# Lenze AC Tech

Application Note

Sub-micro Braking Guide

Braking applications can be divided into two categories: "dynamic" and "holding". Dynamic braking is used to convert the rotational energy of a load into electrical energy, thus allowing the load to decelerate at a rate faster than it would coast to a stop. Holding is used to prevent the load from rotating when it is at rest, or for emergency stopping, and is usually done with a mechanical brake on the motor. This Application Note briefly covers both braking methods.

Dynamic Braking Applications

All current sub-micro drives are compatible with the optional dynamic braking module. This module allows regenerative energies that are fed back into the drive during braking to be dissipated across resistors within the dynamic braking module. This allows the drive to decelerate or stop the load in a shorter period of time without tripping the drive into an Overvoltage fault. Please refer to the sub-micro dynamic braking instructions for complete wiring and programming information.

Sub-micro Wiring Diagrams - Dynamic Braking
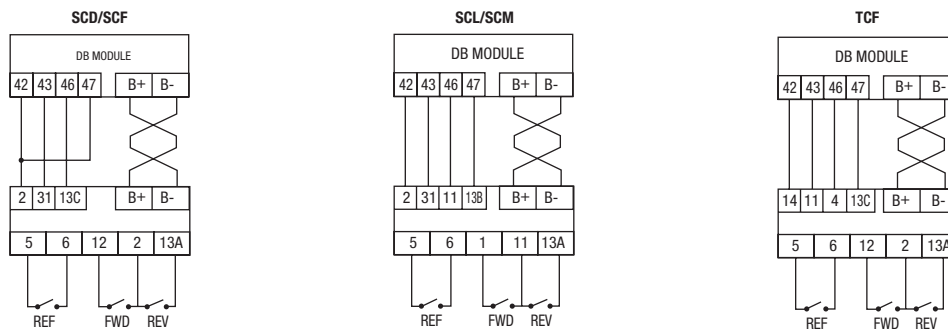
SCD/SCF

SCL/SCM

TCF

Important Application Parameters

Code	Parameter Name	Setting			Comments
		SCD/SCF	SCL/SCM	TCF	
P06	TB-14 Output	--	--	11	DB Trigger Signal
P09	TB-31 Output	04	--	--	DB Trigger Signal
P10	TB-13A Function	05	06	06	Run Reverse
P11	TB-13B Function	--	10	--	Trip Input from DB Module
P12	TB-13C/13E Function	08	20	08	SCD/SCF/TCF = Trip Input from DB Module SCL/SCM = DB Trigger Signal
P19	Acceleration Time	0.1 - 3600 sec		0.1 - 1300 sec	Required Acceleration Time (see Note *1)
P20	Deceleration Time	0.1 - 3600 sec		0.1 - 1300 sec	Required Deceleration Time (see Note *2)
P23	Minimum Frequency	0 Hz - P24			Application Minimum Speed
P24	Maximum Frequency	P23 - 240 Hz			Application Maximum Speed

Notes:
*1. Required Acceleration Time. Setting too fast will result in an OF or PF trip due to excessive current.
*2. Required Deceleration Time. Setting too fast will result in an HF or dF trip due to regeneration.
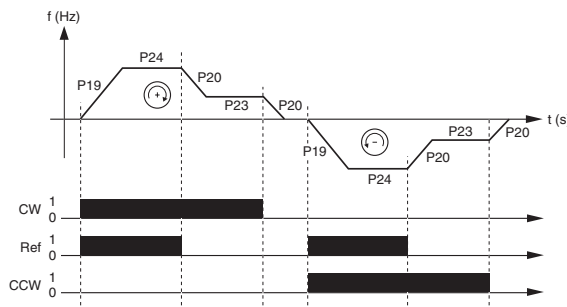

Motion Profile Example

In this 2 speed example, closing "Ref" and "Fwd" simultaneously causes the motor to accelerate to maximum speed. When "Ref" is opened, the motor decelerates to minimum speed. When "Fwd" is opened, the motor decelerates to a stop. This profile is repeated in the opposite direction by closing "Rev".

