Задатак:

Израдити рачунарски модел алата за савијање двоструког угаоника према датој слици уз одговарајуће прорачуне.

Израдити склопни цртеж и радионичке цртеже елемената алата за савијање.

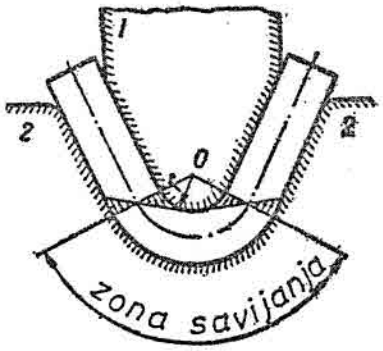
OBRADA SAVIJANJEM

Prema savijanju oblikoanje materijala se izvodi lokalnom deformacijom na mestu savijanja. Pri tome se na unutrašnjoj strani (sloju) javlja sabijanje a u spoljšnjem sloju istezanje materijala

Razlikuju se dva načina savijanja : fazonsko i kruzno savijanje. Fazonskim savijanjem se izradjuju delovi različitog oblika konture poprečnog preseka (oblika L, U, V, O, Z, i dr.), manje ili veće dužineizradjuju se na posebnim masinama (presama) za pravolinijsko savijanjei presovanje ili profilisanjem na mašinama sa profilnim valjcima (sa tri ii više valjaka).

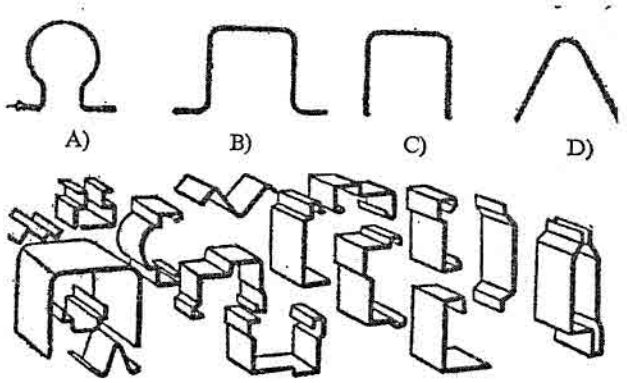
Alati za savijanje

Alati za savijanje mogu biti prosti i složeni. Prosti alati se primenjuju za izradu delova prostijeg oblika (u toku jedne operacije). Na sl. 3.70 prikazan je otvoreni alat za savijanje, koji se sastoji od gornjeg (1) i donjeg oblikača (2) i graničnika (3),

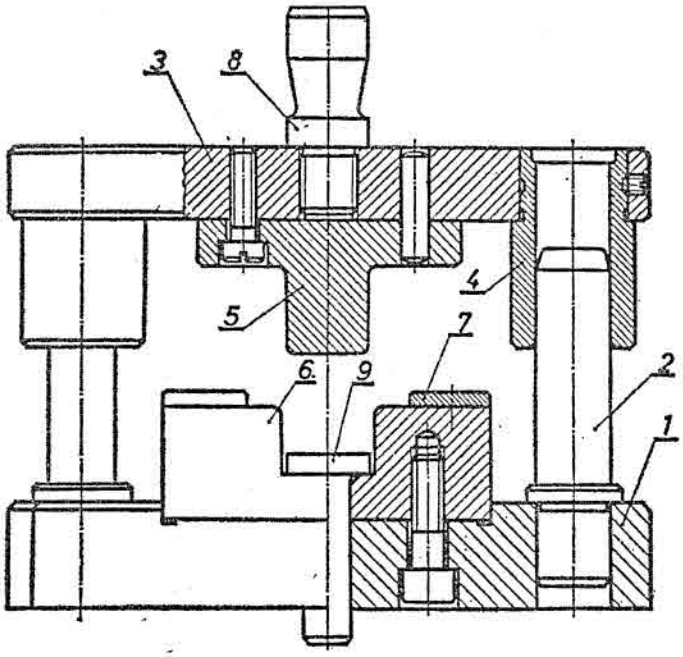


Zona deformisanja pri savijanju: 1 — gornji oblikač; 2 — donji oblikač alata

izmedju kojih se postavlja pripremak (4) za deo u obliku ugaonika



Složeni alati za savijanje imaju vise pari oblikača i koriste se u izradi delova složenog oblika u toku više operacija (stupnjeva).
За алат који ће вршити савијање припремка бирам затворени алат са стубним вођењем (вођење вођицама)



Na slici prikazan je zatvoreni alat za savijanje (sa stubnim vodjenjem), koji je iste konstrukcije kao i alat za izvlačenje prikazan na sl. 3.61, s tim što su u ovom slučaju radni organi alalti oblikača (5) i (6) (1 - donja pliča, 2 – stubovi za vodjenje, 3 – gornja ploča, 4 – čaura za vodjenje, 5 – gornji oblikač, 6 – donji oblikač, 7 – graničnici, 8 – rukavac, 9 – izbacivač).

