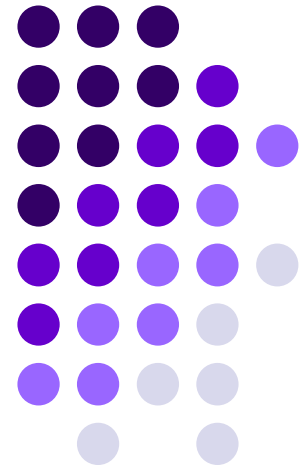
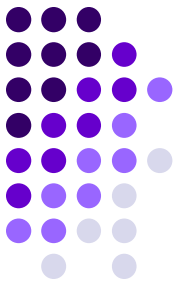


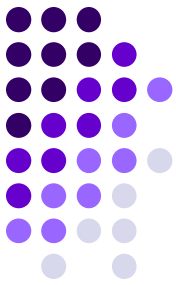
Senzori si traductoare





Cuprins 8

Masurarea fortei de prehensare
Recunoasterea unei piese
Polizare, slefuire
Montaj robotizat
Traductor tensorezistiv

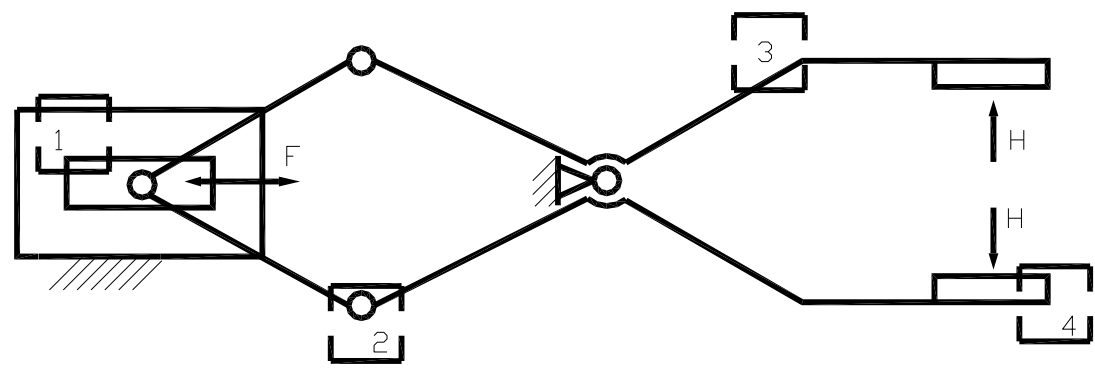
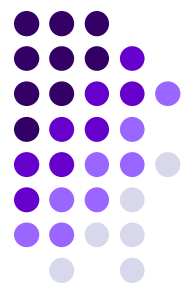


- Forta - una din mărimile mecanice de bază care fac obiectul culegerii de informații într-un sistem;
- Înțeleasă în sens generalizat, ca un tursor $\tau()$, cu șase componente;
- Definită în mod general și sintetic, forța este cauza deplasărilor și deformațiilor unui corp sau a unui ansamblu de corpuri;
- Considerând conversia energetică realizată de traductor ca și un criteriu de bază, pentru măsurarea forței se utilizează:
 - ❖ traductoare parametrică – tensorezistivi, cu coardă vibrantă, cu elemente nespecifice, etc.
 - ❖ traductoare generatoare – piezoelectrice, magnetostrictive etc.

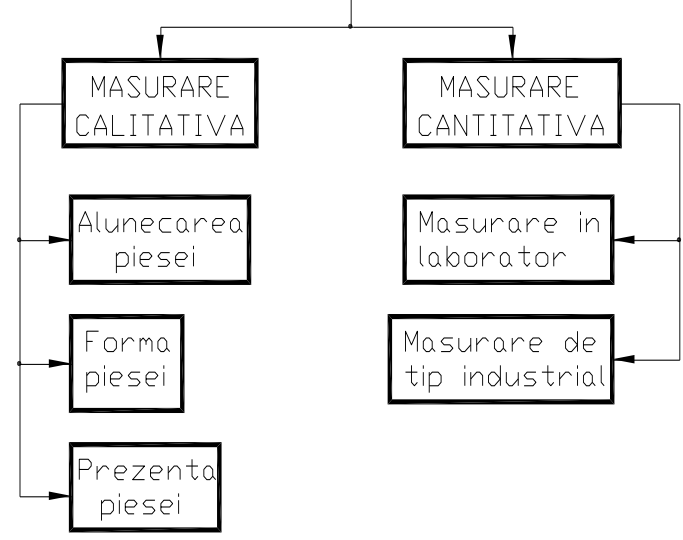
Aplicatii diverse:

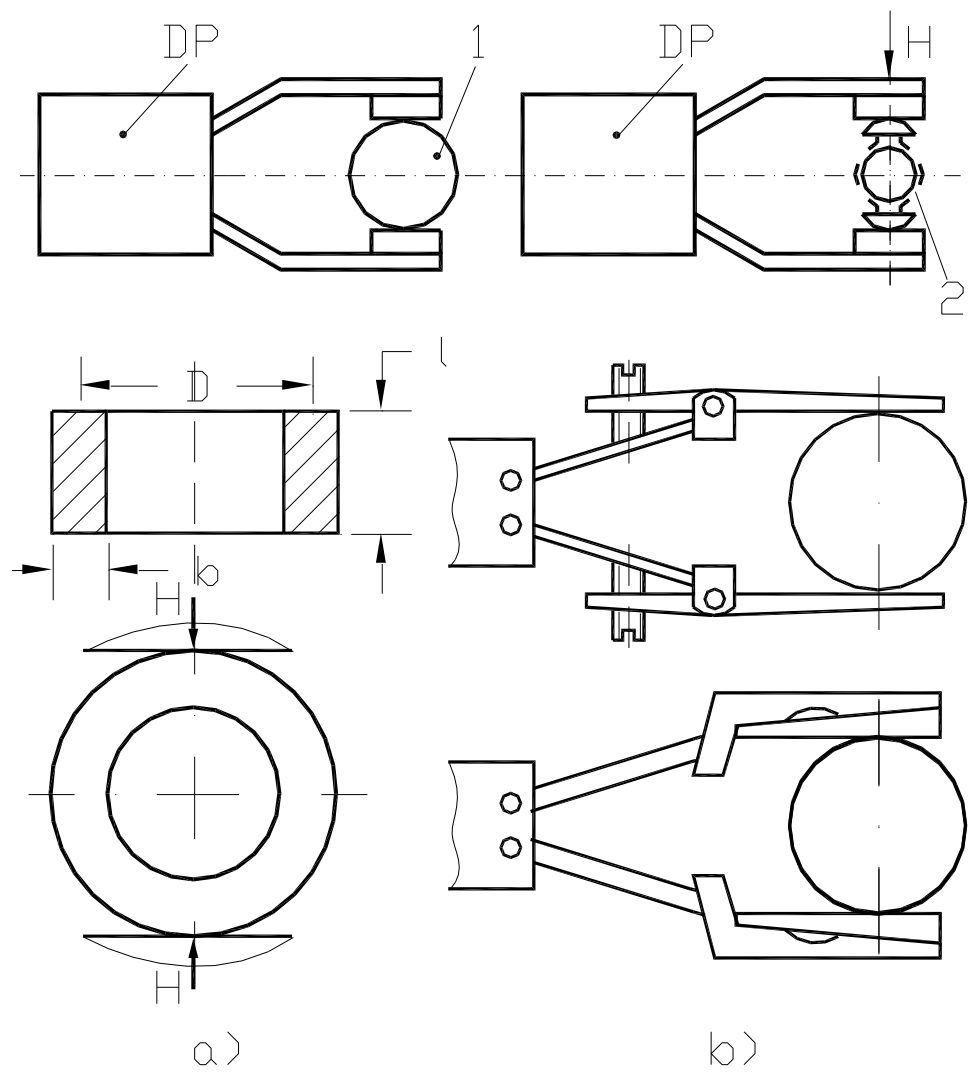
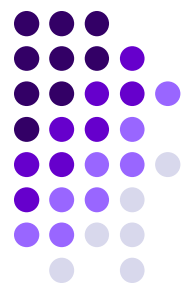
- Operatii tehnologice controlate prin forta
- Masurarea fortei de prehensare
- Instruirea robotilor industriali
- etc.

