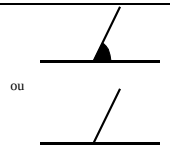
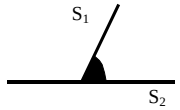
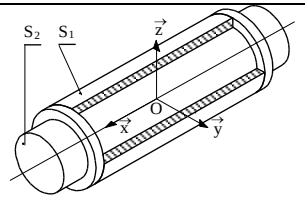
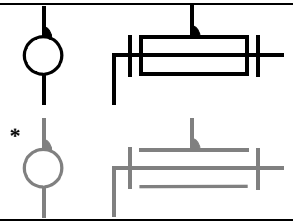
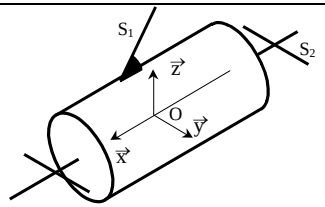
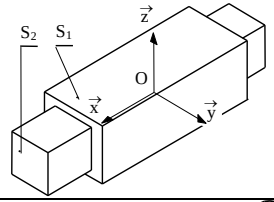
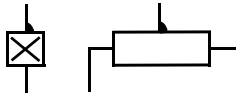
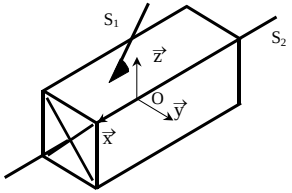
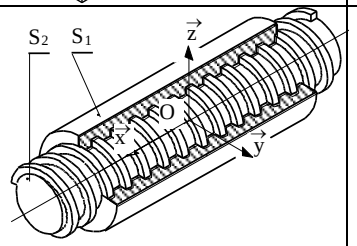
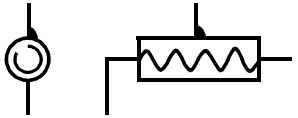
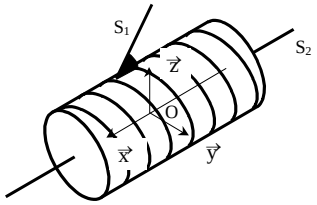
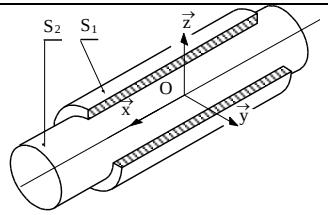
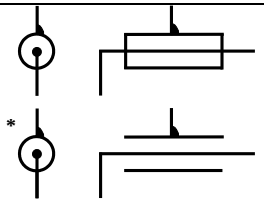
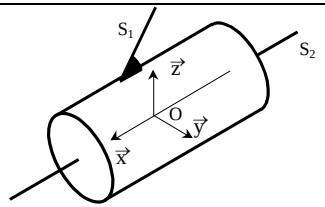
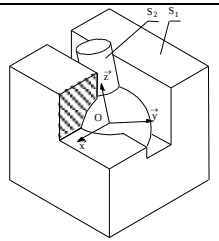
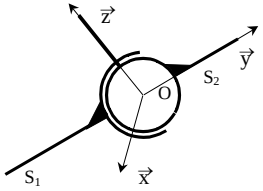
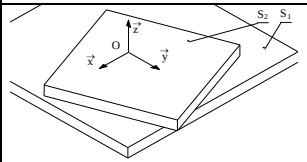
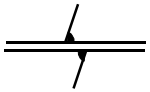