Izračunavanje sile potrebne za savijanje dvostrukog ugaonika prema slici pripremka.

Podaci u komadu

b = 44 mm h = 23,25 mm r = 2 mm
c = 36 mm s = 2 mm R= r + s = 2 + 2 = 4 mm

Podaci o alatu

radijus tiskača: rt = 2 mm
radijus kalupa: rk = 4 mm

Podaci o materijalu
Materijal komada je čelicni lim Č.1530 (C. 45). Za ovaj material po podacima iz tabele uz sl. 17 (kome priblizno odgovara čelik 45 po GOST-u) je:

Ψm = 0,14; km 670 N/mm^2 sv $\approx k_o$ $400N/mm^2$

Čvrstoća istezanja

$\sigma m = k_m(1-\Psi_m)$ $670(1-0,14)$ $576,2N/mm^2$

Poluprečnik neutralne naponske linije

$\rho n = \sqrt{R \cdot r} = \sqrt{4 \cdot 2} = 2,83mm \approx 3mm$

Reducirani poluprečnik krivine

$\rho r = \frac{\rho n}{s} = \frac{3}{2} = 1,5mm$

Sobzirom da je ρr =1,5mm ovaj problem spada u područje čisto plastičnog savijanja.
Maksimalna deformacija :

$$\Psi \max = 1 - \frac{\rho n}{R} = 1 - \frac{3}{4} = 0,25$$

$$\Psi \max = 0,25$$

Što znači da najveći stvarni napon savijanja leži u području

$$k\max > k_m 670N/mm^2$$

Moment savijanja u čisto plastičnom području (obrazac 94)

$$M = \beta \cdot b \left\{ \frac{(D+B)\cdot s^2}{4} - \frac{B\cdot\sqrt{R\cdot r}}{2}\left[R + \frac{1}{3}\frac{r^2}{R}\frac{4}{3}\sqrt{R\cdot r} \right] \right\}$$

gde je :

$$D = k_m \frac{1-2\Psi_m}{1-\Psi_m} = 670\frac{1-2\cdot 0{,}14}{1-0{,}14} = 561$$

$$B = tg\alpha_m = \frac{k_m}{1-\psi_m} = \frac{670}{1-0{,}14} = 779$$

pa je :

$$M = 1{,}15\cdot 44\left\{ \frac{(561+779)\cdot 2^2}{4} - \frac{779\cdot\sqrt{4\cdot 2}}{2}\left[4 + \frac{1}{3}\frac{2^2}{4} - \frac{4}{3}\sqrt{4\cdot 2} \right] \right\}$$

Moment savijanja po približnom obrascu (95)

$$M = n\sigma_m \frac{b\cdot s^2}{4}$$

n = 1,6 (za tvrdji material)

$$M = 1{,}6\cdot 580\cdot\frac{44\cdot 2^2}{4} = 40{,}832\cdot 10^3\, Nmm,$$

dok je moment savijanja po obrascu (88) kojim se zanemaruje efekti očvršćavanja :

$$M = \sigma_v \frac{b\cdot s^2}{4} = 400\cdot\frac{44\cdot 2^2}{4} = 17{,}6\cdot 10^3\, Nmm,$$

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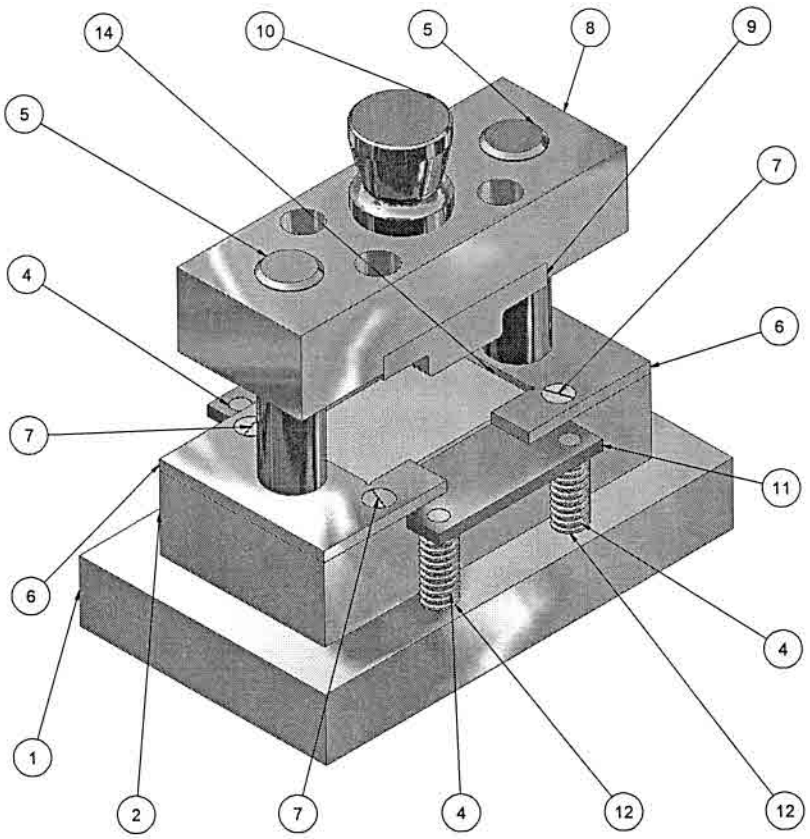

