Technologie

Les composants pneumatiques (1ère partie)

Energie pneumatique

Production et distribution

Conditionnement de l'air

Actionneurs pneumatiques

Vérins : Simple effet – Double effet - Rotatifs - Autres

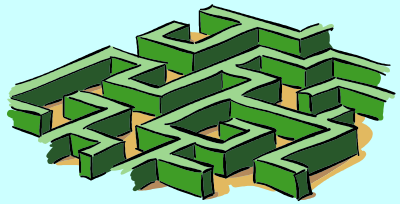
Autres actionneurs

Distributeurs pneumatiques

3/2 - 5/2 - 5/3 centre fermé - 5/3 centre ouvert

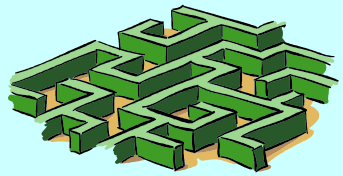
Accessoires et contrôle des vérins

Mise en œuvre



Énergie pneumatique

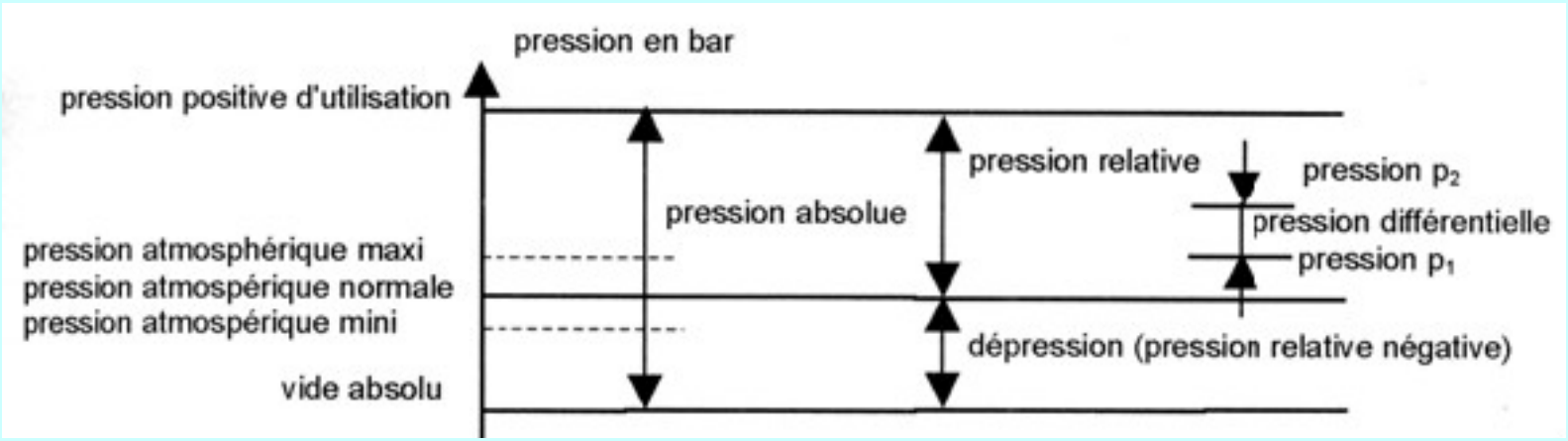
- Air comprimé = fluide pour le transport de l'énergie.
- Unité légale : le pascal (Pa) 1 Pa = 1 N/m²
- Unité usuelle : le bar
  1 bar = 1 daN/cm² = 10^5 Pa.
- Exemples de pression relative :
  - Réseau industriel : 4 à 6 bars
  - Pneumatique d'automobile : ≈ 2 bars
  - Air comprimé en bouteille : 150 bars



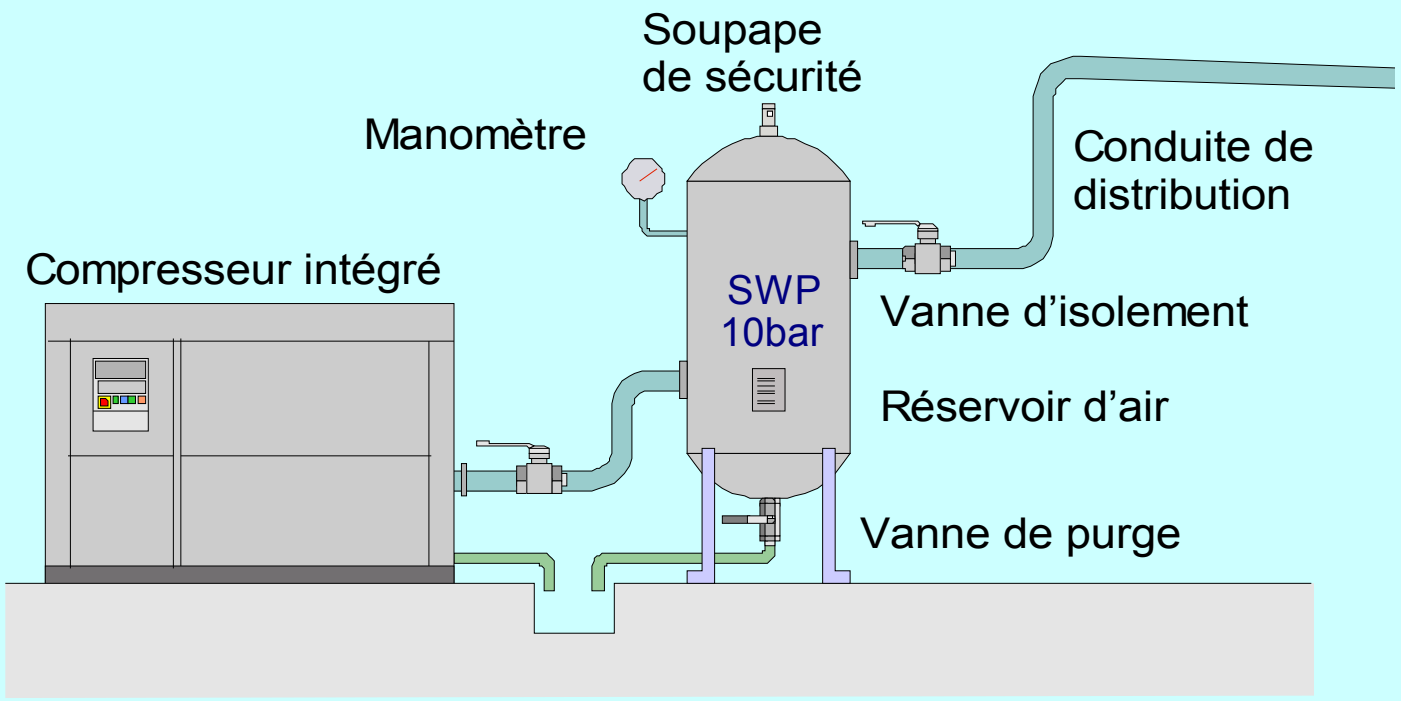
ARS2 - Pneumatique

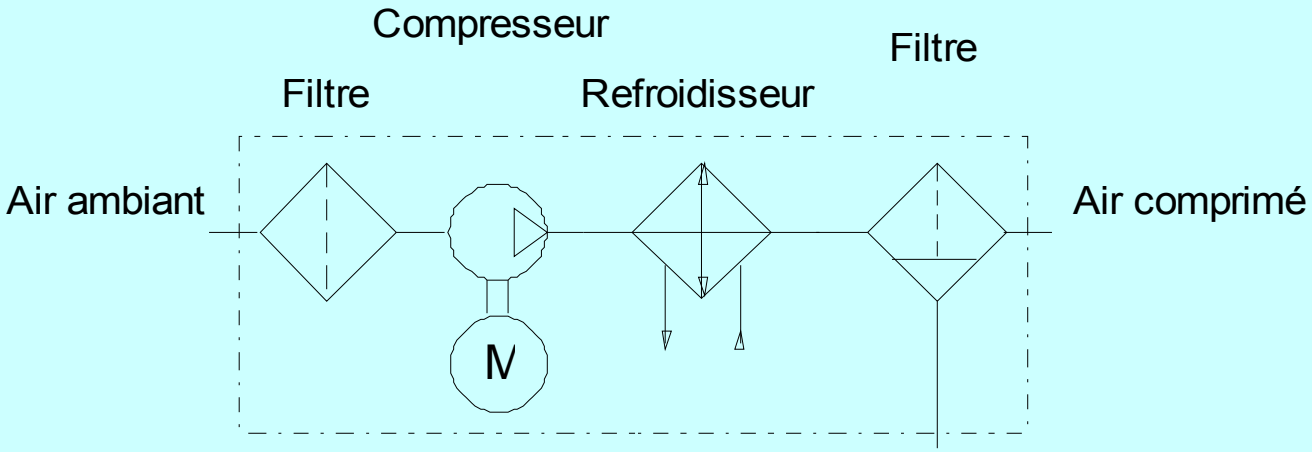
Pression relative / absolue ?