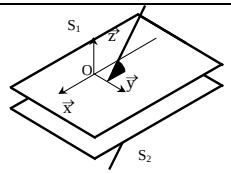
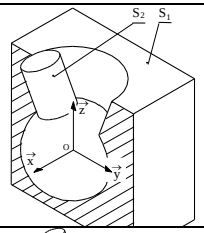
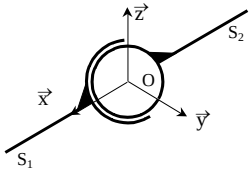
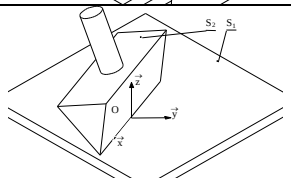
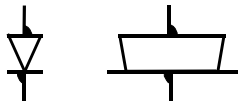
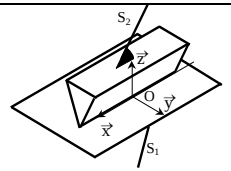
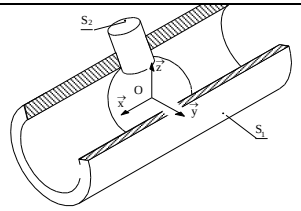
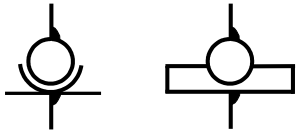
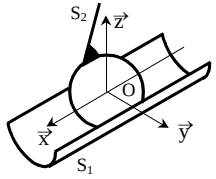
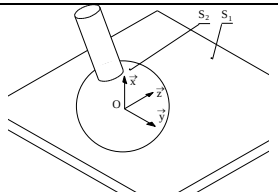
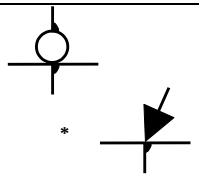
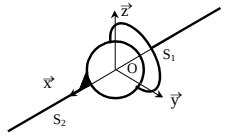
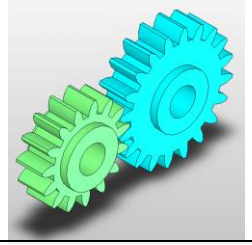
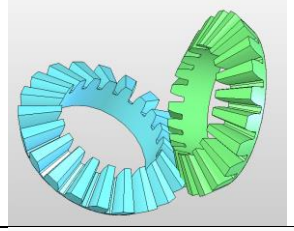
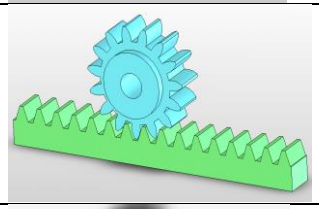
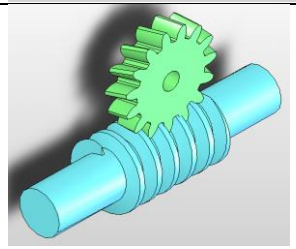
Liaisons usuelles entre deux solides d'après NF EN 23952, ISO 3952