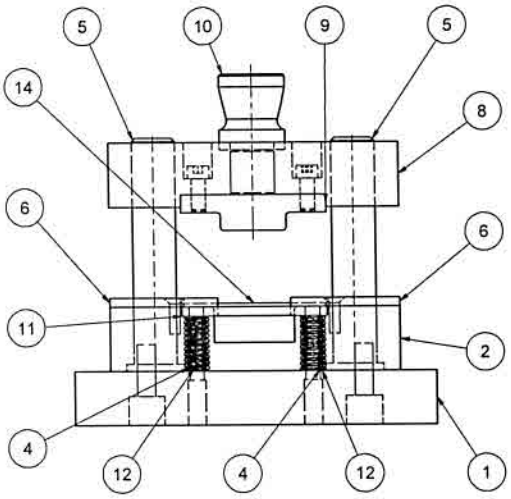

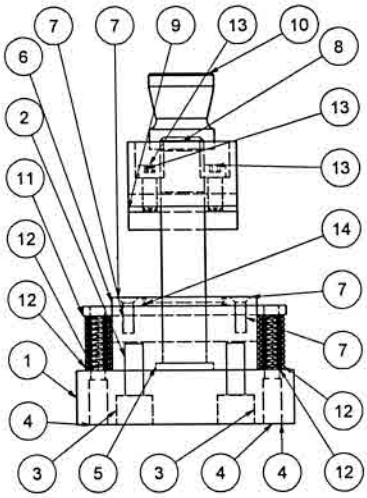

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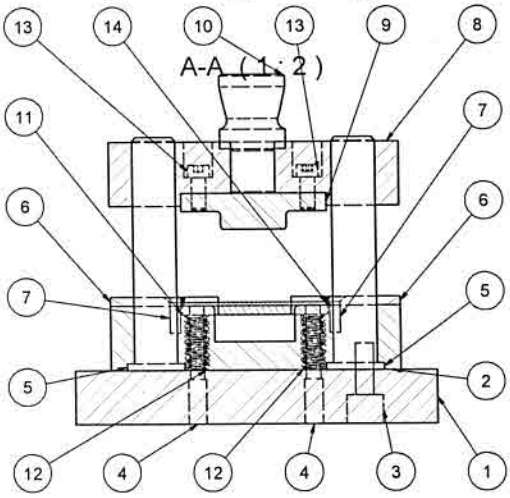

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ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	Osnovna ploca	
2	1	Donji oblikac	
3	2	Civije	
4	4	Opruga	
5	2	Vodjica	
6	2	Granicna letva	
7	4	Vijak M6	
8	1	Gornja ploca	
9	1	Gornji oblikac	
10	1	Cep	
11	1	Drzac lima	
12	4	Oprugaa	
13	4	Vijak M8	
14	1	Obradak	

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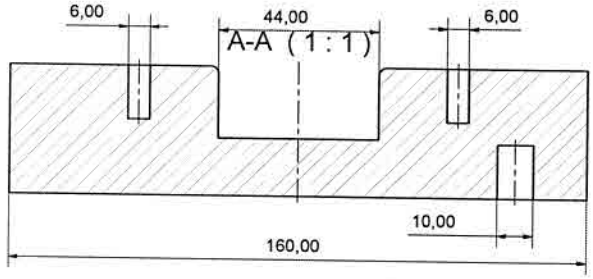

