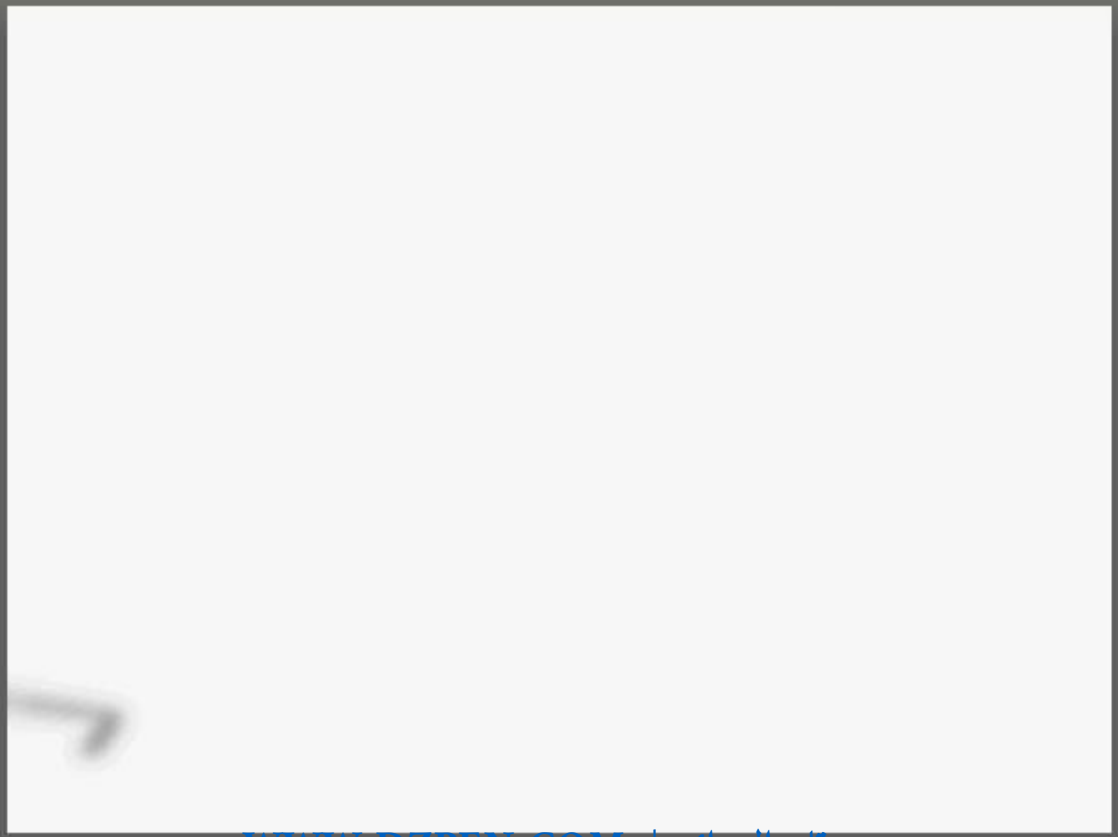
Le Transformateur triphasé



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Le transformateur triphasé

1 Constitution

2 Repérages et notations

3 Couplage des transformateurs

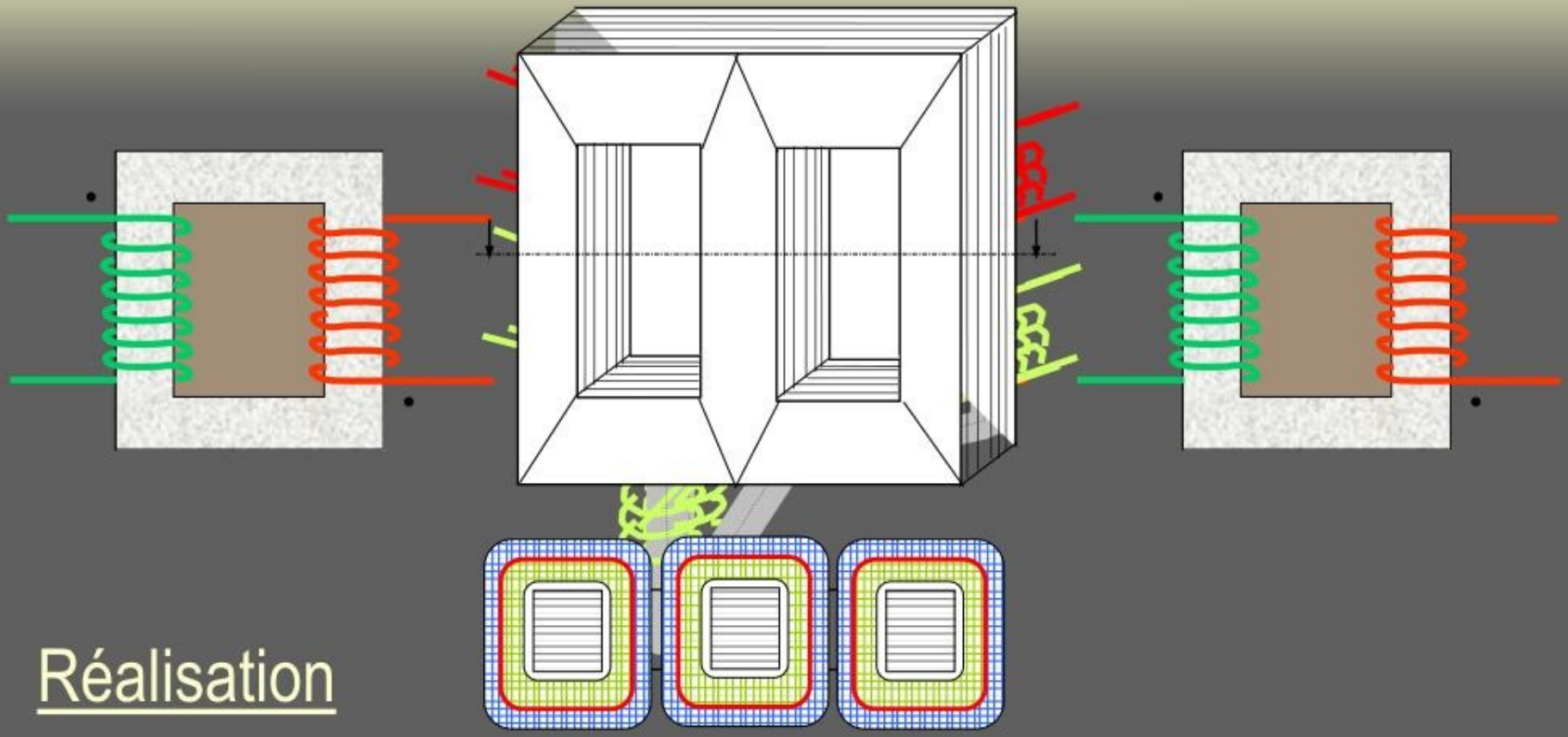
