Impact of the VSD on the W22Xdb Motor Temperature Rise

Motors driven by with frequency inverters may present a higher temperature rise than when operating under sinusoidal supply. This occurs due to the combined effects of the losses increase resulting from the PWM harmonics and the reduction in ventilation experienced by self-ventilated motors when operating at low frequencies. There are basically three solutions to avoid excessive overheating of the motor in VSD applications:

- Torque derating (oversizing of the self-ventilated motor frame size);
- Forced ventilation (use of an independent cooling system);
- Optimal Flux Solution (exclusive to applications where both motor and drive are WEG).

Torque Derating Criteria

In order to maintain the temperature rise of WEG motors within acceptable levels, when driven by VSD, the speed range-related loadability limits established in figures 1 (for operation under constant flux condition) or 3 (for operation under optimal flux condition) must be observed.

Notes:

1. *These derating curves relate to the motor thermal capability only and do not concern the insulation class. Speed regulation will depend on VSD mode of operation and proper adjustment.*
2. *Torque derating is usually necessary when the motor is required to drive constant torque loads (e.g. screw compressors, conveyors, extruders, etc.). For squared torque loads, such as pumps and fans, no torque derating is normally required.*

Constant Flux Condition

Applicable when the motor is driven by any commercial drive operating with any control scheme other than the Optimal Flux available in WEG frequency drives.

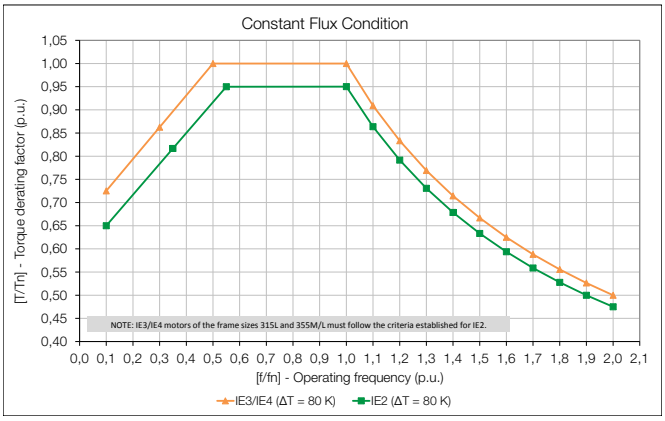

Figure 1 - Derating curves for constant flux condition

Forced Ventilation

For those cases where an independent cooling system is available, W22Xdb motors will have loadability as per Figure 2.

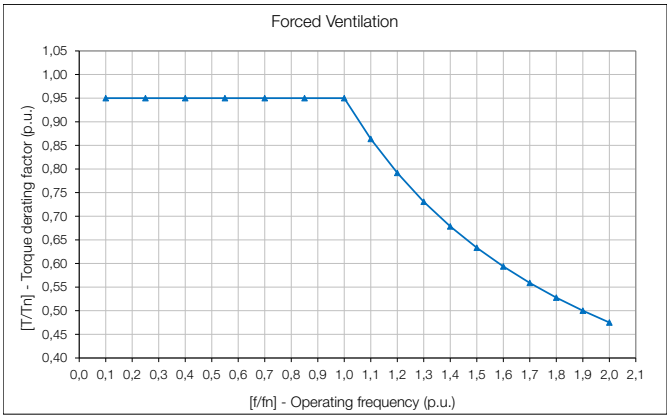

Figure 2 - Derating curves for Forced Ventilation condition

Optimal Flux Condition

The study of the composition of the overall motor losses and its relation to operation parameters such as the frequency, the magnetic flux, the current, and the speed variation led to the determination of an optimal flux value for each operating frequency. The implementation of this solution within the CFW-11 and CFW-700 control algorithms means that the motor optimal flux condition can be automatically applied by the drive throughout the speed range, resulting in a continuous minimization of losses. As a consequence of this loss minimization, the use of the optimal flux control provides higher efficiency and lower temperature rise. Therefore, the torque derating factors for this operating condition are lower than for constant V/f, as shown in figure 3. The optimal flux solution was developed for low frequency applications with constant torque loads. It should not be used for variable torque loads nor when the operating speed range includes points above the base (rated) frequency. The Optimal Flux Solution may be only applied under the following conditions:

- The motor has an efficiency class IE2 or above;
- The motor is controlled by a WEG drive (CFW-11 or CFW-700);
- Sensorless vector control is used.

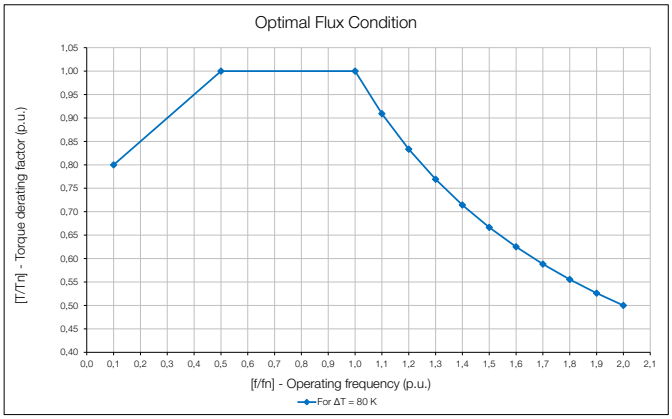

Figure 3 - Derating curves for Optimal Flux condition

Do you still have questions?
Please, contact the nearest WEG office.

MOTORS

+44 1527 513800

info-uk@weg.net

Redditch - Worcestershire - UK

www.weg.net

Cod: TN01 | Rev: 01 | Date (m/a): 10/2020.