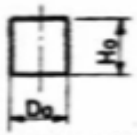
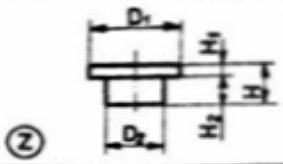
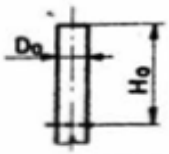
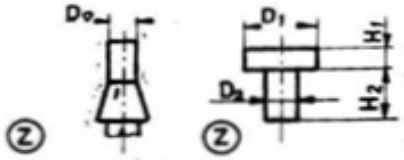
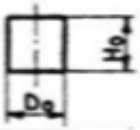
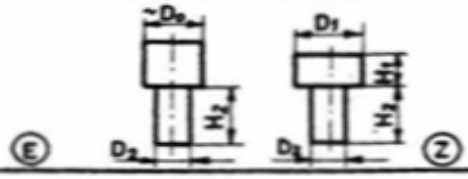
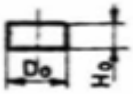
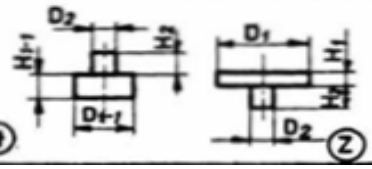
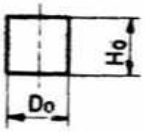
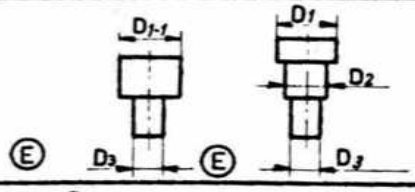
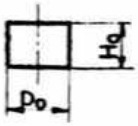
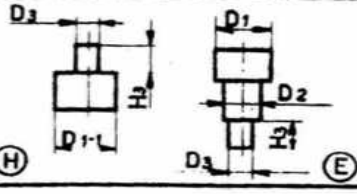