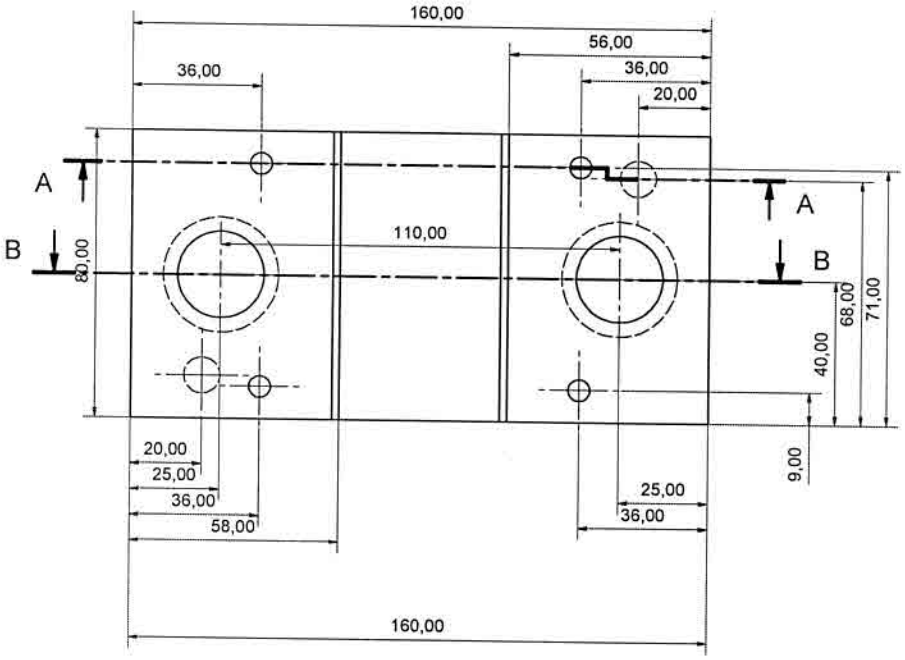

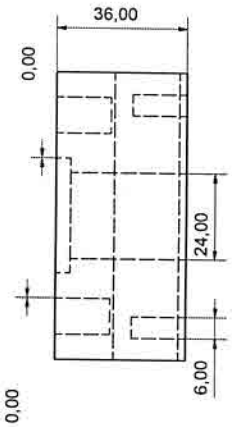

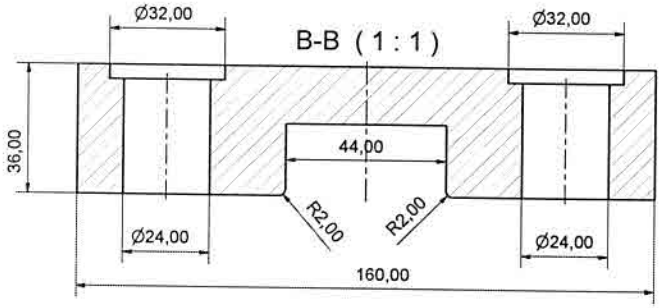

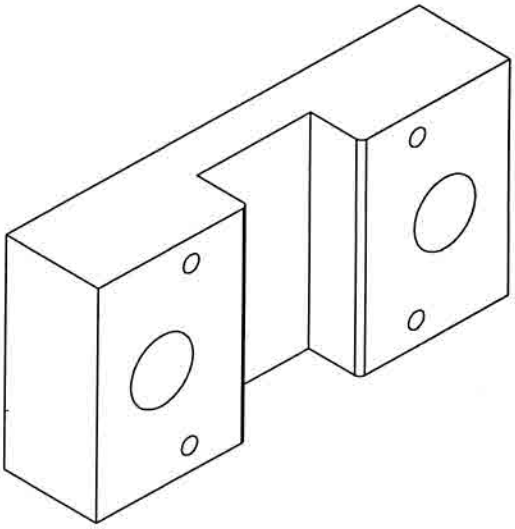

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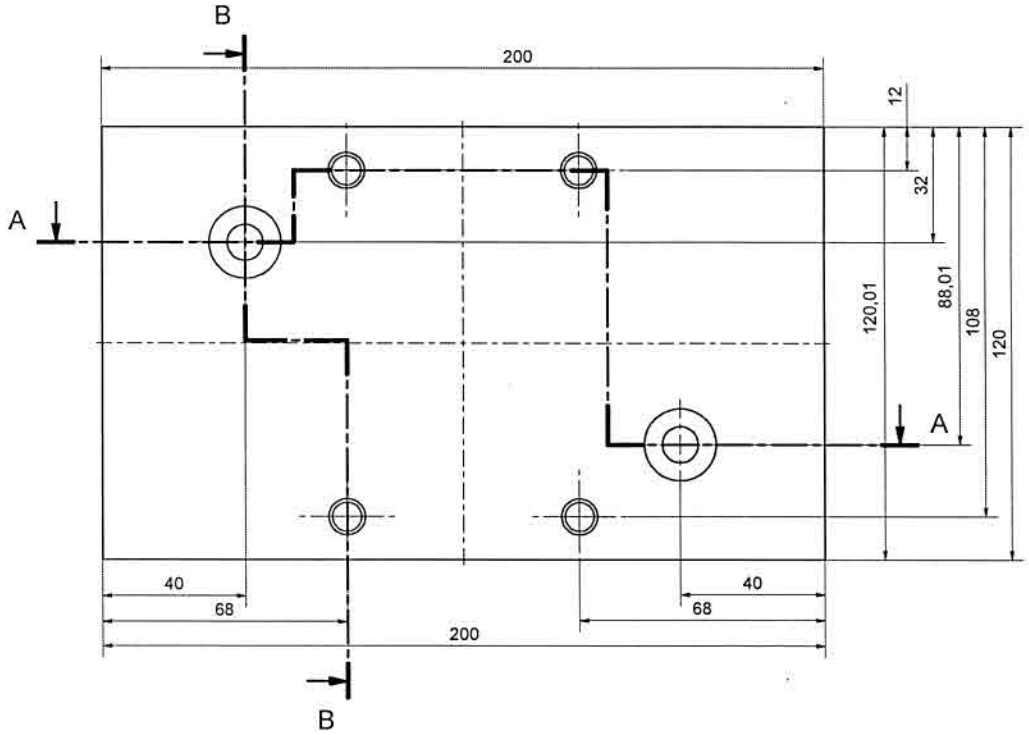