4 Rapport de transformation

5 Indice horaire

6 Schéma équivalent, chute de tension en charge

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Constitution



Réalisation

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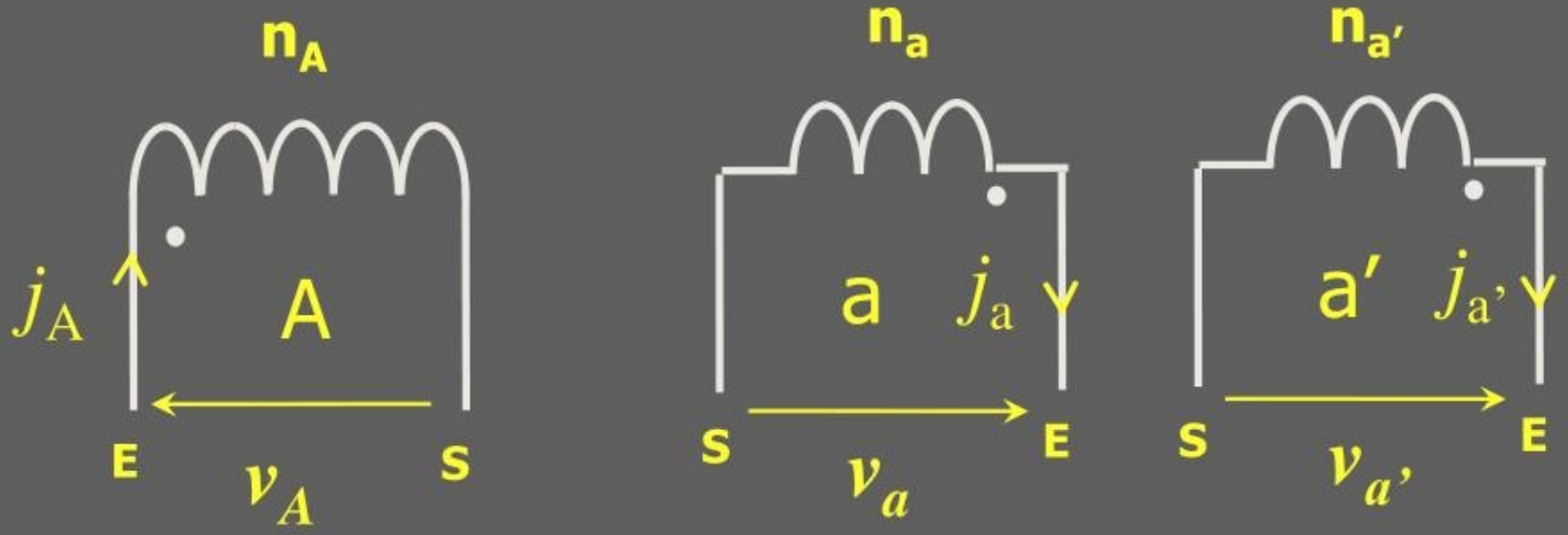
Repérage et notation

