

Rectifier Circuit - Single Phase

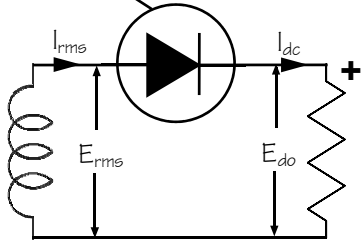
β is the maximum device conduction period (degrees)

F is the frequency of either the line or the ripple

E_{pr} is the maximum peak repetitive voltage appearing across the device

$$I_{rms} = 1.57I_{dc}$$

$$I_{ave} = I_{dc}$$



$$E_{rms} \approx 2.22E_{do}$$

$$I_{rms} = 1.57I_{dc}$$

$$\beta = 180^\circ$$

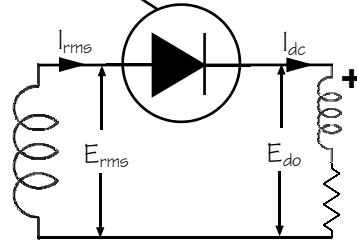
$$E_{pr} = 1.41E_{rms}$$

$$F_{ripple} = F_{supply}$$

HALF WAVE with RESISTIVE LOAD

$$I_{rms} = 1.41I_{dc}$$

$$I_{ave} = I_{dc}$$



$$E_{rms} \approx 2.22E_{do}$$

$$I_{rms} = 1.41I_{dc}$$

$$\beta = 180^\circ$$

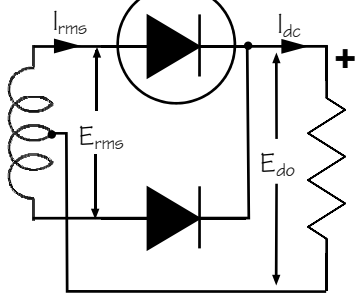
$$E_{pr} = 1.41E_{rms}$$

$$F_{ripple} = F_{supply}$$

HALF WAVE with INDUCTIVE LOAD

$$I_{rms} = 0.786I_{dc}$$

$$I_{ave} = 0.5I_{dc}$$



$$E_{rms} \approx 2.22E_{do}$$

$$I_{rms} = 0.786I_{dc}$$

$$\beta = 180^\circ$$

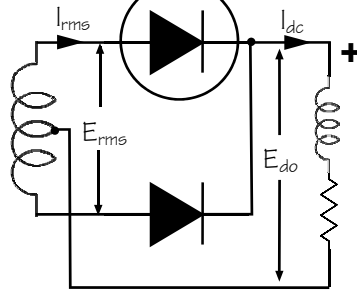
$$E_{pr} = 1.41E_{rms}$$

$$F_{ripple} = 2F_{supply}$$

FULL WAVE CENTRE TAPPED with RESISTIVE LOAD

$$I_{rms} = 0.707I_{dc}$$

$$I_{ave} = 0.5I_{dc}$$



$$E_{rms} \approx 2.22E_{do}$$

$$I_{rms} = 0.707I_{dc}$$

$$\beta = 180^\circ$$