- Sur le terrain :
  pression manométrique = pression relative
- Dans les formules : pression absolue =
  pression atmosphérique + pression relative
  ≈ 1 bar

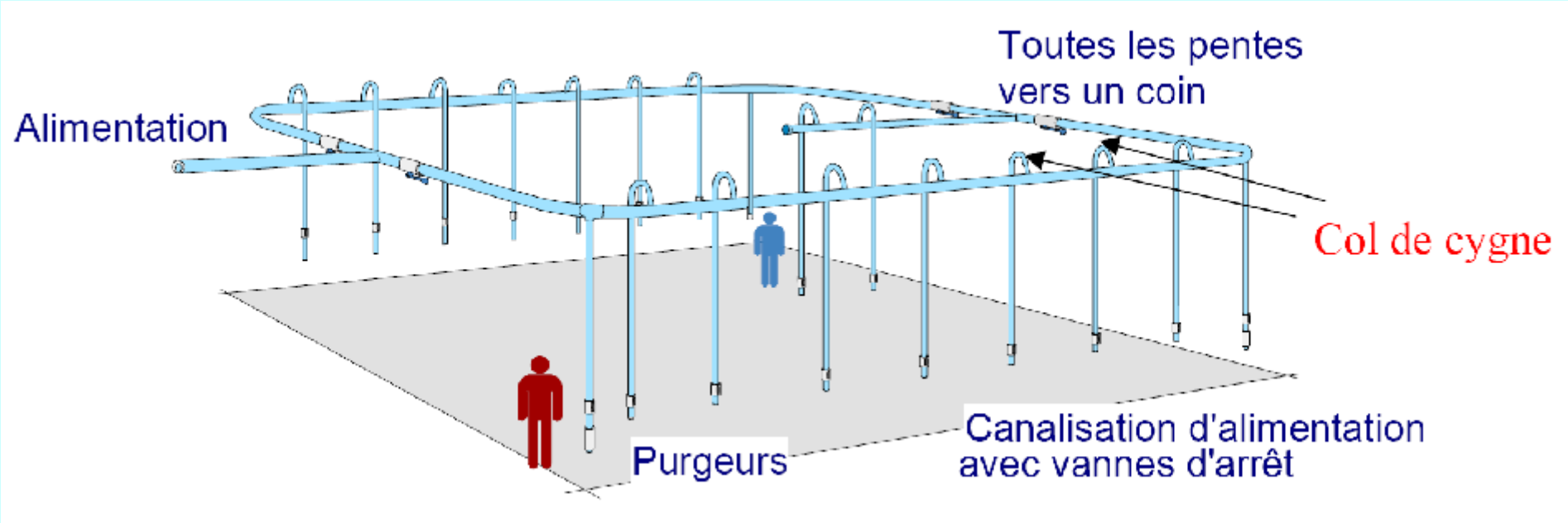


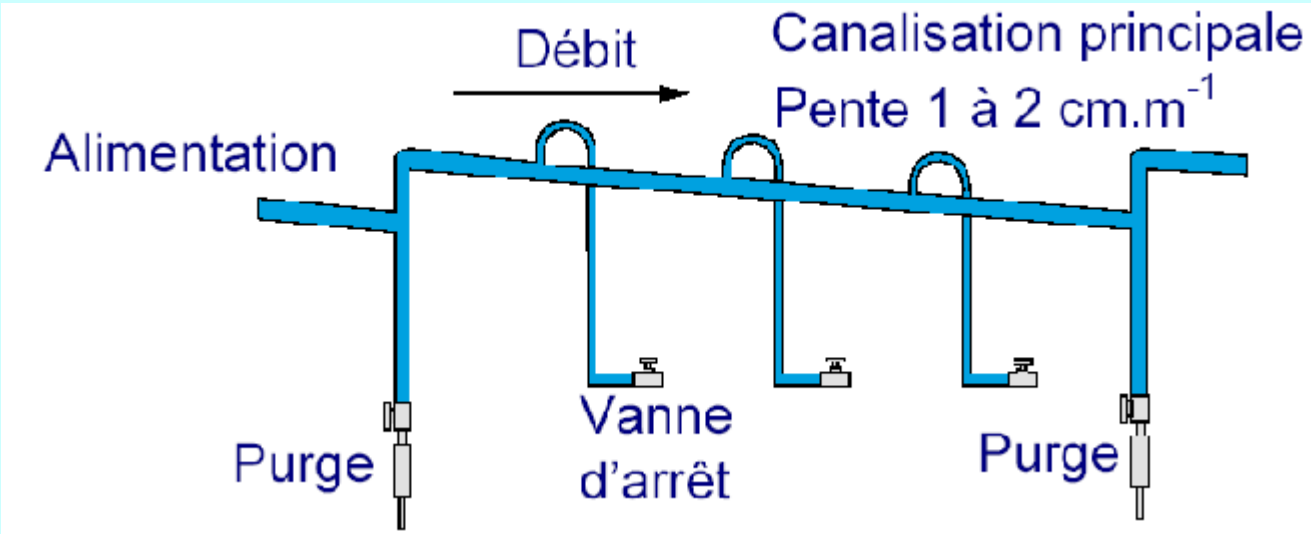
Production de l'énergie pneumatique





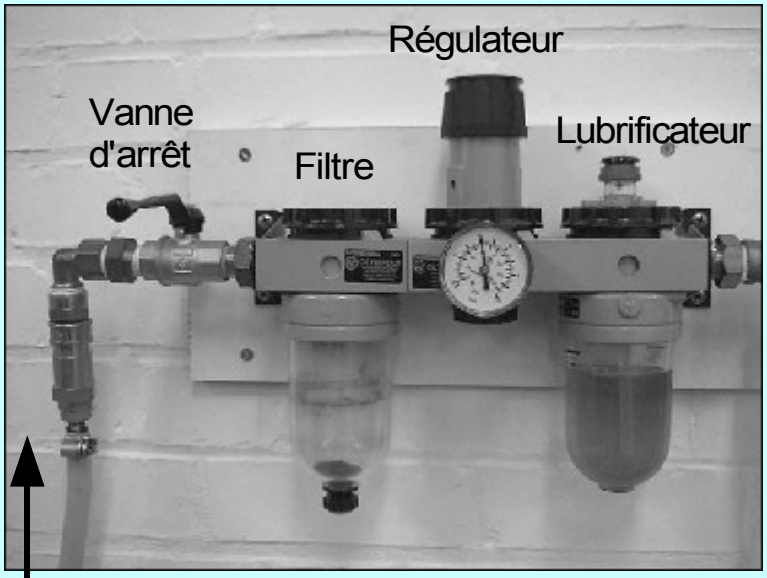
Distribution de l'énergie pneumatique

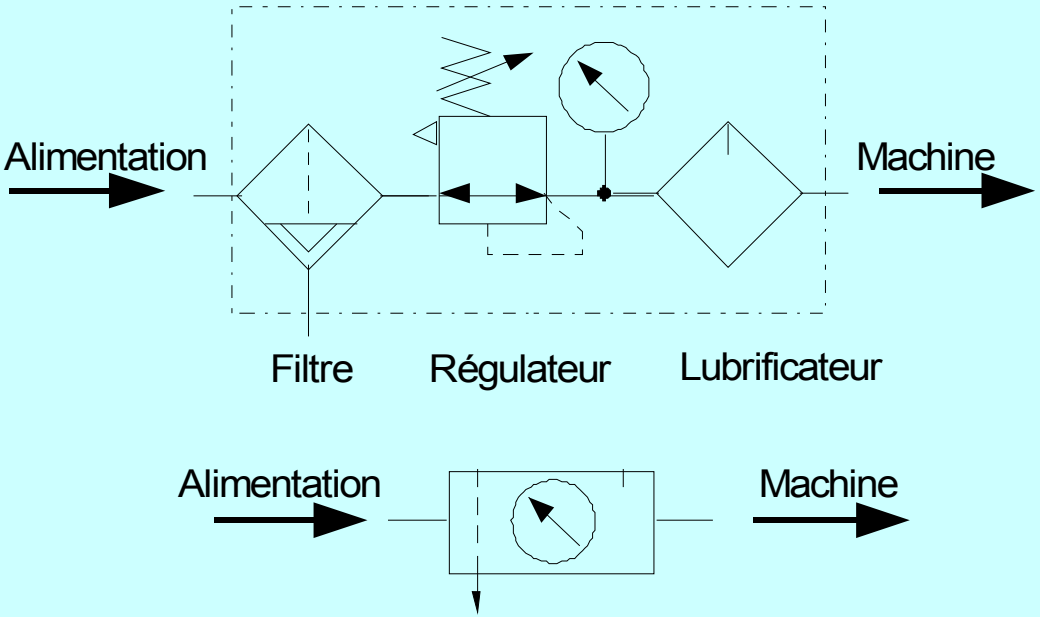




Conditionnement de l'air

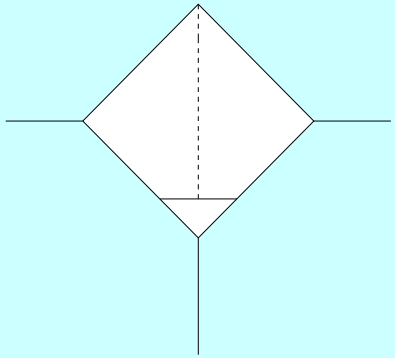
- Unité F.R.L. (« Tête de ligne »)



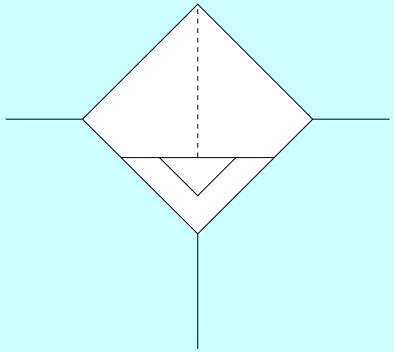


Unité F.R.L. : Le Filtre

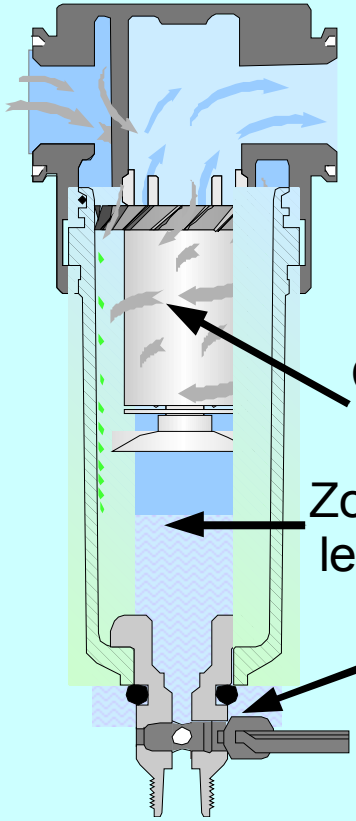
- Eliminer l'humidité
- Recueillir les impuretés



