Dynamic Brake Selection for Sub-Micro & SMV Series Drives

Dynamic braking is used when an overhauling load causes regeneration from the motor to occur, especially in situations where the required deceleration time to stop the motor cannot be achieved due to High Voltage nuisance tripping. Most Lenze-AC Tech DB circuits are rated for light-duty use only. The dynamic braking (DB) control circuit is connected to and monitors the fixed DC bus line. When the DC bus reaches 114% of the maximum tolerance, it triggers the chopper circuit in the dynamic brake. The DB circuit will be active whenever the voltage rises on the DC bus. This can occur while the drive is running, while it accelerates or decelerates or even when it is stopped. Using dynamic braking allows a faster deceleration time of a high inertia load. However, fast deceleration of a high inertia load may sometimes cause regeneration and trip the drive into a High Voltage fault. To avoid this, a dynamic brake chopping circuit is switched on when the voltage levels exceed the rated tolerance and brake resistors dissipate the regenerated voltage as excess energy.

Thermal Protection from Overload for the DB Module

Lenze-AC Tech brake modules rated at 0.33 to 10 HP have resistors that are internally mounted. In these modules there is a thermistor that monitors the resistor's temperature and can be connected back to the drive to trigger a drive fault. Refer to Table 1.

Table 1: Dynamic Braking Modules with Built-in Resistors

HP	240V	480V	590V
0.25-0.5	845-206 40 W / 250 Ω	845-406 40 W / 1000 Ω	N/A
1-1.5	845-209 80 W / 125 Ω	845-409 80 W / 500 Ω	845-509 80 W / 775 Ω
2-3	845-211 160 W / 63 Ω	845-411 160 W / 250 Ω	845-511 160 W / 388 Ω
5	845-213 240 W / 42 Ω	845-413 240 W / 167 Ω	845-513 240 W / 258 Ω
7.5	845-214 360 W / 28 Ω	845-414 360 W / 111 Ω	845-514 360 W / 172 Ω
10	845-215 480 W / 21 Ω	845-415 480 W / 83 Ω	845-515 480 W / 129 Ω

The larger modules (15 to 30 HP) use a brake chopper circuit plus a set of external resistors. These configurations do not have a thermistor or any other means for monitoring resistor temperature. Refer to Tables 2 and 3.

Table 2: External Resistors for Sub-Micro Series DB Modules (15-30HP)

HP	240V	480V	590V
15-20	845-200	N/A	N/A
15-30	N/A	845-400	845-500

Table 3: External Resistors for SMV Series DB Modules (15-30HP)

HP	240V	480V	590V
15-20	841-009 500W / 12Ω	841-009 510W / 47Ω	841-010 530W / 70Ω
25-30	N/A	841-011 770W / 31Ω	841-012 800W / 47Ω

Copyright © 2009 by Lenze AC Tech Corporation

For general information only. Content subject to change without notice.

Both of these braking configurations are triggered and controlled by Lenze-AC Tech drive control software. This means the control board is monitoring the DC bus level and triggers the brake when the voltage level exceeds 114%. The software is programmed to activate the chopper circuit for up to 5 seconds. If it doesn't reduce the DC Bus voltage to an acceptable level, then the module sends a fault trip (dF) to the drive. There is an algorithm in the drive software that is designed to keep track of how long and how often the brake is triggered.

When smaller HP brake modules (0.33 - 10 HP) are applied, protection is provided by the thermistor and the software algorithm. In the larger HP brake modules (15 - 30 HP) protection is provided by the software algorithm only.

For the SC series and SMV series[1] drives, the DB circuit is completely external to the drive inside a separate module. The DB module is independent of the drive's normal function and ratings. Current sharing or connecting the DC bus terminals between multiple drives is not allowed. Use larger DB kits or connect modules in parallel to keep the same drive size. Lenze-AC Tech offers modules based on HP and voltage rating. This means even a 15HP Dynamic Brake module could be used on a 5HP drive.

Correctly Sizing the Dynamic Brake to Stop a Large Inertial Load

A very common question from customers is how to properly size dynamic braking for a large inertial load. In order to do this, gather all the (drive) system mechanical and electrical characteristics to properly calculate the DB value. Whether or not the DB resistor bank will meet these requirements can only be determined by analyzing the entire mechanical system of the driven equipment.

Troubleshooting Dynamic Brake Faults

Drive Display shows "EF" when using a DB kit

The "EF" display means either noise is coming onto the 13A or 13B terminals, or the dynamic braking circuit is sending a faulty signal to the drive. Disconnect the 13A or 13B wire feed to TB 47 on the braking module. If the fault doesn't return, the problem is noise on that line or the DB module is bad. If a dF alarm occurs, the regenerated energy is overheating the braking resistors. In this case, a higher resistor value is necessary.

Insufficient Energy from the Dynamic Braking Circuit

Sometimes the amount of energy that must be dissipated using dynamic braking is too much for the DB circuit. Lenze-AC Tech Dynamic Braking circuits are primarily light-duty and not intended for long on-times. In this case, using a separate line regeneration module is recommended. The line regeneration module is tied between the 3-phase input side of the drive and the DC bus terminals. It is used for regeneration control of any AC drive system that uses a fixed DC bus system. This unit provides for regulation of the bus and prevents the drive from tripping on overvoltage. Regeneration modules are available from companies like Bonitron.

Using a Lenze-AC Tech DB with Another Manufacturer's Drive

Applications Suipport is often asked if the Lenze-AC Tech DB module can be used with a non-Lenze AC Tech drive. This is not possible. The Lenze-AC Tech sub-micro drives have specific inputs that are set to trigger the Lenze-AC Tech DB modules. Other VFD manufacturers may encounter problems trying to trigger the DB chopper properly.

1 For the SMVector drives, the dynamic braking module includes a small connector that plugs onto the drive's DC Bus Board for the B+ and B- connections. A set of mounting instructions is included.

Copyright © 2009 by Lenze AC Tech Corporation

For general information only. Content subject to change without notice.