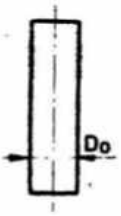
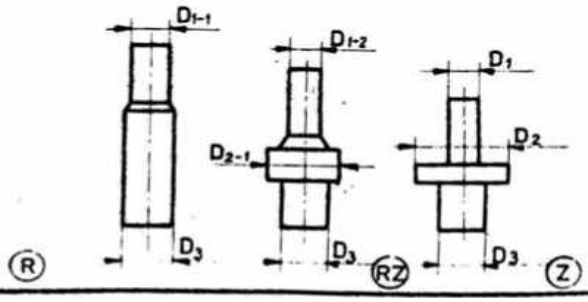
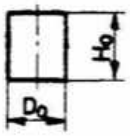
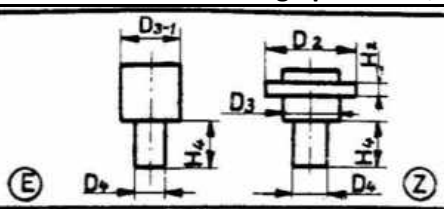
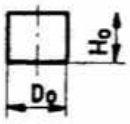
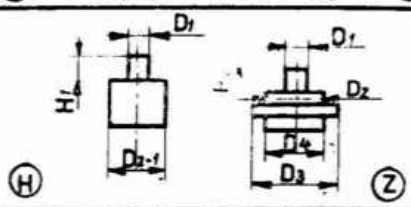
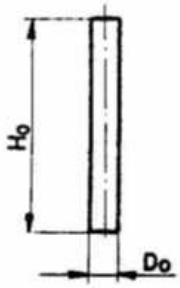
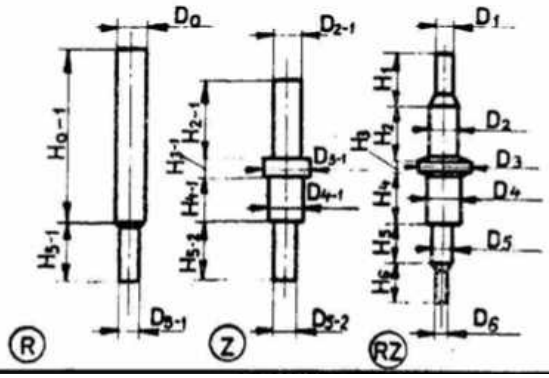
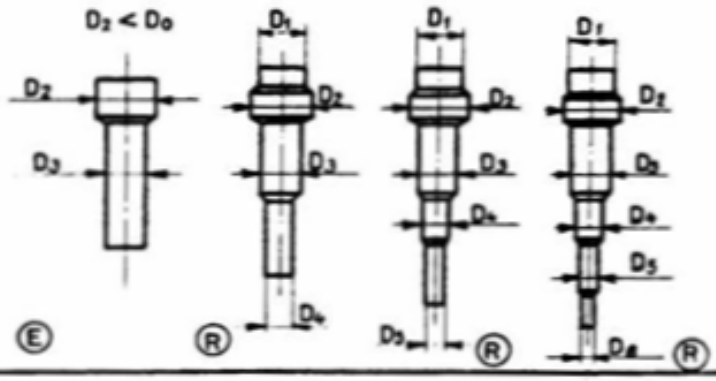
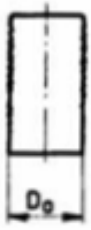
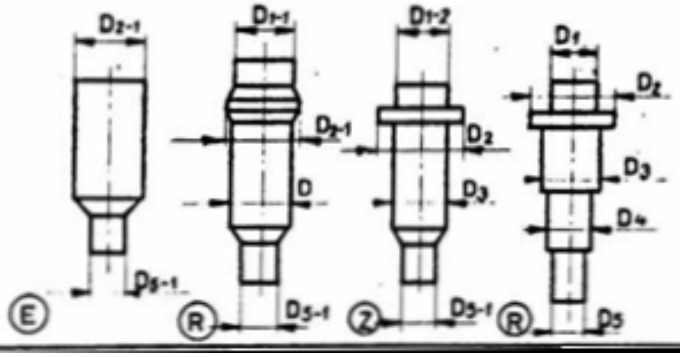
E – forward xtrusion H – backward extrusion Z – upsetting Ly – punching