Filtre avec purge manuelle



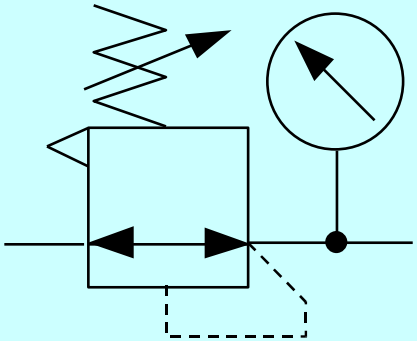
Filtre avec purge auto

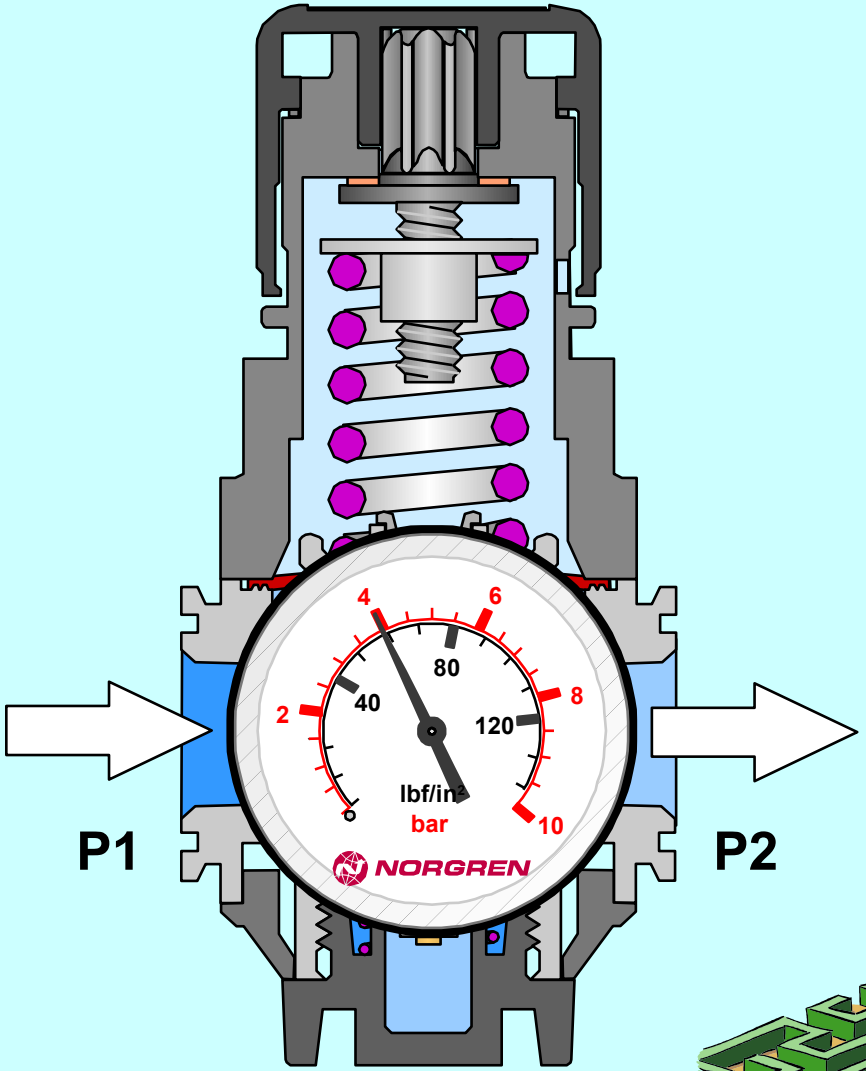


ARS2 - Pneumatique

Mano-régulateur (ou Mano-détendeur)

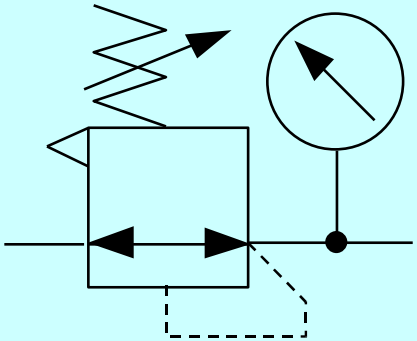
- Réguler la pression
- Régler la pression

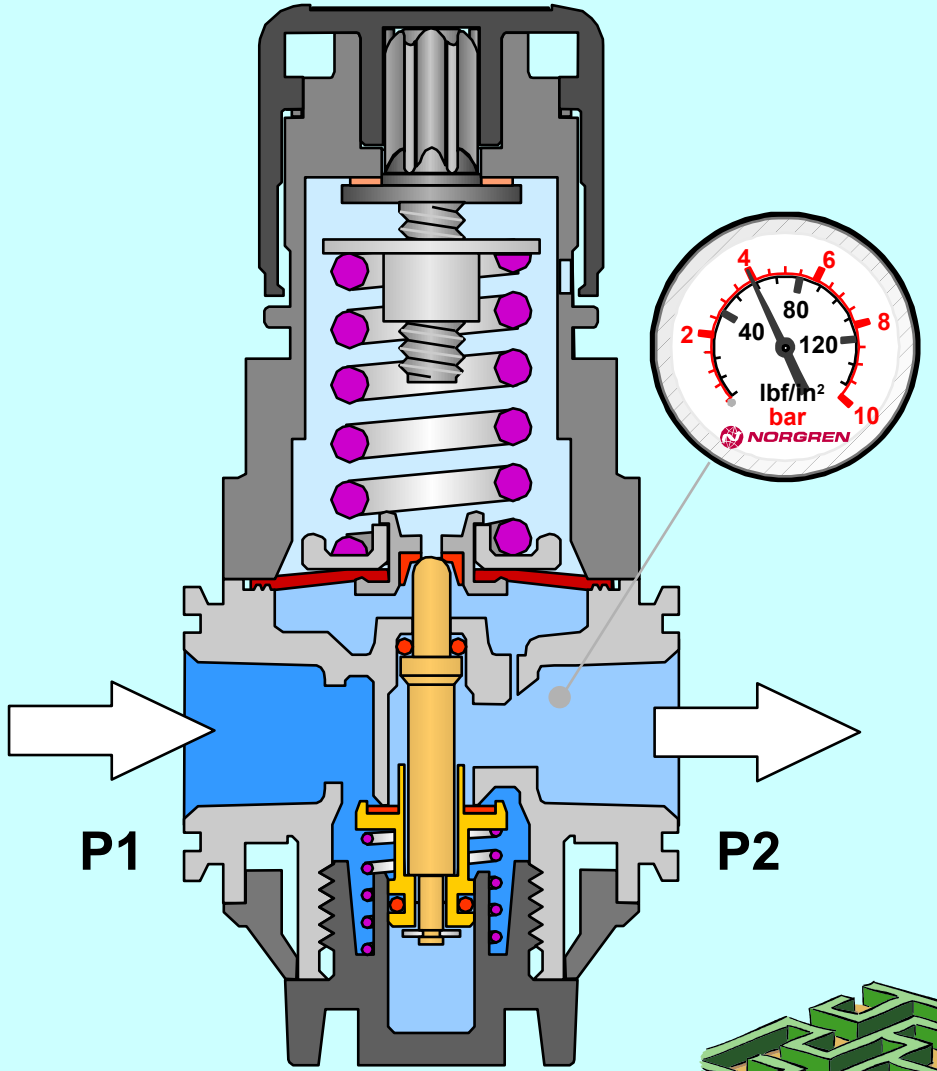




ARS2 - Pneumatique

Mano-régulateur (ou Mano-détendeur)

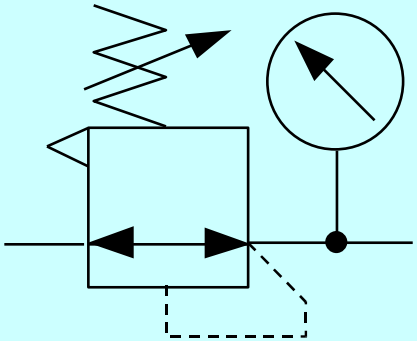


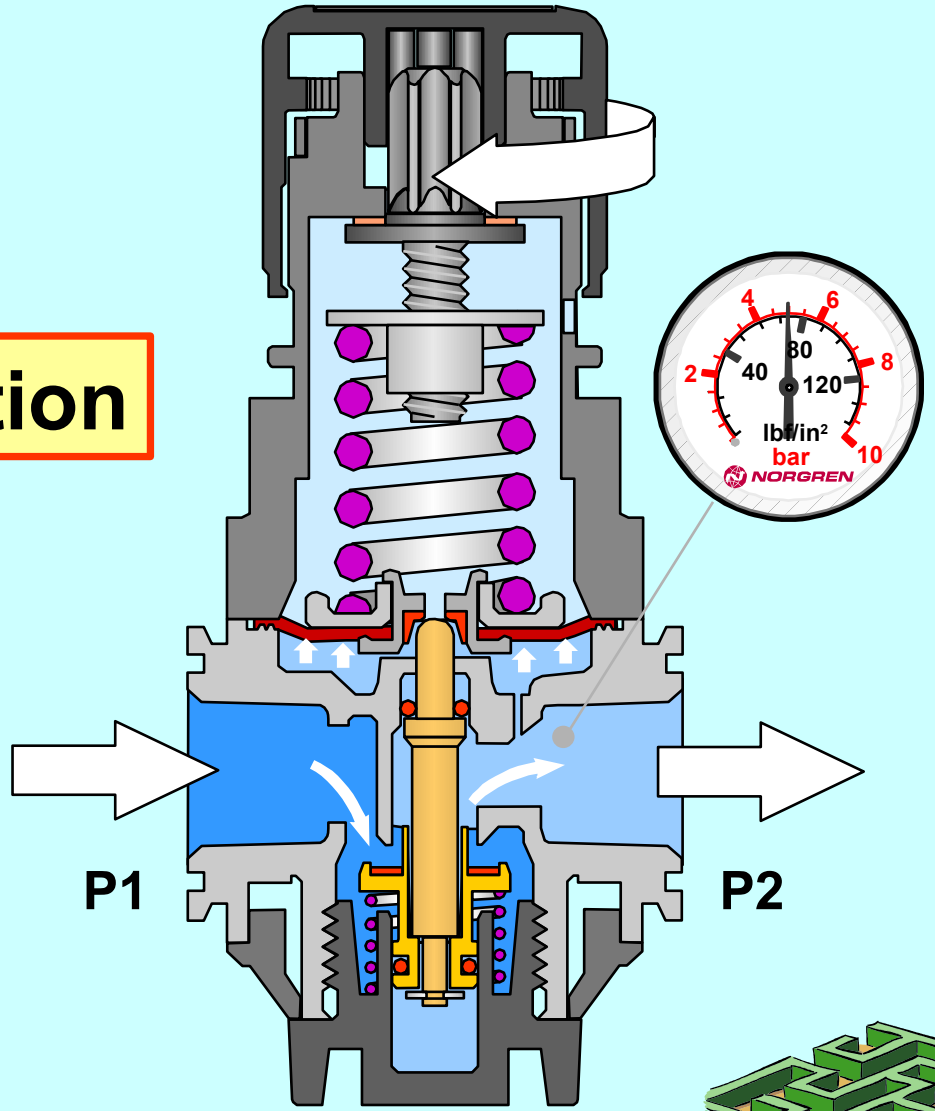


ARS2 - Pneumatique

Mano-régulateur (ou Mano-détendeur)