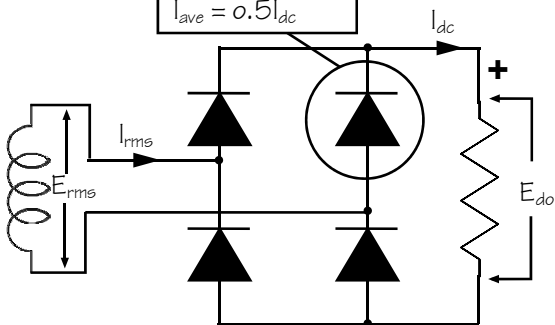
$$E_{pr} = 1.41E_{rms}$$

$$F_{ripple} = 2F_{supply}$$

FULL WAVE CENTRE TAPPED with INDUCTIVE LOAD

$$I_{rms} = 0.786I_{dc}$$

$$I_{ave} = 0.5I_{dc}$$



$$E_{rms} \approx 1.11E_{do}$$

$$I_{rms} = 1.11I_{dc}$$

$$\beta = 180^\circ$$

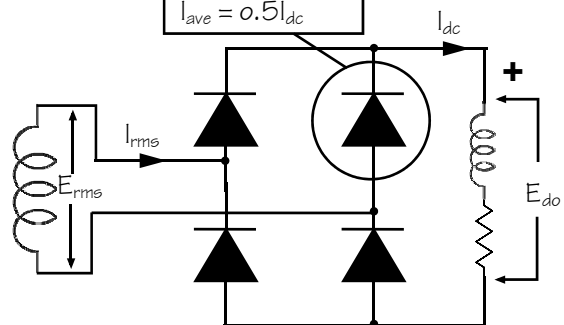
$$E_{pr} = 1.41E_{rms}$$

$$F_{ripple} = 2F_{supply}$$

FULL WAVE BRIDGE with RESISTIVE LOAD

$$I_{rms} = 0.707I_{dc}$$

$$I_{ave} = 0.5I_{dc}$$



$$E_{rms} \approx 1.11E_{do}$$

$$I_{rms} = I_{dc}$$

$$\beta = 180^\circ$$

$$E_{pr} = 1.41E_{rms}$$

$$F_{ripple} = 2F_{supply}$$

FULL WAVE BRIDGE with INDUCTIVE LOAD

Rectifier Circuits - Three Phase and AC Controller

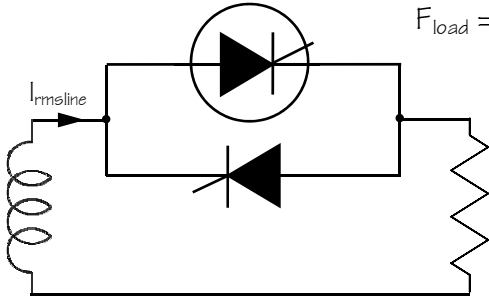
$$I_{rms\ device} = 1.57 I_{ave}$$

$$I_{ave} = 0.45 I_{rms\ line}$$

$$\beta = 180^\circ$$

$$E_{pr} = 1.41 E_{rms}$$

$$F_{load} = F_{supply}$$



β is the maximum device conduction period (degrees)

F is the frequency of either the line or the ripple

E_{pr} is the maximum peak repetitive voltage appearing across the device

This diagram represents a single phase regulator.
For three phase applications a similar arrangement is used in each line.