symboles



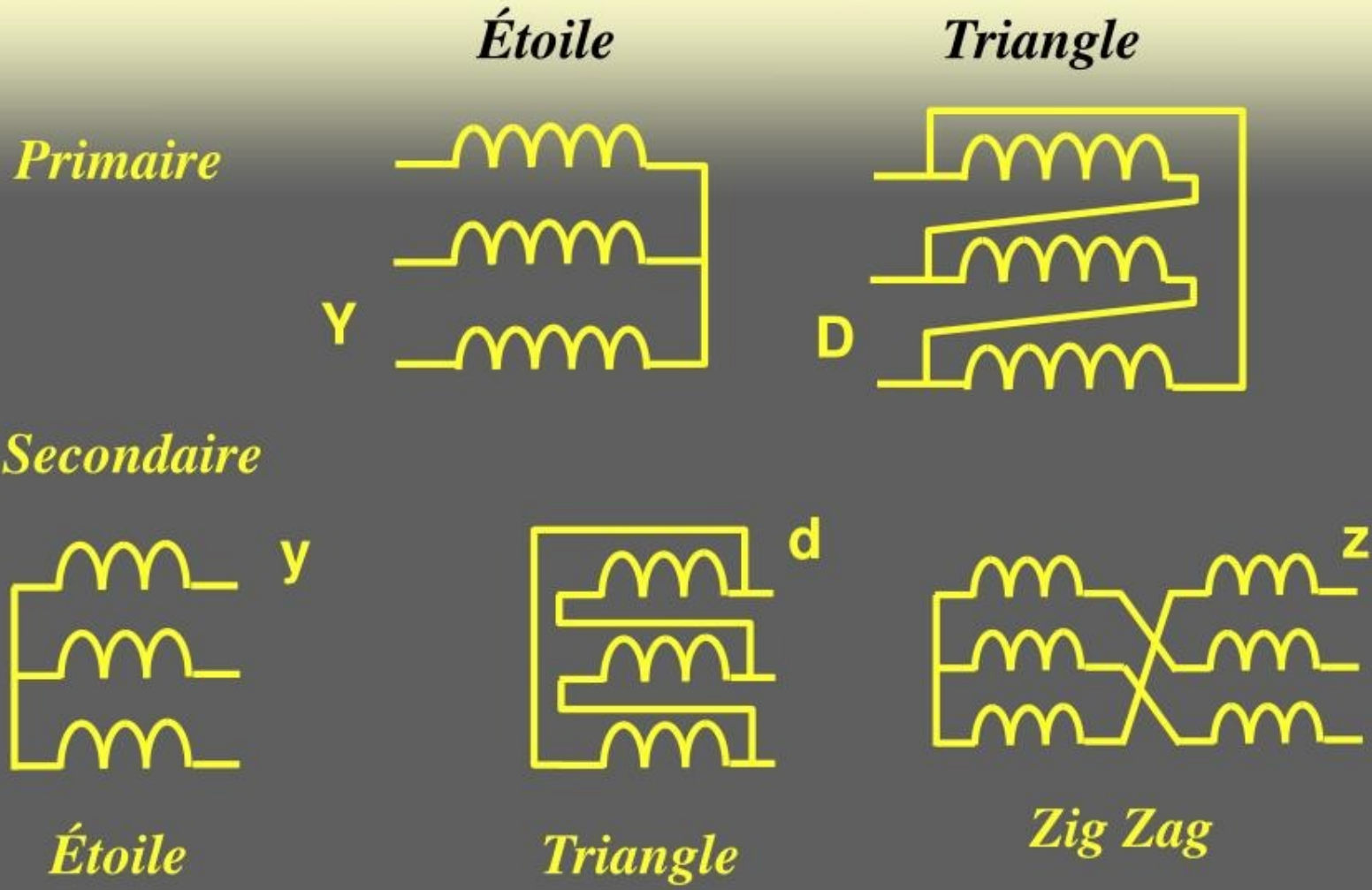


Colonne A



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Couplages



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Couplages

primaire / secondaire	Étoile	Triangle
Étoile	Yy	Dy
Triangle	Yd	Dd
Zigzag	Yz	Dz

Couplages normalisés

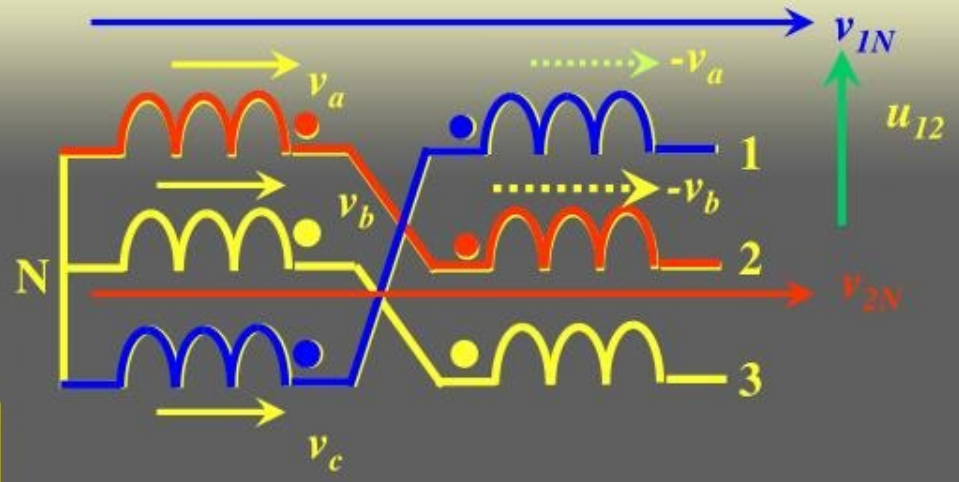
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Rapports de transformation