ASSISTANCE SHEET

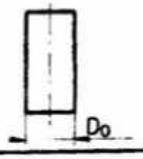
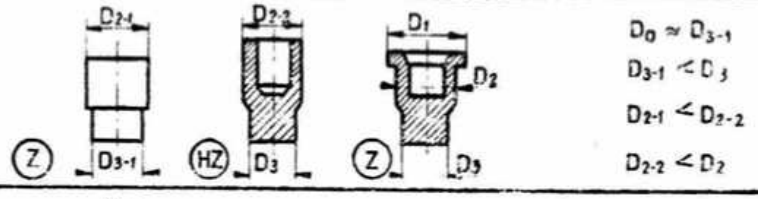
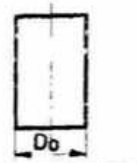
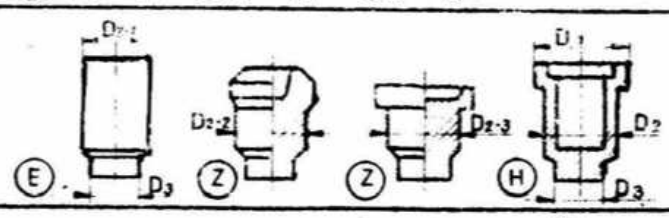
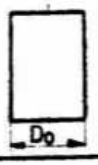
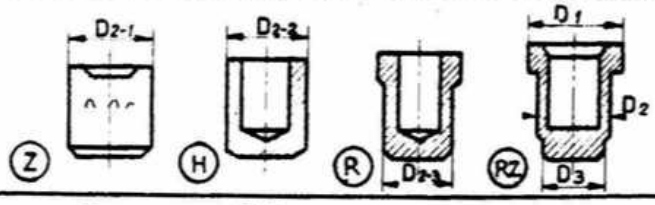
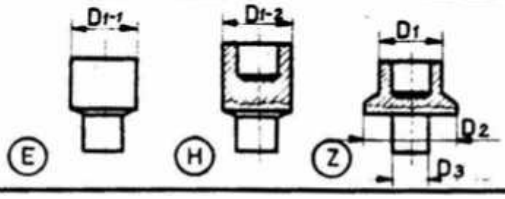
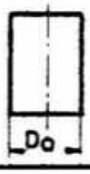
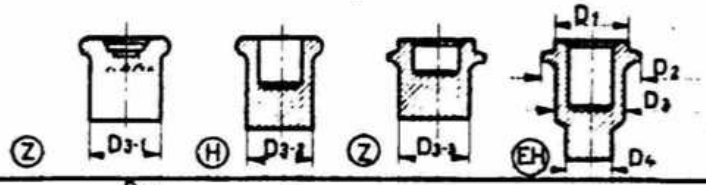
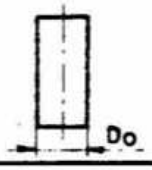
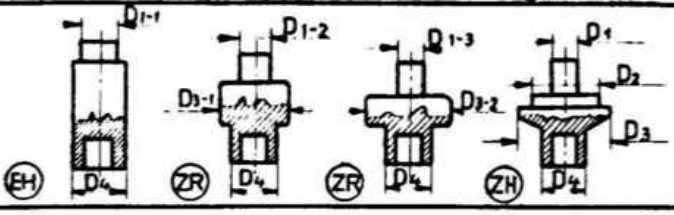
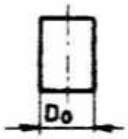
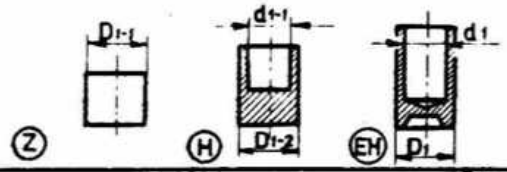
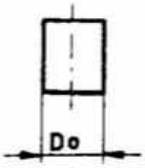
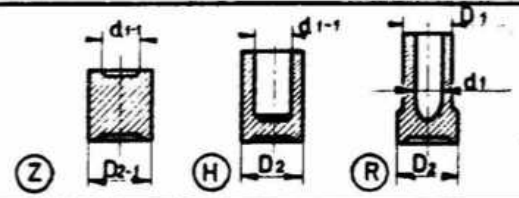
to select bulk forming operation steps

No.	Initial form	Forming operations, size relations
1		 $D_0 = D_2$ $H_0 - H_2 \leq 2.6\,D_0$
2		 $D_0 = D_2$ $H_0 \leq 4.5\,D_0$
3		 $D_2 < D_0 < D_1$ $H_0 \leq 2.5\,D_0$ $D_0 \approx 0.5(D_1^2 + D_2^2)$
4		 $D_0 < D_{1-1} < D_1$ $H_0 \leq 2.6\,D_0$ $H_2 / D_2 \leq 3$ $D_{1-1} / D_2 \geq 1.6$
5		 $D_0 < D_{1-1} < D_1$ $H_0 \leq 2.5\,D_0$
6		 $D_0 < D_{1-1} < D_1$ $H_0 \leq 2.5\,D_0$ $H_3 / D_3 \leq 3$; $D_1 / D_3 \geq 1.6$
7		 $D_0 = D_3$ $D_{1-1} < D_{1-2}$ $D_{1-2} < D_1$