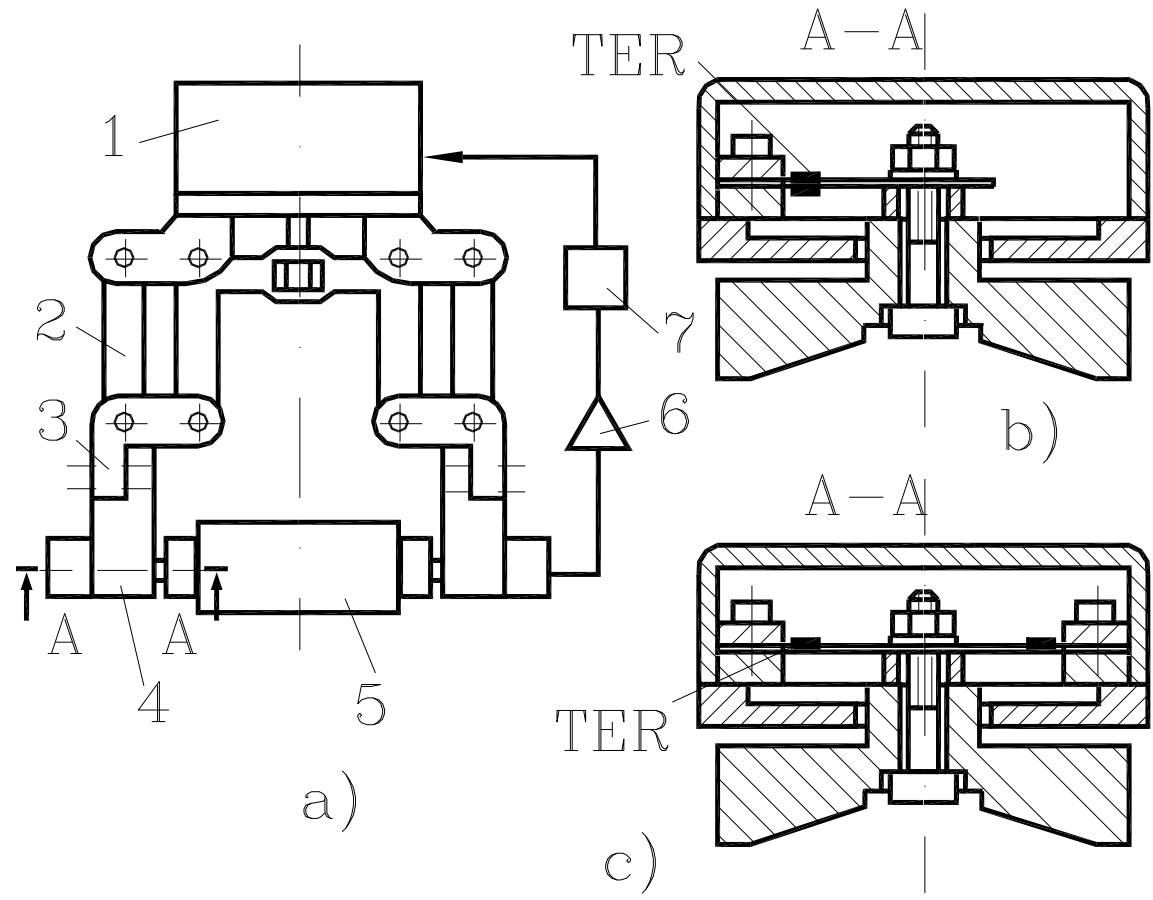
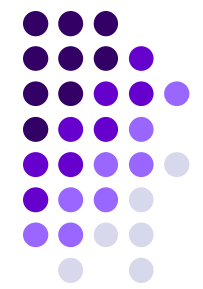
Masurarea fortei de prehensare

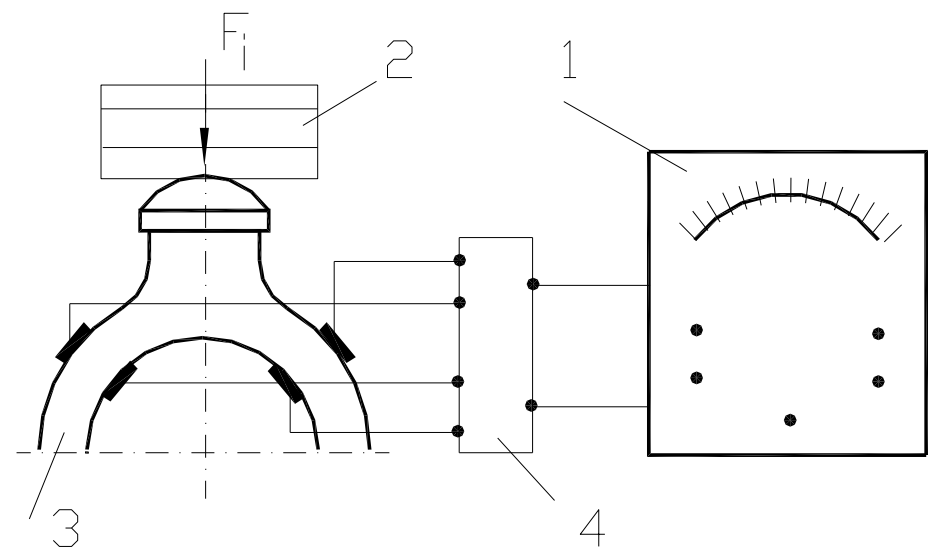
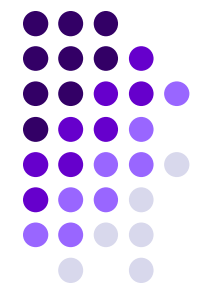