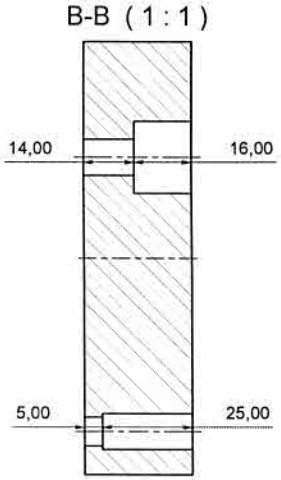

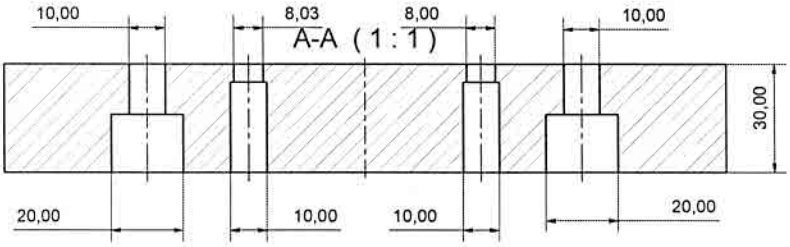

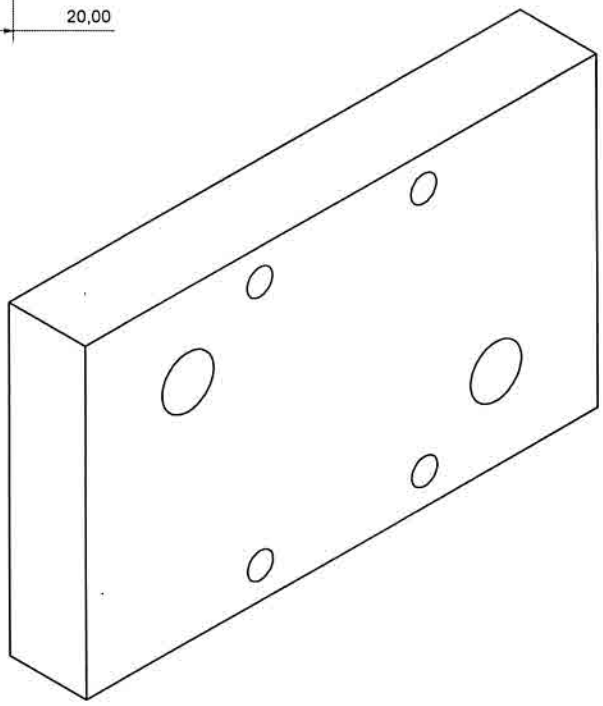

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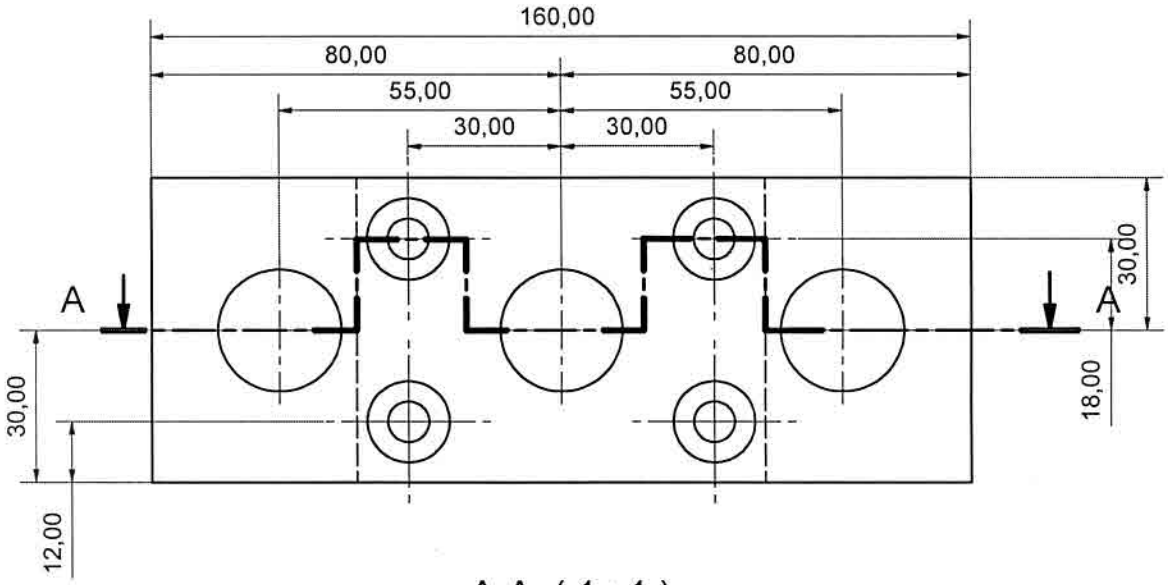