AC REGULATOR RESISTIVE or INDUCTIVE LOAD

$$I_{rms} = 0.587 I_{dc}$$

$$I_{ave} = 0.333 I_{dc}$$

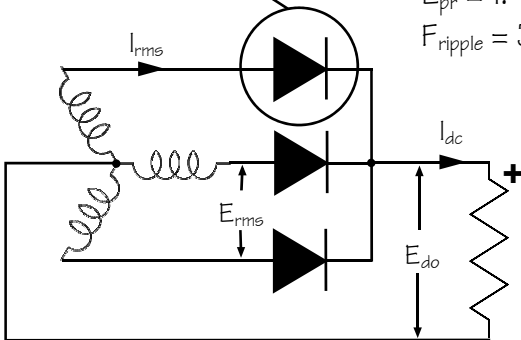
$$E_{rms} \approx 1.48 E_{do}$$

$$I_{rms} = 0.587 I_{dc}$$

$$\beta = 120^\circ$$

$$E_{pr} = 1.41 E_{rms}$$

$$F_{ripple} = 3F_{supply}$$



$$I_{rms} = 0.577 I_{dc}$$

$$I_{ave} = 0.333 I_{dc}$$

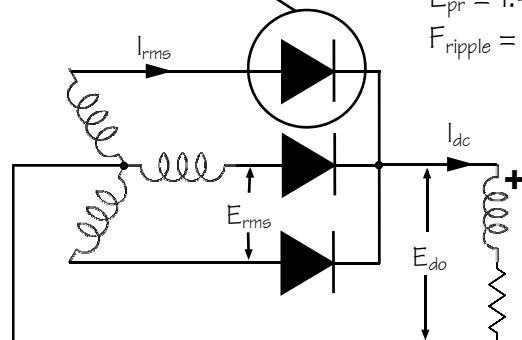
$$E_{rms} \approx 1.48 E_{do}$$

$$I_{rms} = 0.577 I_{dc}$$

$$\beta = 120^\circ$$

$$E_{pr} = 1.41 E_{rms}$$

$$F_{ripple} = 3F_{supply}$$

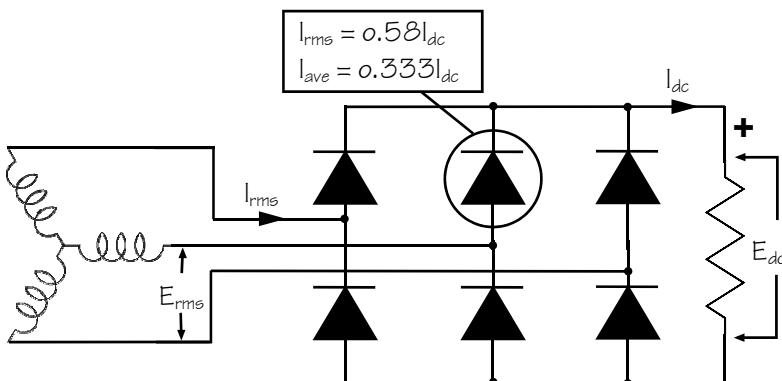


STAR CONNECTION With RESISTIVE LOAD

STAR CONNECTION With INDUCTIVE LOAD

$$I_{rms} = 0.58 I_{dc}$$

$$I_{ave} = 0.333 I_{dc}$$



$$E_{rms} \approx 0.742 E_{do}$$

$$I_{rms} = 0.817 I_{dc}$$

$$\beta = 120^\circ$$

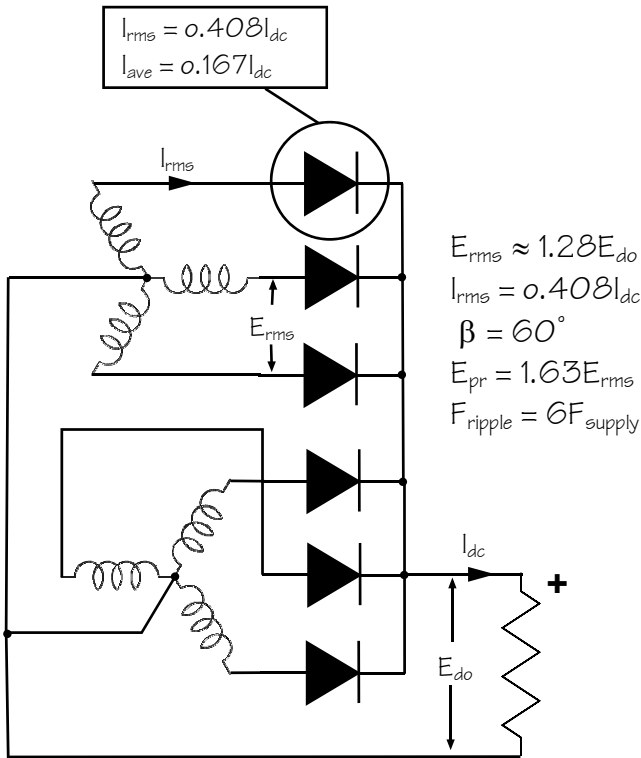
$$E_{pr} = 1.41 E_{rms}$$

$$F_{ripple} = 6F_{supply}$$

BRIDGE with RESISTIVE or INDUCTIVE LOAD

Rectifier Circuits - Six Phase

β is the maximum device conduction period (degrees) F is the frequency of either the line or the ripple
 E_{pr} is the maximum peak repetitive voltage appearing across the device



