flow PIM 1

**Output Inverter Application**

**General conditions**

- **3phase SPWM**
  - $V_{dc_{on}} = 15$ V
  - $V_{dc_{off}} = -15$ V
  - $R_{g_{on}} = 16$ Ω
  - $R_{g_{off}} = 16$ Ω

**figure 1. IGBT**

Typical average static loss as a function of output current

$$P_{loss} = f(I_{out})$$

At

- $T_j = 150$ °C
- $M_i \cos \phi$ from -1 to 1 in steps of 0.2

**figure 2. FWD**

Typical average static loss as a function of output current

$$P_{loss} = f(I_{out})$$

At

- $T_j = 150$ °C
- $M_i \cos \phi$ from -1 to 1 in steps of 0.2

**figure 3. IGBT**

Typical average switching loss as a function of output current

$$P_{loss} = f(I_{out})$$

At

- $T_j = 150$ °C
- DC-link = 600 V
- $f_{sw}$ from 2 kHz to 16 kHz in steps of factor 2

**figure 4. FWD**

Typical average switching loss as a function of output current

$$P_{loss} = f(I_{out})$$

At

- $T_j = 150$ °C
- DC-link = 600 V
- $f_{sw}$ from 2 kHz to 16 kHz in steps of factor 2
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**figure 5.**
Typical available 50Hz output current as a function of $M_i \times \cos \varphi$

$I_{\text{out}} = f(M_i \times \cos \varphi)$

At
- $T_j = 150 \, ^\circ\text{C}$
- DC-link = 600 V
- $f_{\text{sw}} = 4 \, \text{kHz}$
- $T_s$ from 60 °C to 100 °C in steps of 5 °C

**figure 6.**
Typical available 50Hz output current as a function of switching frequency

$I_{\text{out}} = f(f_{\text{sw}})$

At
- $T_j = 150 \, ^\circ\text{C}$
- DC-link = 600 V
- $M_i \cos \varphi = 0.8$
- $T_s$ from 60 °C to 100 °C in steps of 5 °C

**figure 7.**
Typical available 50Hz output current as a function of $M_i \cos \varphi$ and switching frequency

$I_{\text{out}} = f(f_{\text{sw}}, M_i \cos \varphi)$

At
- $T_j = 150 \, ^\circ\text{C}$
- DC-link = 600 V
- $T_s = 80 \, ^\circ\text{C}$
- $T_s$ from 60 °C to 100 °C in steps of 5 °C
- $M_i = 0$

**figure 8.**
Typical available 0Hz output current as a function of switching frequency

$I_{\text{out,peak}} = f(f_{\text{sw}})$

At
- $T_j = 150 \, ^\circ\text{C}$
- DC-link = 600 V
- $T_s$ from 60 °C to 100 °C in steps of 5 °C
- $M_i = 0$
**Output Inverter Application**  
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**figure 9.** Inverter  
Typical available peak output power as a function of heatsink temperature  
\[ P_{\text{out}} = f(T_s) \]

At  
\[ T_s = 150 \, ^\circ C \]

DC-link = 600 V  
Mi = 1  
\[ \cos \phi = 0,80 \]

\[ f_{\text{sw}} \text{ from } 2 \text{ kHz to } 16 \text{ kHz in steps of factor 2} \]

**figure 10.** Inverter  
Typical efficiency as a function of output power  
\[ \text{efficiency} = f(P_{\text{out}}) \]

At  
\[ T_s = 150 \, ^\circ C \]

DC-link = 600 V  
Mi = 1  
\[ \cos \phi = 0,80 \]

\[ f_{\text{sw}} \text{ from } 2 \text{ kHz to } 16 \text{ kHz in steps of factor 2} \]

**figure 11.** Inverter  
Typical available overload factor as a function of motor power and switching frequency  
\[ P_{\text{peak}} / P_{\text{nom}} = f(P_{\text{nom}}, f_{\text{sw}}) \]

At  
\[ T_s = 80 \, ^\circ C \]

DC-link = 600 V  
Mi = 1  
\[ \cos \phi = 0,8 \]

\[ f_{\text{sw}} \text{ from } 1 \text{ kHz to } 16 \text{ kHz in steps of factor 2} \]

Motor eff: 0,85