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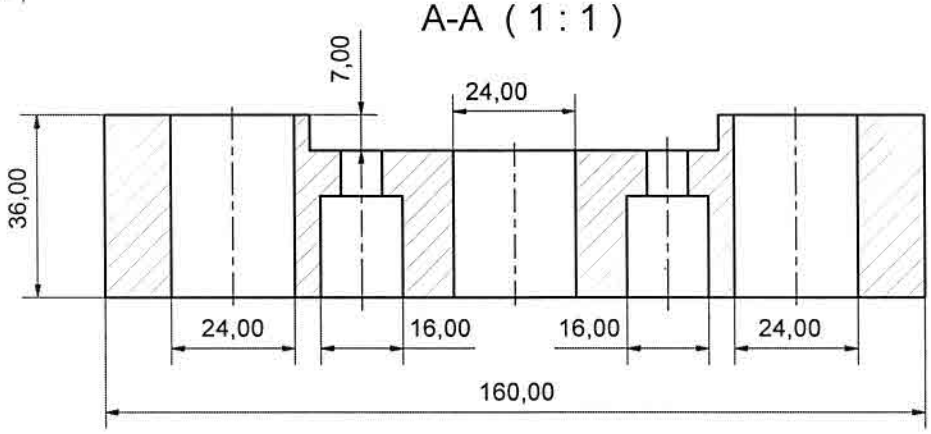

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gornja ploca

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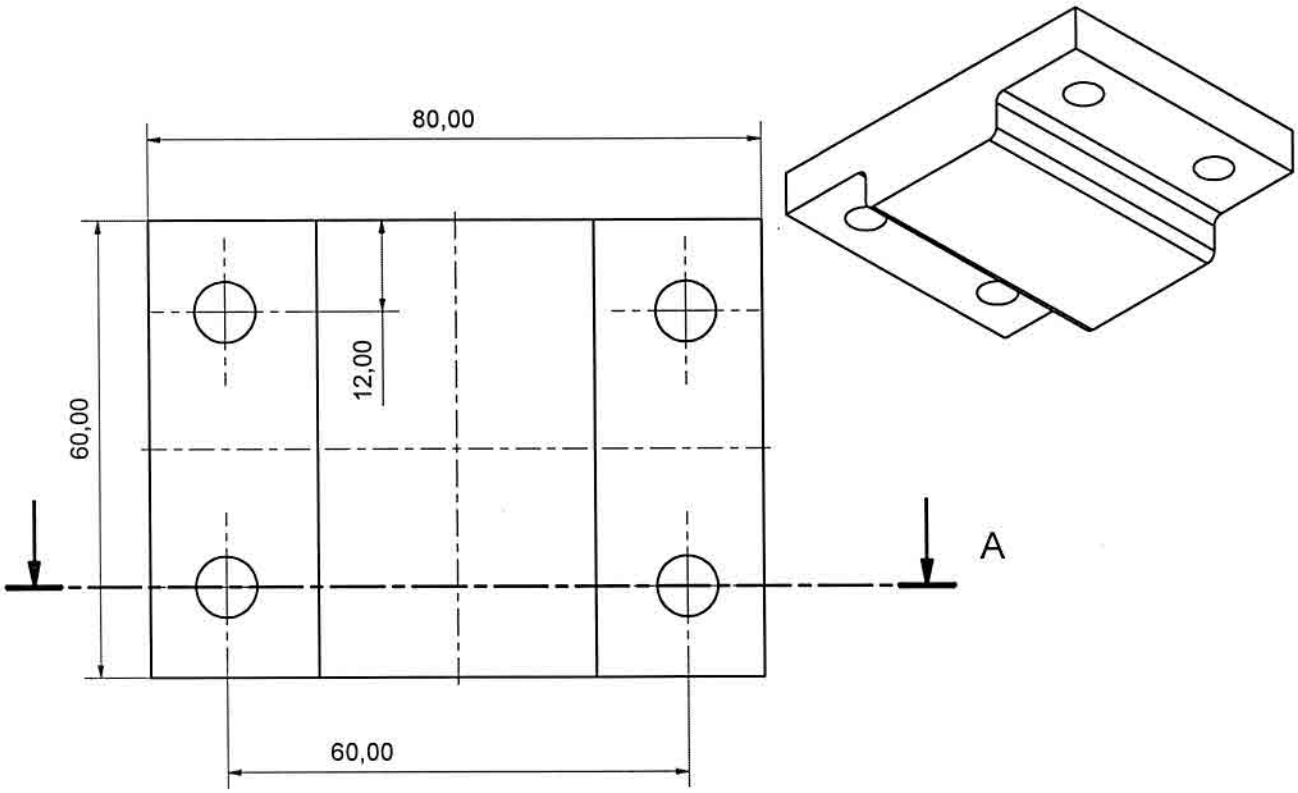