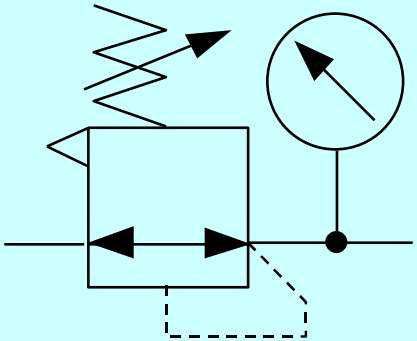
Réglage augmentation

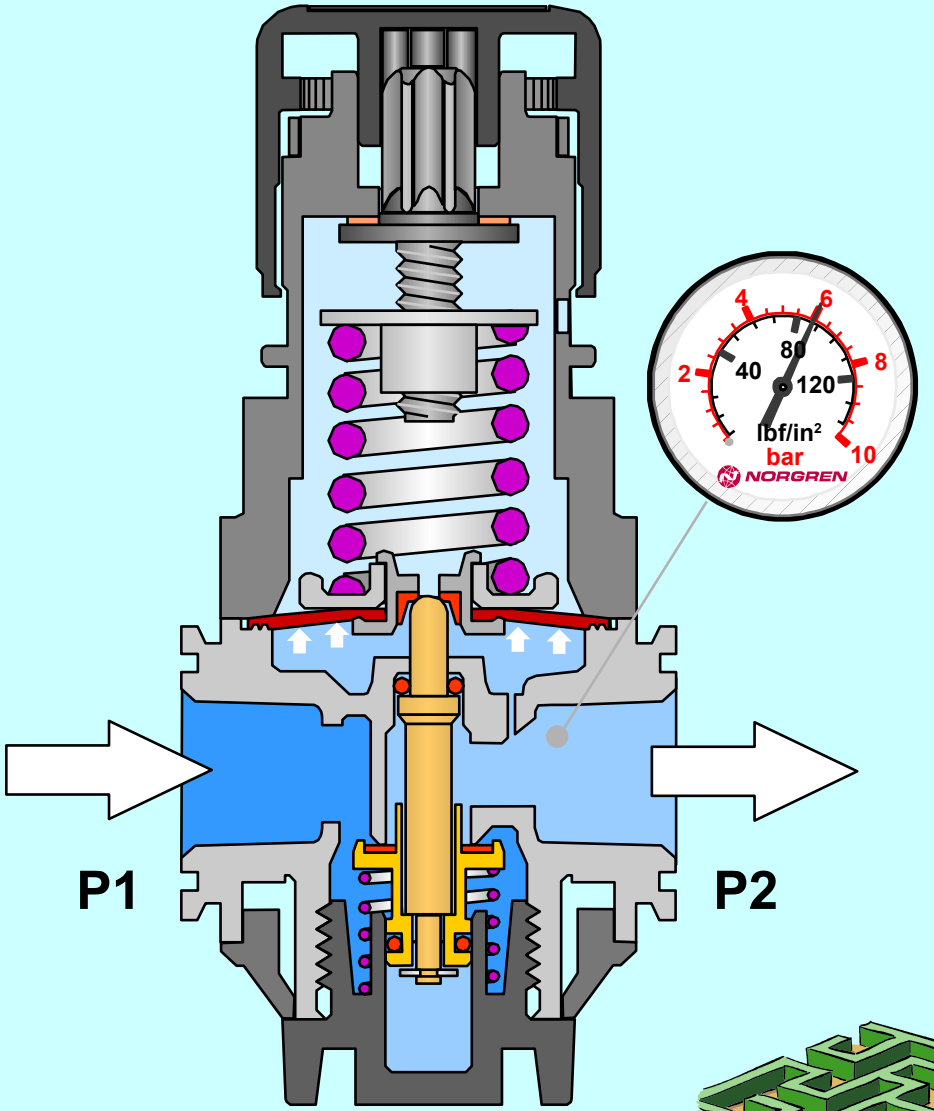




ARS2 - Pneumatique

Mano-régulateur (ou Mano-détendeur)

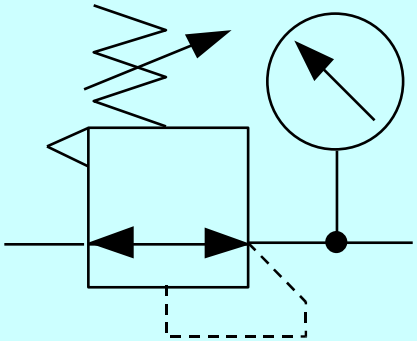


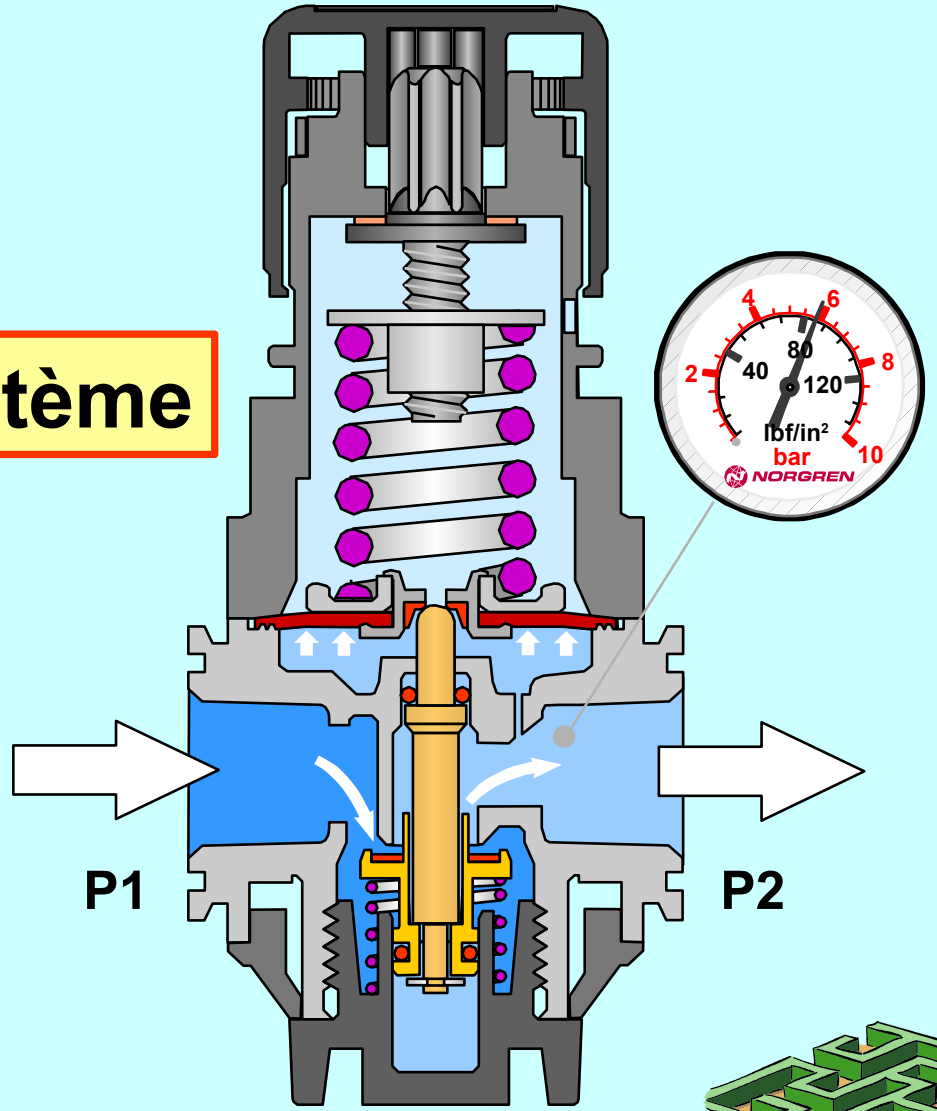


ARS2 - Pneumatique

Mano-régulateur (ou Mano-détendeur)