**DOUBLE STAR without IPT
RESISTIVE or INDUCTIVE LOAD**

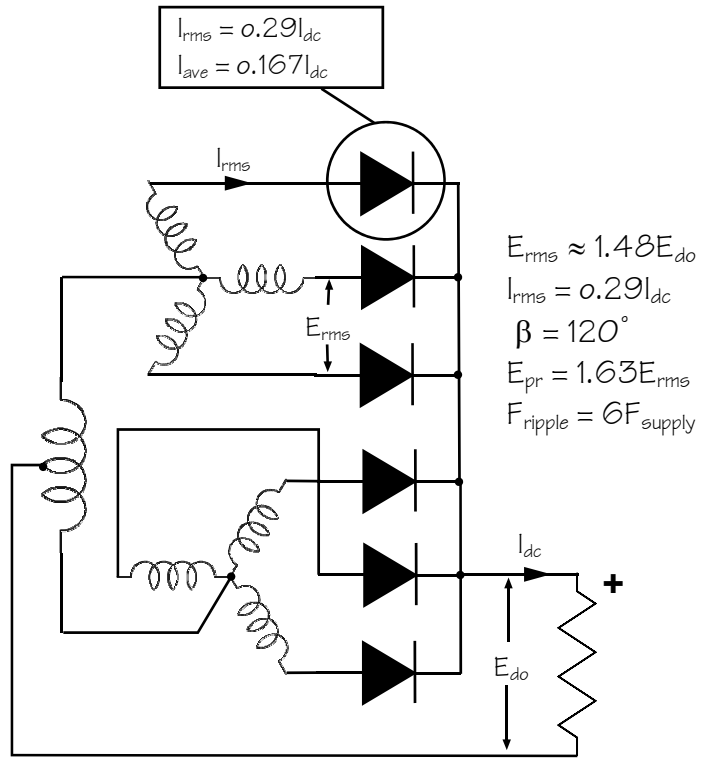
$$E_{rms} \approx 1.28 E_{do}$$

$$I_{rms} = 0.408 I_{dc}$$

$$\beta = 60^\circ$$

$$E_{pr} = 1.63 E_{rms}$$

$$F_{ripple} = 6 F_{supply}$$



**DOUBLE STAR with IPT
RESISTIVE or INDUCTIVE LOAD**

$$E_{rms} \approx 1.48 E_{do}$$

$$I_{rms} = 0.29 I_{dc}$$

$$\beta = 120^\circ$$

$$E_{pr} = 1.63 E_{rms}$$

$$F_{ripple} = 6 F_{supply}$$

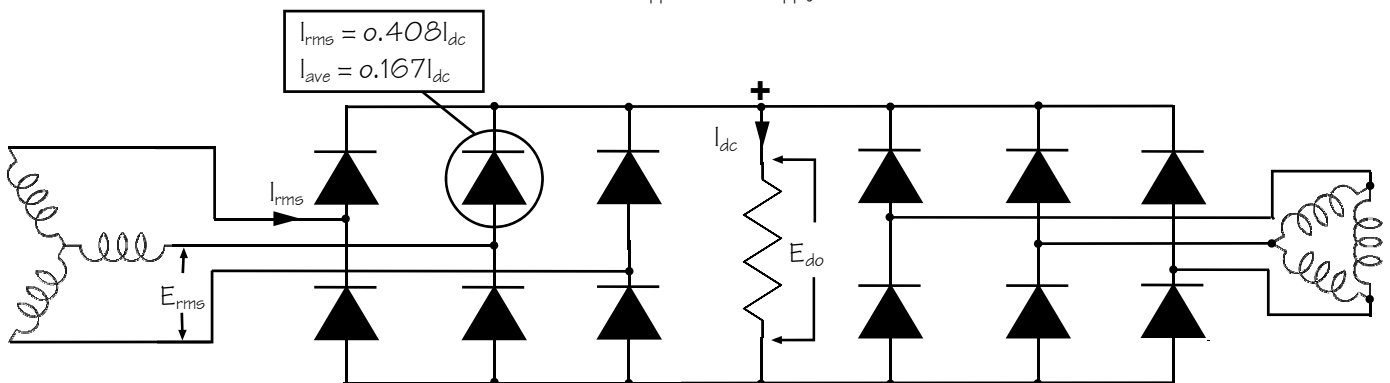
$$E_{rms} \approx 0.715 E_{do}$$

$$I_{rms} = 0.577 I_{dc}$$

$$\beta = 60^\circ$$

$$E_{pr} = 1.52 E_{rms}$$

$$F_{ripple} = 12 F_{supply}$$



**PARALLEL BRIDGE without IPT
with RESISTIVE or INDUCTIVE LOAD**

Rectifier Circuits - Six Phase

β is the maximum device conduction period (degrees) F is the frequency of either the line or the ripple
 E_{pr} is the maximum peak repetitive voltage appearing across the device

