



Technical informations
Informations techniques

Electrical data
Rappels d'électricité

Power formula / Loi de Joule

P = Power in watts
U = Voltage
I = Current in amperes

$$P = U \cdot I$$

P = Puissance en Watts
U = Tension en Volts
I = Intensité en Ampères

Variations / Variations

$$I = \frac{P}{U}$$

$$U = \frac{P}{i}$$

$$I = \frac{U}{R}$$

U = Voltage
R = Resistance in ohms
I = Current in amperes

$$U = R \cdot I$$

U = Tension en Volts
R = Valeur ohmique en ohms
I = Intensité en Ampères

$$P = \frac{U^2}{R}$$

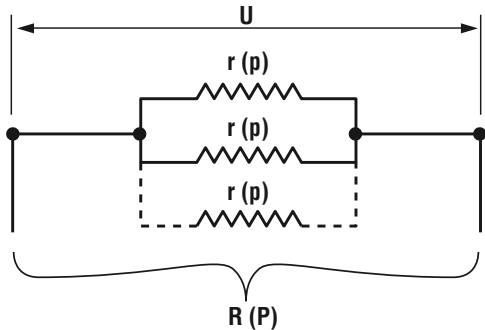
$$R = \frac{U^2}{P}$$

Element connections / Groupement de résistances

(Heating elements "r" of unit power "p" with nominal voltage "Un")

(Eléments "r" de puissance unitaire "p" sous leur tension nominale "un")

Parallel wiring
Cablage parallèle



no. of elements n = 2 : $R = \frac{r}{2} \Rightarrow P = 2p$
nbre d'éléments

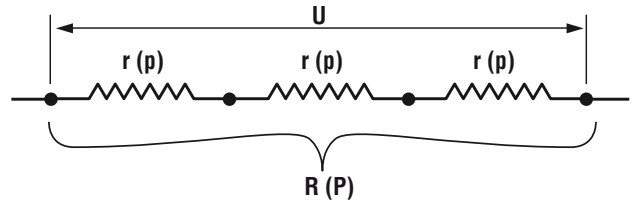
no. of elements n = 3 : $R = \frac{r}{3} \Rightarrow P = 3p$
nbre d'éléments

no. of elements n = x : $R = \frac{r}{x} \Rightarrow P = x \cdot p$
nbre d'éléments

NOTE: Watt density (W/cm²) for each element is unchanged
NOTA: Conservation de la charge (W/cm²) dissipée par chaque élément

if "U" = "un" :
si "U" = "un" :

Series wiring
Cablage série



no. of elements n = 2 : $R = 2r \Rightarrow P = \frac{p}{2}$
nbre d'éléments

NOTE: Watt density (W/cm²) for each element is divided by 4
NOTA: Division par 4 de la charge (W/cm²) dissipée par chaque élément

no. of elements n = 3 : $R = 3r \Rightarrow P = \frac{p}{3}$
nbre d'éléments

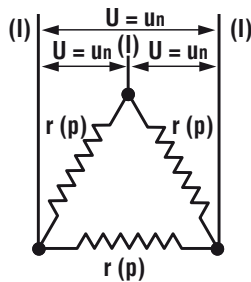
NOTE: Watt density (W/cm²) for each element is divided by 9
NOTA: Division par 9 de la charge (W/cm²) dissipée par chaque élément

no. of elements n = x : $R = xr \Rightarrow P = \frac{p}{x}$
nbre d'éléments

NOTE: Watt density (W/cm²) for each element is divided by x²
NOTA: Division par x² de la charge (W/cm²) dissipée par chaque élément

Element connections / Couplage de résistances

Delta connection
Couplage triangle



Watt density (W/cm²) for each element is unchanged
Conservation de la charge (W/cm²) dissipée par chaque élément

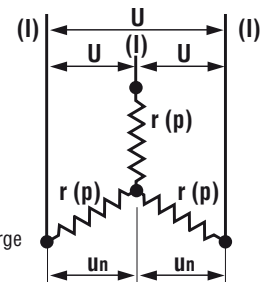
Normal using
Utilisation normale

$$U = un$$

$$P = 3p$$

$$I = \frac{P}{U\sqrt{3}} = \frac{P}{1,7 U}$$

Star connection
Couplage étoile



Watt density (W/cm²) for each element is unchanged
Conservation de la charge (W/cm²) dissipée par chaque élément

Elements supply voltage
Tension nominale des éléments
un = 230V un = 400V

Elements supply voltage
Tension nominale des éléments
un = 230V un = 400V

P = 3p (Watt density W/cm ² unchanged) (maintien de la charge W/cm ²)	P = p/3 (Watt density W/cm ² divided by 3) (charge W/cm ² divisée par 3)	U = Supply voltage Tension 230V / 3ph d'alimentation	U = 230V / 3ph	P = p (Watt density W/cm ² divided by 3) (charge W/cm ² divisée par 3)	P = p / 3 (Watt density W/cm ² divided by 9) (charge W/cm ² divisée par 9)
P = 9p DANGER!! (Watt density W/cm ² multiplied by 3) (charge W/cm ² multipliée par 3)	P = p (Watt density W/cm ² unchanged) (maintien de la charge W/cm ²)	U = 400V / 3ph	U = 400V / 3ph	P = 3p (Watt density W/cm ² unchanged) (maintien de la charge)	P = p (Watt density W/cm ² divided by 3) (charge W/cm ² divisée par 3)