Consommation système

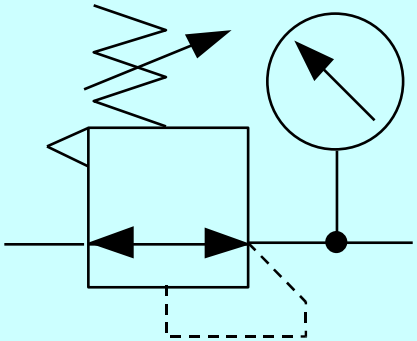


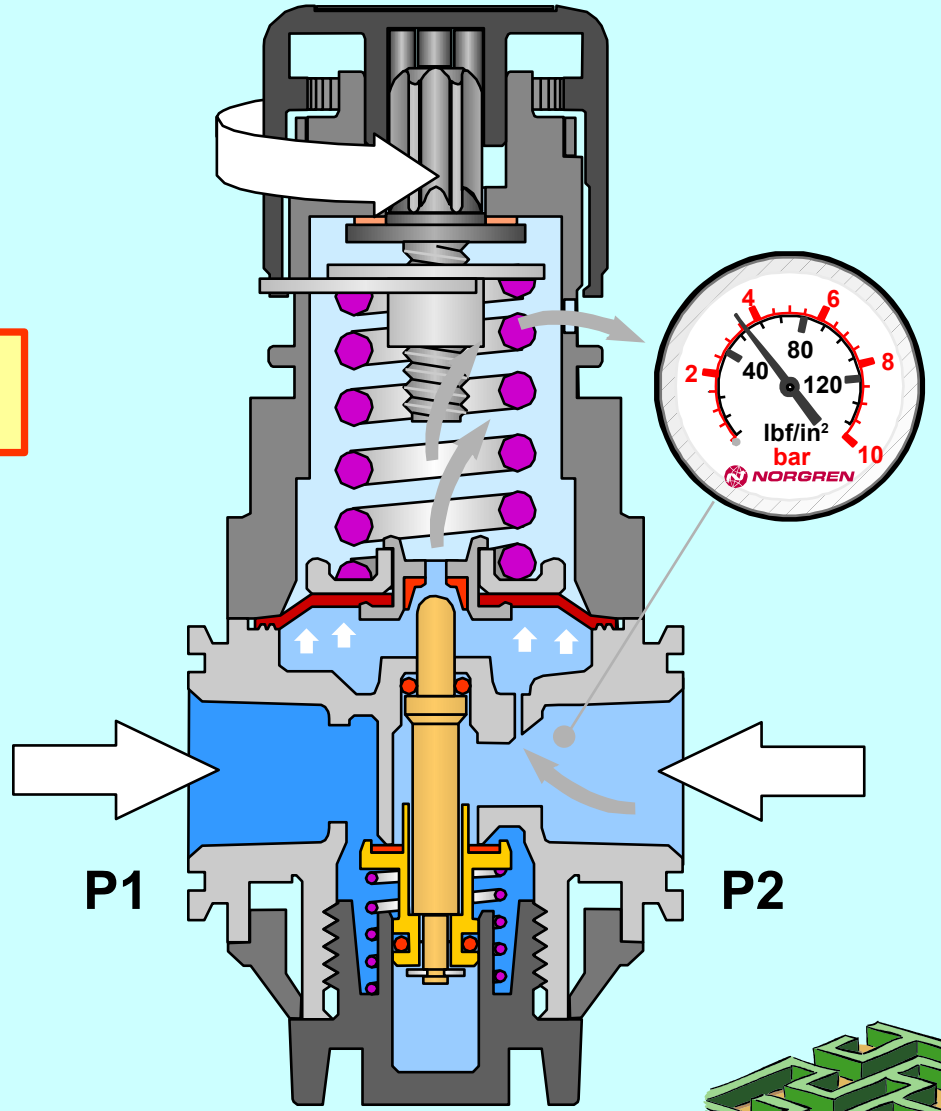


ARS2 - Pneumatique

Mano-régulateur (ou Mano-détendeur)

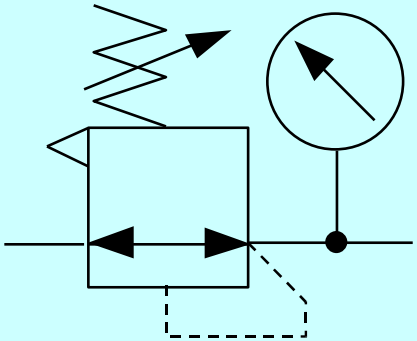
Réglage diminution

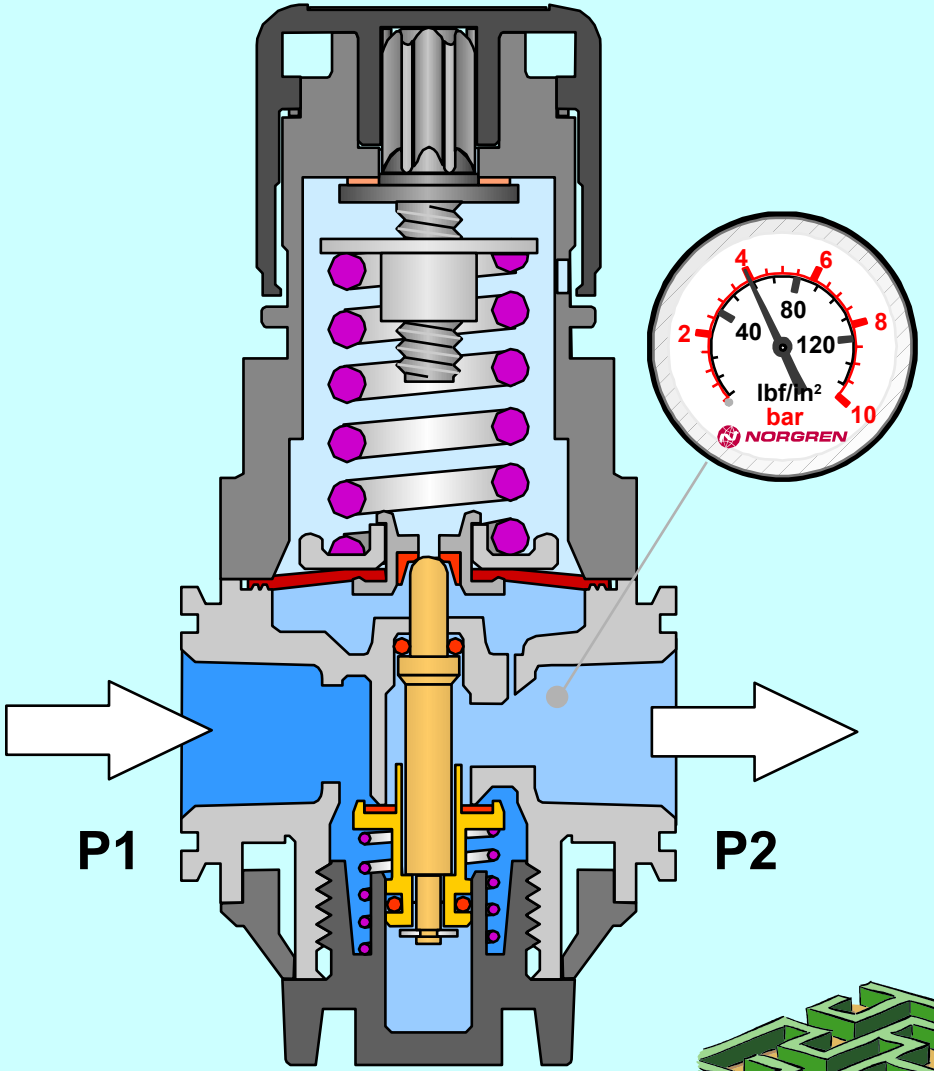




ARS2 - Pneumatique

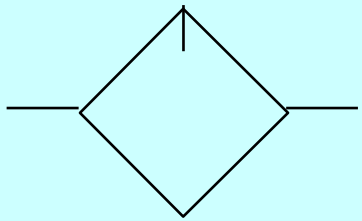
Mano-régulateur (ou Mano-détendeur)

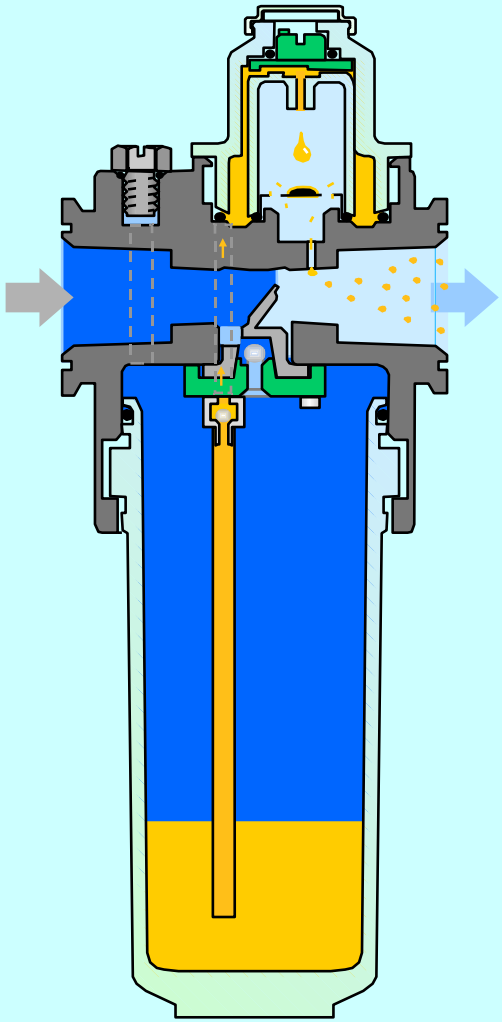


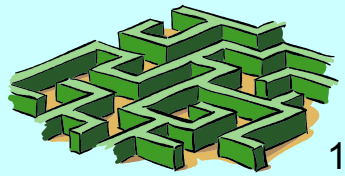


Lubrificateur

- Eviter la corrosion
- Améliorer le glissement

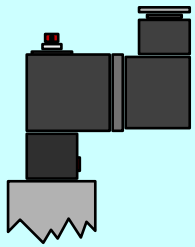
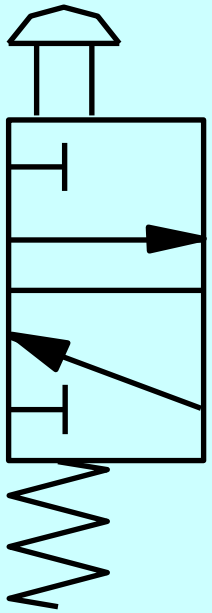




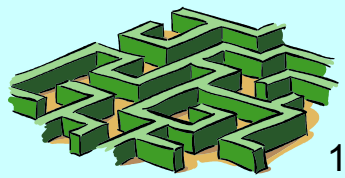


Sectionneur-purgeur

- Vanne assurant le mise en/hors énergie…
  manœuvré manuellement ou électriquement.

