

BLOCUL DE ACTIONARE

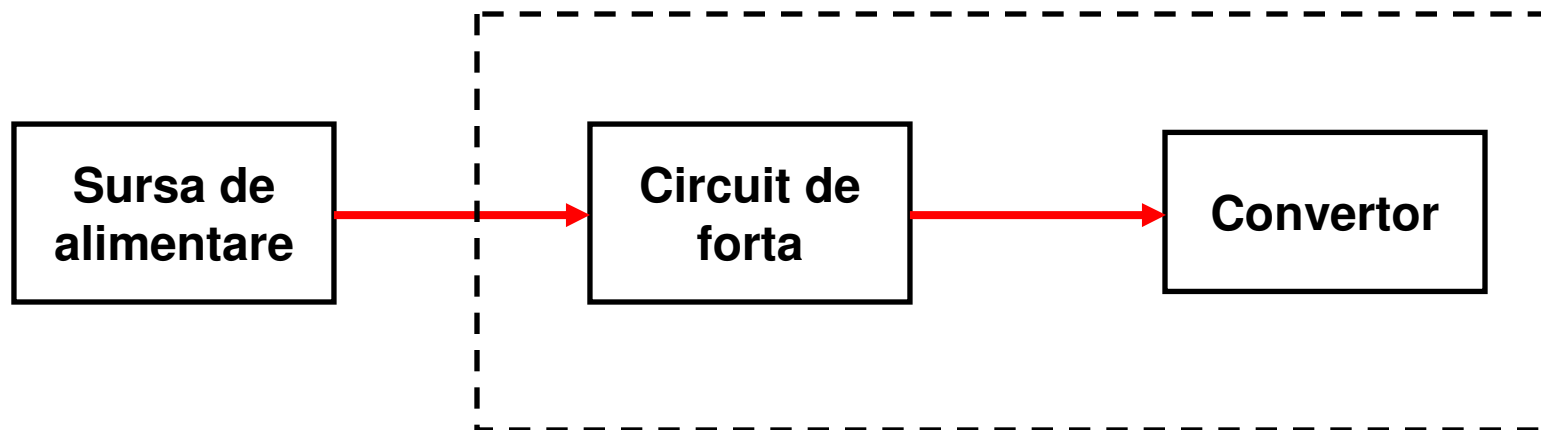
- este responsabil de a asigura puterea necesară dezvoltării mișcărilor principale, secundare și auxiliare.
- sistemele de acționare folosite sunt electrice, pneumatice, hidraulice sau, în cele mai multe cazuri, mixte.

**Sisteme
hidropneumatice**

**Sisteme
electrice**

**Sisteme
mixte**

Structura unui bloc de actionare

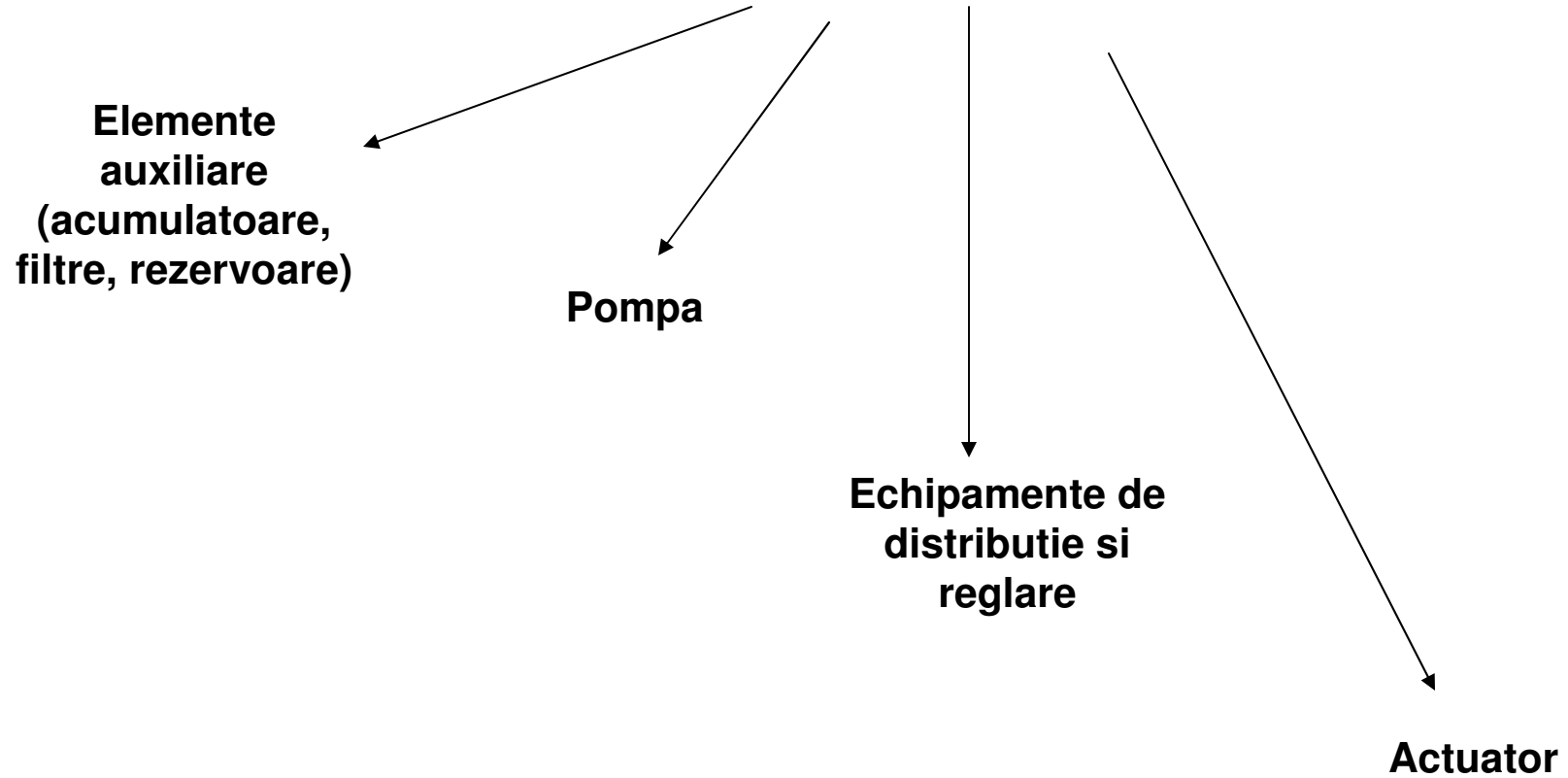


SISTEME DE ACȚIONARE PNEUMATICE ȘI HIDRAULICE (HIDROPNEUMATICE)

- **unul din cele mai economice și comode mijloace de acționare**
- **o sursă ieftină de acționare, cu aplicabilitate în cazul masinilor-unelte, manipuletoarelor, roboților secvențiali, vehicule, etc.**

SISTEM HIDROPNEUMATIC: presupune o generare de energie hidraulică sau pneumatică și apoi o transformare a acesteia în energie mecanică, cu avantajul posibilității efectuării unui control ușor și precis a energiei intermediare.

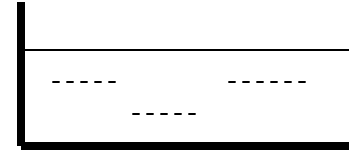
COMPONENTELE UNUI SISTEM HIDROPNEUMATIC



ELEMENTE AUXILIARE

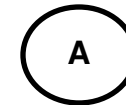
REZERVOR

- Pastreaza fluidul si alimenteaza pompele
- Realizeaza transferul de caldura
- Permite eliminarea aerului din fluid
- Retine impuritatile



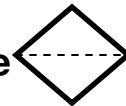
ACUMULATOR

- Inmagazineaza energia hidraulica
- Amortizeaza pulsatiile

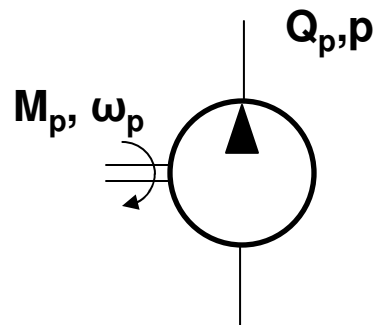


FILTRE

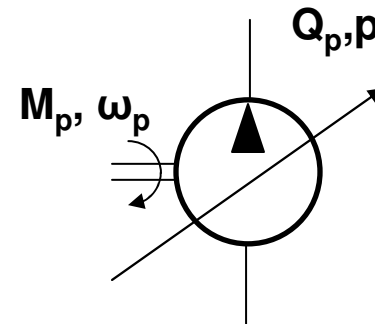
- Au capacitatea de a retine particule de ordinul micronilor
- Sunt importante din punct de vedere al andurantei si sigurantei in functionare
- Se utilizeaza site metalice, elemente textile, magnetice ceramice poroase.
- Se instaleaza in conducta de presiune sau de intoarcere.



GENERATOARE DE ENERGIE HIDROSTATICĂ (pompe volumice)



Cu debit constant

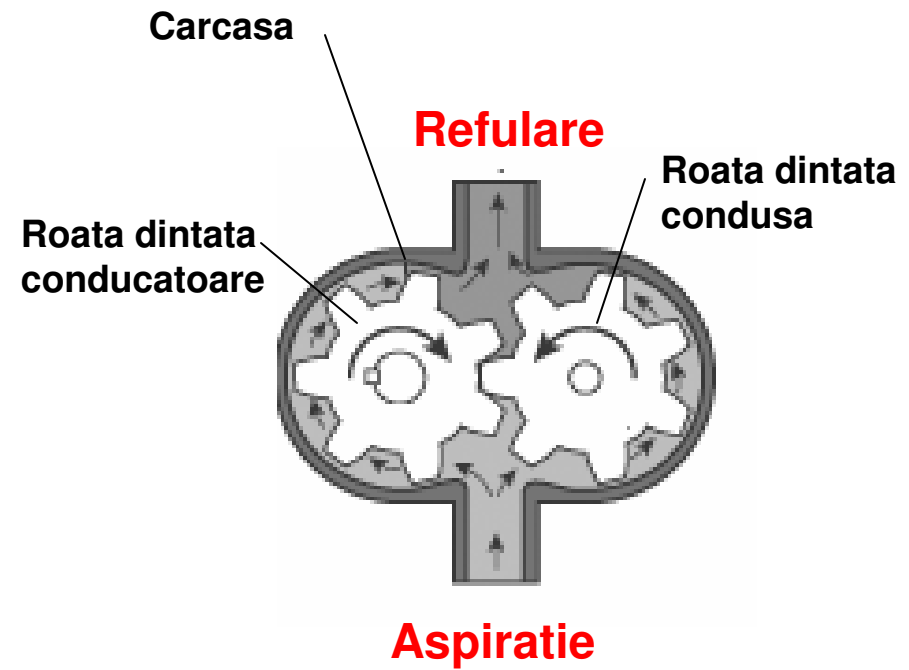
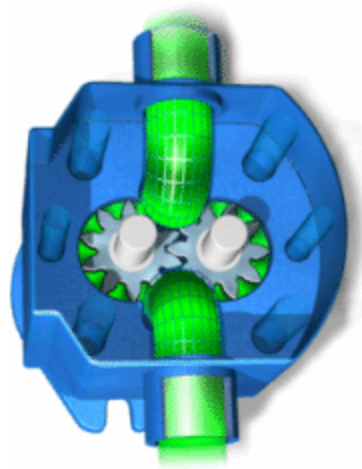


Cu debit variabil

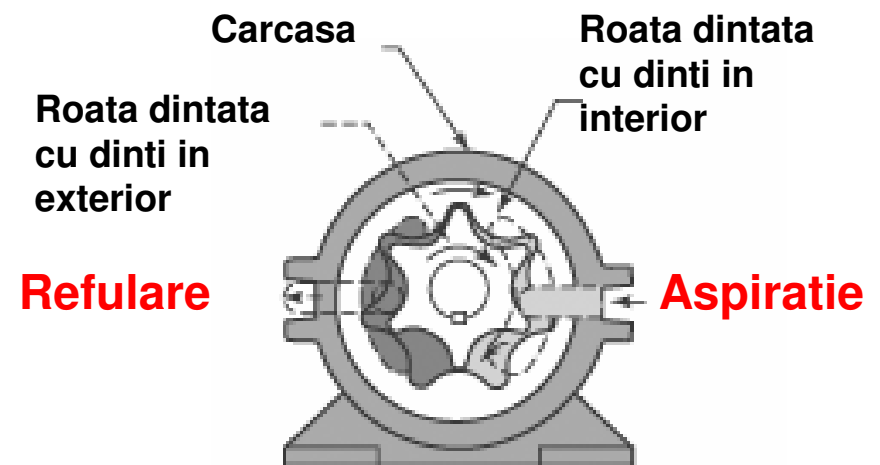
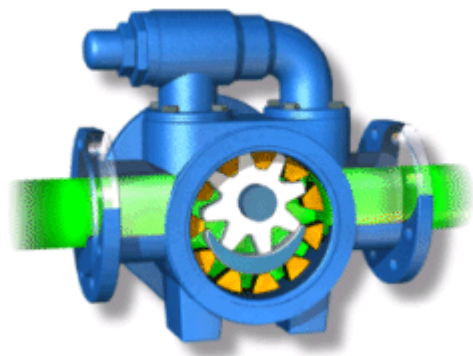
Furnizeaza actuatorului energia necesara pentru acesta sa efectueze lucrul mecanic.