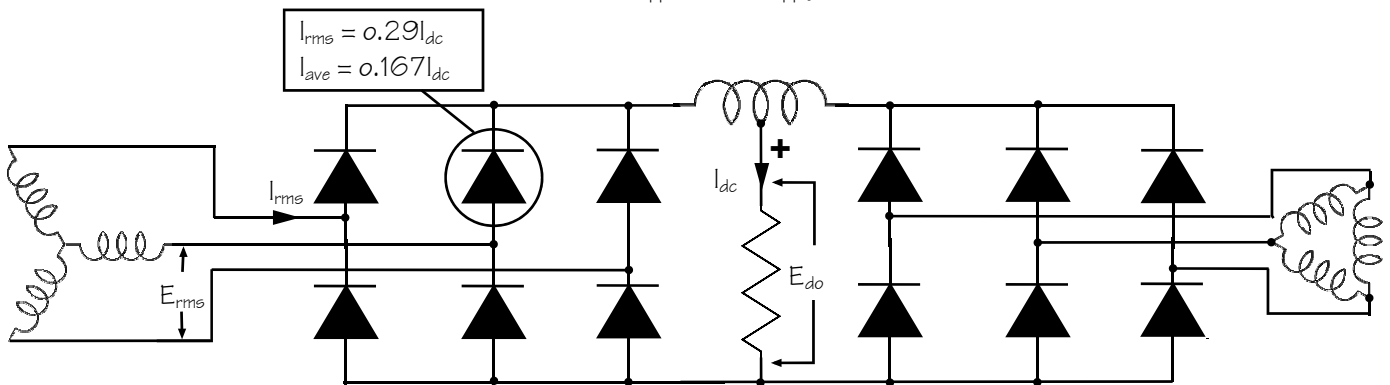
$$E_{rms} \approx 0.742E_{do}$$

$$I_{rms} = 0.408I_{dc}$$

$$\beta = 120^\circ$$

$$E_{pr} = 1.52E_{rms}$$

$$F_{ripple} = 12F_{supply}$$



**PARALLEL BRIDGE with IPT
with RESISTIVE or INDUCTIVE LOAD**

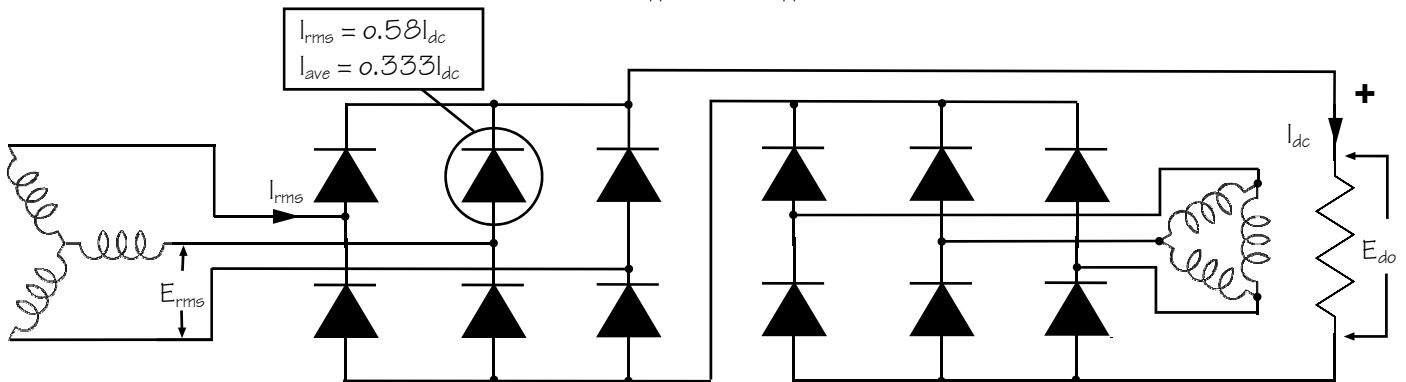
$$E_{rms} \approx 0.37E_{do}$$

$$I_{rms} = 0.817I_{dc}$$

$$\beta = 120^\circ$$

$$E_{pr} = 1.41E_{rms}$$

$$F_{ripple} = 12F_{supply}$$



**SERIES BRIDGE
with RESISTIVE or INDUCTIVE LOAD**