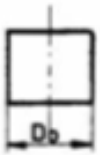
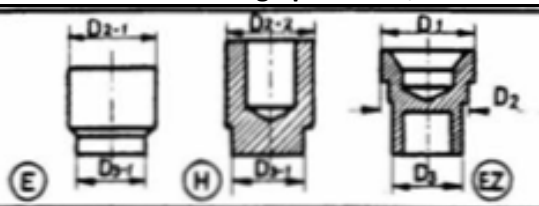
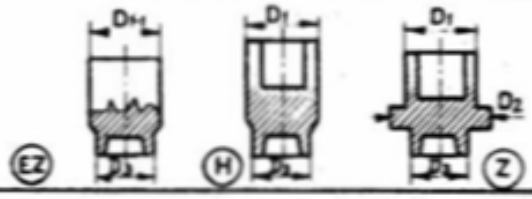
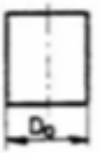
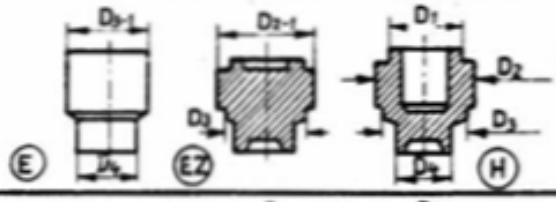
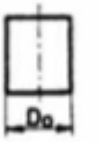
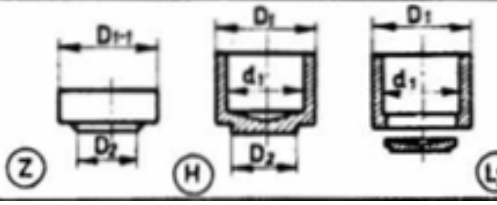
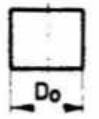
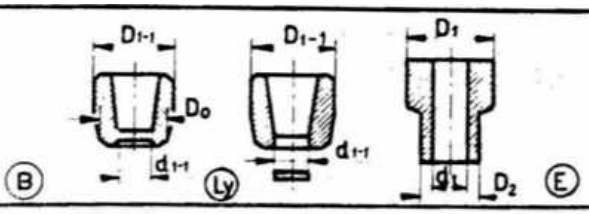
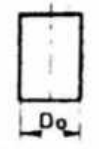
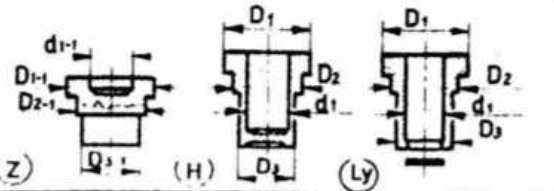
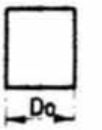
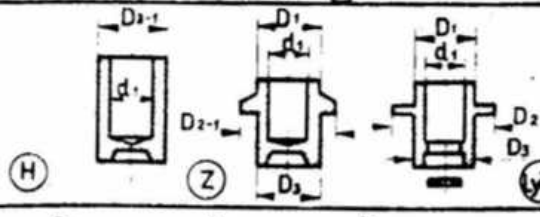
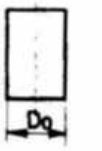
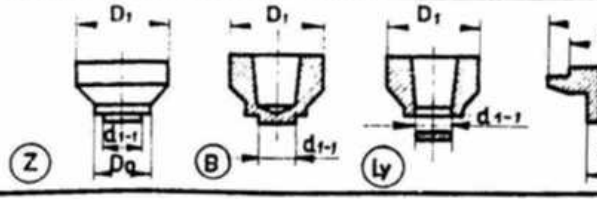
E – forward xtrusion H – backward extrusion Z – upsetting Ly – punching

No.	Initial form	Forming operations, size relations
8		 $D_0 < D_{3-1} < D_3$ $H_0 \leq 2{,}5\ D_0$
9		 $D_0 < D_{2-1} < D_2 = D_4$ $H_0 \leq 2{,}5\ D_0$ $H_1 / D_1 \leq 3$; $D_3 / D_1 \geq 1{,}6$
10		 $D_0 < D_{2-1} > D_2$ $D_{5-1} < D_{5-2} > D_5$
11		 $D_2 < D_0$
12		

