I

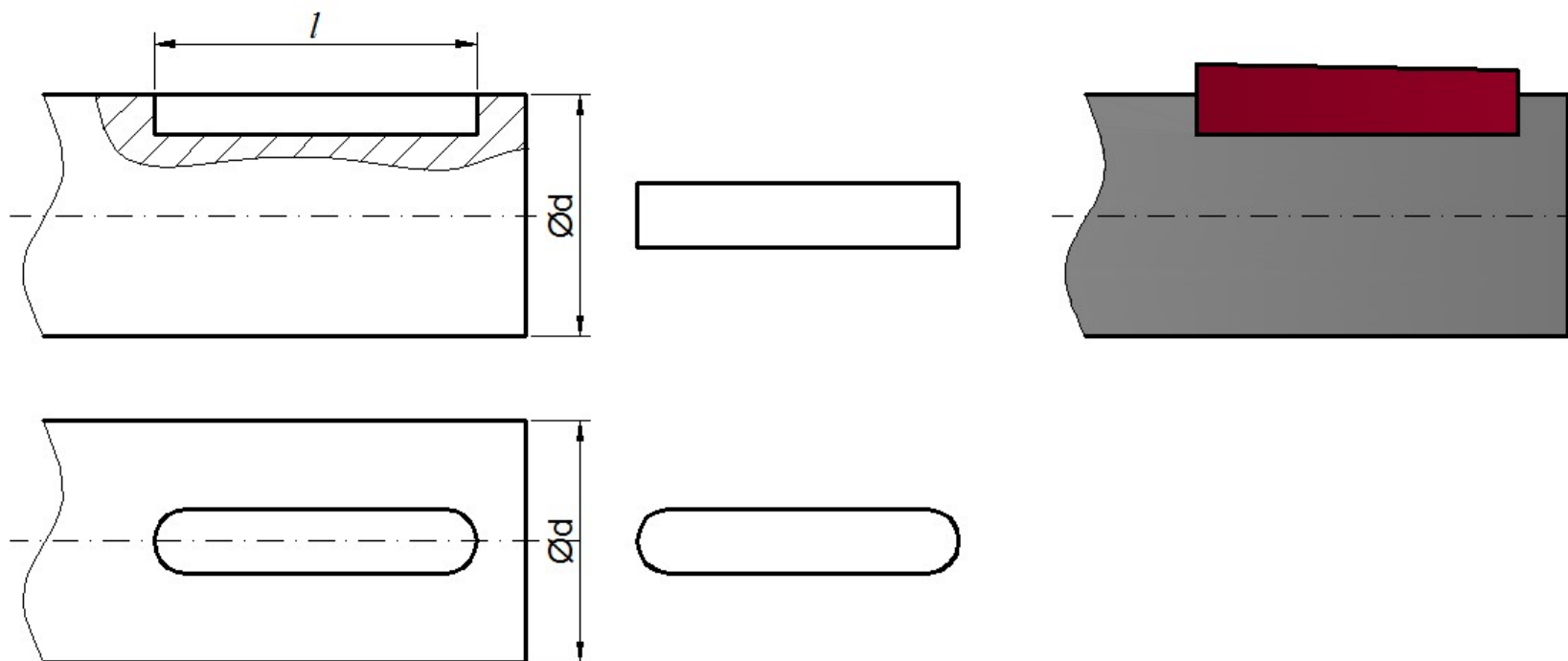
Prepisati i precrtati sve

**Klinovi** – strojni elementi klinastog oblika, obično s nagibom 1:100, koji se primjenom sile umeću između vratila i glavine, čime se na dodirnim površinama stvara sila trenja potrebna za prijenos okretnog momenta.

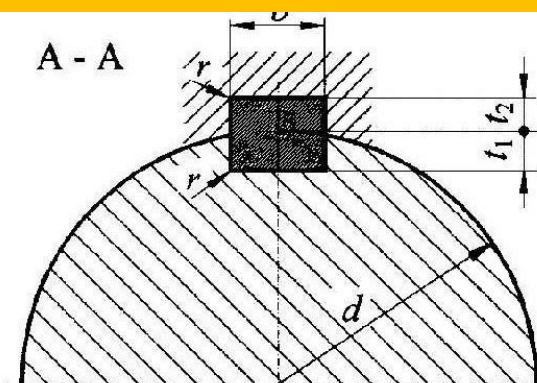
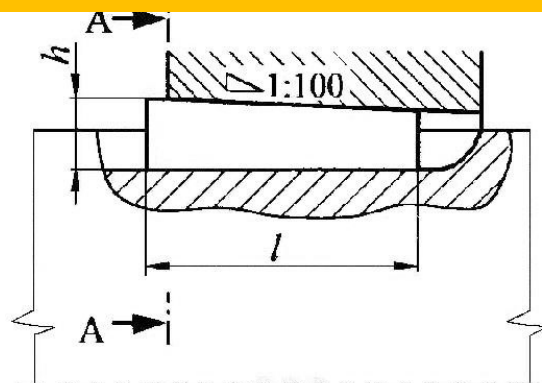