Désignation	Degré de liberté		SYMBOLES		Torseur cinématique dans la base $(\vec{x},\vec{y},\vec{z})$	Forme particulière conservée
			Vues planes	Perspective		
Liaison encastrement ou liaison fixe	**0**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}0&0\\0&0\\0&0\end{Bmatrix}_P$	
Liaison pivot d'axe $(0,\vec{x})$	**1**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}\omega_x&0\\0&0\\0&0\end{Bmatrix}_P$	$\forall$ P $\in$ à l'axe $(0,\vec{x})$
Liaison glissière de direction $\vec{x}$	**1**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}0&v_x\\0&0\\0&0\end{Bmatrix}_P$	$\forall$ P
Liaison hélicoïdale d'axe $(0,\vec{x})$	**1**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}\omega_x&v_x\\0&0\\0&0\end{Bmatrix}_P$ avec $\lvert V_x\rvert=\frac{\text{pas}}{2\pi}\lvert\omega_x\rvert$	$\forall$ P $\in$ à l'axe $(0,\vec{x})$
Liaison pivot glissant d'axe $(0,\vec{x})$	**2**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}\omega_x&v_x\\0&0\\0&0\end{Bmatrix}_P$	$\forall$ P $\in$ à l'axe $(0,\vec{x})$

Liaison sphérique à doigt centre O direction du doigt $\vec{z}$ plan de la rainure $(\vec{y},\vec{z})$	**2**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}\omega_x & 0\\ 0 & 0\\ \omega_z & 0\end{Bmatrix}_P$	En O centre de la sphère
Liaison appui plan de normale $\vec{z}$	**3**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}0 & v_x\\ 0 & v_y\\ \omega_z & 0\end{Bmatrix}_P$	$\forall$ P
Liaison sphérique de centre O	**3**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}\omega_x & 0\\ \omega_y & 0\\ \omega_z & 0\end{Bmatrix}_P$	En O centre de la sphère
Liaison linéaire rectiligne droite de contact $(0,\vec{x})$ et plan tangent au contact $(\vec{x},\vec{y})$	**4**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}\omega_x & v_x\\ 0 & v_y\\ \omega_z & 0\end{Bmatrix}_P$	$\forall$ P $\in$ au plan $(0\,;\vec{x},\vec{z})$
Liaison linéaire annulaire d'axe $(0,\vec{x})$	**4**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}\omega_x & v_x\\ \omega_y & 0\\ \omega_z & 0\end{Bmatrix}_P$	En O centre de la sphère
Liaison sphère plan de centre O plan tangent au contact $(O,\vec{y},\vec{z})$	**5**				$\left\{V(S_2/S_1)\right\}=\begin{Bmatrix}\omega_x & 0\\ \omega_y & v_y\\ \omega_z & v_z\end{Bmatrix}_P$	$\forall$ P $\in$ à l'axe $(0,\vec{x})$

Les engrenages

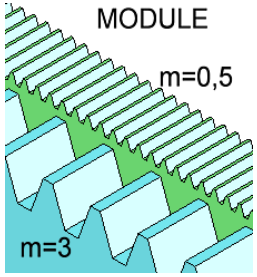
Un engrenage est un mécanisme composé de deux roues dentées.
L'une des roues entraîne l'autre par l'action des dents qui sont successivement en contact.
La roue qui a le plus petit nombre de dents est appelée pignon.
Une combinaison d'engrenages est appelée train d'engrenages.
Selon la position relative des axes, on distingue :

Engrenage cylindrique à denture droite		$\frac{\omega_{20}}{\omega_{10}} = \pm\frac{Z_1}{Z_2} = \pm\frac{R_1}{R_2} = \pm\frac{D_1}{D_2}$ - si contact extérieur + si contact intérieur
Engrenage conique à denture droite		$\frac{\omega_{20}}{\omega_{10}} = \pm\frac{Z_1}{Z_2} = \pm\frac{R_1}{R_2} = \pm\frac{D_1}{D_2}$
Pignon crémaillère		$R_2.\omega_{20} = V_1$
Roue et vis sans fin		$\frac{\omega_{20}}{\omega_{10}} = \pm\frac{N_1}{Z_2}$

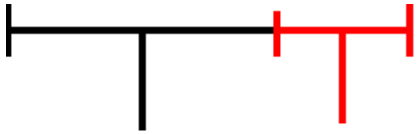
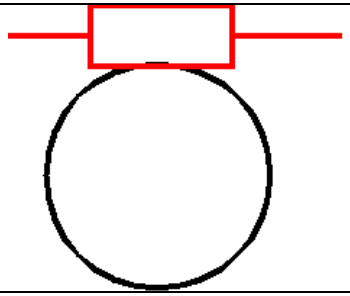
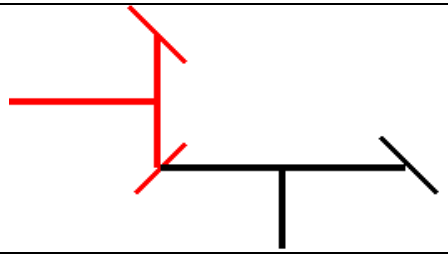
Module m

Deux pignons, roues, crémaillère et vis sans fin qui engrènent ensemble ont la même taille de dents.

Nombre de dents Z **Diamètre primitif D** $D = m \times Z$



Symbolisation cinématique des engrenages

Engrenage à denture droite extérieur	Roue et vis sans fin
	
Engrenage à denture droite intérieur	Engrenage conique