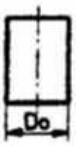
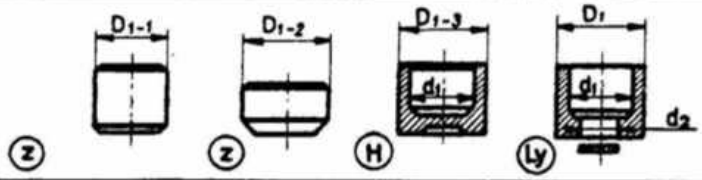
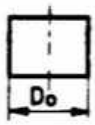
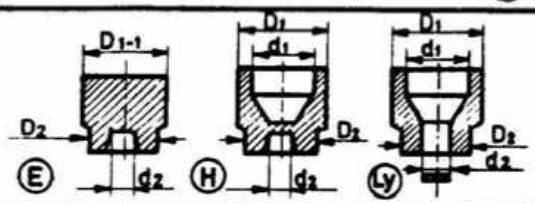
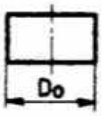
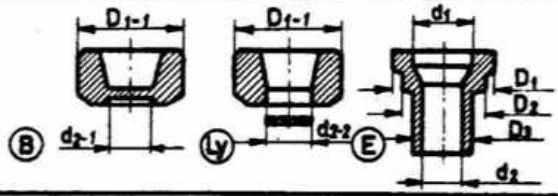
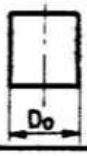
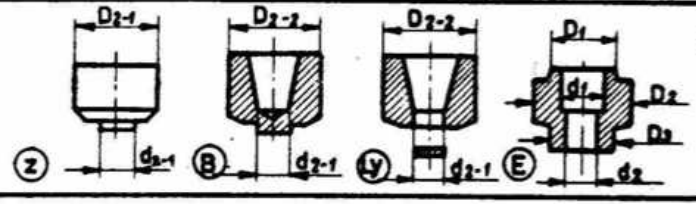
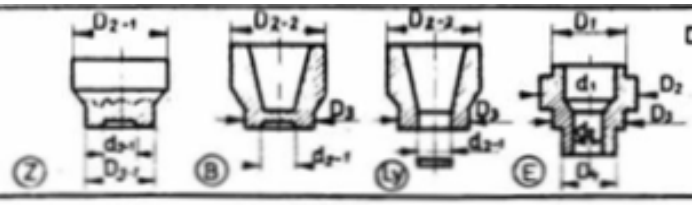
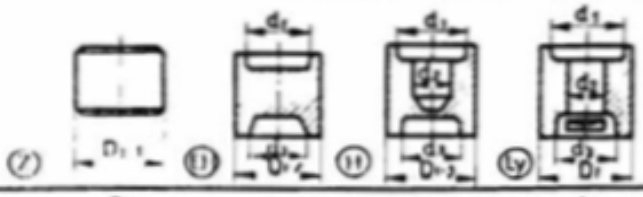
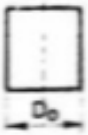
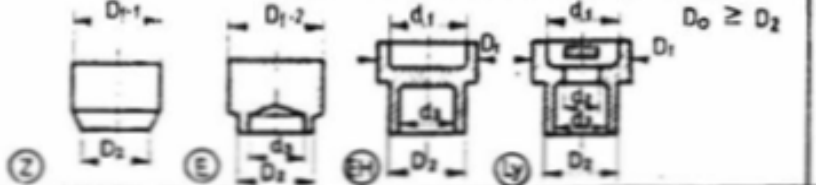
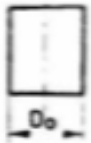
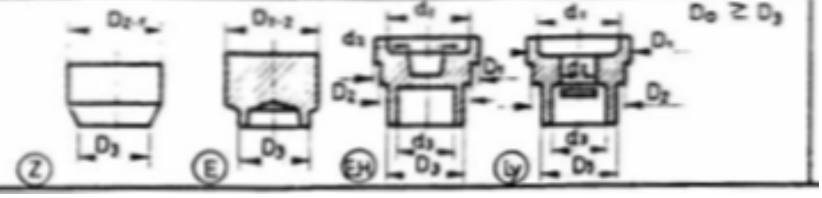
E – forward xtrusion H – backward extrusion Z – upsetting Ly – punching