DETERMINAREA FORTEI DE PREHENSARE

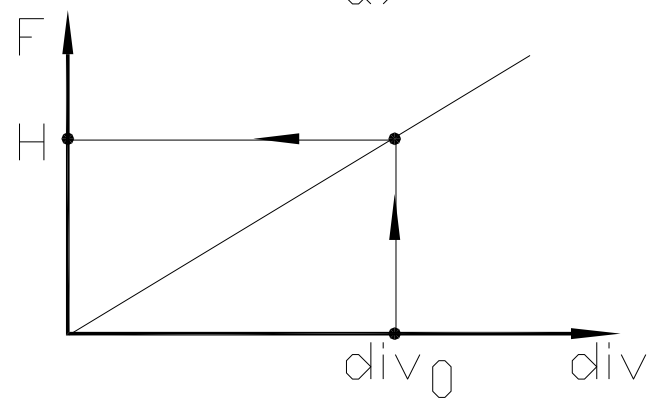






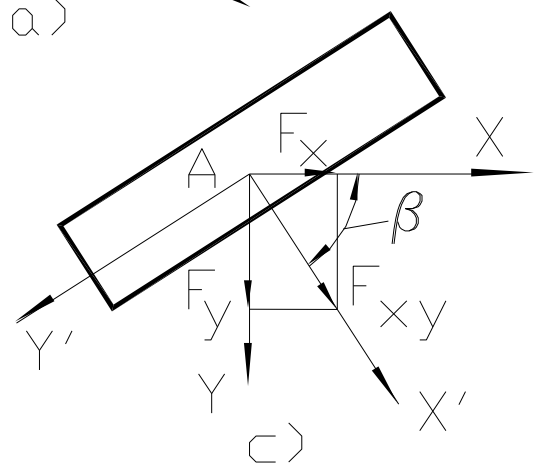
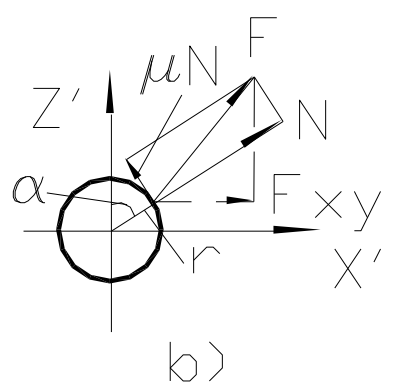
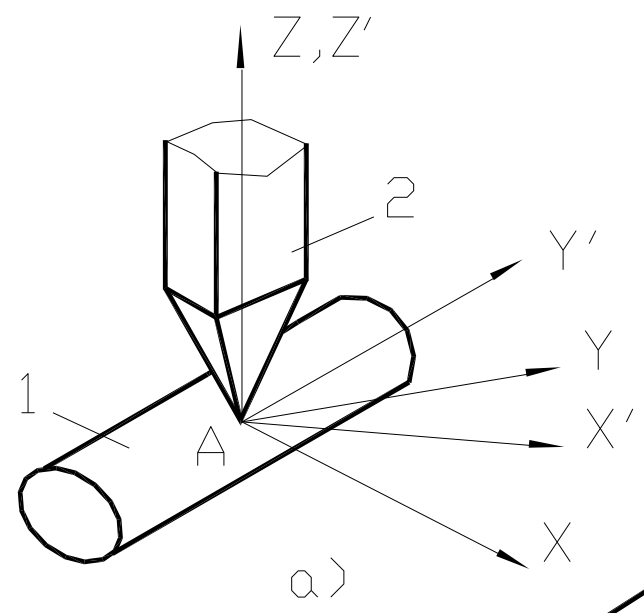
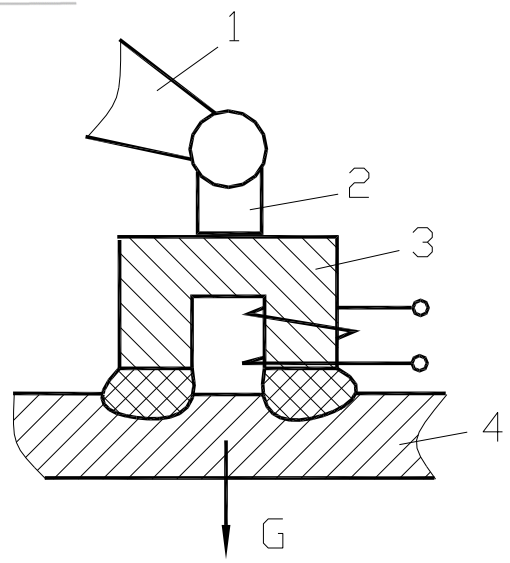
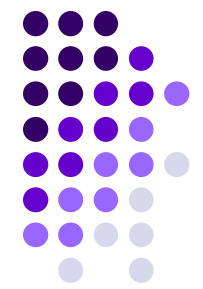


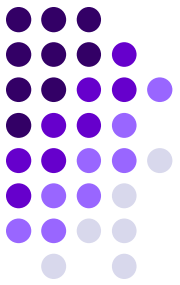
a)



b)

Recunoasterea unei piese





$$F_x = (N \sin \alpha - \mu N \cos \alpha) \cdot \cos \beta$$

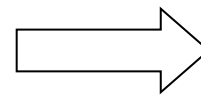
$$F_y = (N \sin \alpha - \mu N \cos \alpha) \cdot \sin \beta$$

$$F_z = N \cos \alpha + \mu N \sin \alpha$$

$$\alpha = \theta_f + \arccos \left(\frac{F_z}{\sqrt{F_x^2 + F_y^2 + F_z^2}} \cdot \cos \theta_f \right)$$