Solutii constructive

➤ Cu roti dintate – angrenaj exterior



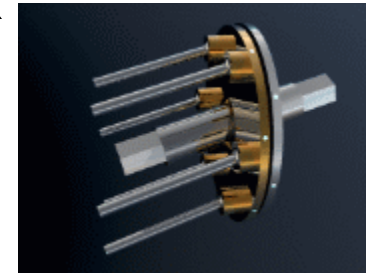
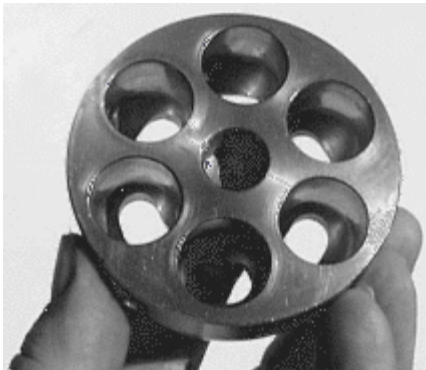
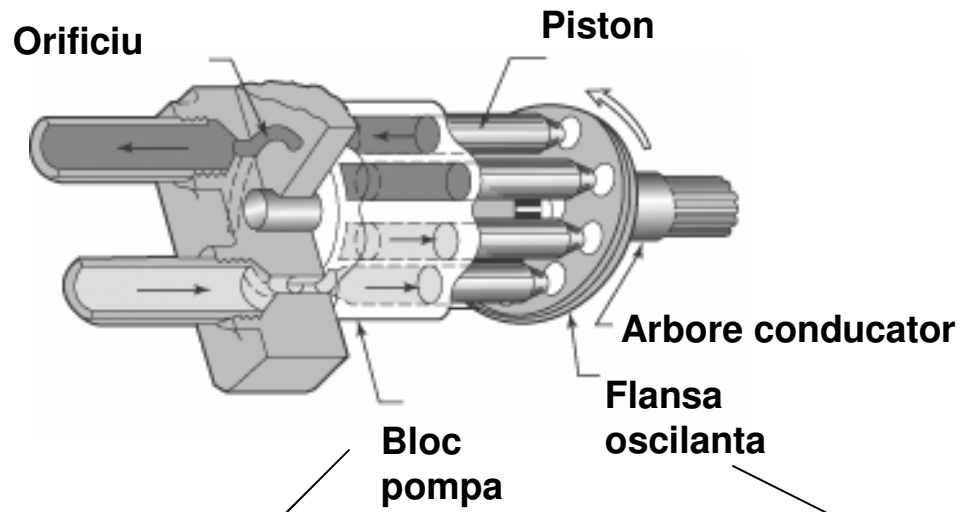
➤ **Cu roti dintate – angrenaj interior**



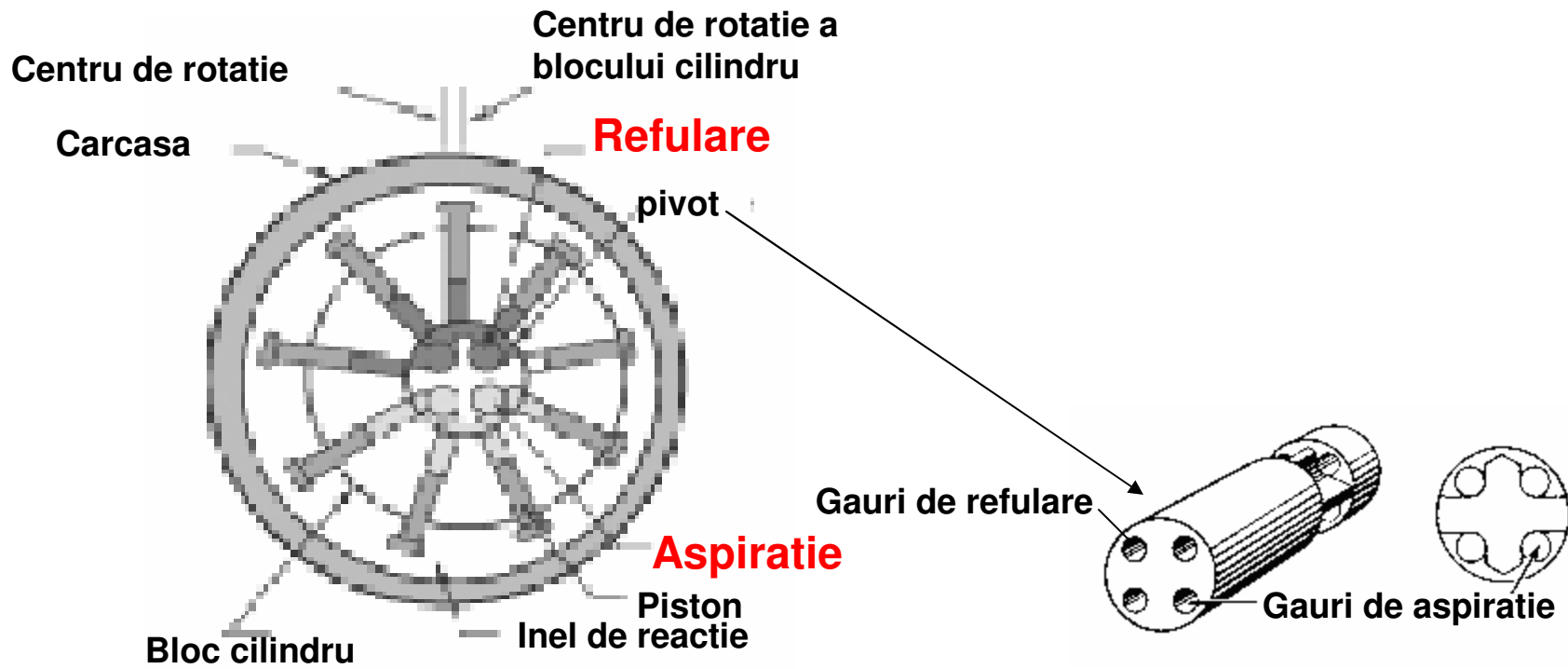
➤ **Cu pistonase axiale**

Refulare

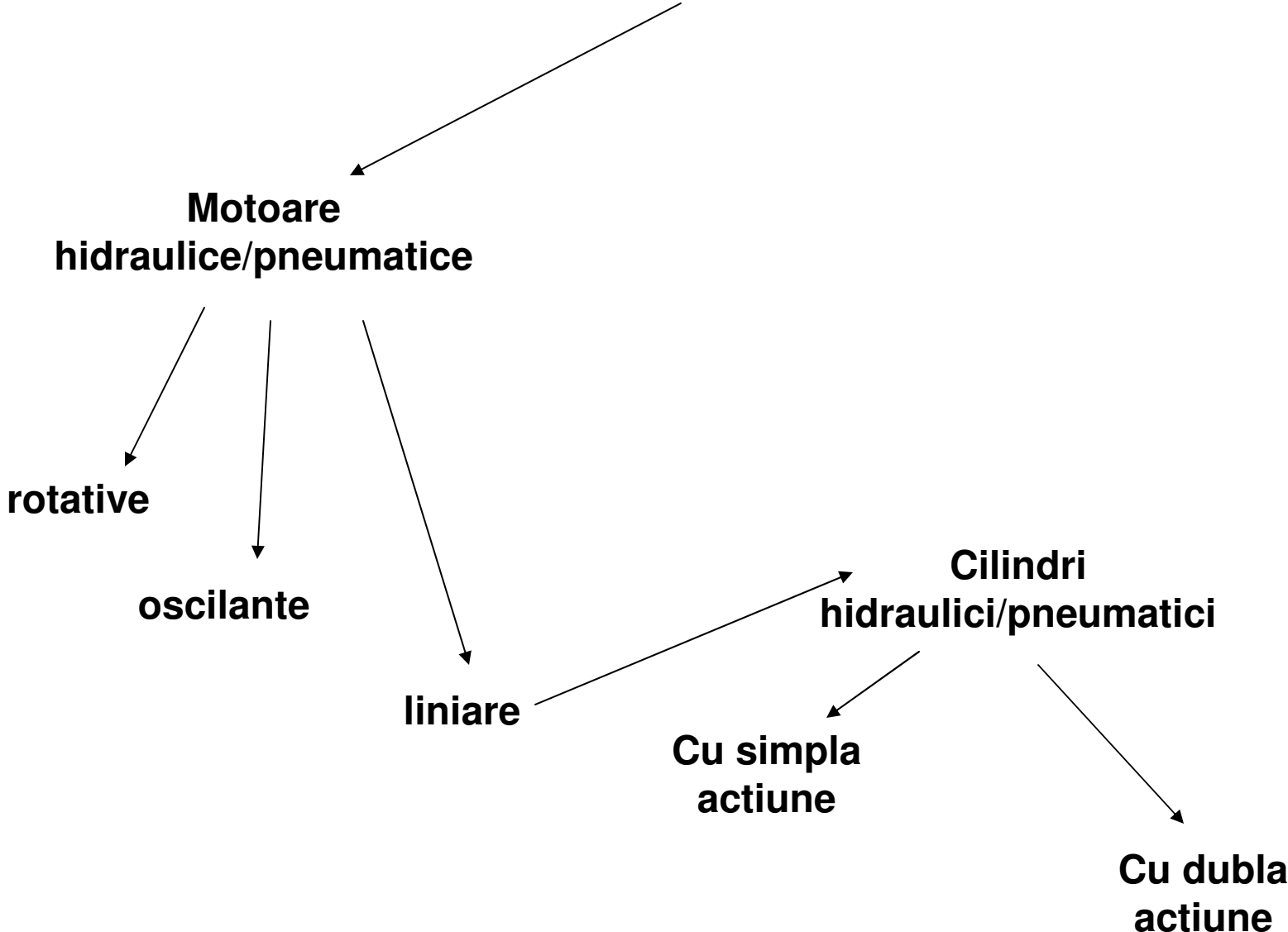
Aspiratie



➤ **Cu pistonase radiale**

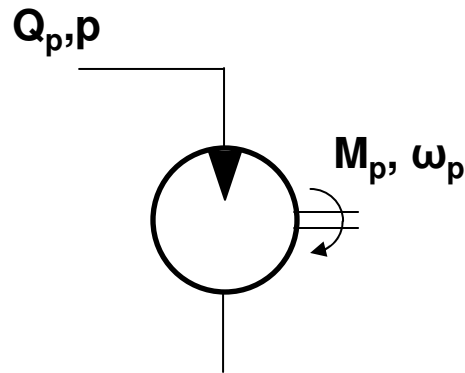


ACTUATOARE (elemente de executie)

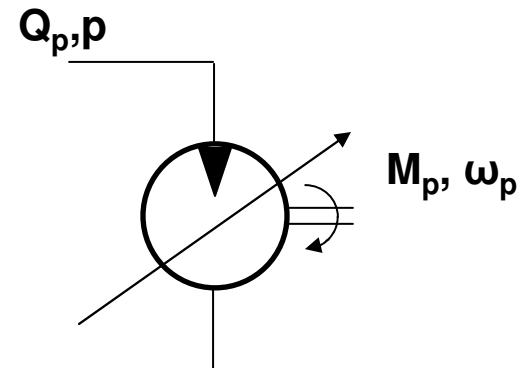


Motoare rotative

Preiau energia hidrostatica a elementului generator (presiune \times debit) si o transforma in energie mecanica de rotatie (cuplu \times viteza unghiulara).



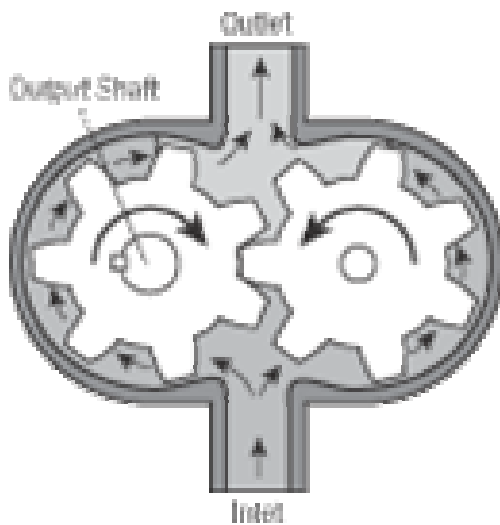
Cu capacitate constanta



Cu capacitate variabila

Constructiv seamana cu pompele, dar pe baza unui debit si a unei presiuni se dezvoltă un cuplu la o anumita viteza.