No.	Initial form	Forming operations, size relations
13		 $D_0 \approx D_{3-1}$ $D_{3-1} < D_3$ $D_{2-1} < D_{2-2}$ $D_{2-2} < D_2$
14		
15		
16		 $D_0 < D_{1-1}$ $D_{1-1} < D_{1-2}$ $D_{1-2} < D_1$
17		
18		
19		 $D_0 < D_{1-1}$ $D_{1-1} < D_{1-2}$ $D_{1-2} < D_1$ $d_{1-1} < d_1$
20		 $D_0 < D_{2-1}$ $D_{2-1} < D_2$ $d_{1-1} > d_1$

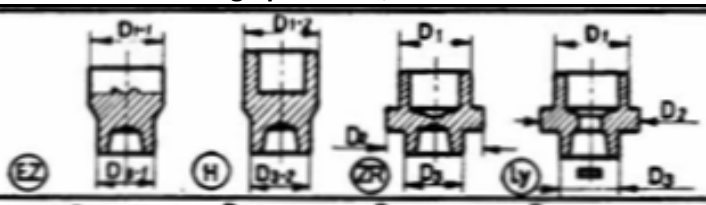
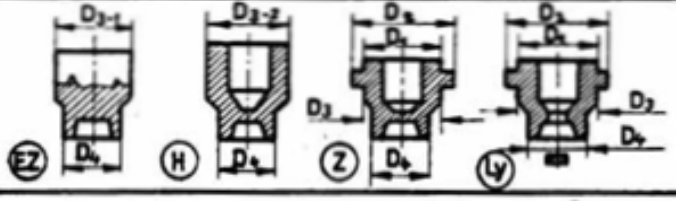
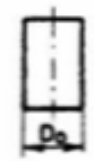
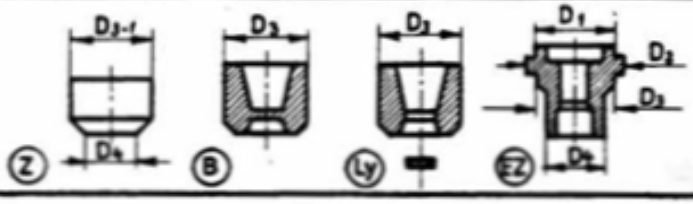
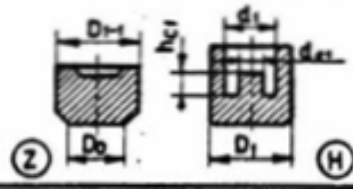
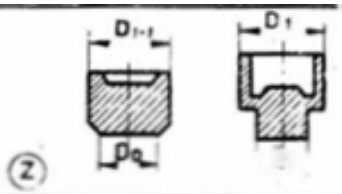
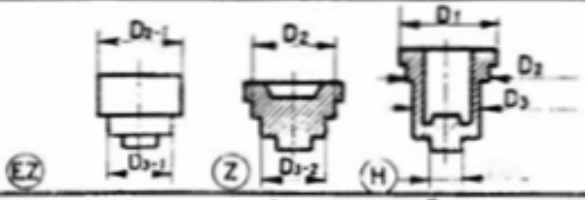
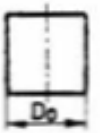
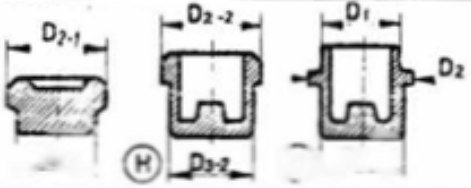
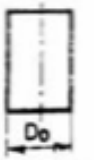
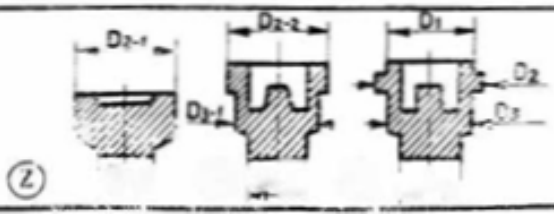
E – forward xtrusion H – backward extrusion Z – upsetting Ly – punching