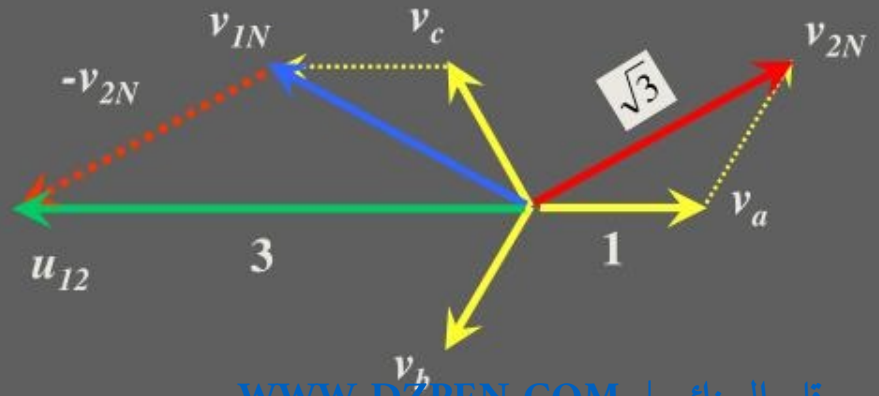
primaire / secondaire	Étoile	Triangle
Étoile	$\frac{n_S}{n_P}$	$\sqrt{3}\frac{n_S}{n_P}$
Triangle	$\frac{1}{\sqrt{3}}\frac{n_S}{n_P}$	$\frac{n_S}{n_P}$
Zigzag	$\sqrt{3}\frac{n_S}{n_P}$	$3\frac{n_S}{n_P}$

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Secondaire en zig zag



$$\underline{U}_{12} = -3\,\underline{V}_a$$



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Indice horaire

$$I = \frac{\theta}{\pi/6}$$



I = 5

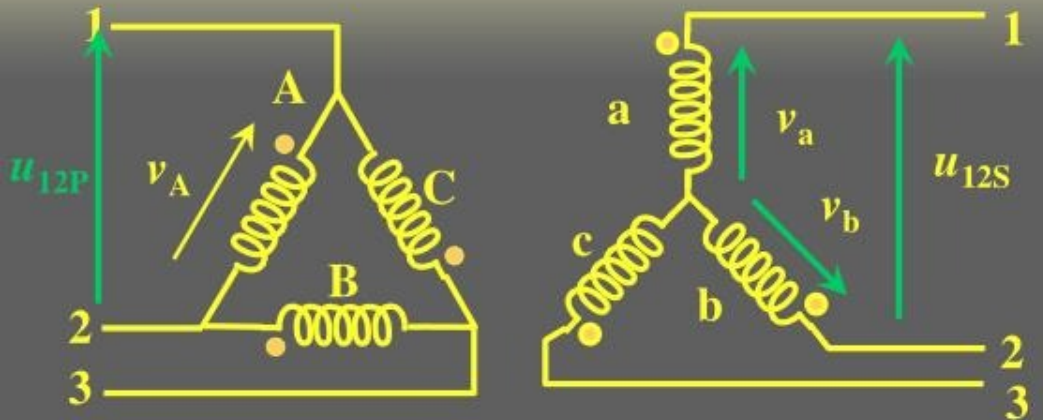
La grande aiguille représente la tension de référence au primaire elle pointe vers 12 h