➤ **Cu roți dinate exterioare**



Presiuni de lucru: 63-160 bar

Turatii:

Min: 400-500 rot/min

Max: 3000-4000 rot/min

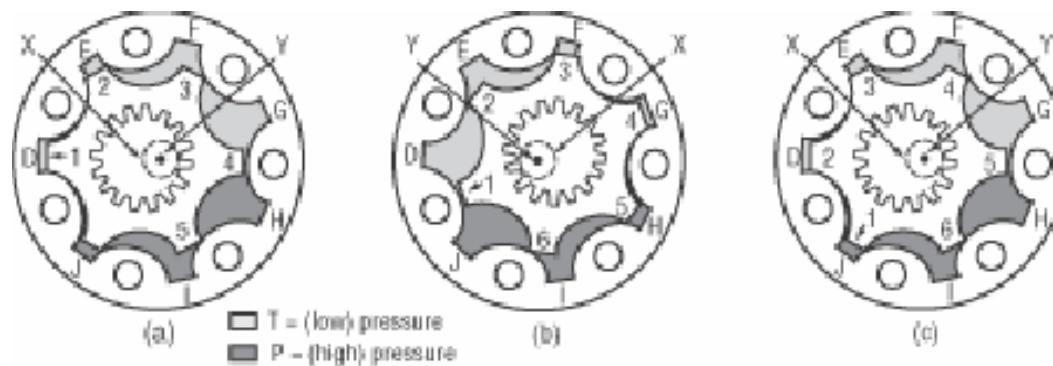
➤ Cu roti dintate interioare

Presiuni de lucru: 100-160 bar

Turatii:

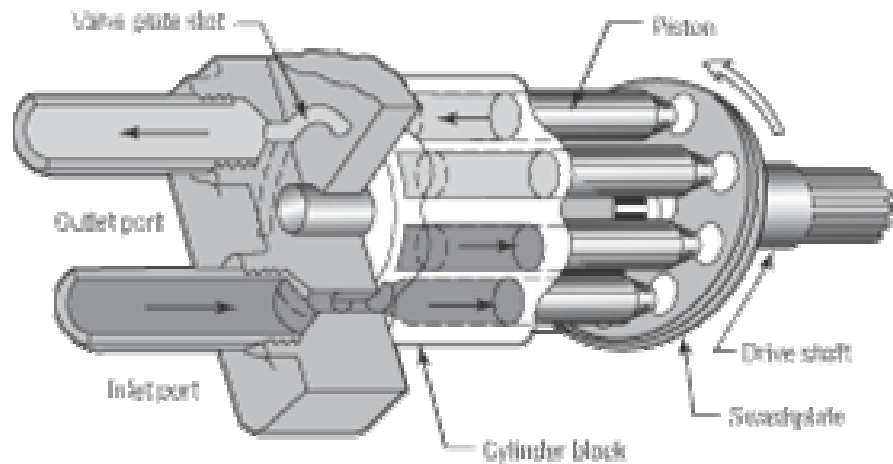
Min: 6-10 rot/min

Max: 500-800 rot/min



- 2 roti dintate, una in interiorul celeilalte.
- Cea exterioara este fixa si are un dinte sau mai multi in plus.
- Cea interioara se misca.
- Arborele de iesire este cuplat la cea interioara.

➤ Cu pistoane axiale

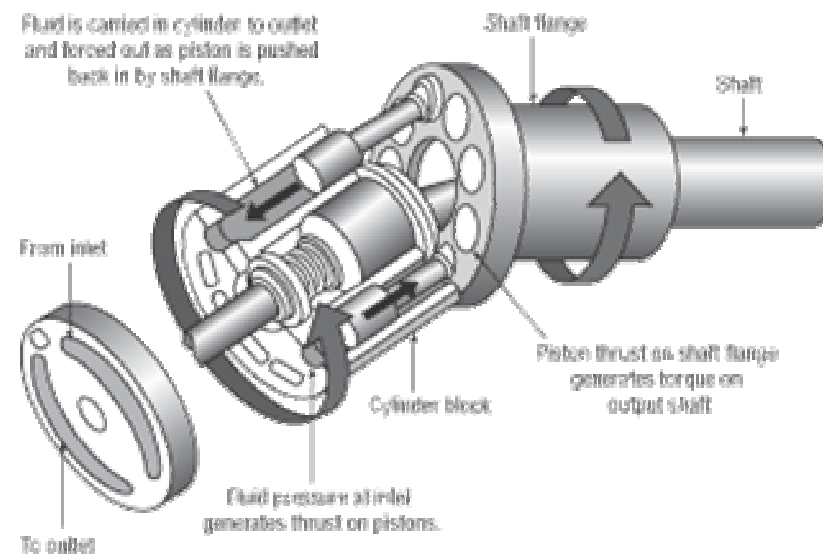


Presiuni de lucru: 200-300 bar

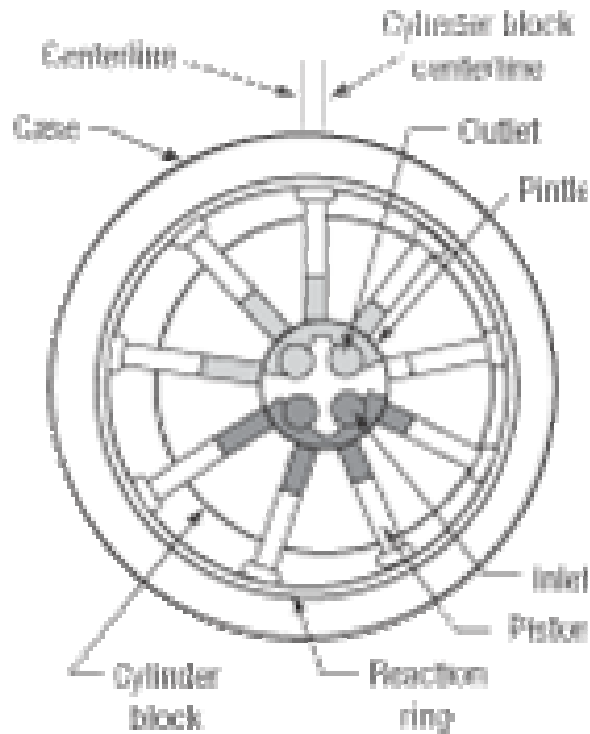
Turatii:

Min: 200-300 rot/min

Max: 2000-2500 rot/min



➤ Cu pistoane radiale



Presiuni de lucru: 300-400 bar

Turatii:

Min: 30-50 rot/min

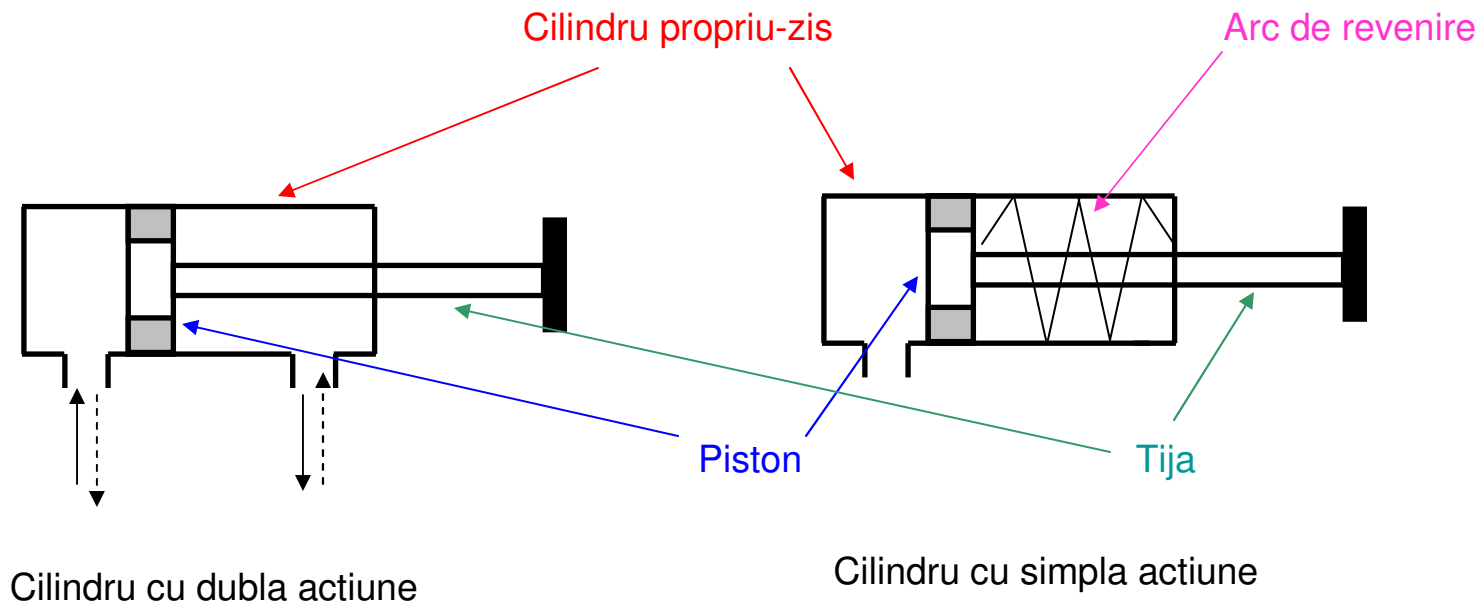
Max: 1000-1500 rot/min

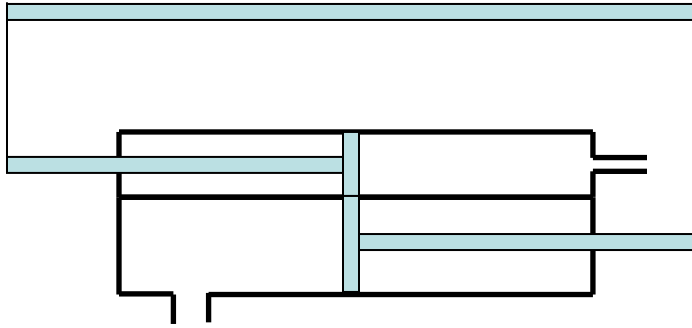
Observatie. Motoarele cu pistoane necesita un organ de distributie pentru conectarea alternativa a camerelor variabile la orificiile de admisie-evacuare.

Motoare liniare

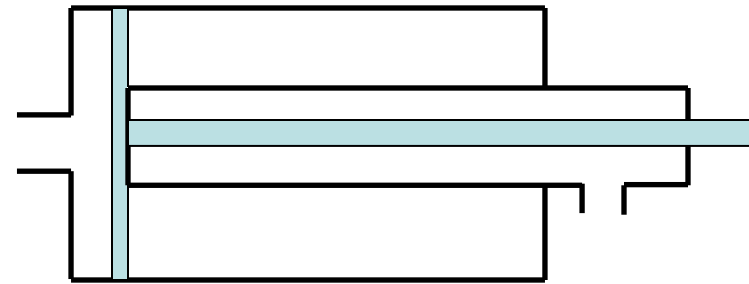
Preiau energia hidrostatica a elementului generator (presiune \times debit) si o transforma in energie mecanica de translatie (forta \times viteza).

Au la baza cilindri hidraulici/pneumatici.