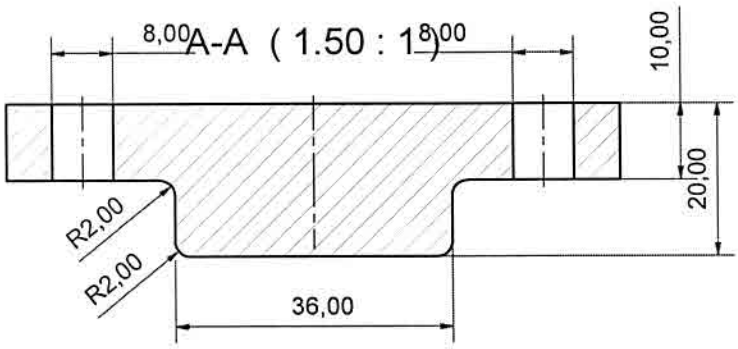

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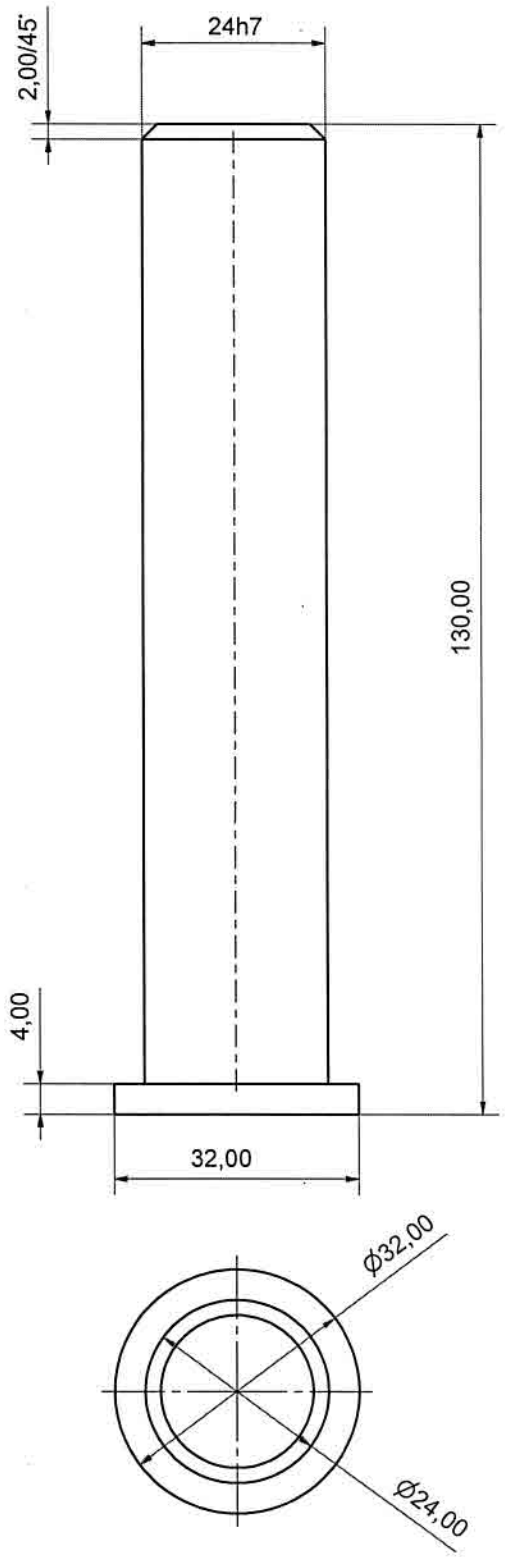
gornji oblikac

1



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Vodjica

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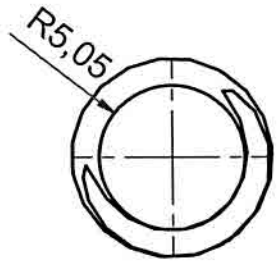

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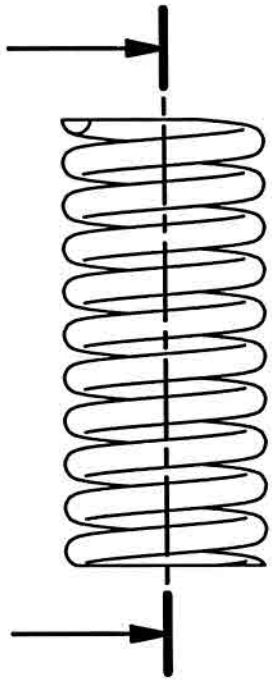

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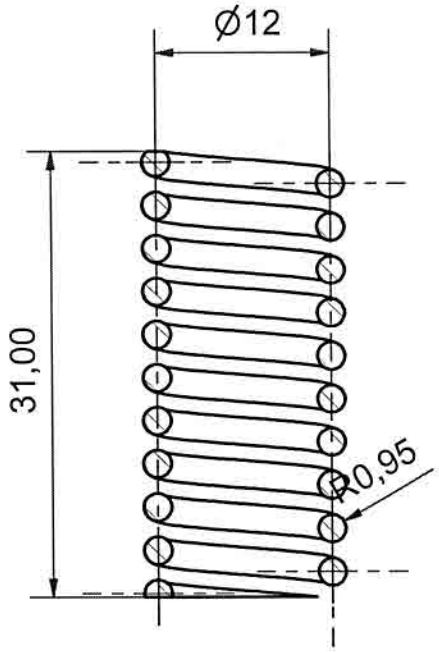