θ est le retard de phase de $U_{\alpha\beta S}$ sur $U_{\alpha\beta P}$

La petite aiguille représente la tension homologue au secondaire

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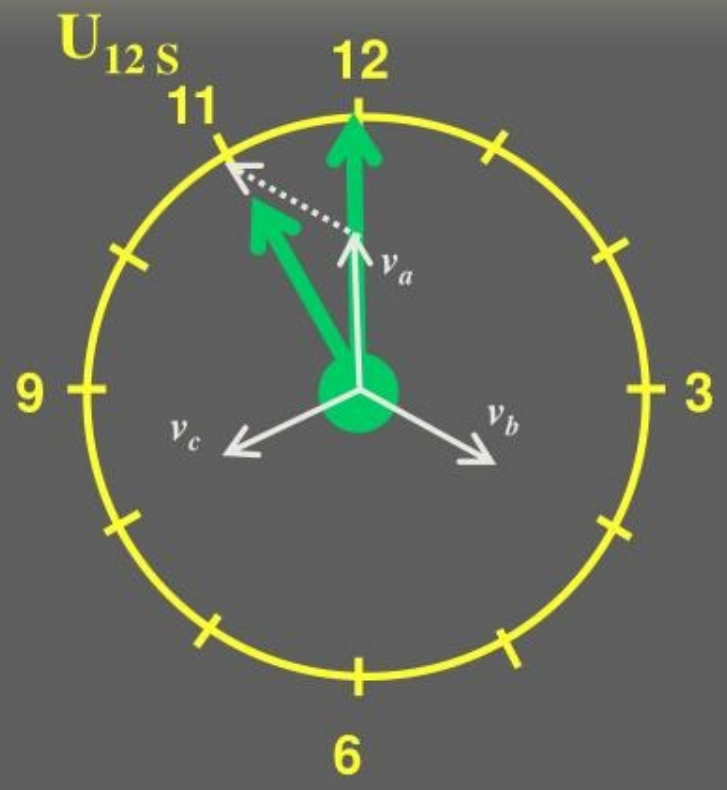
Indice horaire