$$\beta = \arctg \frac{F_y}{F_x}$$

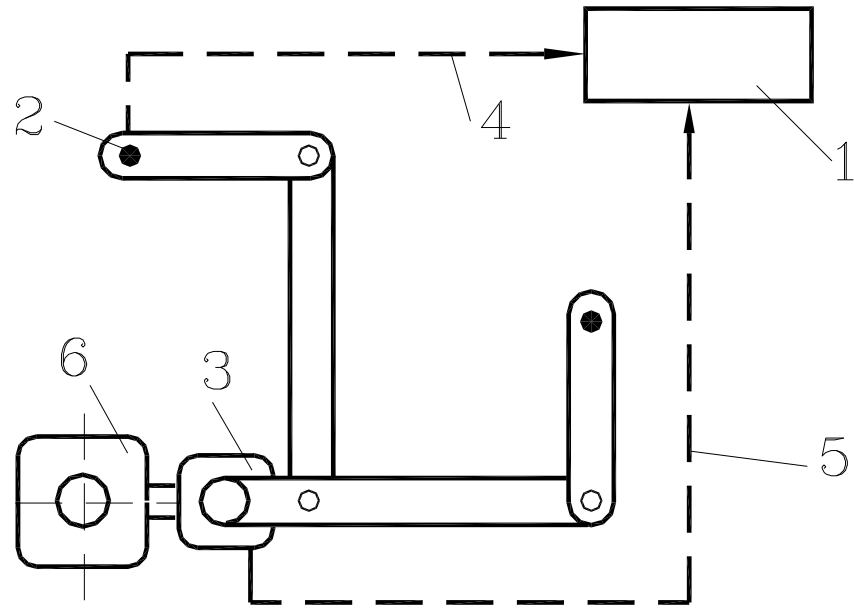
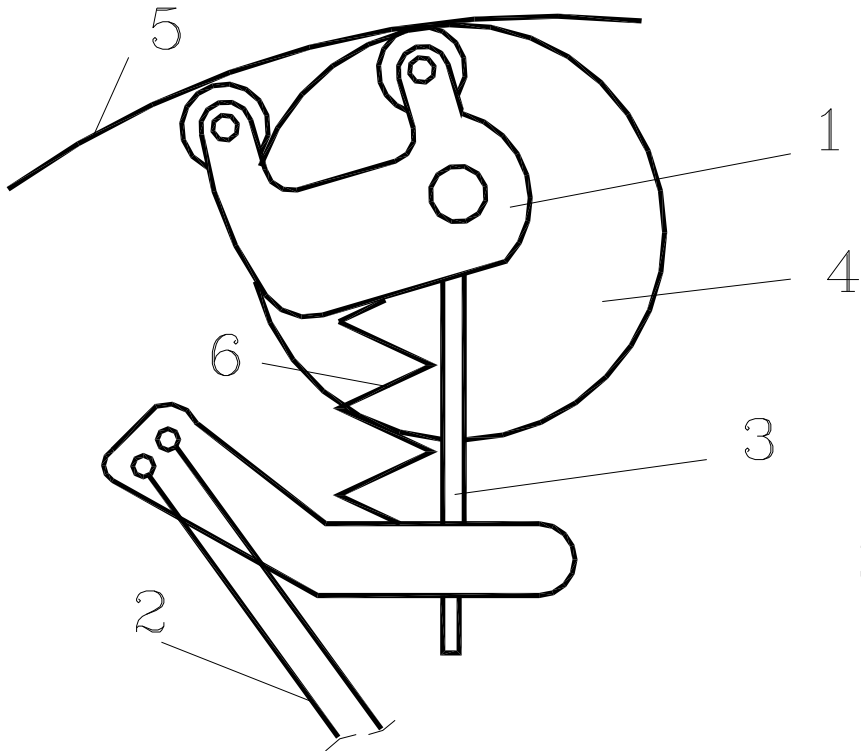
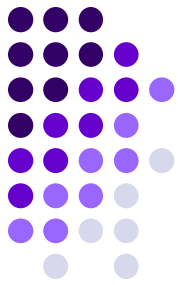
$$\theta_f = \arctg \mu$$



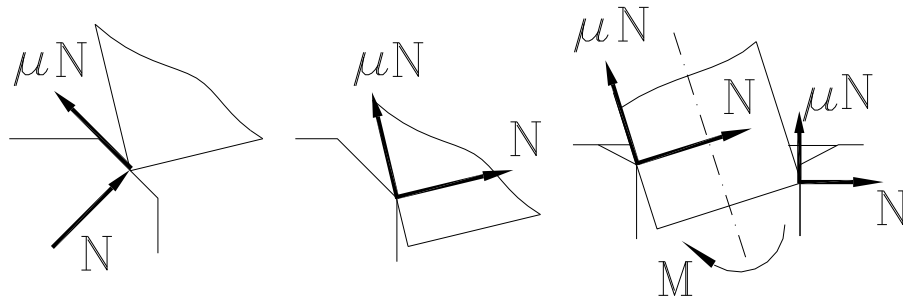
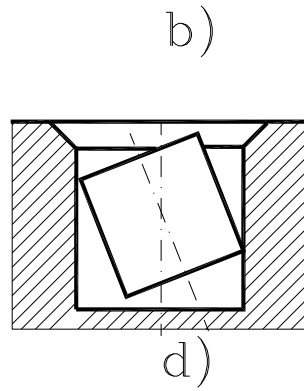
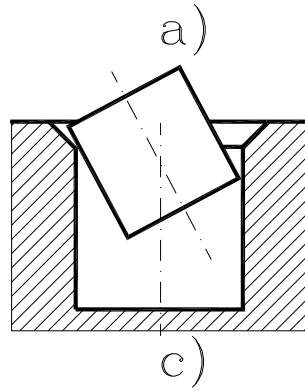
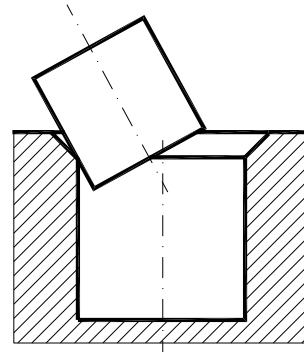
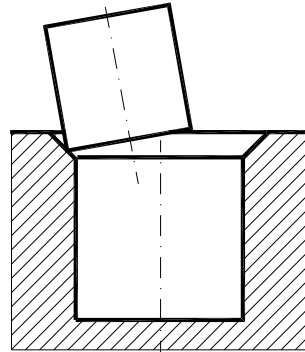
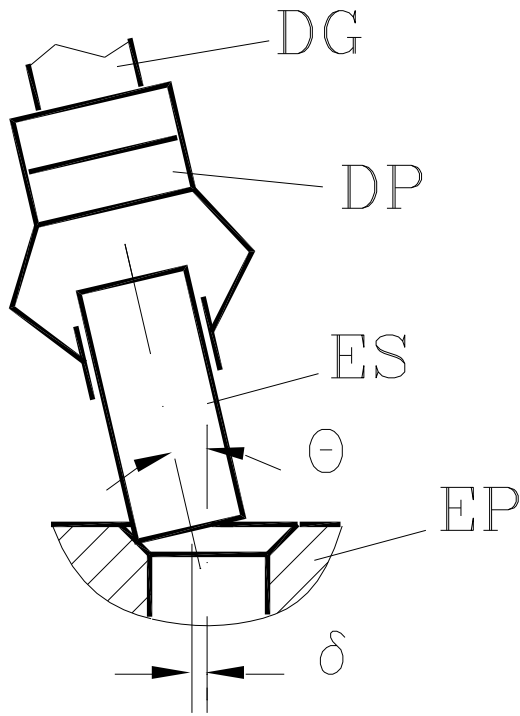
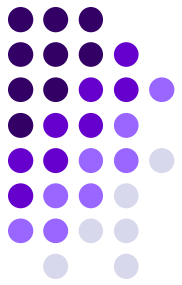
$$X'_A = r \sin \alpha$$