# KLINOVI

## žlijebljeni klinovi



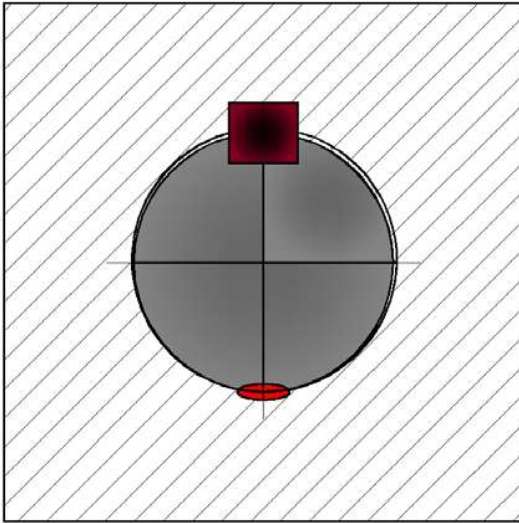
# KLINOVI



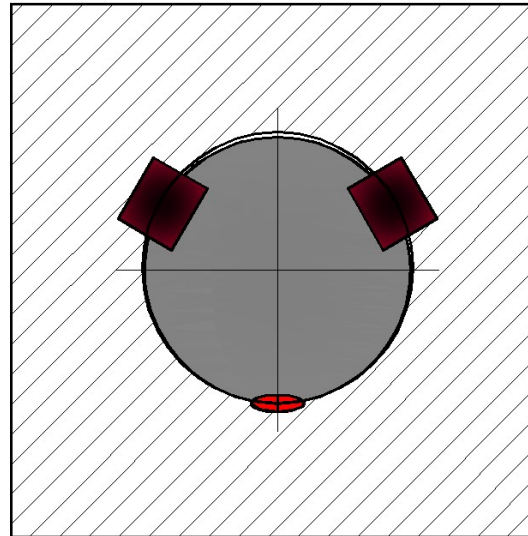
| Promjer vratila<br>$d$ [mm] | Dimenzije klina<br>$b \times h$ [mm] | Širina utora<br>$b$ [mm] | Dubina utora u vratilu<br>$t_1$ [mm] | Dubina utora u glavini<br>$t_2$ [mm] |
|-----------------------------|--------------------------------------|--------------------------|--------------------------------------|--------------------------------------|
| > 6 ... 8                   | 2x2                                  | 2                        | 1,2                                  | 0,5                                  |
| > 8 ... 10                  | 3x3                                  | 3                        | 1,8                                  | 0,9                                  |
| > 10 ... 12                 | 4x4                                  | 4                        | 2,5                                  | 1,2                                  |
| > 12 ... 17                 | 5x5                                  | 5                        | 3,0                                  | 1,7                                  |
| > 17 ... 22                 | 6x6                                  | 6                        | 3,5                                  | 2,2                                  |
| > 22 ... 30                 | 8x7                                  | 8                        | 4                                    | 2,4                                  |
| > 30 ... 38                 | 10x8                                 | 10                       | 5                                    | 2,4                                  |
| > 38 ... 44                 | 12x8                                 | 12                       | 5                                    | 2,4                                  |
| > 44 ... 50                 | 14x9                                 | 14                       | 5,5                                  | 2,9                                  |
| > 50 ... 58                 | 16x10                                | 16                       | 6                                    | 3,4                                  |
| > 58 ... 65                 | 18x11                                | 18                       | 7                                    | 3,4                                  |
| > 65 ... 75                 | 20x12                                | 20                       | 7,5                                  | 3,9                                  |
| > 75 ... 85                 | 22x14                                | 22                       | 9                                    | 4,4                                  |
| > 85 ... 95                 | 25x14                                | 25                       | 9                                    | 4,4                                  |
| > 95 ... 110                | 28x16                                | 28                       | 10                                   | 5,4                                  |
| > 110 ... 130               | 32x18                                | 32                       | 11                                   | 6,4                                  |

# KLINOVI

Ekscentričnost spoja vratila i glavine s klinom



dodir u dvije točke



dodir u tri točke

## OPTEREĆENJA

- I - sabijanje klina
- II - lokalno rastezanje glavine
- III - lokalno sabijanje vratila