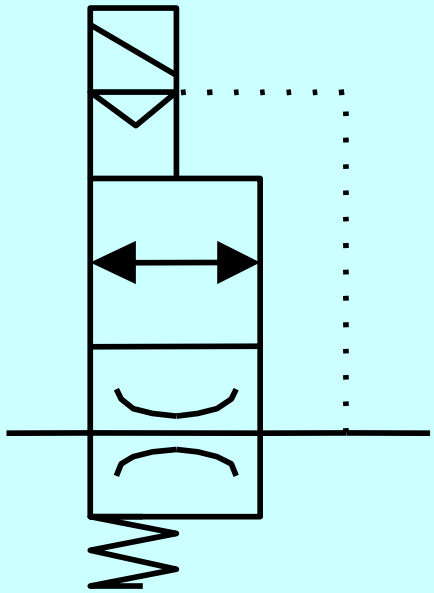
- Isoler le circuit pneumatique de la machine par rapport à la source.
- Vider le circuit pneumatique de la machine.



Démarreur progressif

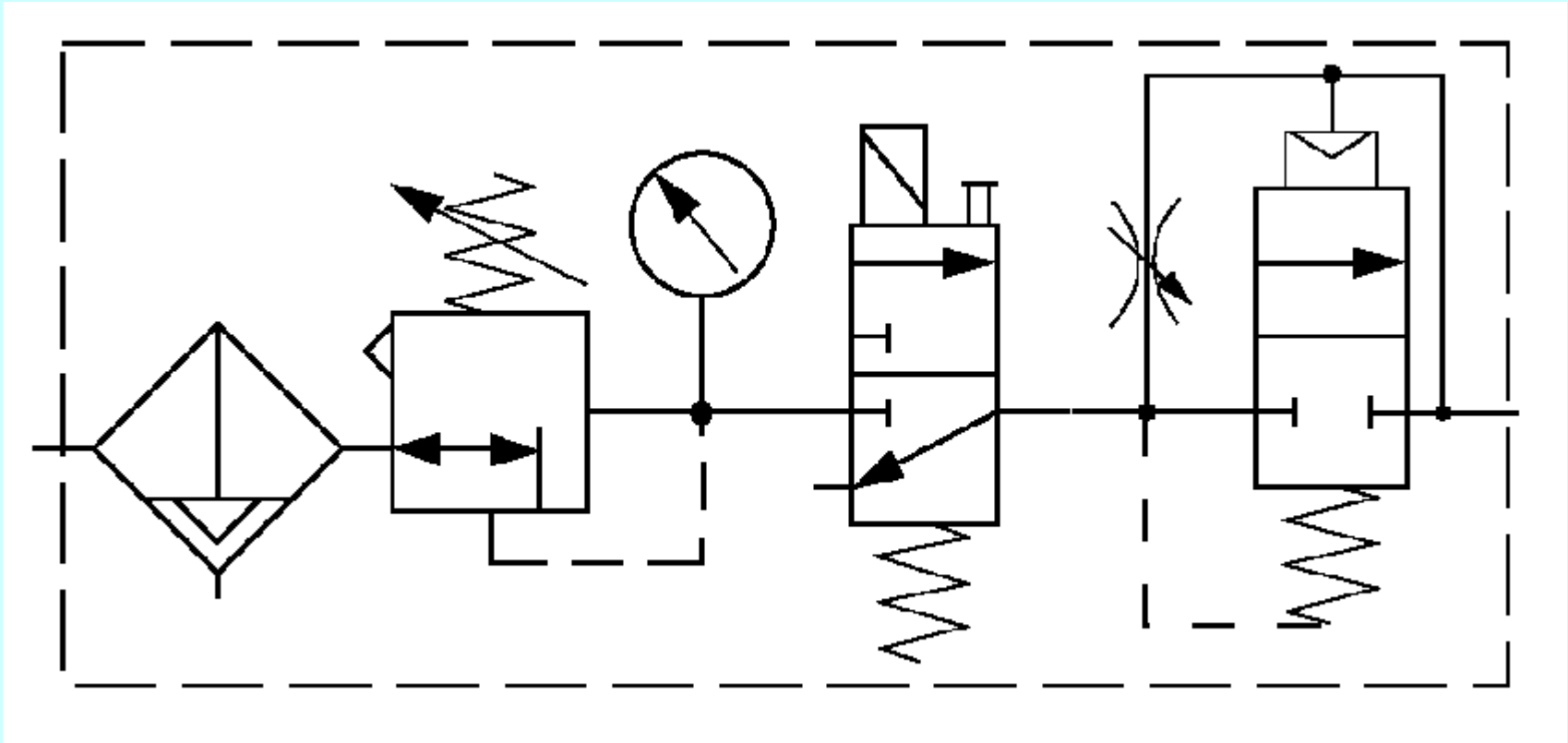
- Montée progressive de la pression
- Evite l'effet catapulte au démarrage

- Monté en sortie du FRL ou après le sectionneur général.



ARS2 - Pneumatique

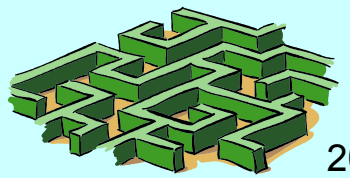
Filtre + Mano-détendeur + Sectionneur - purgeur + Démarreur progressif



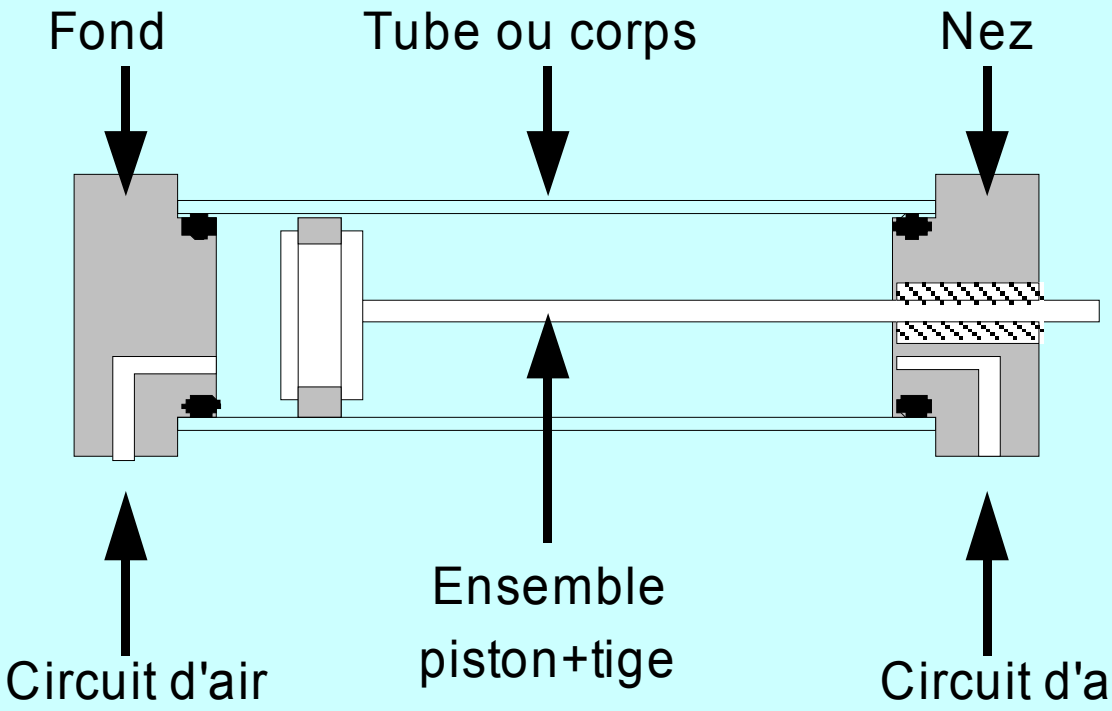
Actionneurs pneumatiques

- Convertir l'énergie de puissance pneumatique en énergie mécanique
  - de translation,
  - de rotation,
  - d'aspiration.

- Vérins
- Moteurs
- Ventouses (Générateurs de vide)