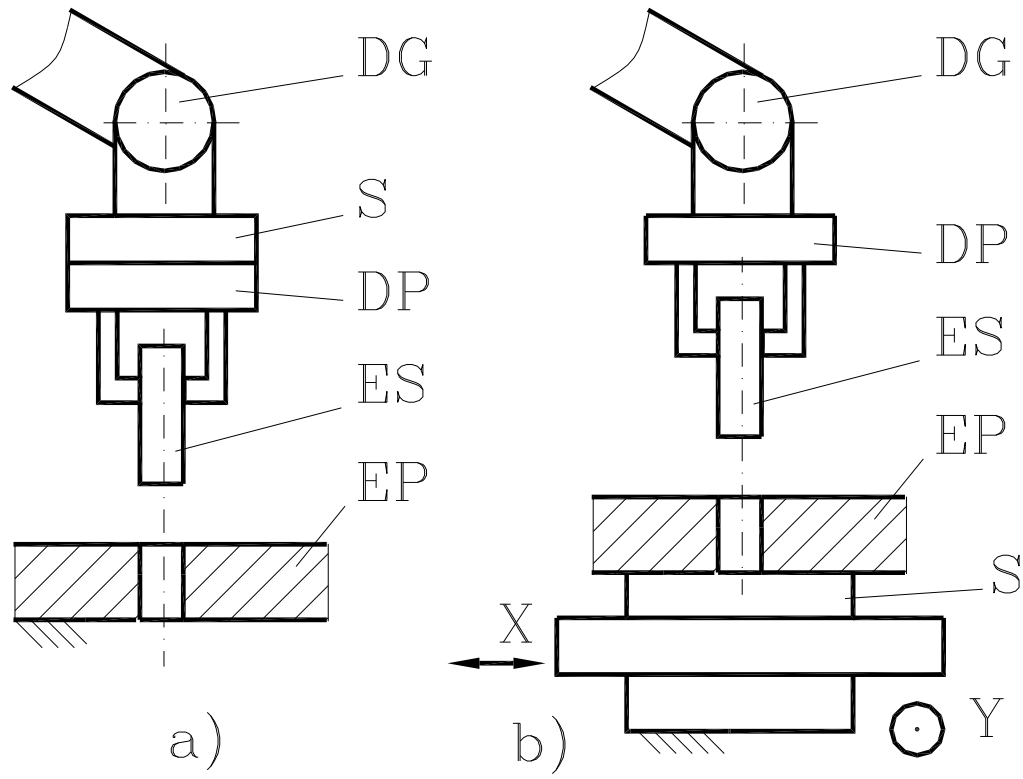
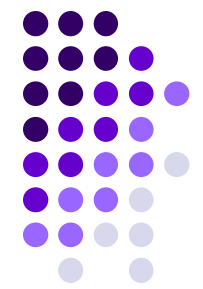
$$Z'_A = r \cos \alpha$$

Polizare, slefuire, taiere

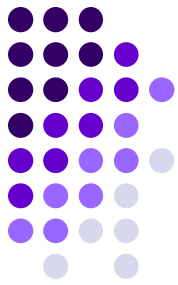


Montaj robotizat





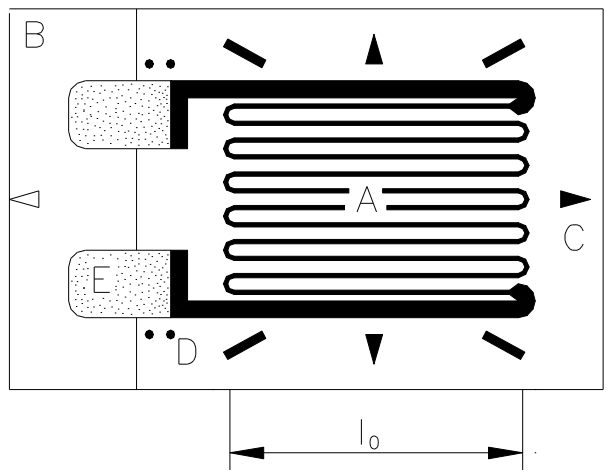
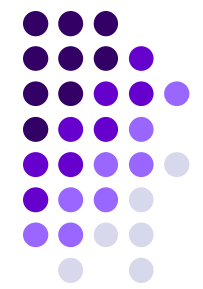
Traductor tensorezistiv



$$\frac{\Delta R}{R} = \frac{\Delta \rho}{\rho} + \frac{\Delta l}{l} - \frac{\Delta S}{S} = \frac{\Delta \rho}{\rho} + \varepsilon \cdot (1 + 2\mu)$$

$$K = \frac{\Delta R / R}{\varepsilon} = 1 + 2 \cdot \mu + \frac{\Delta \rho}{\rho} \cdot \frac{1}{\varepsilon}$$

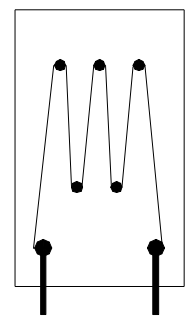
Metal sau aliaj	Nume cunoscute	K
Cupru (60 %), Nichel (40 %)	Constantan, Cupron, Copel	+ 2.1
Nichel (80 %), Crom (20 %)	Nichrom, Tophet	+ 2.2
Nichel (75 %), Crom (20 %) + adaosuri	Karma, Evanohm, Chromel R	+ 2.1
Fier – Nichel – Molibden	Isoelastic	+3.5



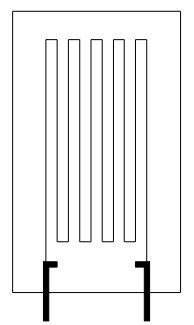
sensibilitate transversala



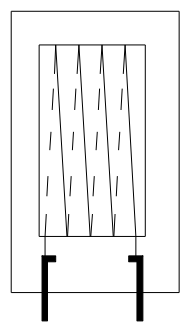
sensibilitate longitudinala



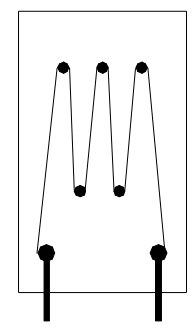
Terminologia pentru un traductor TER



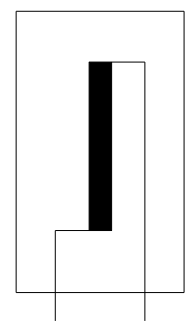
a)



b)

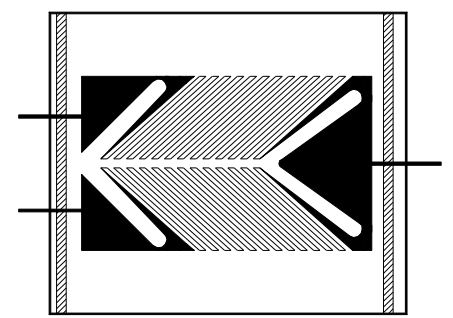


c)