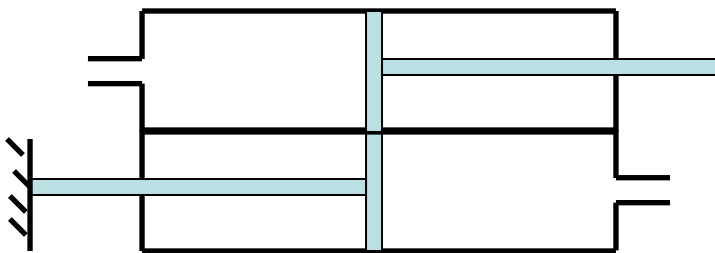




Motor hidraulic bicilindru diferential cu piston mobil, cu actiune dubla



Motor hidraulic bicilindru diferential cu piston mobil, telescopic



Motor hidraulic bicilindru diferential cu piston fix, cu actiune dubla

ECHIPAMENTE DE DISTRIBUTIE SI REGLARE

**Aparataj
directional sau
de distributie**

**Aparataj de reglaj
si control al
vitezelor**

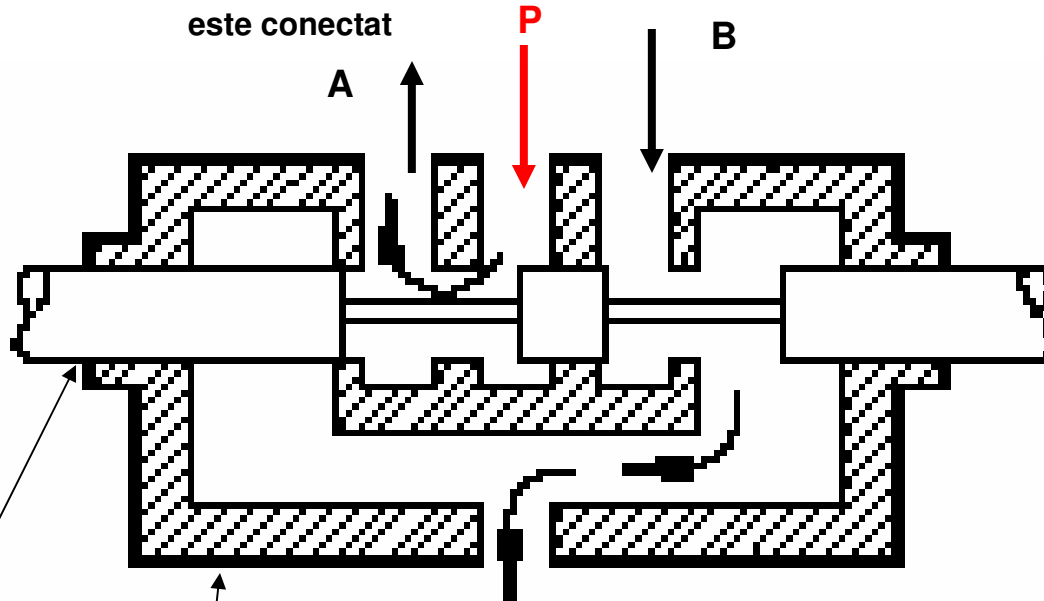
**Aparataj de reglaj
si control al
presiunilor**

Elemente hidraulice/pneumatice directionale (distribuitoare)

- **Dirijeaza fluidul de lucru de la sursa de presiune spre organul activ de lucru sau spre alte elemente ale sistemului.**
- **Asigura evacuarea acestuia, dupa incheierea functiei programate.**
- **Permit reversarea sensului miscarii motoarelor hidraulice.**

Legaturile cu camerele de lucru ale sistemului la care este conectat

De la sursa de presiune/circuitul activ



Parte mobila

Parte fixa

Constructiv:

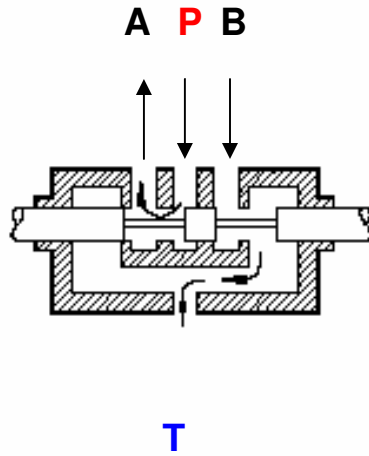
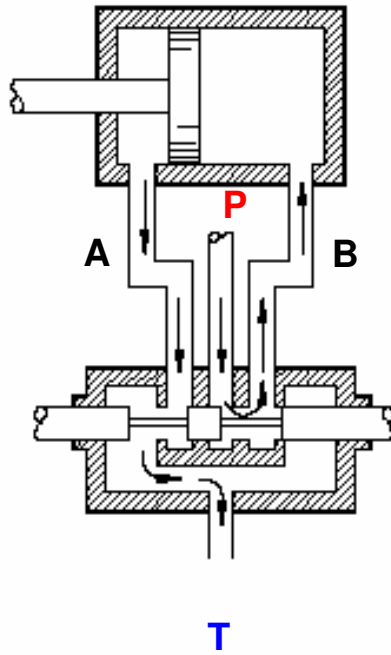
Parte comanda

La/spre rezervor

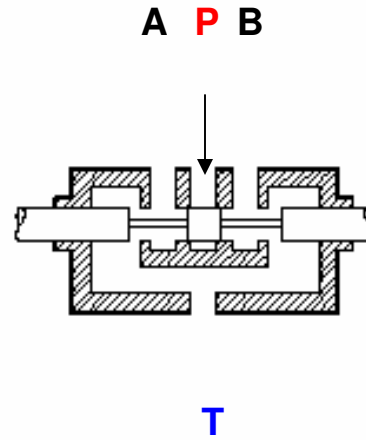
T

- Manuala
- Mecanica
- Electrica
- Hidraulica
- Pneumatica
- Electrohidraulica

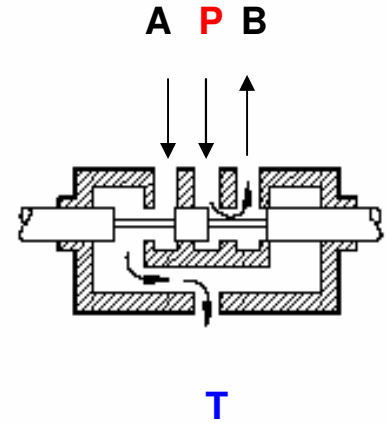
Cilindru




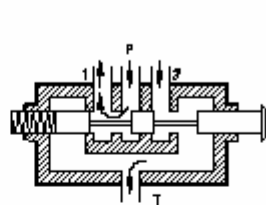


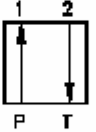



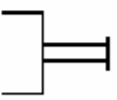
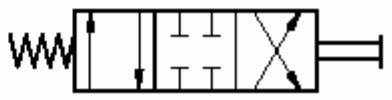
Pozitia 1



Pozitia 2

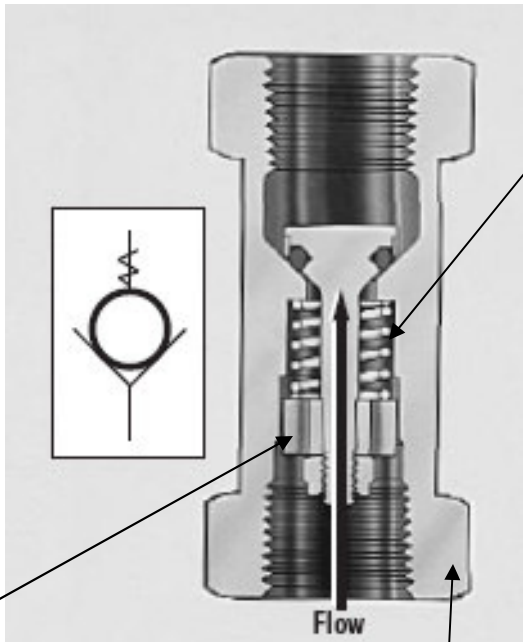


Pozitia 3

<p>Simbolul de baza pentru o pozitie</p>	
<p>Adaugarea orificiilor</p>	 <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>A B</p>  <p>P T corect</p> </div> <div style="text-align: center;"> <p>A^P B</p>  <p>T gresit</p> </div> </div>
<p>Fluxurile de curgere pentru fiecare pozitie</p>	  
<p>Comanda</p>	  <p style="text-align: center;">Cu arc de revenire manuala</p>
<p>Simbolul final</p>	

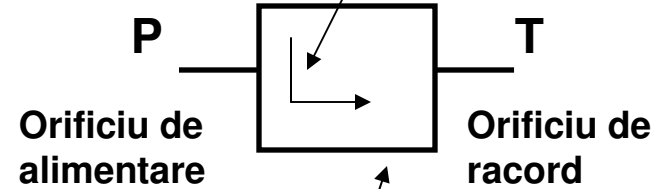
Elemente hidraulice/pneumatice pentru controlul si reglarea presiunii (supape)

- **Permit circulatia fluidului intr-un singur sens;**
- **Limiteaza valoarea maxim admisa a presiunii generale in sistem;**
- **Mentin constanta presiunea in sistem, permitand curgerea la rezervor a debitului in exces;**
- **Asigura o succesiune dinainte stabilita a intrarii in functiune a elementelor de executie;**
- **Diferentiaza presiunile de lucru ale diferitilor consumatori;**
- **Regleaza forta/momentul exercitat de actuator independent de debitul pe care acesta il consuma.**



Resort de reglaj

Parte mobila



Parte mobila

Parte fixa

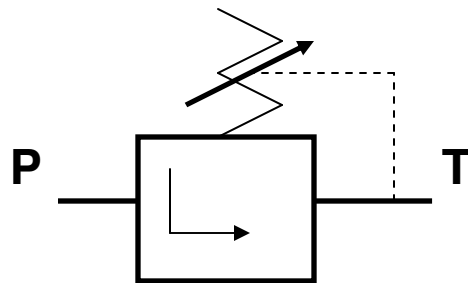
Parte fixa

Constructiv

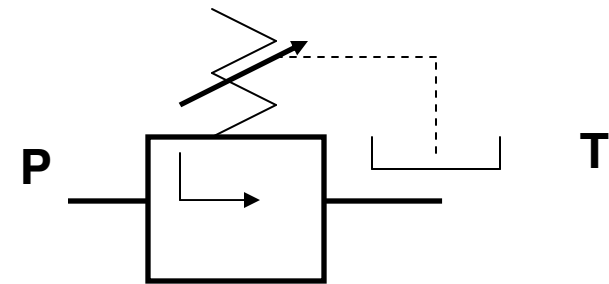
Comanda

Dupa starea normala a elementului de etansare:

- **Supape normal inchise, care in pozitia initiala nu permit trecerea agentului de lucru prin tronsonul de conducta pe care sunt montate;**
- **Supape normal deschise, care in pozitia initiala permit trecerea lichidului de lucru prin tronsonul de conducta pe care sunt montate.**



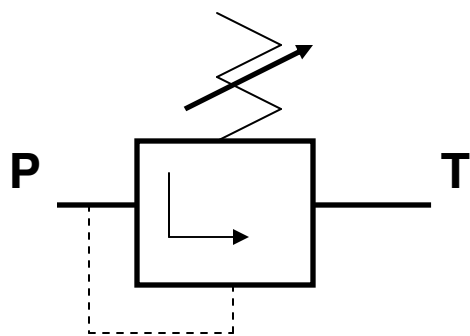
Norma inchisa, cu drenaj intern



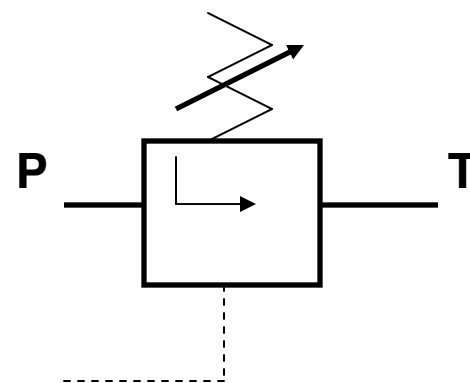
Norma deschisa, cu drenaj extern

Dupa tipul comenzii:

➤ **Supape cu comanda directa, la care semnalul de comanda se aplica direct sertarului mobil al supapei; comanda poate fi culeasa din circuitul supravegheat (interna), sau dintr-un circuit exterior celui pe care este montata supapa (externa)**



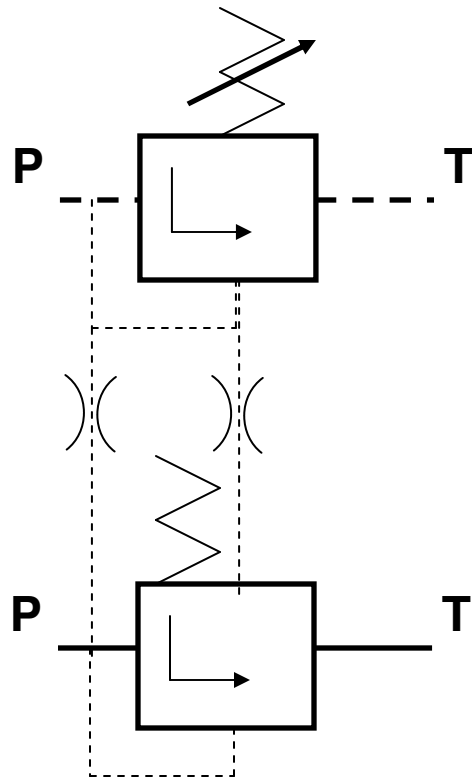
**Norma inchisa, cu comanda
interna**



**Norma deschisa, cu comanda
externa**

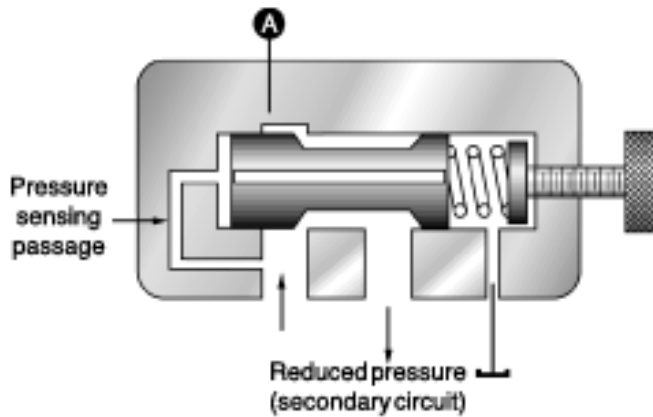
Dupa tipul comenzii:

➤ **Supape cu comanda indirecta (pilotate);**

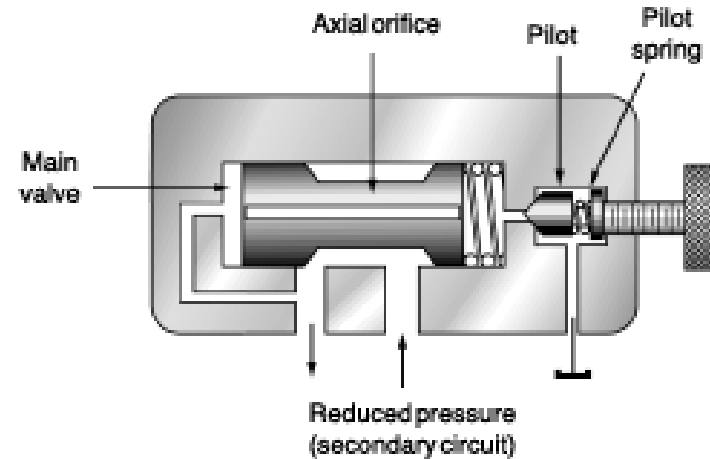


**Supapa pilotata normal inchisa cu comanda
interna**

Supape de siguranta – in cazul inversarilor de sens sau la cresteri accidentale de sarcina peste limitele admise se deschid pentru a atenua varfurile de presiune

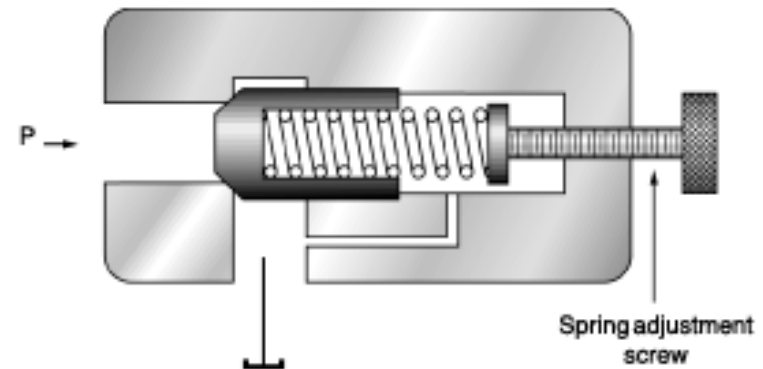
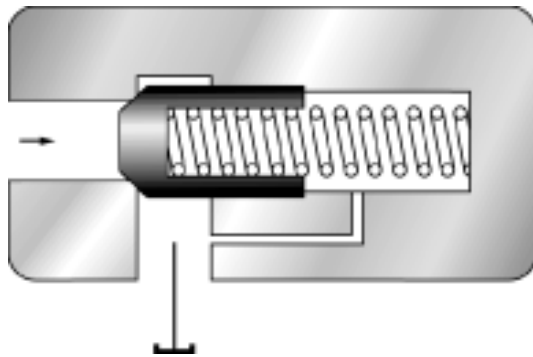


Supapa cu comanda directa

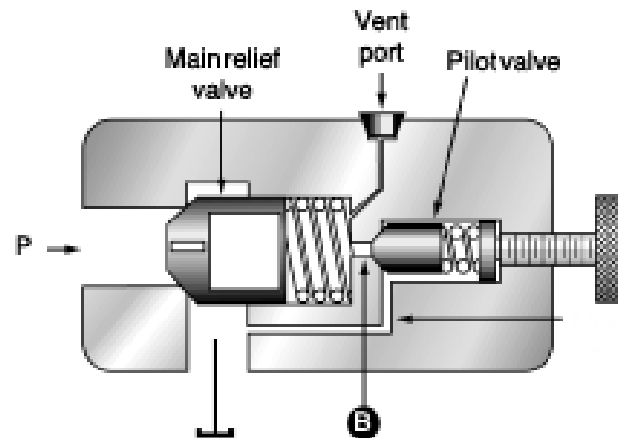


Supapa pilotata

Supape de descarcare – pentru mentinerea presiunii la o valoare constanta, prin deversarea la rezervor a debitului in exces.

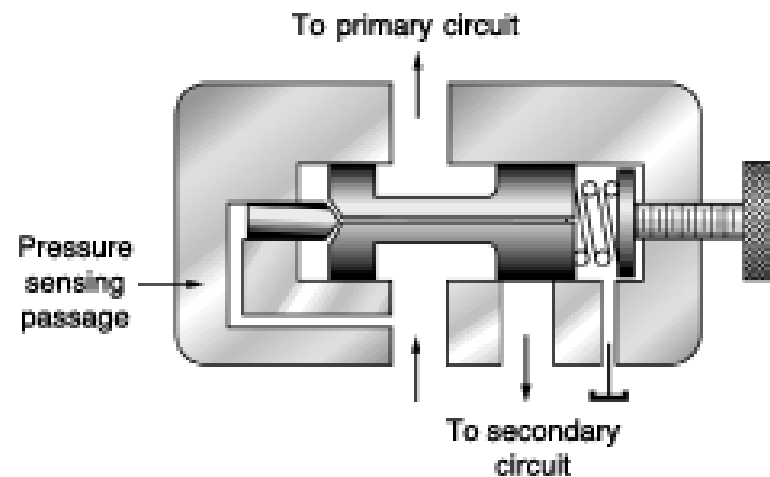


Supape cu comanda directa

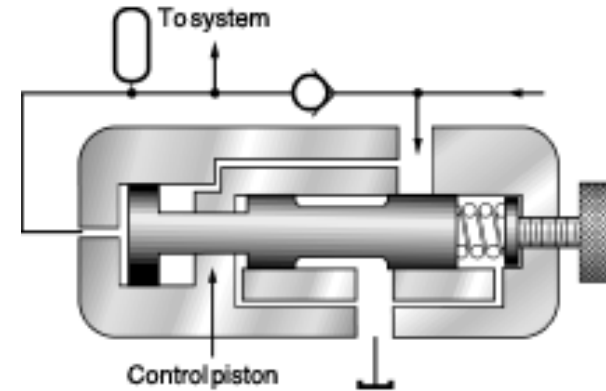
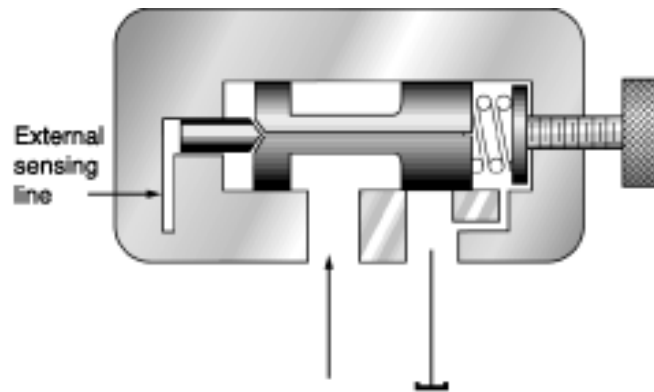


Supapa pilotata

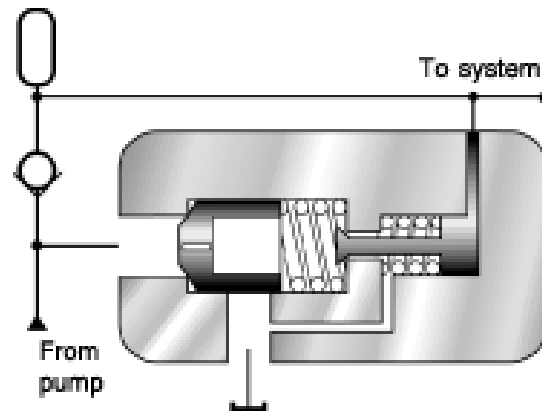
Supape de succesiune – asigura o anumita ordine de intrare in functiune a doua sau mai multe actuatore alimentate de la acelasi circuit, parametru de comanda fiind presiunea din actuatorul actionat la inceputul ciclului.



Supape de deconectare – asigura descarcarea pompei direct la rezervor, in aplicatiile care actioneaza un element de executie cu ciclu tehnologic in mai multe trepte de viteza.

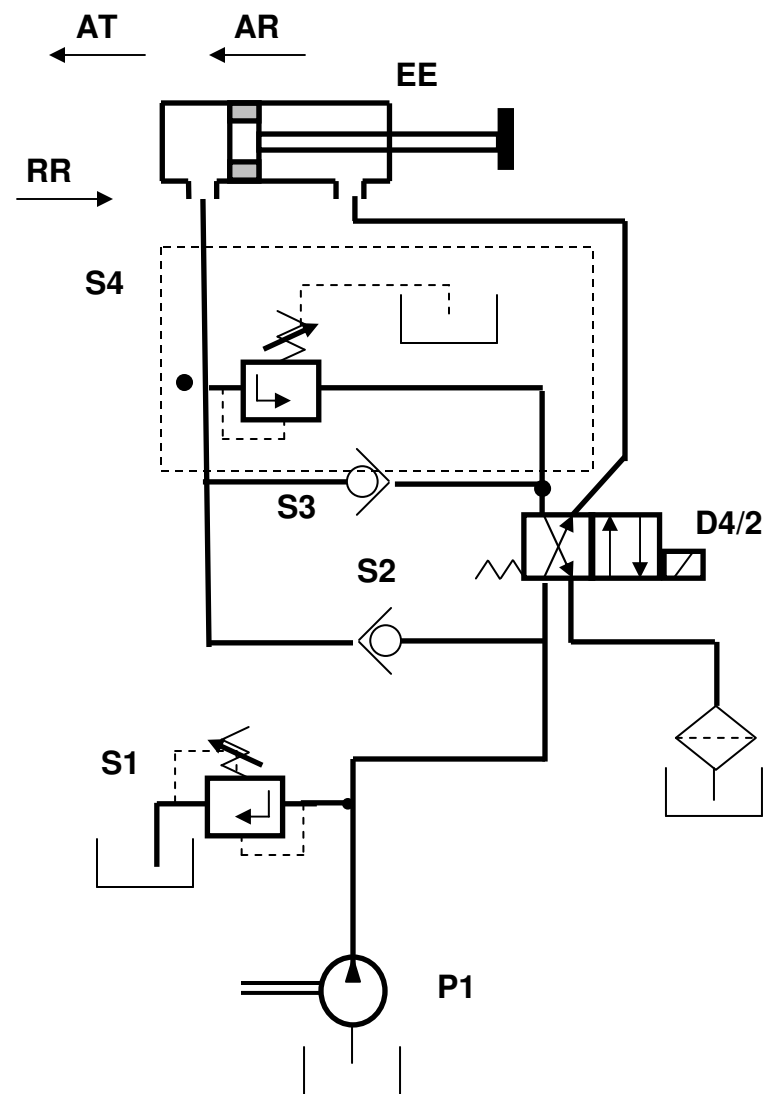
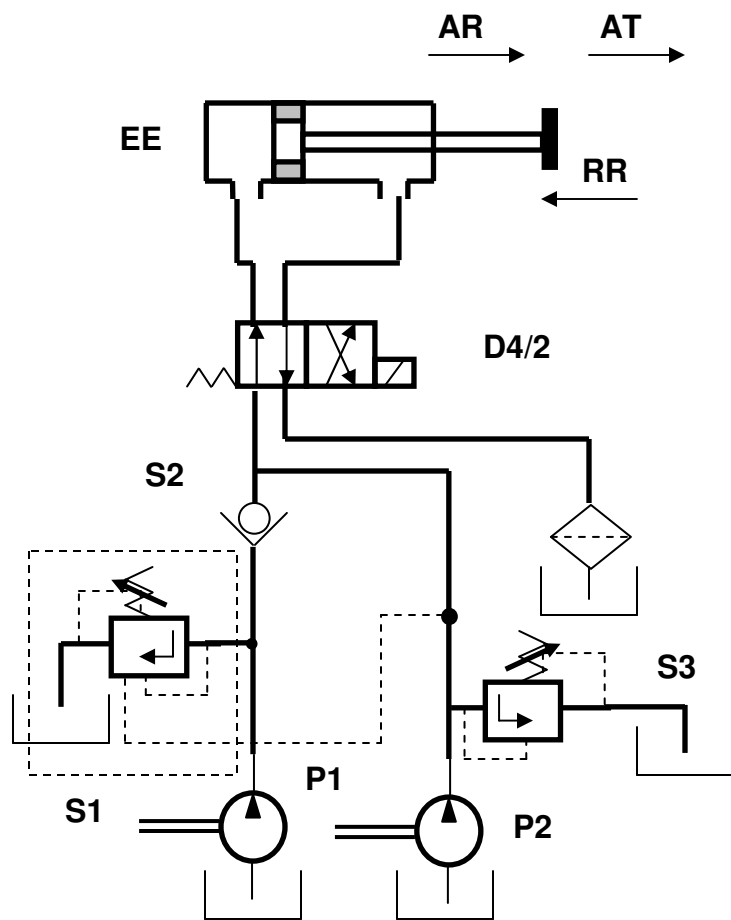


