



The Motor Control Warehouse

Overview of Dynamic Braking with Inverters

MCW Hints & Tips 0001

When the rotor of an induction motor turns slower than the speed set by the applied frequency, the motor is transforming electrical energy into mechanical energy at the motor shaft. This process is referred to as 'motoring'.

When the rotor turns faster than the synchronous speed set by a drive output, the motor is transforming mechanical energy from the motor shaft into electrical energy. This condition is referred to as 'regeneration'.

Regeneration may be caused by a drive ramp to stop or a reduction in commanded speed on a high inertia load or an overhauling load that causes the shaft speed to be greater than the synchronous speed.

If the motor is regenerating, the DC bus voltage will increase. Unless method of dealing with the regenerative energy is provided either internal within the drive or externally with a separate piece of equipment, the drive will protect itself with a DC Bus overvoltage trip, thus stopping the regenerative condition.

There are 3 ways of dealing with the regenerated energy:

1. Provide a 'regenerative bridge converter' that has the ability to change the regenerated/DC bus energy into fixed frequency utility power i.e. regenerate back on to the mains supply.
2. Connect a number of drives together via their DC bus connections such that "regenerative" energy from one motor / drive can be absorbed and used by another "motoring" drive on the same DC bus line.



3. Release the energy in the form of heat through a braking resistor.

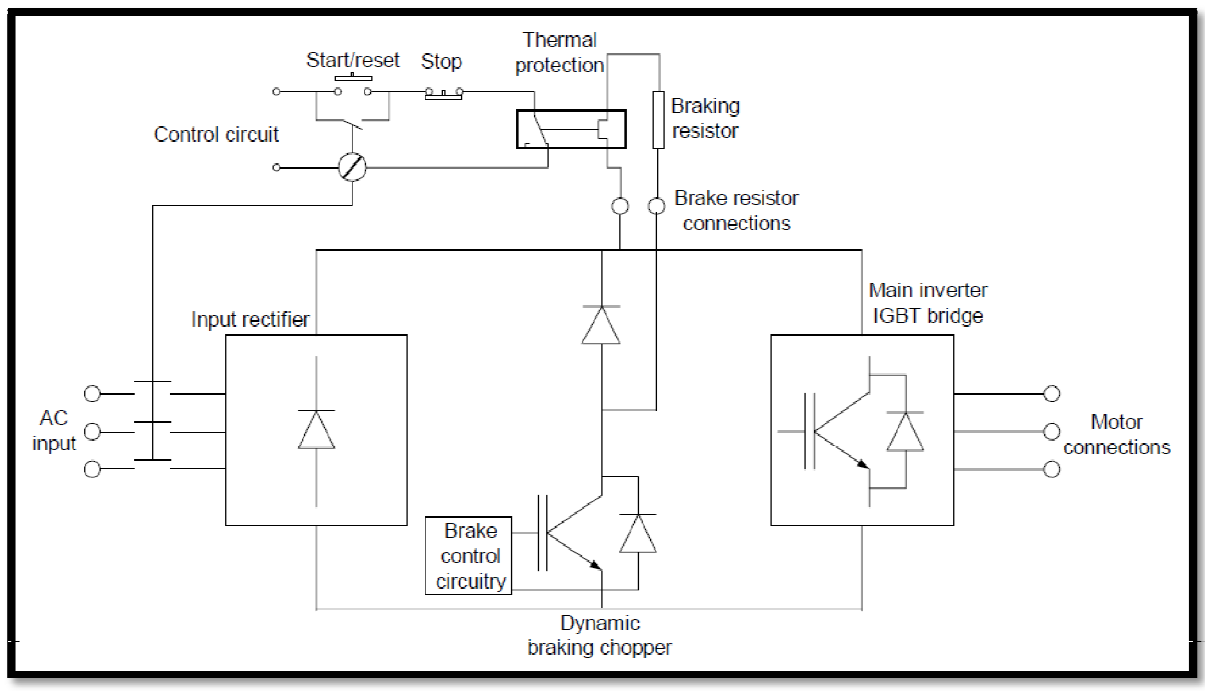
A series circuit consisting of a transistor and resistor is placed across the DC bus and is switched into circuit when the DC bus voltage increases above a set level. The easiest way to remove this regenerated energy is method 3.

Many drives already have an internal braking transistor, its switching is controlled by the drive software. Some drives are fitted with an internal braking resistor. This resistor is usual of a small power rating so before use, its rating must be checked as being suitable for the application.

With an external braking resistor, the user just has to connect the resistor across the braking resistor terminals of the drive (Note: Correct braking resistor sizing and protection are required).

If no internal braking transistor is available, a standalone braking unit and resistor will be required.

Typical Inverter Braking Circuit



With correct setting of the thermal overload, if the braking resistor gets too hot, the thermal overload contacts will open and remove power from the inverter.