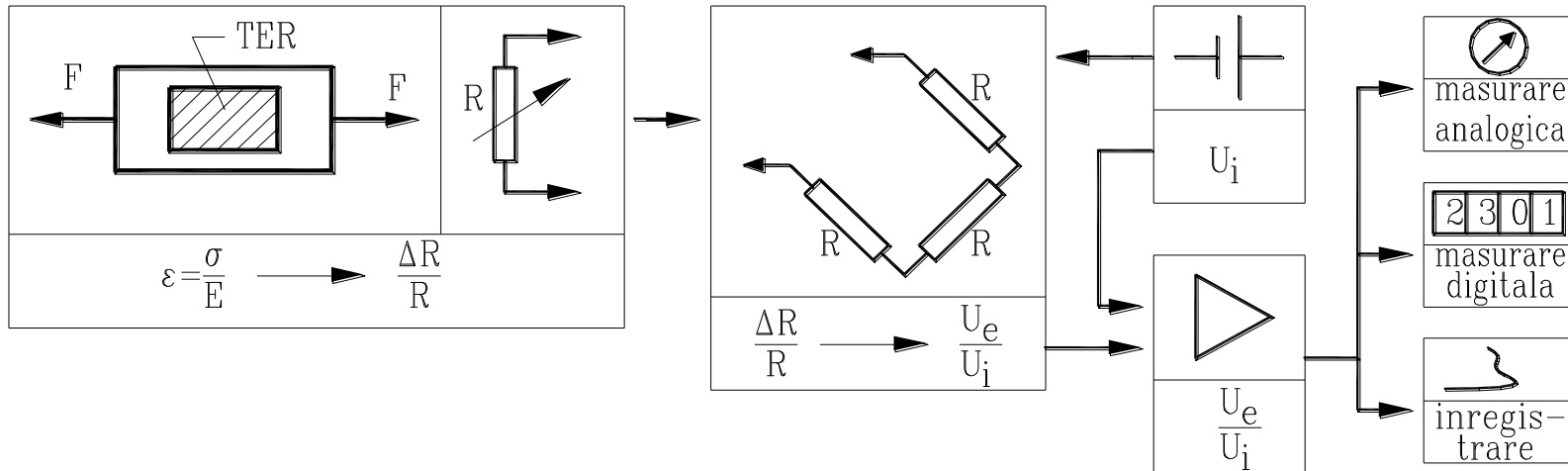
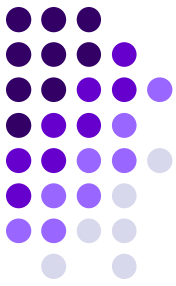
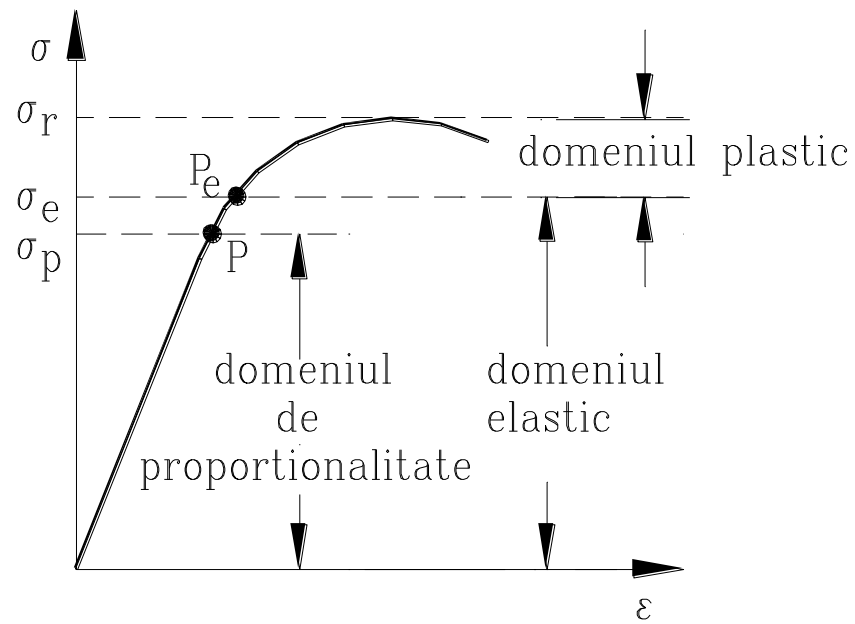
d)

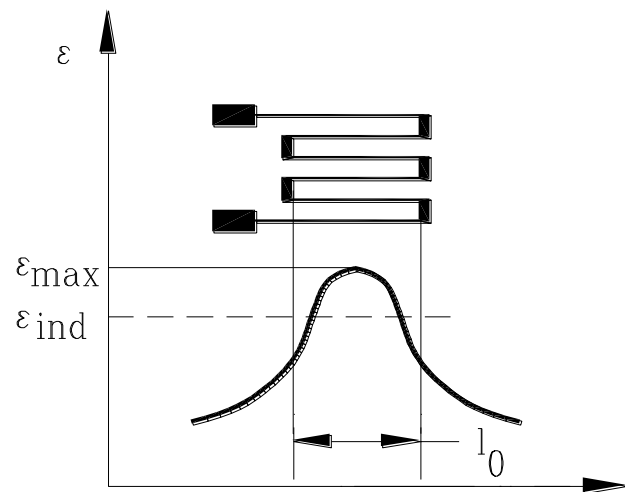
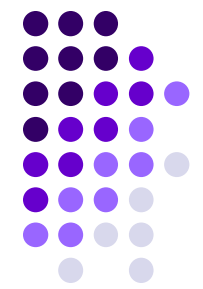
120 Ω, 300 Ω, 600 Ω.



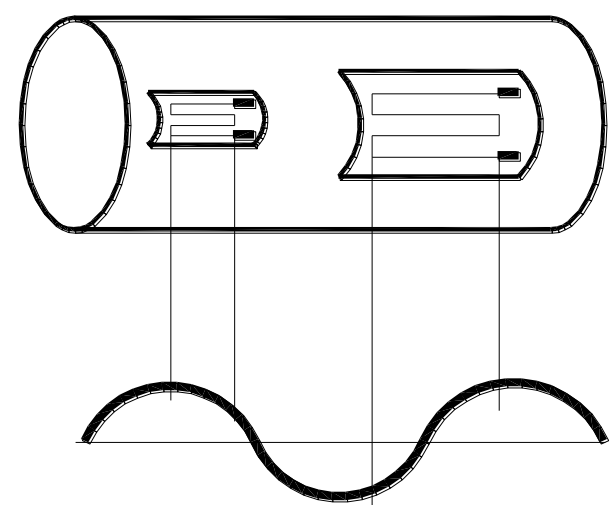
Rozeta pentru torsiune

$$\sigma = E \cdot \varepsilon$$

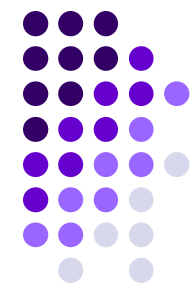




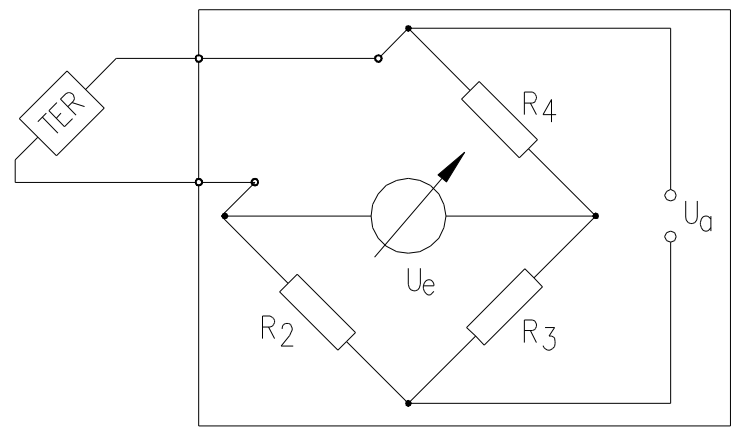
a)