Supape cu comanda directa

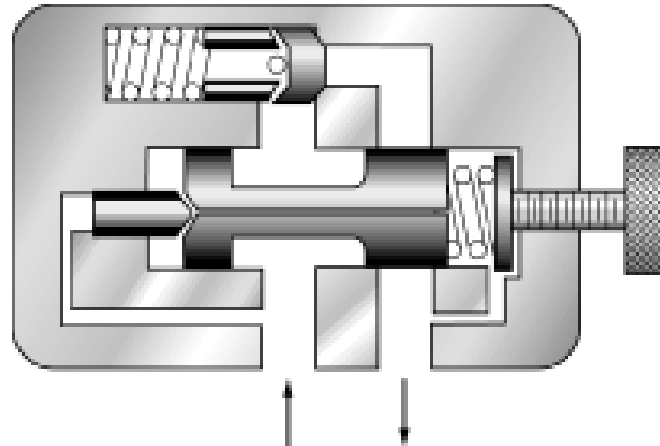


Supapa pilotata

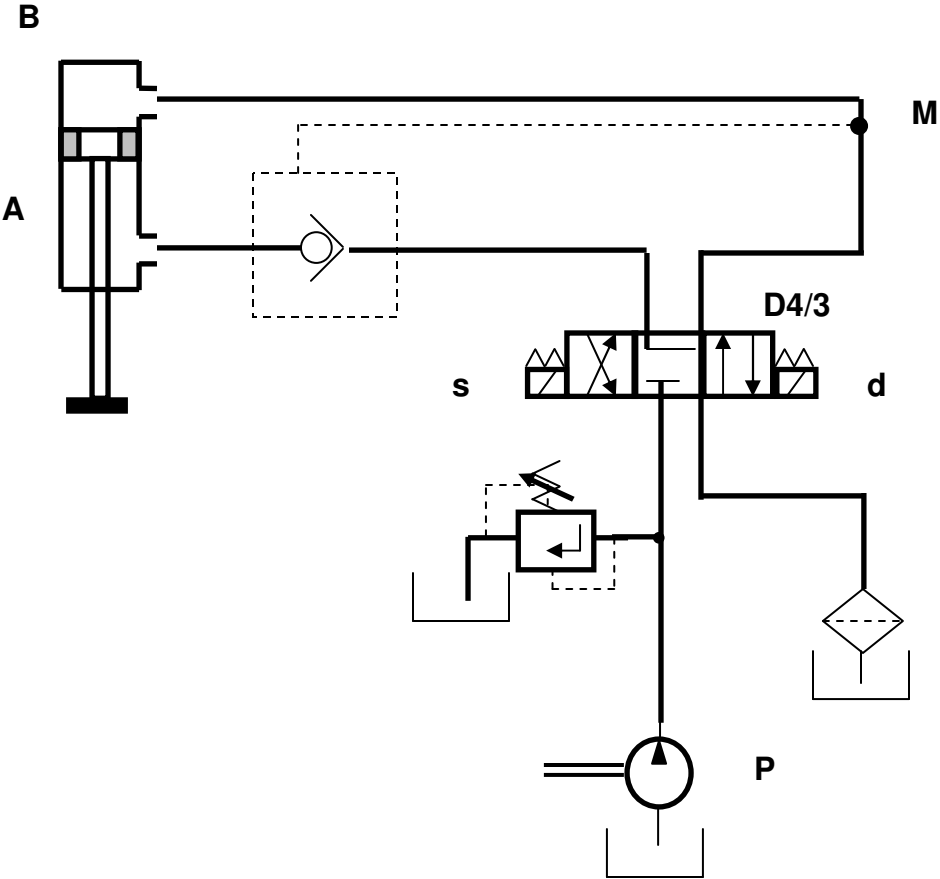
Exemplu de circuit cu supapa de deconectare/conectare

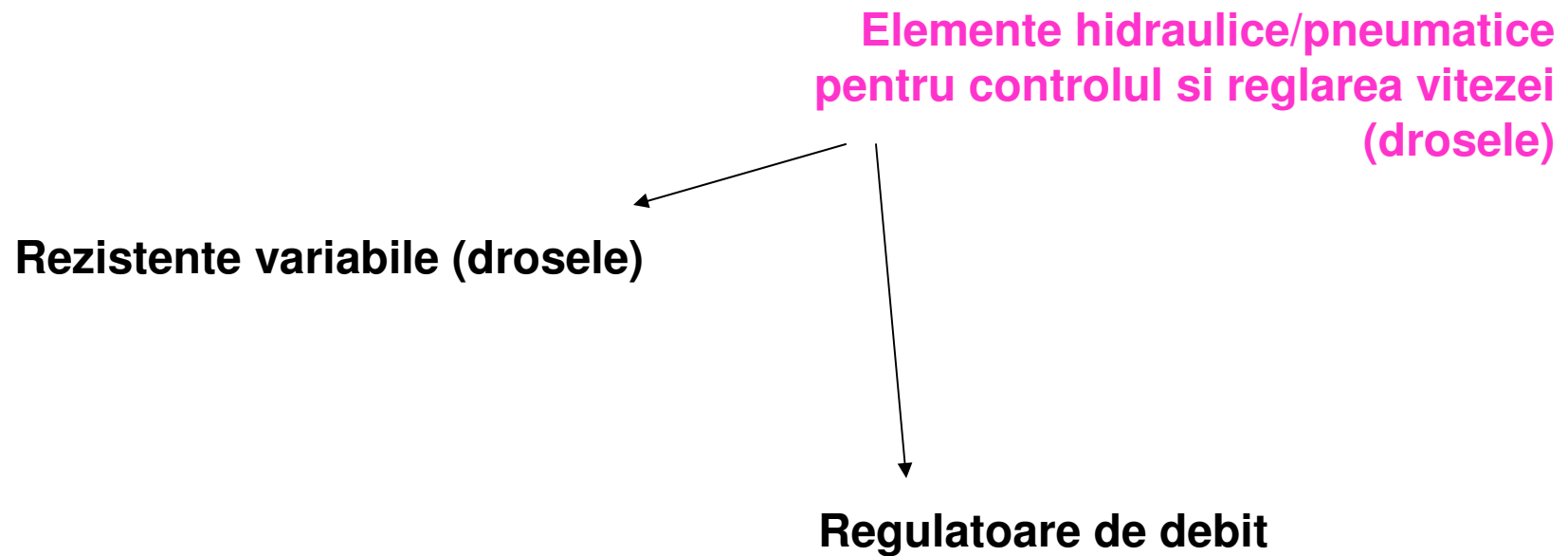


Supape de sens – au rolul de a stabili anumite sensuri de curgere preferentiale in circuitele actionarilor. Se folosesc la compensarea pierderilor de lichid in actionarile hidraulice care lucreaza in circuit inchis. Variantele deblocabile permit curgerea bidirectionala a lichidului hidraulic pe portiunea de conducta pe care sunt montate.



Exemplu de circuit cu supapa de sens deblocabila

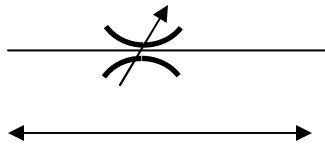




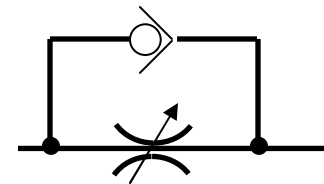
- **Permit controlul permanent al debitului care intra sau iese din actuator.**
- **Modul de reglare a debitului este diferit in functie de caracteristicile sursei de alimentare, caracteristicile motorului si de solutia aleasa.**

Rezistente variabile (drosele) – permit reglarea rezistiva a vitezei prin reglarea debitului

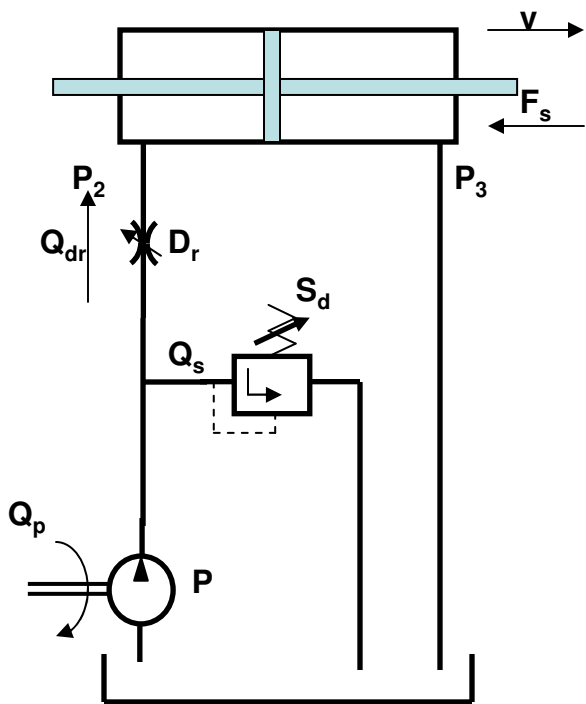
Acest tip de reglare se utilizeaza pentru puteri mici, de maximum 7 kW.



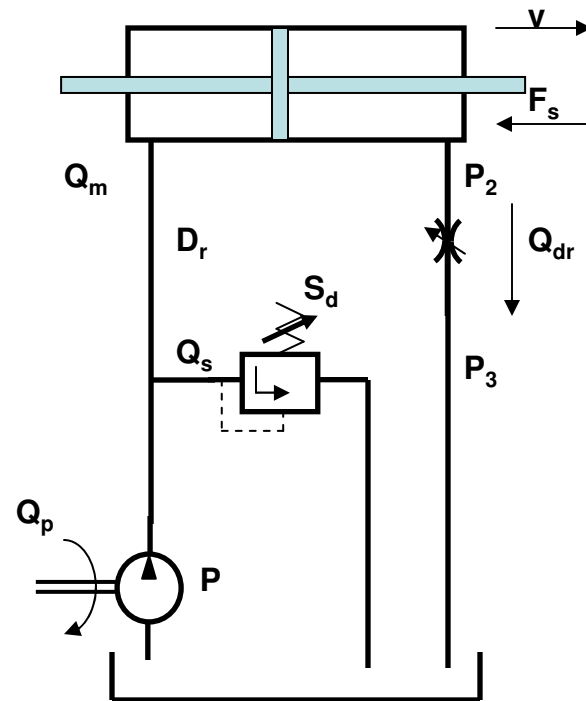
Drosel bidirectional



Drosel de cale

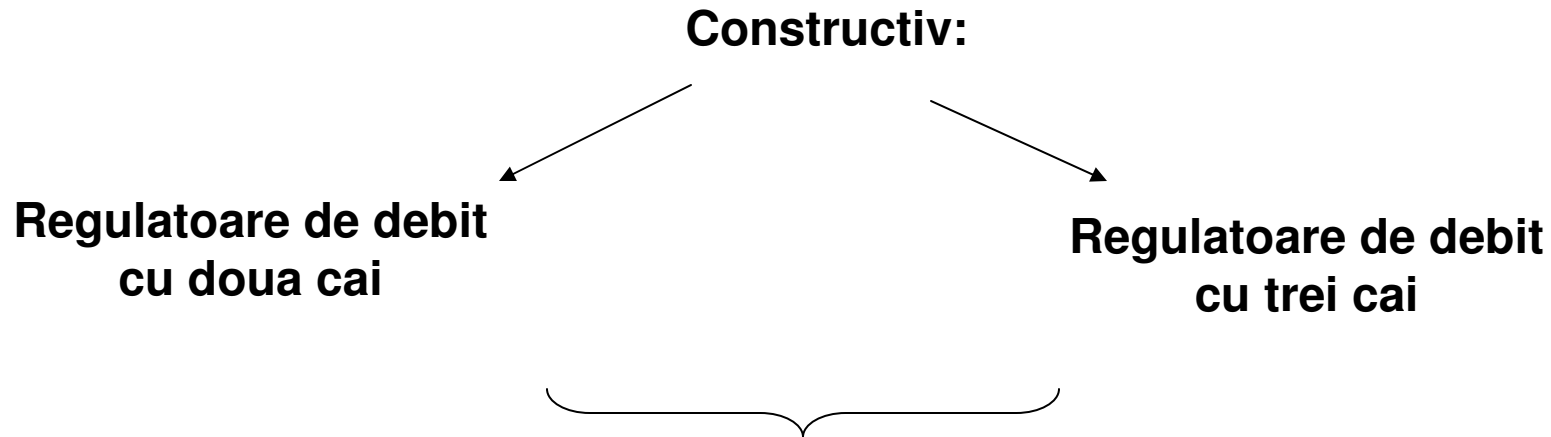


Drosel montat pe intrare



Drosel montat pe iesire

Regulatoare de debit – sunt elemente ale actionarilor hidraulice prin care se mentine constanta viteza elementului de executie chiar daca sarcina exterioara se modifica.