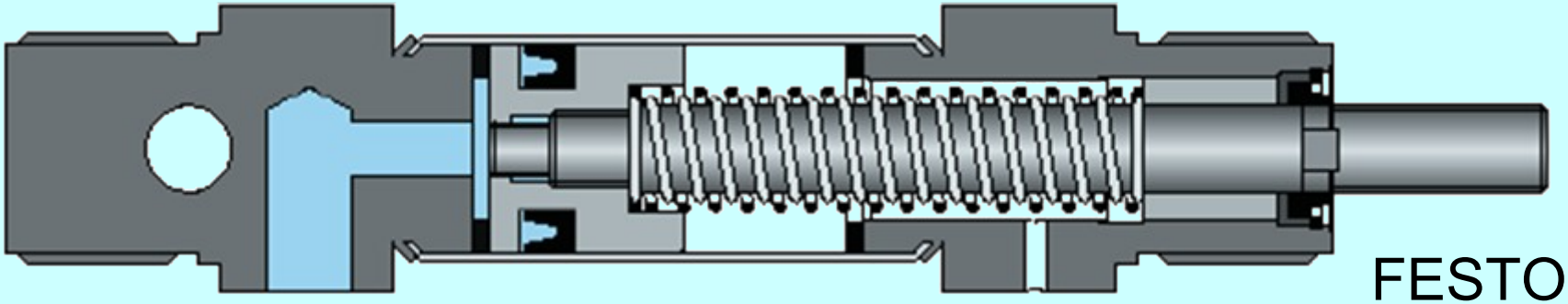


Constitution d'un vérin

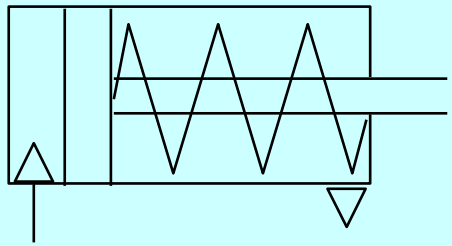


ARS2 - Pneumatique

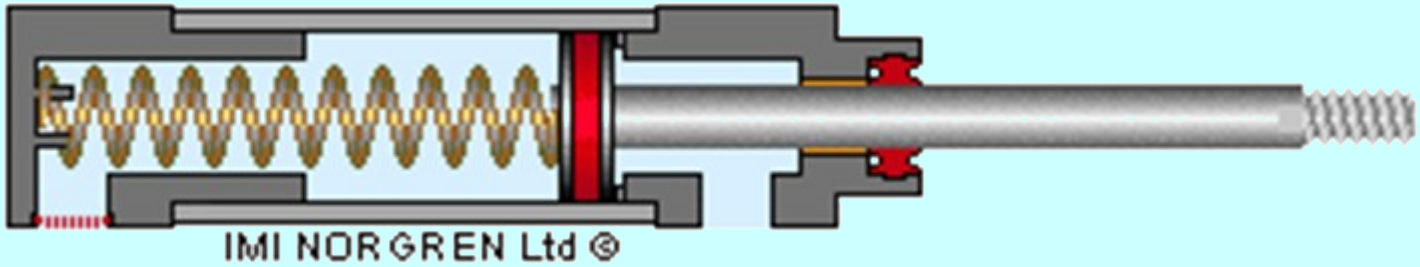
Vérin Simple Effet



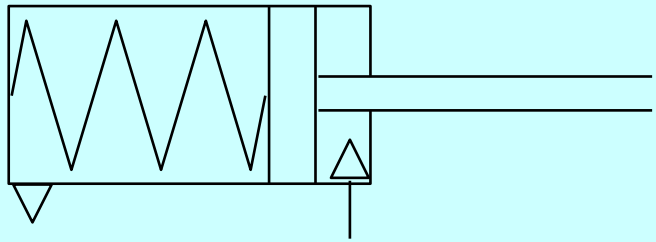
- **Position repos : tige rentrée**



Vérin Simple Effet

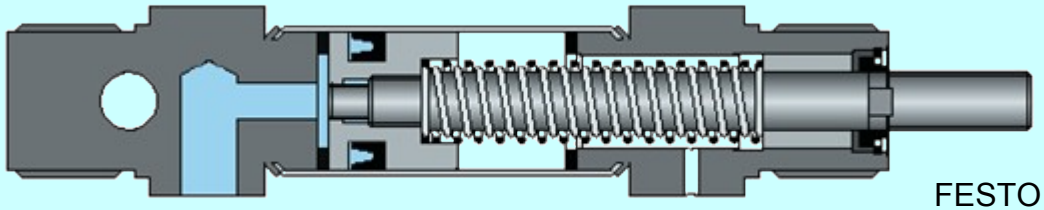


- **Position repos : tige sortie**

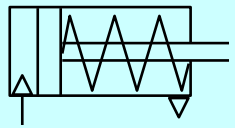


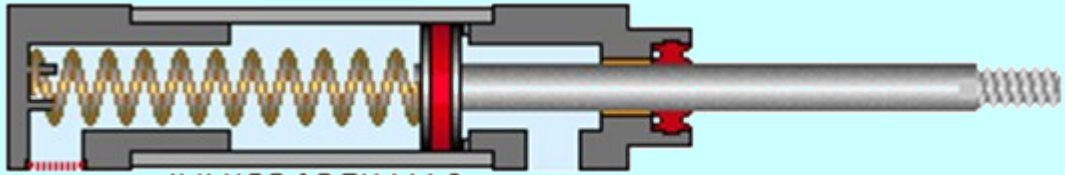
ARS2 - Pneumatique

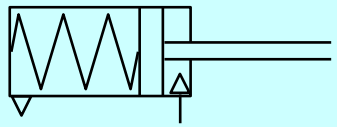
Vérin Simple Effet



FESTO



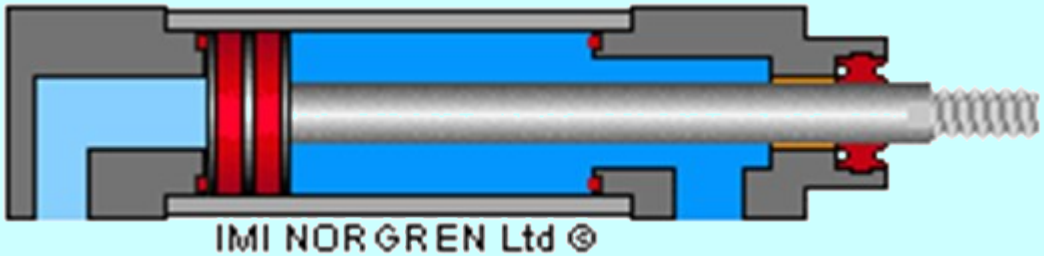


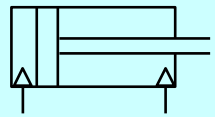


- **Revient en position repos en cas de coupure pneumatique**
- **Nb de canalisation =1**
- **Dimensionnement : ne pas oublier la force du ressort !**

ARS2 - Pneumatique

Vérin Double Effet





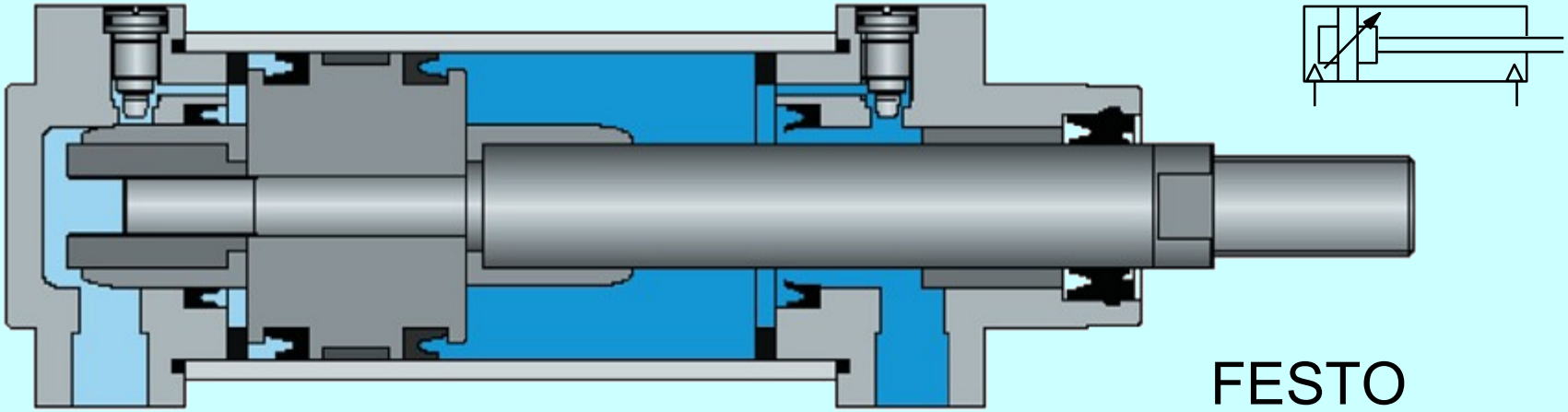
- **Reste en position en cas de coupure pneumatique**

- **Effort en poussant : F = P . S**
- **Effort en rentrant : F = P . (S – S_{tige})**