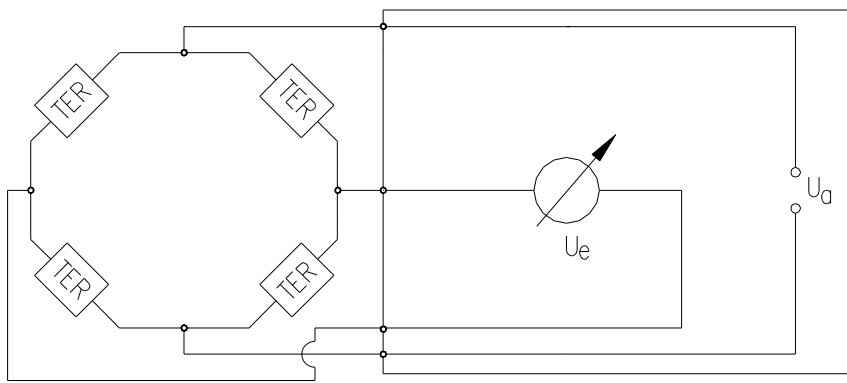
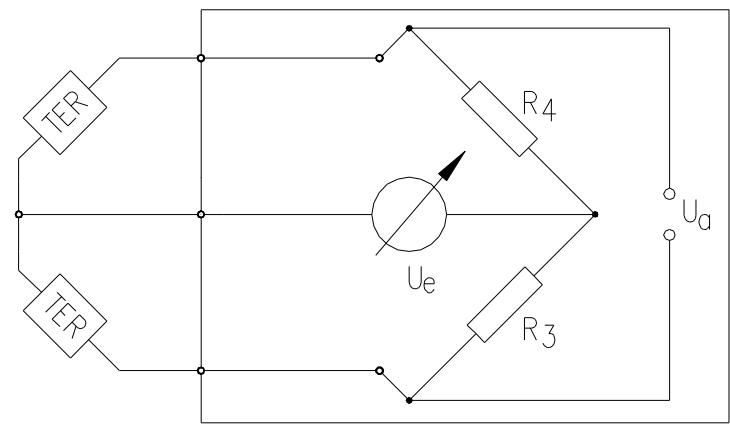
b)



Sfert de punte



Semi punte

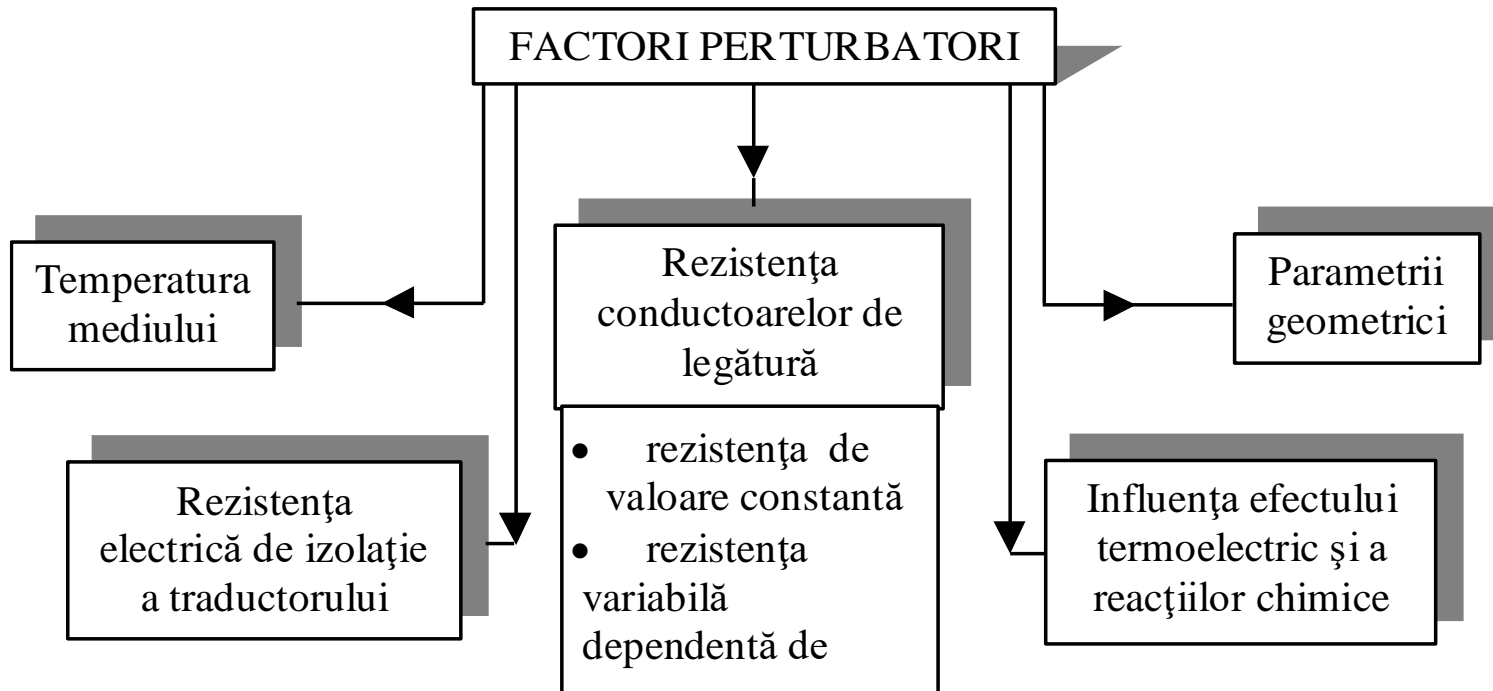
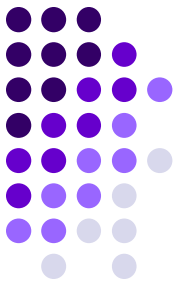


Punte completa

$$U_e = 10^{-6} \cdot \frac{1}{4} \cdot U_i \cdot N \cdot k \cdot \varepsilon \quad [V]$$

$$N = \begin{cases} \sum_i 1 \\ \sum_j \mu \\ 0 \end{cases}$$

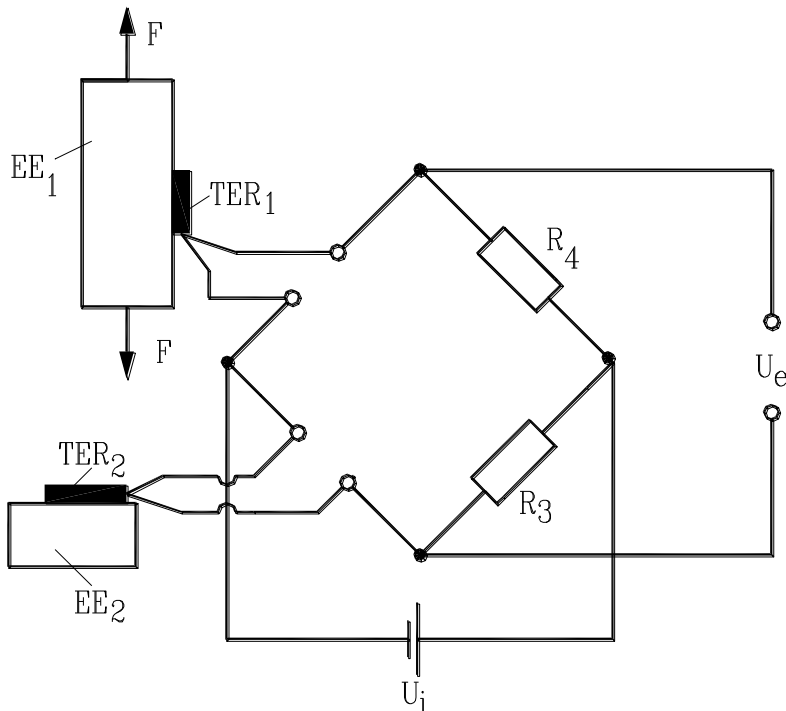
$$U_i = 2 \cdot \sqrt{R \cdot P_S \cdot l_0 \cdot B}$$