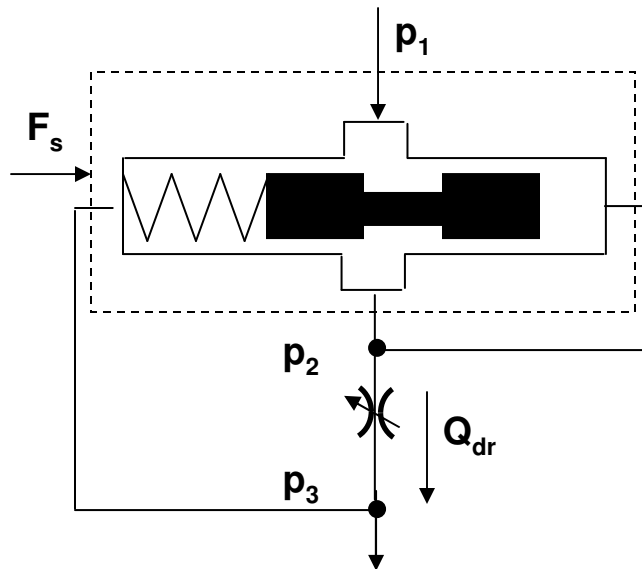


Au in structura lor elemente de control si reglaj al presiunii – supape de presiune- si elemente de reglare a debitului – drosele.

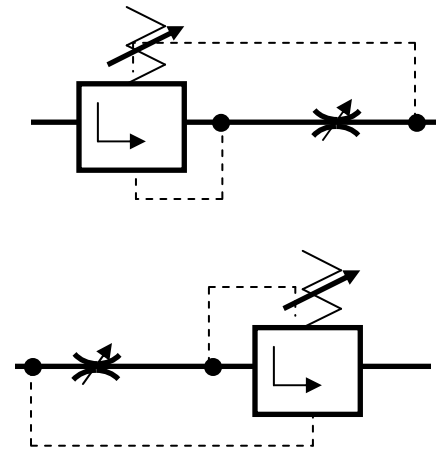
Principiul de functionare: mentinerea constanta a caderii de presiune pe droselul incorporat, pentru o deschidere fixa a acestuia, indiferent de variatia sarcinii exterioare la elementul de executie.

Regulatoare de debit cu doua cai

Mentinerea constanta a caderii de presiune pe drosel se realizeaza prin elemente de natura constructiva: resortul de reglaj, respectiv sectiunea activa de lucru a sertarului.

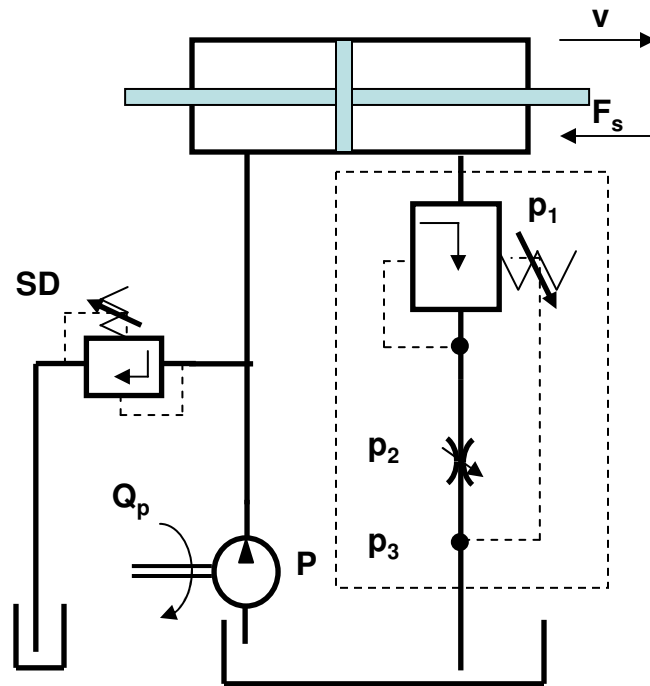


Schema de principiu



Simbolizarea

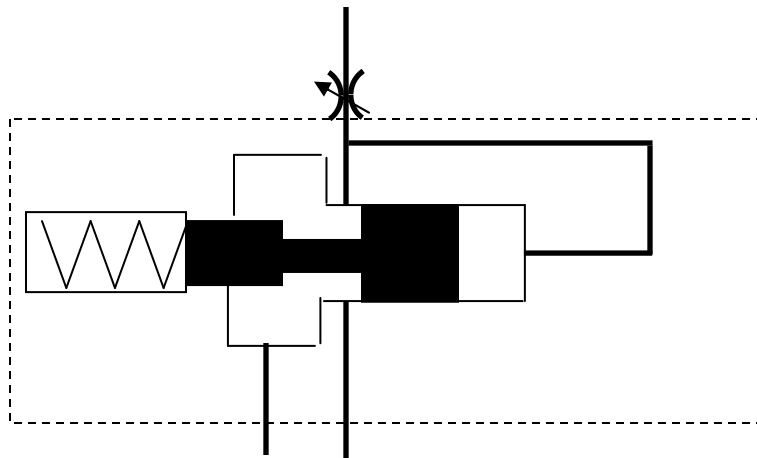
Poate fi montat atat la intrarea, cat si la iesirea elementului de executie, sau in paralel cu acesta, preferandu-se totusi montarea pe returul actuatorului, pentru o stabilitate sporita a actionarii.



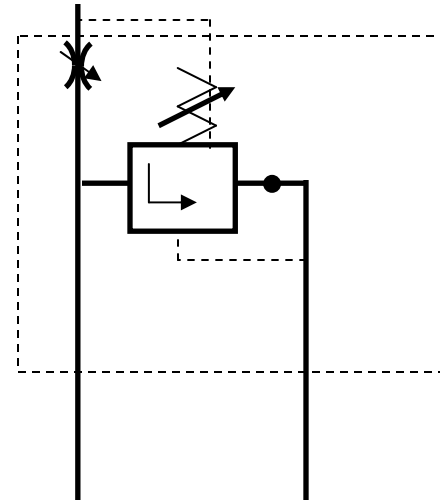
Exemplificarea modului de montare

Regulatoare de debit cu trei cai

Mentinerea constanta a caderii de presiune in circuit se realizeaza prin deversarea surplusului de debit prin supapa, sistemul hidraulic lucrând la presiune variabila, in functie de sarcina exterioara a elementului de executie

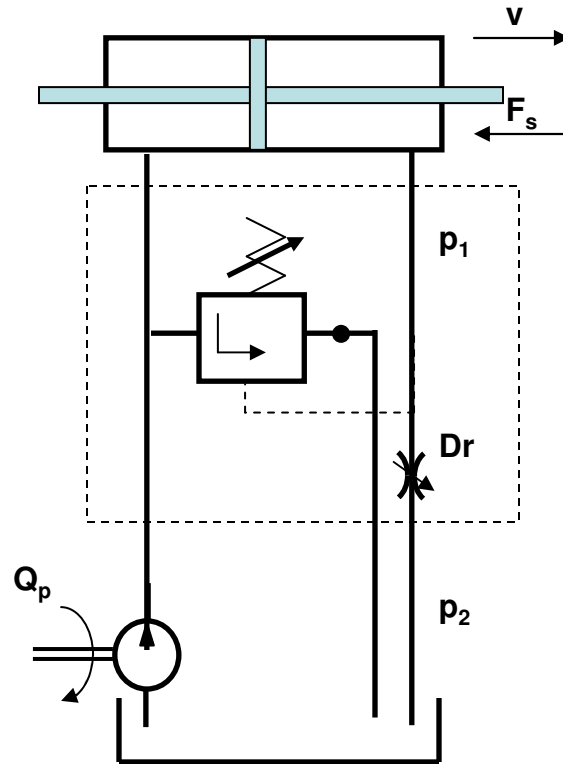


Schema de principiu



Simbolizarea

Amplasarea se face numai pe conducta de admisie in motorul hidraulic, fara a mai fi nevoie de supapa de deversare, eventual cu prezenta unei supape de presiune normal inchisa, cu rol de protectie a circuitului.

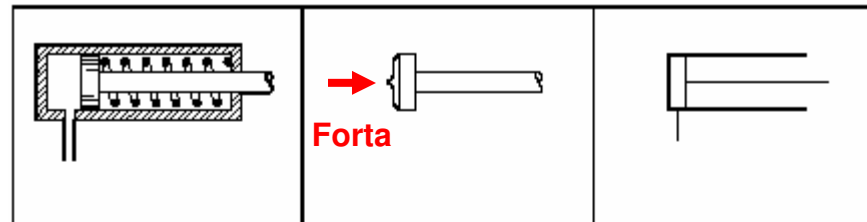


Exemplificarea modului de montare

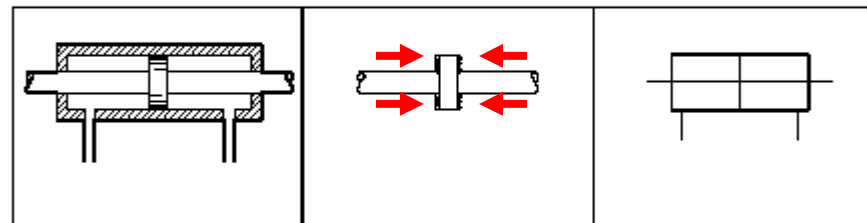
SIMBOLURI UTILIZATE IN SISTEMELE HIDROPNEUMATICE

ACTUATOARE LINIARE

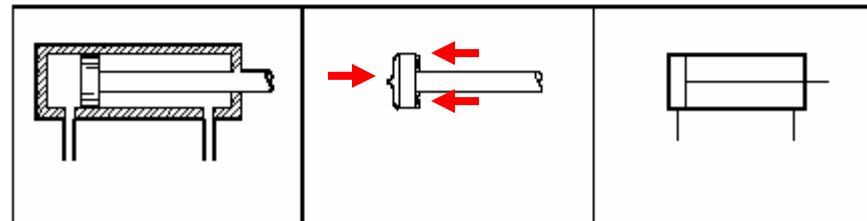
SIMPLA ACTIUNE



DUBLA ACTIUNE – cu forte egale de o parte si de cealalta



DUBLA ACTIUNE – cu forte diferite de o parte si de cealalta



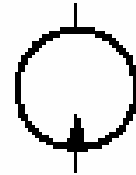
Pictorial

Modul de
actiune al
fortelor

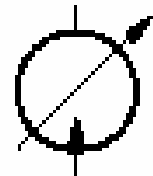
Simbol

ACTUATOARE ROTATIVE

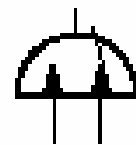
CU CAPACITATE
CONSTANTA



CU CAPACITATE
VARIABILA

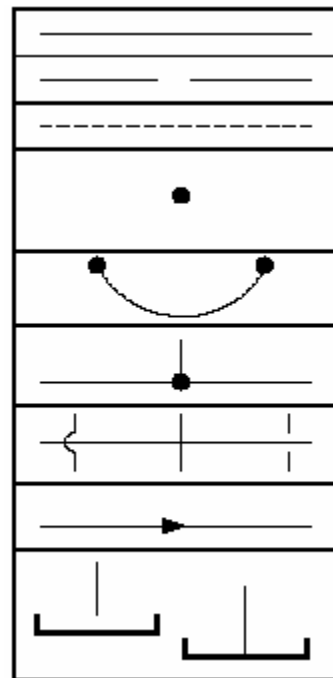


OSCILANT



CONDUCTE SI TUBURI

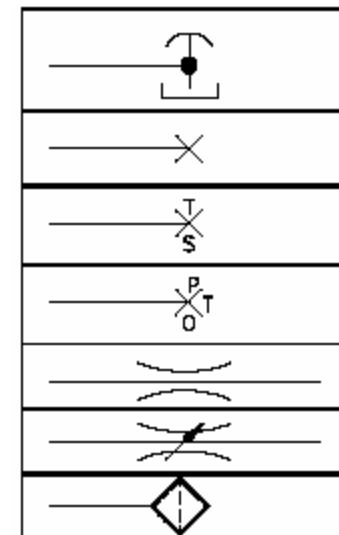
Linie de lucru
 Linie de comanda
 Linie de drenaj
 Conexiune
 Legatura flexibila
 Intersectie
 Traversare
 Sens de curgere
 La rezervor:



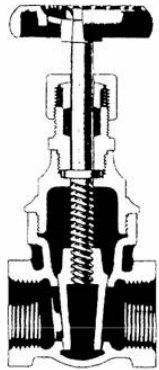
Peste nivelul
fluidului

Sub nivelul
fluidului

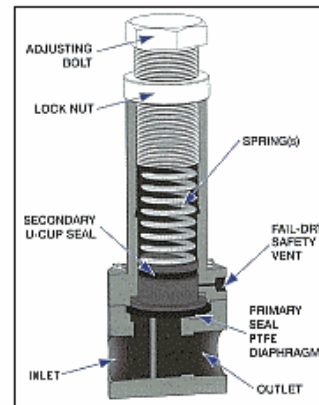
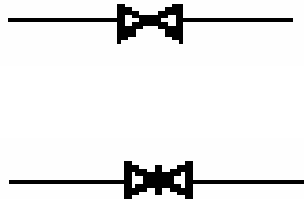
Linie la iesire
multipla
 Linie infundata
 Statie de testare
 Statie de testare
 Ingustare fixa
 Ingustare variabila
 Linie la filtru