No.	Initial form	Forming operations, size relations
21		 $D_0 < D_{2-1}$ $D_{2-1} < D_{2-2}$ $D_{3-1} < D_3$
22		 $D_0 < D_{1-1}$ $D_{1-1} < D_1$ $D_0 = D_3$
23		 $D_0 < D_{3-1}$ $D_{3-1} < D_3$ $D_{2-1} < D_2$
24		 $D_{1-1} \leq D_1$ $D_2 < d_1$ $D_0 = D_2$
25		 $D_0 < D_{1-1}$ $D_{1-1} < D_1$ $d_{1-1} < d_1$
26		 $D_0 \leq D_{3-1}$ $D_{1-1} \leq D_1$ $D_{2-1} \leq D_2$ $D_{3-1} \leq D_3$
27		 $D_0 < D_{3-1}$ $D_{3-1} < D_3$
28		

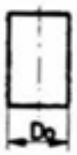
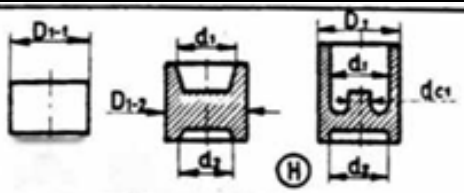
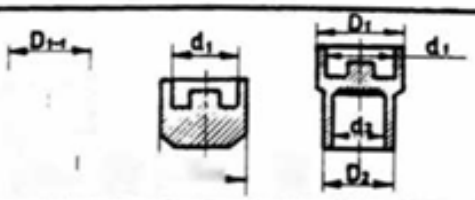
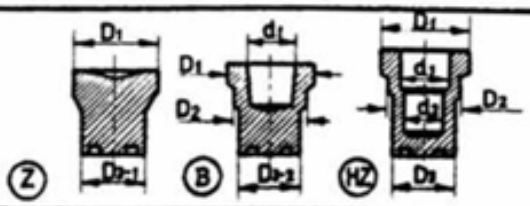
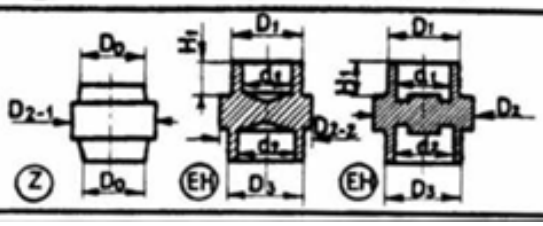
E – forward xtrusion H – backward extrusion Z – upsetting Ly – punching

No.	Initial form	Forming operations, size relations
29		 $D_1 \geq 1.5\,D_0$
30		 $D_0 \approx 0.97\,D_1$ $D_{1-1} > D_0$ $D_{1-1} < D_1$
31		 $D_0 \approx 0.97\,D_1$ $D_{1-1} > D_0$ $D_{1-1} < D_1$ $d_{2-2} > d_2$
32		 $D_2 \geq 1{,}5D_0$
33		 $D_0 \leq D_{3-1}$
34		
35		 $D_0 \geq D_2$
36		 $D_0 \geq D_3$

E – forward xtrusion H – backward extrusion Z – upsetting Ly – punching

No.	Initial form	Forming operations, size relations
37		
38		
39		
40		
41		
42		
43		
44		

E – forward xtrusion H – backward extrusion Z – upsetting Ly – punching

No.	Initial form	Forming operations, size relations
45		
46		
47		
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