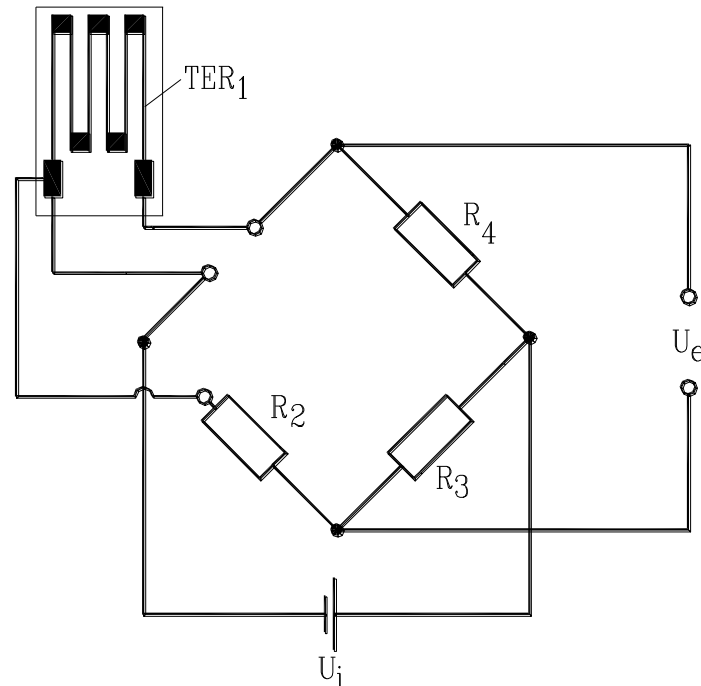
$$dl = dl_e - dl_t$$

$$\frac{dR}{R} = (\alpha_\rho - \alpha_t) \cdot \Delta T + K \cdot (\alpha_e - \alpha_t) \cdot \Delta T + K \cdot \varepsilon$$

$$K = K_0 \cdot [1 - f(\varepsilon, T)]$$



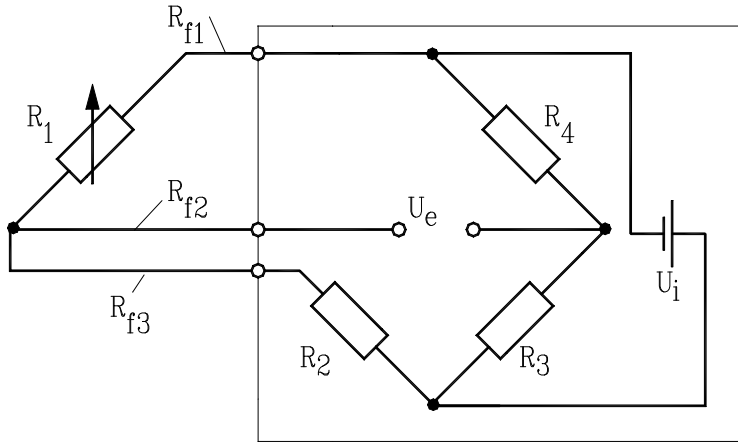
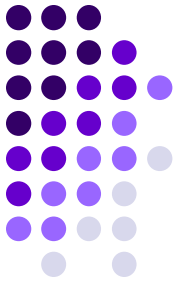
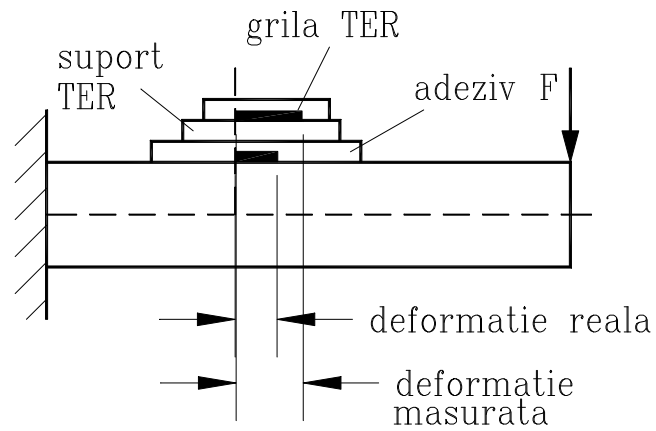
a)



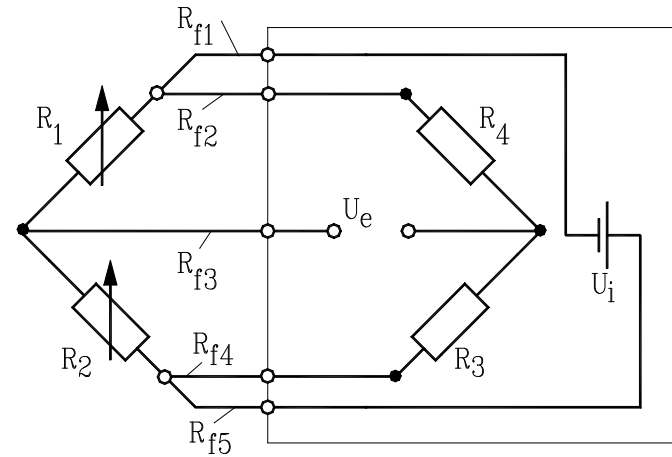
b)

Evitarea erorilor de măsurare datorate câmpului termic

Infuența grosimii stratului de adeziv asupra deformației măsurate



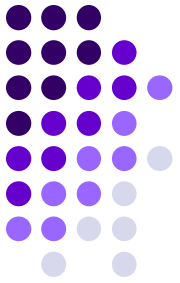
a)



b)

Eliminarea erorilor datorate variației rezistențelor conductoarelor de legătură prin cablarea cu trei (a) și respectiv cinci conductoare (b)

$$R_e = \frac{R}{1 + \frac{R}{R_{iz}}}$$



Se recomandă ca $R_{iz} > 10^3 \text{ M}\Omega$. Pentru o rezistență de izolație cuprinsă în intervalul $[60 \text{ k}\Omega \dots 6 \text{ G}\Omega]$, semnalul eroare variază între $10^3 \mu\text{m/m}$ și $10^{-2} \mu\text{m/m}$

$$E = \beta \cdot \Delta T$$