Mechanical Brake Applications

Sub-micro drives can also be used with a mechanical brake in the configurations shown below. Mechanical brakes are often used for holding the motor shaft once the load has stopped, or for emergency stopping of the load. The open-collector output on the SCD, SCF, and TCF Series drives can be used to trigger another relay that engages/releases the brake, while the relay output on the SCL/SCM Series drives may be able to engage/release the brake directly, depending on the brake's power requirements (or the drive's relay can be used to trigger another relay that engages/releases the brake). Centrifugal brake applications require further design consideration and you should contact AC Tech before approaching these applications.

Sub-micro Wiring Diagrams - Mechanical Brake
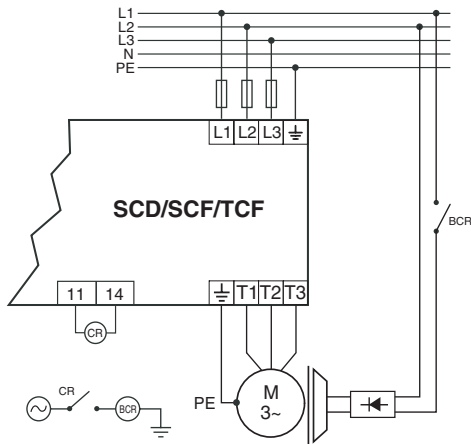
NOTE: CR coil must be rated ≤50mA at 12VDC
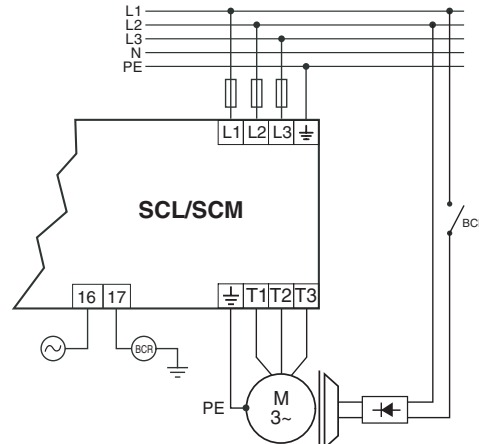
NOTE: BCR coil must be rated ≤3A at 240Vac max

Important Application Parameters

Code	Parameter Name	Setting		Comments
		SCD/SCF/SCL/SCM	TCF	
P06	TB-14 Output / Relay Output	07		Output activated when Preset Speed #3 value (P33) is exceeded
P19	Acceleration Time	0.1 - 3600 sec	0.1 - 1300 sec	Required Acceleration Time (see Note *1)
P20	Deceleration Time	0.1 - 3600 sec	0.1 - 1300 sec	Required Deceleration Time (see Note *2)
P23	Minimum Frequency	0 Hz - P24		Application Minimum Speed (see Note *3)
P24	Maximum Frequency	P23 - 240 Hz		Application Maximum Speed
P28	Fixed Boost	0 - 30%		Low Speed Voltage Boost (See Note *4)
P33	Preset Speed #3	≥ 0.1 Hz		Set to required threshold to engage/release brake (see Note *5)

Notes:

*1. Required Acceleration Time. Setting too fast will result in an OF or PF trip due to excessive current.

*2. Required Deceleration Time. Setting too fast will result in an HF trip due to regeneration.

*3. The Minimum Speed setting must be set to a value above P33 so that the drive always runs at a speed above which the Relay output enagages the mechanical brake.

*4. Set Voltage Boost in conjunction with P33 to ensure the required torque is produced at the motor before the brake is released. Care must be taken for applications running at low speeds for a period of time to ensure any increase in Boost does not cause over-heating of the motor.

*5. Set in conjunction with P28 to ensure required torque is produced at the motor before the brake is released. Setting too high may result in an OF or PF trip due to excessive current.