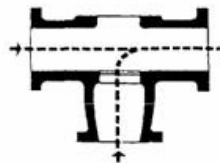
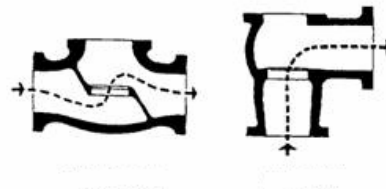
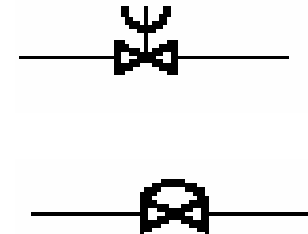
SUPAPE

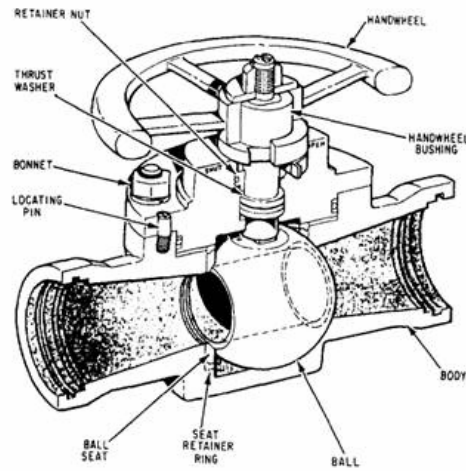


Supapa cu scaun conic
(de presiune)

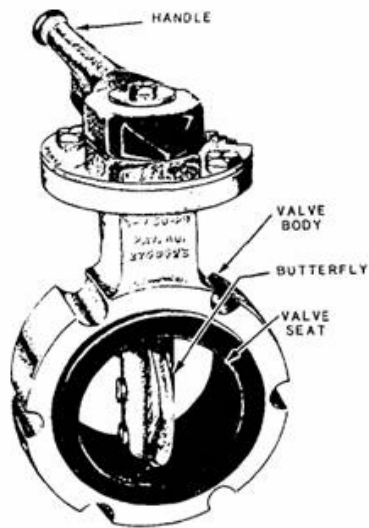
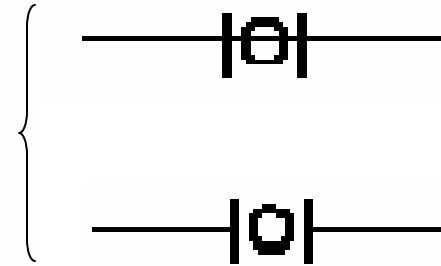


Supapa cu diafragma

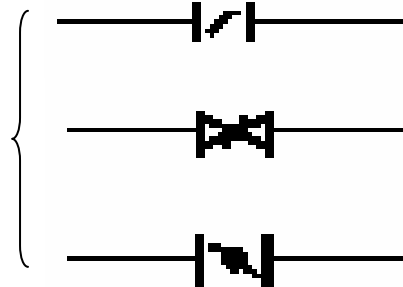


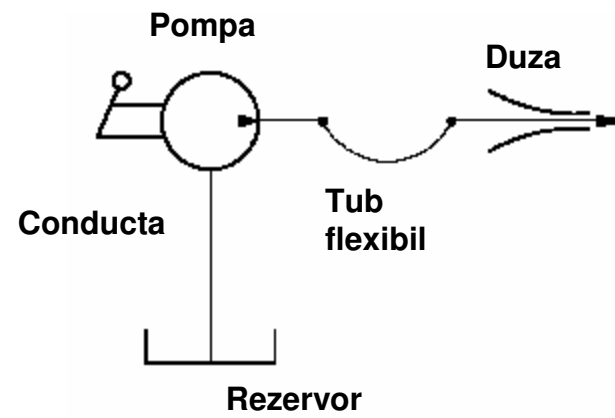
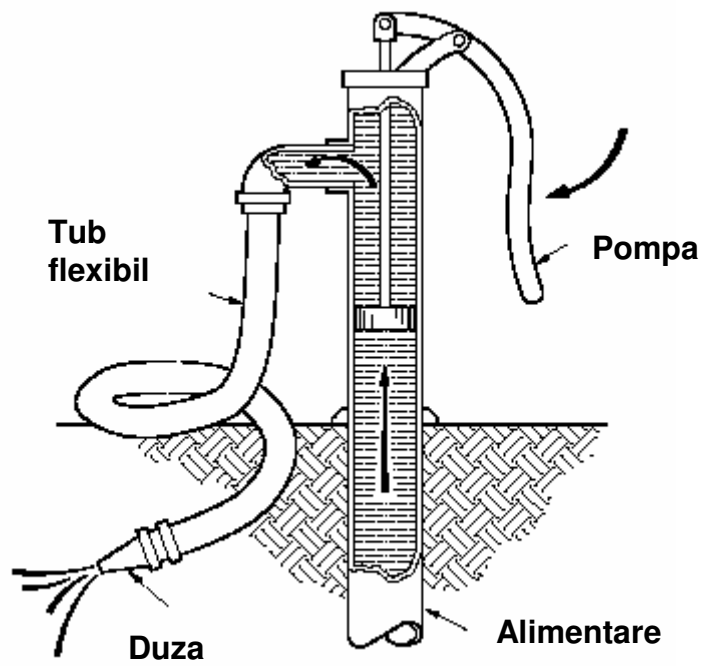


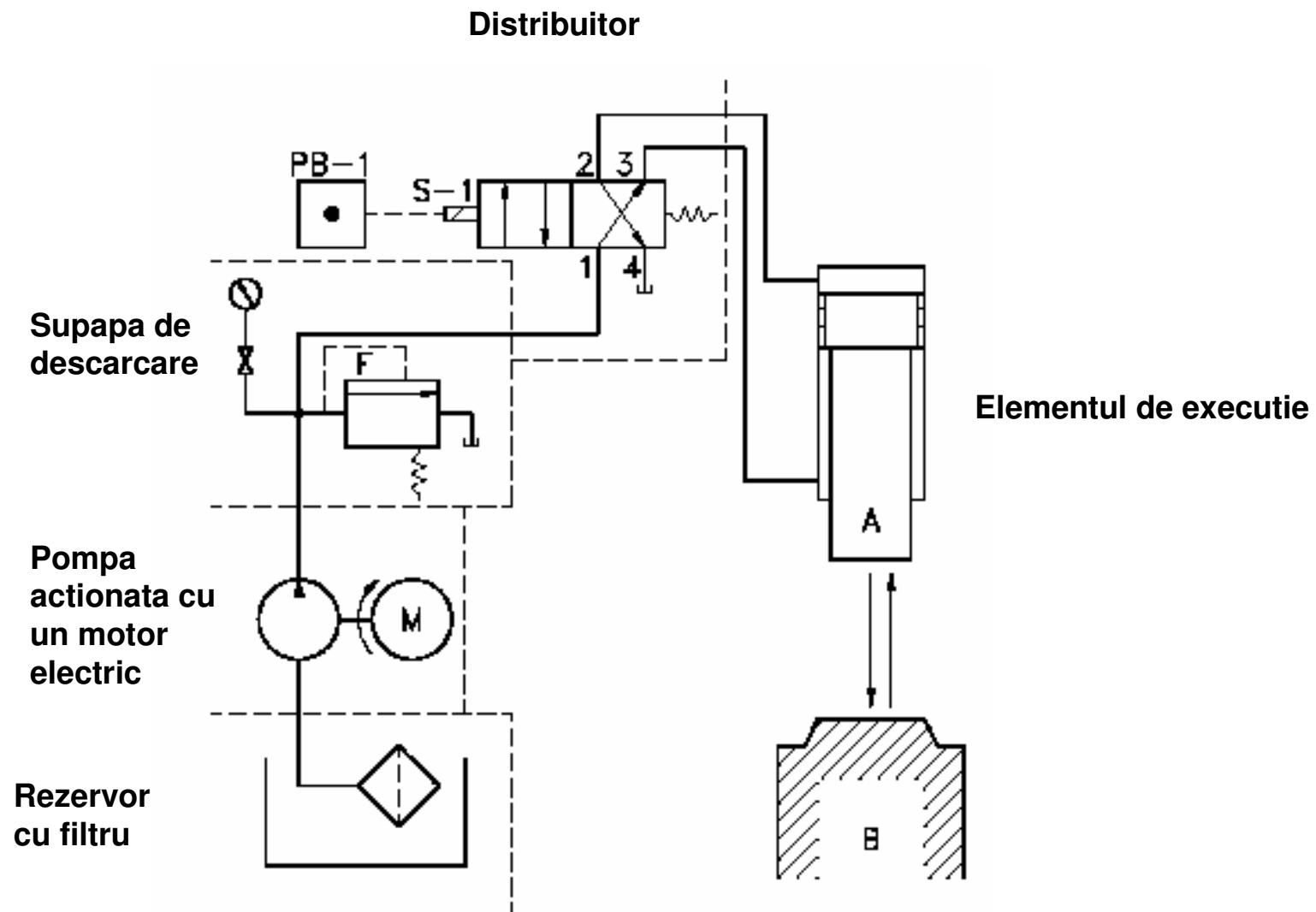
Supapa cu bila



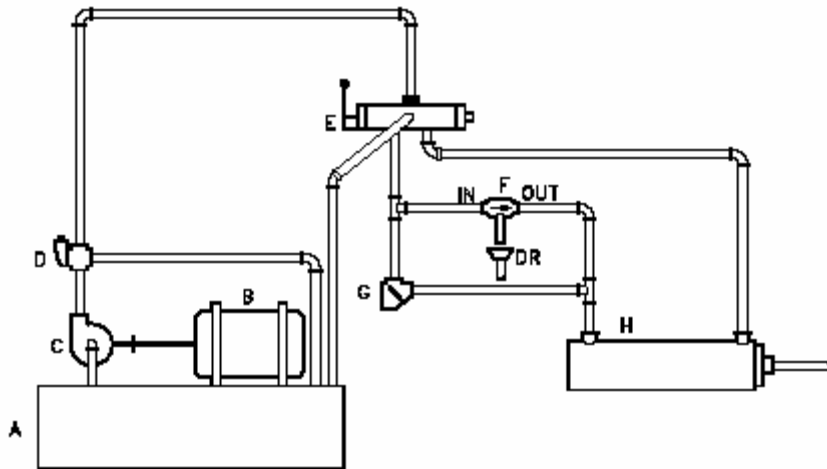
Supapa fluture



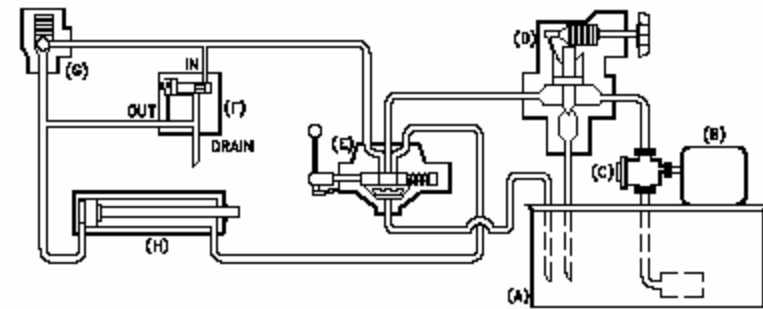




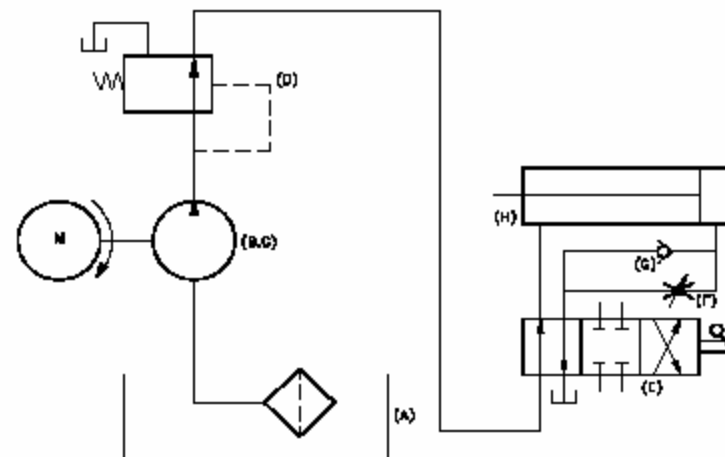
Grafic



Secțiune transversală



Diagrama



Lista elementelor componente

A – Rezervor

B – Motor electric

C – Pompa

D – Supapa de descarcare

E – Distribuitor

F – Drosel

G – Supapa de sens

H – Actuator

2007-2008