INVERSORES TIPO I

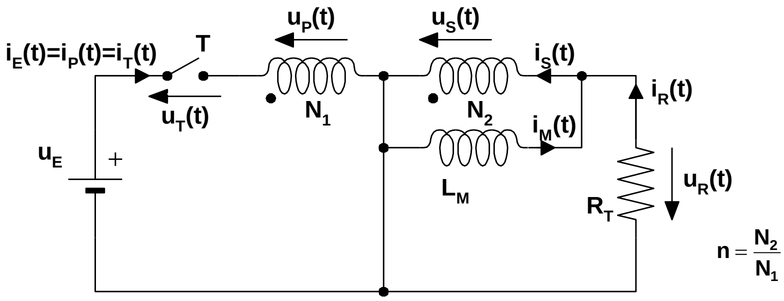

Figura.1. Nombres de las variables para el inversor BT1

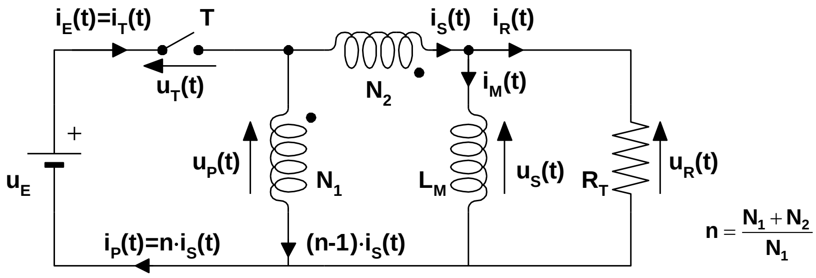

Figura2. Inversor BT2D y variables a considerar

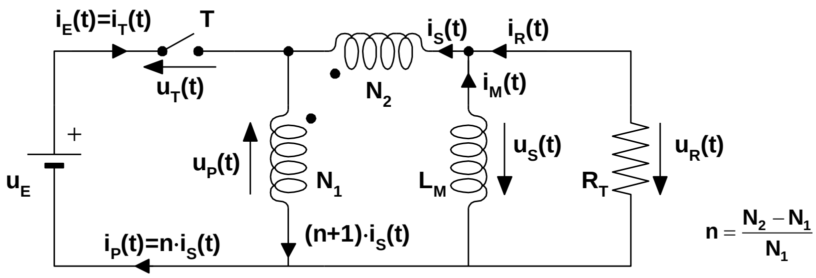

Figura3. Inversor BT2I y variables a considerar

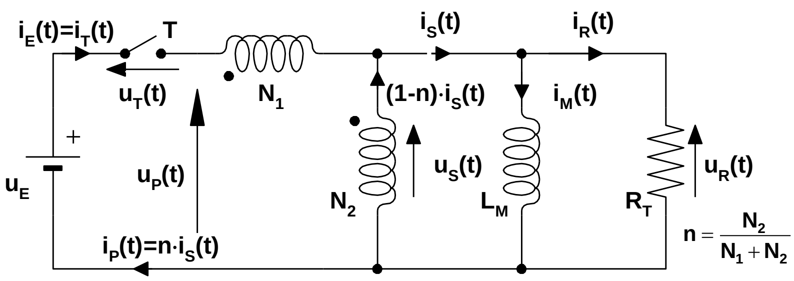

Figura4. Inversor BT3D y variables a considerar

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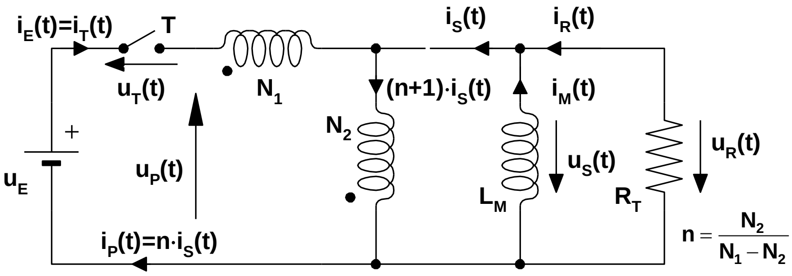

Figura5. Inversor BT3I y variables a considerar

Base de normalización:

Potencia base: $P_{BASE} = P_{TN}$. La potencia base es la potencia nominal del tubo.

Impedancia base: $Z_{BASE} = R_{TN}$. La impedancia base es igual a la impedancia de la lámpara fluorescente, es decir, el valor medio de la impedancia de la lámpara a potencia nominal.

Inductancia base: $L_{BASE} = L_M$ es igual a la inductancia magnetizante definida en cada caso.