$$\underline{U}_{12\,S} = \underline{V}_a - \underline{V}_b$$

Couplage $\mathbf{Dy_{11}}$

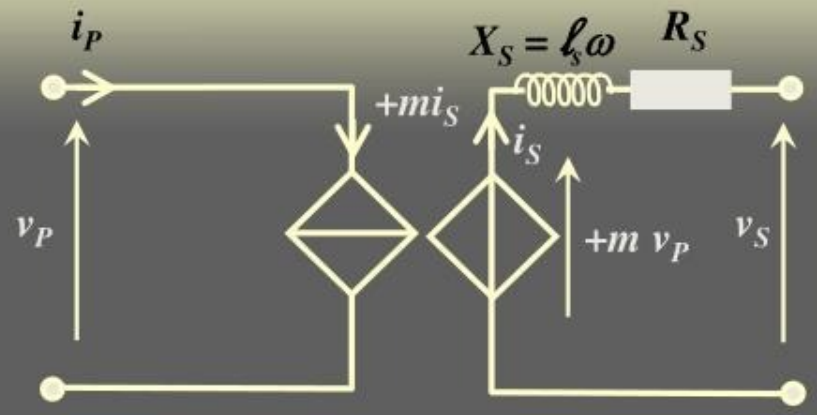
$$U_{12\,P} = V_A$$

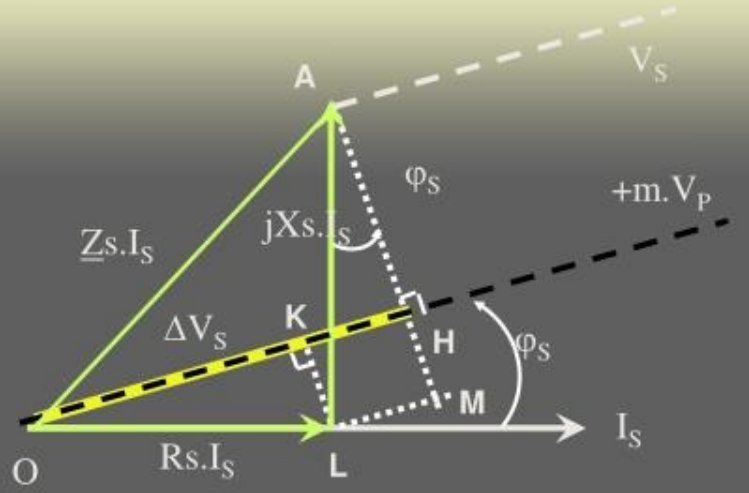


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Schéma équivalent

Pour une phase





$$\Delta V_S = R_S.I_S.\cos(\varphi_S) + X_S.I_S.\sin(\varphi_S)$$

$$\Delta U_S = \sqrt{3}\,\Delta V_S$$

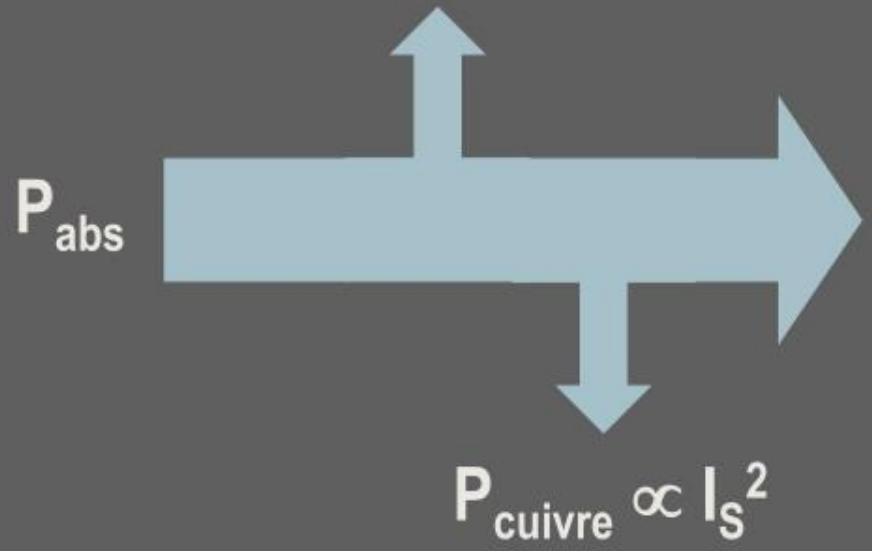
$$U_S = U_{S0} - \Delta U_S = mU_P - \Delta U_S$$

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Rendement

$P_{fer} \propto U_P^2$

$$\eta = \frac{Pu}{Pu + Pertes}$$



$$Pu = \sqrt{3} U_S . I_S . \cos\varphi_S$$

$P_{cuivre} \propto I_S^2$

$$\eta = \frac{\sqrt{3}\, U_S . I_S . \cos\varphi_S}{\sqrt{3}\, U_S . I_S . \cos\varphi_S + P_{P0} + 3R_S I_S^2}$$

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Essai à circuit secondaire ouvert

dit « Essai à vide »

On règle : U_{P0} *à sa valeur nominale avec l'ATV*

On mesure : U_{S0}, I_{P0}, P_{P0}

On calcule : m, φ_{P0}, I_{mag}, I_F, L_{mag}, R_F,

$$m = \frac{U_{S0}}{U_{P0}}$$

$$\varphi_{P0} = \frac{P_{P0}}{\sqrt{3} U_{P0} I_{P0}}$$

$$R_F = \frac{U_{P0}}{\sqrt{3} I_{P0} \cos(\varphi_{P0})}$$

$$L_P \omega = \frac{U_{P0}}{\sqrt{3}\, I_{P0} \sin(\varphi_{P0})}$$

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Essai à circuit secondaire en court-circuit *dit « Essai en court-circuit »*

Attention c'est un essai sous tension réduite !

Bien vérifier que l'ATV est à zéro avant de mettre sous tension

$$R_S = \frac{P_{PCC}}{3I_{SCC}^{\ 2}}$$

$$Z_S = \frac{mU_{PCC}}{\sqrt{3}I_{SCC}}$$

$$X_S = \sqrt{Z_S^{\ 2} - R_S^{\ 2}}$$

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