## 单相半波可控整流电路

电阻：平均值：$U_d = 0.45U_2 \frac{1+\cos\alpha}{2}$

电感：$L\frac{di_d}{dt} + Ri_d = \sqrt{2}U_2 \sin\omega t$

$I_{dVT} = \frac{\pi-\alpha}{2\pi} I_d$ 平均值

$I_{VT} = \sqrt{\frac{\pi-\alpha}{2\pi}} I_d$ 有效值

晶闸管最大反向电压 $\sqrt{2}U_2$

续流二极管电压 $-U_d$，最大反向电压 $\sqrt{2}U_2$

## 单相桥式全控整流电路

电阻：晶闸管承受最大正向电压和反向电压为 $\frac{\sqrt{2}}{2}U_2$、$\sqrt{2}U_2$

$U_d = 0.9U_2 \frac{1+\cos\alpha}{2}$ $I_d = \frac{U_d}{R} = \frac{0.9U_2}{R} \frac{1+\cos\alpha}{2}$

$I_{dVT} = \frac{I_d}{2} = 0.45\frac{U_2}{R} \frac{1+\cos\alpha}{2}$

$I_{VT} = \frac{1}{\sqrt{2}} I$ ← 有效值

电感：移相：$0 \sim 90°$

晶闸管承受最大正向电压均为 $\sqrt{2}U_2$

$I_{dVT} = \frac{1}{2} I_d$ $I_T = \frac{I_d}{\sqrt{2}} = 0.707 I_d$

反电动势负载

※三相半波可控整流电路

电阻 $\alpha \leq 30°$，负载电流连续

$$U_d = 1.17 U_2 \cos\alpha$$

$30° < \alpha < 150°$，负载电流断续

$$U_d = 0.675 [1 + \cos(\frac{\pi}{6} + \alpha)]$$

$$\frac{1.17}{\sqrt{3}}$$

晶闸管承受的最大反向电压

$$U_{RM} = \sqrt{2} \times \sqrt{3} U_2 = \sqrt{6} U_2 = 2.45 U_2$$

晶闸管阳极与阴极间的最大电压

$$U_{TM} = \sqrt{2} U_2$$

阻感负载

$$U_d = 1.17 U_2 \cos 2$$

$$I_2 = I_{VT} = \frac{1}{\sqrt{3}} I_d = 0.577 I_d \text{（有效值）}$$

$$I_{VT} = \frac{I_{VT}}{1.57} = 0.368 I_d$$

$U_{T-M} = U_{RM} = 2.45U_2 = \underbrace{\sqrt{2}}_{\text{取峰值}} \times \underbrace{\sqrt{3}U_2}_{\text{线电压}}$

## ☆三相半式全控整流电路

电阻：$\alpha$角移相 $0 \sim 120°$

阻感：$\alpha$角移相 $0 \sim 90°$

$\alpha \leq 60°$ $U_d = 2.34U_2\cos\alpha$

$\alpha > 60°$ $U_d = 2.34U_2\left[1+\cos\left(\frac{\pi}{3}+\alpha\right)\right]$

## ☆阻感

$$U_d = \frac{U_a + U_b}{2}$$

$$\Delta U_d = \frac{3}{2\pi} X_B I_d$$

$$\cos\alpha - \cos(\alpha+\gamma) = \frac{2X_B I_d}{\sqrt{6}U_2}$$

$\begin{cases} I_d \uparrow, \gamma \uparrow \\ X_B \uparrow, \gamma \uparrow \\ \alpha \leq 90° \text{时}, \alpha \downarrow, \gamma \uparrow \end{cases}$