El resto de valores base, derivados de los anteriores, son:

Tensión base: V_{BASE} , tal que

$$\frac{U_{BASE}^2}{Z_{BASE}} = P_{BASE} \Rightarrow U_{BASE} = \sqrt{P_{BASE} \cdot Z_{BASE}} = \sqrt{P_{TN} \cdot R_{TN}} \qquad [1]$$

Corriente base:

$$I_{BASE}^2 \cdot Z_{BASE} = P_{BASE} \Rightarrow I_{BASE} = \sqrt{\frac{P_{BASE}}{Z_{BASE}}} = \sqrt{\frac{P_{TN}}{R_{TN}}} \qquad [2]$$

Período base:

$$T_{BASE} = \frac{L_{BASE}}{Z_{BASE}} = \frac{L_M}{R_{TN}} \qquad [3]$$

Frecuencia angular base:

$$\omega_{BASE} = \frac{1}{T_{BASE}} \qquad [4]$$

En la tabla aparecen los nombres dados a las variables normalizadas

Variable	Variable sin normalizar	Variable normalizada
Tensión	u	$m = \frac{u}{U_{BASE}}$
Corriente	i	$j = \frac{i}{I_{BASE}}$
Potencia	P	$\Psi = \frac{P}{P_{BASE}}$
Impedancia, resistencia	Z,R	$Q = \frac{Z}{Z_{BASE}}$
Inductancia	L	$\lambda = \frac{L}{L_{BASE}}$
Frecuencia angular	ω	$\Omega = \frac{\omega}{\omega_{BASE}}$
Tiempo	t	$\tau = \frac{t}{t_{BASE}}$
Período	T	$\Gamma = \frac{T}{T_{BASE}}$

Tabla1. Nombres de las variables utilizadas y normalización.

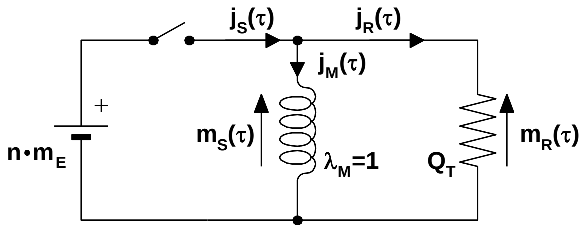

Figura6. Circuito equivalente normalizado y referido al secundario para los inversores BT tipo I

Modo M0: $0 \le \tau \le D\cdot\Gamma$	Modo M1: $D\cdot\Gamma \le \tau \le \Gamma$
$j_M(\tau) = j_{M0} + \frac{n\cdot m_E}{\lambda_M}\cdot\tau$	$j_M(\tau) = j_{MD\Gamma}\cdot e^{-\frac{Q_T}{\lambda_M}\cdot(\tau - D\cdot\Gamma)}$
$j_R(\tau) = \frac{n\cdot m_E}{Q_T}$	$j_R(\tau) = -j_M(\tau)$
$j_S(\tau) = j_{M0} + \frac{n\cdot m_E}{\lambda_M}\cdot\tau + \frac{n\cdot m_E}{Q_T}$	$j_S(\tau) = 0$
$j_T(\tau) = j_E(\tau) = j_P(\tau) = n\cdot j_S(\tau)$	$j_T(\tau) = j_E(\tau) = j_P(\tau) = 0$
$m_R(\tau) = m_S(\tau) = n\cdot m_E$	$m_R(\tau) = m_S(\tau) = Q_T\cdot j_{MD\Gamma}\cdot e^{-\frac{Q_T}{\lambda_M}\cdot(\tau - D\cdot\Gamma)}$
$m_P(\tau) = m_E$	$m_P(\tau) = \frac{m_S(\tau)}{n}$
$m_T(\tau) = 0$	$m_T(\tau) = m_E - \frac{Q_T\cdot j_{MD\Gamma}\cdot e^{-\frac{Q_T}{\lambda_M}\cdot(\tau - D\cdot\Gamma)}}{n}$

Tabla 2. Resumen de tensiones y corrientes normalizadas en el circuito

Potencia entregada

$$= (n\cdot m_E)^2\cdot D\cdot\left(\frac{1}{Q_T} + \frac{D\cdot\Gamma}{2\cdot\lambda_M}\cdot\frac{1 + e^{-\frac{Q_T}{\lambda_M}\cdot\Gamma(1-D)}}{1 - e^{-\frac{Q_T}{\lambda_M}\cdot\Gamma(1-D)}}\right) = \Psi(D, \Gamma, n\cdot m_E, Q_T)$$

$$\Psi = \frac{n\cdot m_E + \overline{j_M}\cdot Q_T}{\frac{Q_T}{n\cdot m_E} + \frac{1}{\Delta j_M}\cdot Ln\frac{\bar{j}_M + \frac{\Delta j_M}{2}}{\bar{j}_M - \frac{\Delta j_M}{2}}} = \Psi(\bar{j}_M, \Delta j_M, n\cdot m_E, Q_T)$$