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opruga

1

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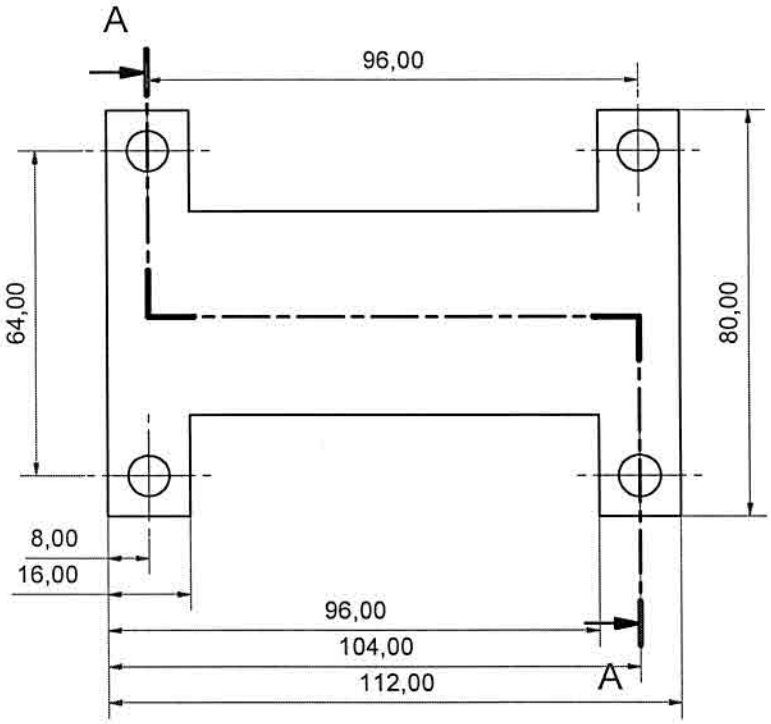

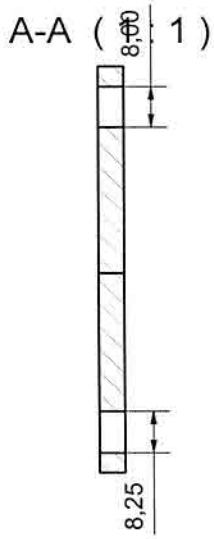

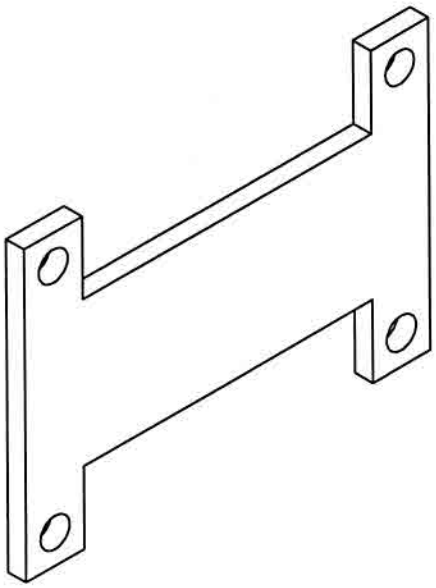

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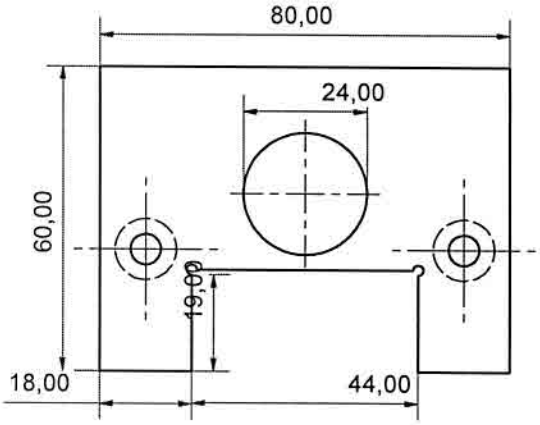

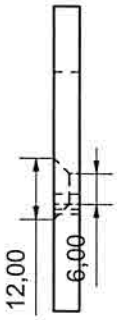

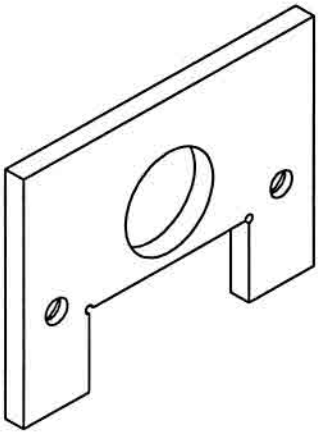

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