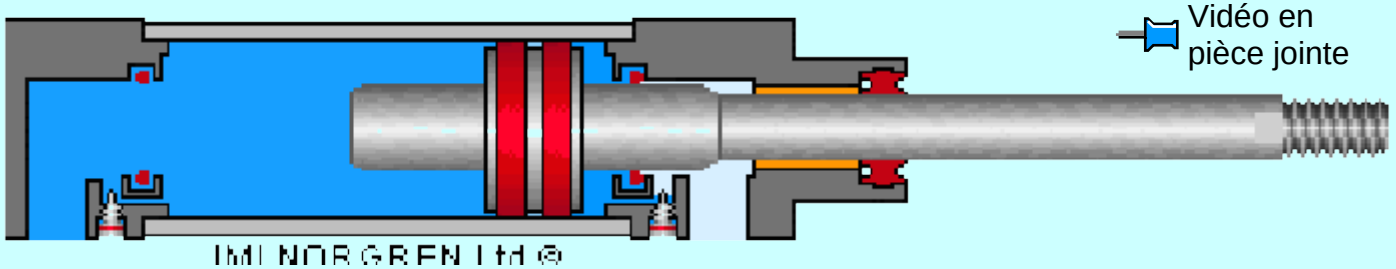
- **Avec ou sans amortissement**

ARS2 - Pneumatique

Vérin Double Effet - Amortissement réglable



FESTO

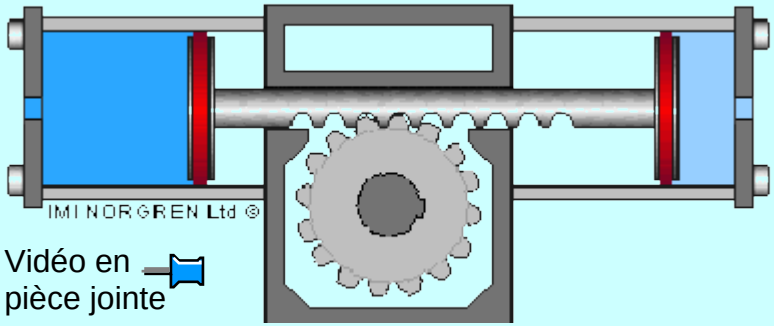


Vidéo en pièce jointe

ARS2 - Pneumatique

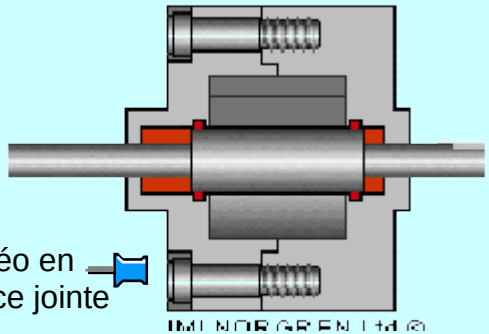
Vérins rotatifs

Pignon-crémaillère

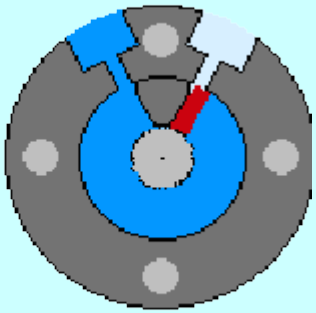


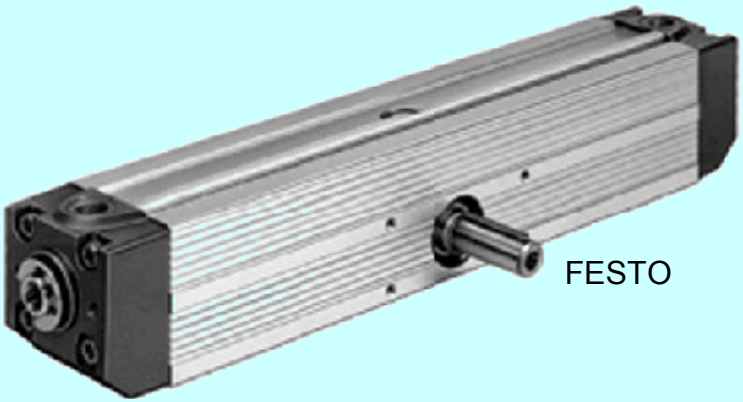
Vidéo en pièce jointe

270°

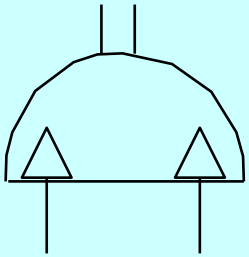


Vidéo en pièce jointe





FESTO



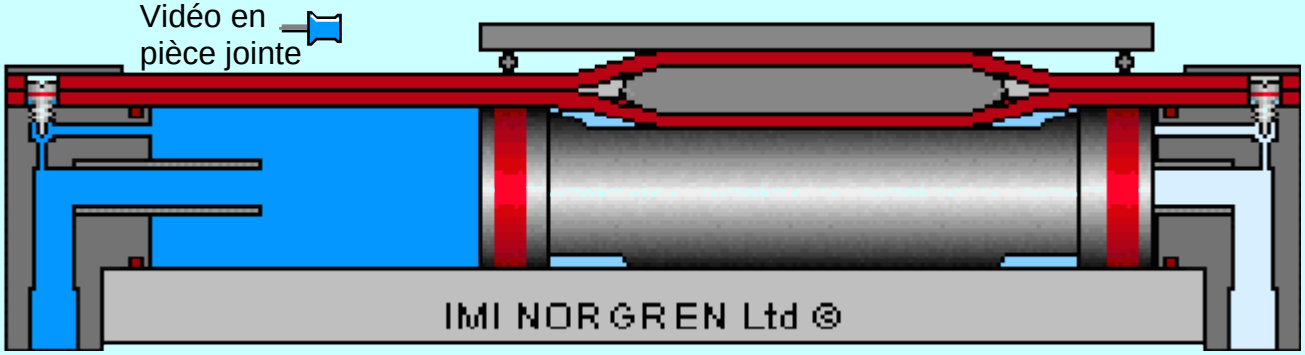
FESTO

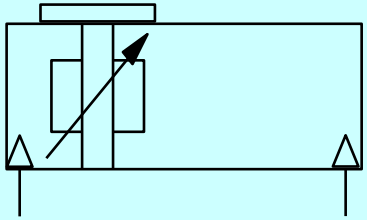
ARS2 - Pneumatique

Autres vérins

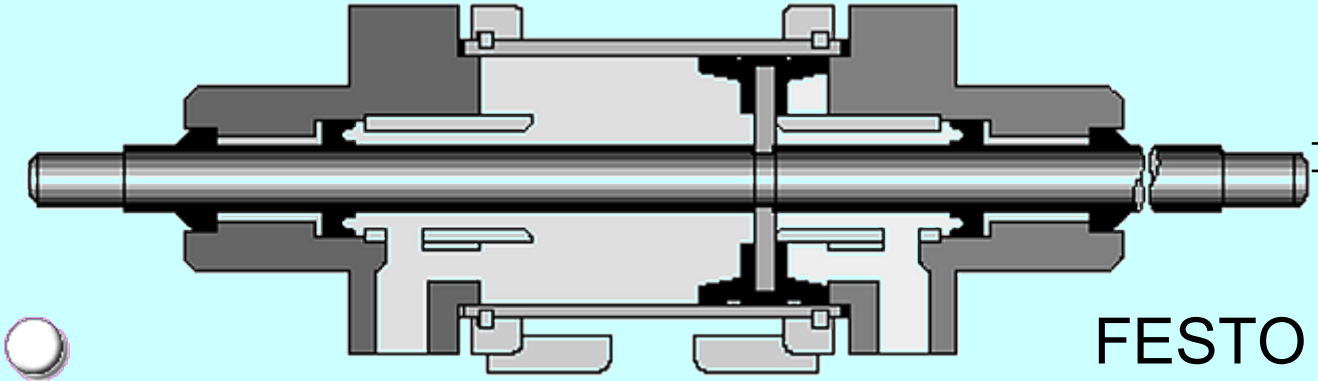
Vérin sans tige

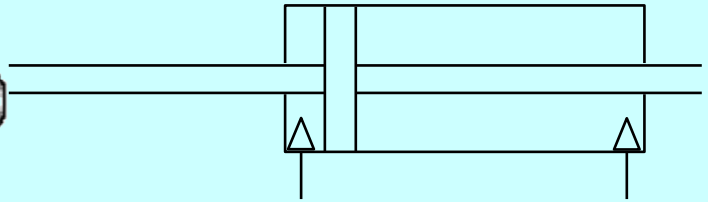
Vidéo en pièce jointe





Vérin double tige

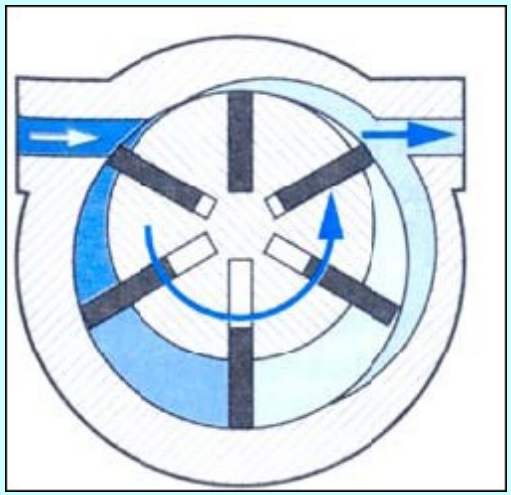


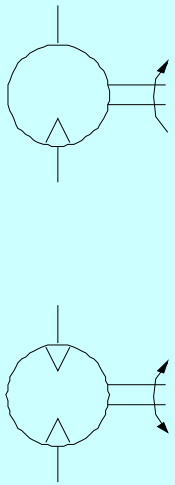


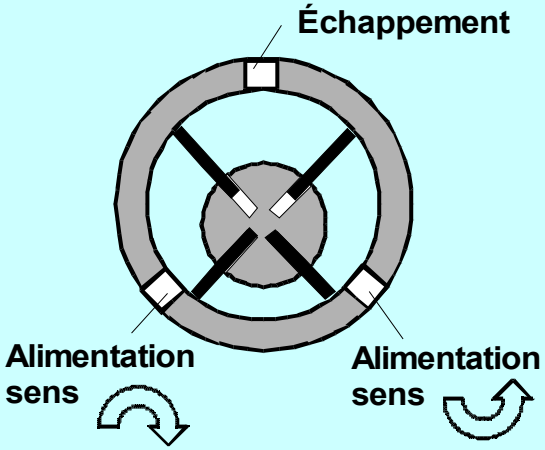
FESTO

Autres actionneurs pneumatiques

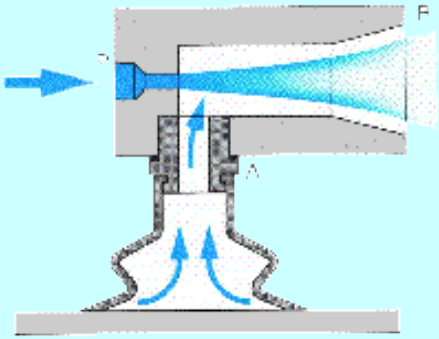
Moteurs à palette

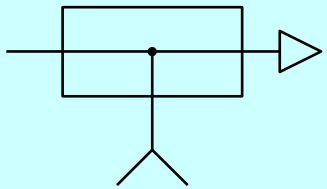






Ventouses (Générateur de vide, effet Venturi)





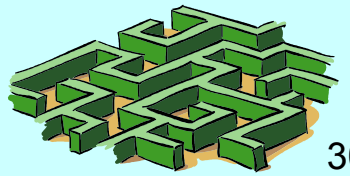
Taux de charge des actionneurs

- Pour utiliser le vérin dans de bonnes conditions…
- pour tenir compte des effets de la contre-pression.
- Taux de charge =

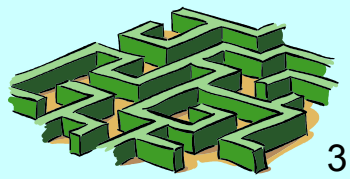
$$\frac{\text{Effort maximal demandé au vérin}}{\text{Effort maximal que le vérin peut produire}}$$

compris entre 0,5 et 0,8.

- En pratique, il faut respecter les recommandations du fabricant.



Principales ressources utilisées pour la conception de ce diaporama

- FISSETTE, Paul. Pneumatique, 1 : Air comprimé et composant (pneumatique1forweb.pdf). <http://www.prm.ucl.ac.be/cours/meca2755/ >.
- FESTO. Dossiers pédagogiques. < http://www.festo.com/INetDomino/be/fr/73b8a0579e24b2e5c1256db7005 >
- HOAREAU, J-P. Animations flash : actionneurs et distribution pneumatique. <http://perso.wanadoo.fr/geea.org/PNEUM/pneum.zip>
- HU, Jean-Louis. Circuit puissance pneumatique. < http://perso.wanadoo.fr/hu.jean-louis/ressourc/auto/telecha/puispneu.zip >.
- ISAMBERT, Loïc. Fonction puissance en pneumatique. < http://www.geea.org/IMG/pdf/pneumatique.pdf>.

Ressources consultées en février 2006