$$\Psi(j_{MD\Gamma}, \tau_{OFF}, n\cdot m_E, Q_T) =$$

$$= \frac{n\cdot m_E\cdot\lambda_M\cdot\left(j_{SMAX} - \frac{n\cdot m_E}{Q_T}\right)\cdot\left(1 - e^{-\frac{Q_T}{\lambda_M}\cdot\tau_{OFF}}\right)\cdot\left(\frac{n\cdot m_E}{Q_T} + \frac{1}{2}\cdot\left(j_{SMAX} - \frac{n\cdot m_E}{Q_T}\right)\cdot(1 + e^{-\frac{Q_T}{\lambda_M}\cdot\tau_{OFF}})\right)}{n\cdot m_E\cdot\tau_{OFF} + \lambda_M\cdot\left(j_{SMAX} - \frac{n\cdot m_E}{Q_T}\right)\cdot\left(1 - e^{-\frac{Q_T}{\lambda_M}\cdot\tau_{OFF}}\right)}$$

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Factor de inversor

$$\varphi_P = \frac{2\cdot\lambda_M\cdot\left(1-e^{-\frac{Q_T}{\lambda_M}\cdot\Gamma(1-D)}\right)}{2\cdot\lambda_M + Q_T\cdot D\cdot\Gamma\cdot\left(1+e^{-\frac{Q_T}{\lambda_M}\cdot\Gamma(1-D)}\right)} = \varphi_P(D,\Gamma,n\cdot m_E,Q_T)$$

$$\varphi_P(n, n\cdot m_E, Q_T, \bar{j}_M, \Delta j_M) =$$

$$= \frac{2\cdot\frac{(n\cdot m_E)^2}{Q_T}}{\frac{n+1}{n}\cdot n\cdot m_E\cdot\left(\overline{j_M}+\frac{n\cdot m_E}{Q_T}\right)+\frac{(n\cdot m_E)^2}{n^2\cdot Q_T}\cdot\left(1+\frac{n+1}{n}\cdot\frac{n\cdot m_E}{Q_T\cdot\Delta j_M}\cdot Ln\frac{\bar{j}_M+\frac{\Delta j_M}{2}-\frac{n\cdot m_E}{n\cdot Q_T}}{\bar{j}_M-\frac{\Delta j_M}{2}-\frac{n\cdot m_E}{n\cdot Q_T}}\right)}$$

$$\varphi_P = \frac{4\cdot n\cdot m_E}{2\cdot n\cdot m_E + Q_T\cdot\left(j_{SMAX}-\frac{n\cdot m_E}{Q_T}\right)\cdot\left(1+e^{-\frac{Q_T}{\lambda_M}\cdot\tau_{OFF}}\right)} = \varphi_P(j_{SMAX},\tau_{OFF},n\cdot m_E,Q_T)$$

Factor de cresta

$$\varphi_C = \frac{j_{RMAX}}{j_{REFICAZ}} = \frac{MAX\left\{\frac{n\cdot m_E}{Q_T}, \frac{n\cdot m_E\cdot D\cdot\Gamma}{\lambda_M\cdot\left(1-e^{-\frac{Q_T}{\lambda_M}\cdot\Gamma(1-D)}\right)}\right\}}{n\cdot m_E\cdot\sqrt{\frac{D\cdot\left(\frac{1}{Q_T}+\frac{D\cdot\Gamma}{2\cdot\lambda_M}\cdot\frac{1+e^{-\frac{Q_T}{\lambda_M}\cdot\Gamma(1-D)}}{1-e^{-\frac{Q_T}{\lambda_M}\cdot\Gamma(1-D)}}\right)}{Q_T}}}$$

$$\varphi_C = \frac{MAX\left\{\frac{n\cdot m_E}{Q_T}, \bar{j}_M+\frac{\Delta j_M}{2}\right\}}{\sqrt{\frac{n\cdot m_E+\overline{j_M}\cdot Q_T}{\frac{Q_T^2}{n\cdot m_E}+\frac{Q_T}{\Delta j_M}\cdot Ln\frac{\bar{j}_M+\frac{\Delta j_M}{2}}{\bar{j}_M-\frac{\Delta j_M}{2}}}}} = \varphi_C(\bar{j}_M,\Delta j_M,n\cdot m_E,Q_T)$$

$$\varphi_C = \frac{j_{RMAX}}{j_{REFICAZ}} = \frac{MAX\left\{\frac{n\cdot m_E}{Q_T}, j_{SMAX}-\frac{n\cdot m_E}{Q_T}\right\}}{\sqrt{\frac{\Psi(j_{SMAX},\tau_{OFF},n\cdot m_E,Q_T)}{Q_T}}} = \varphi_C(j_{SMAX},\tau_{OFF},n\cdot m_E,Q_T)$$