

APPLICATION NOTE

Motor braking

Stopping machinery safely and effectively



RIGHT FROM
THE START

AUCom
MOTOR CONTROL SPECIALISTS

Motor braking using AuCom soft starters

Soft starters are commonly used to start and protect motors running high inertia machines in quarries, mines, saw mills and many other industries. In many cases, controlled stopping of these machines is also of great importance. Coast to stop times for high inertia machines can be extremely long, creating unnecessary process delays for tool changes or maintenance.

AuCom EMX series soft starters provide two options for reducing machine stopping times:

D.C. BRAKING

This stopping mode employs D.C. injection to slow the motor and machine. It does not require the use of a D.C. braking contactor. When commanded to brake, the soft starter creates a stationary D.C. field within all three phases of the rotor causing the motor to slow and come to a stop. D.C. injection across all three phases ensures motor heating is evenly dispersed throughout the motor windings during braking. This provides balanced performance and maximises the braking capacity available from this braking mode.

Motor thermistors and zero speed detection circuits may be connected to the soft starter for additional motor protection and control.

Compared to external braking systems, AuCom's D.C. braking:

- requires no additional equipment or cost
- offers simplified control
- provides moderate braking torque

SOFT BRAKING

The soft braking mode utilises reversing contactors between the soft starter and motor. When the soft starter receives a brake command, it reverses the phase sequence to the motor and begins the braking process by creating a counter rotating magnetic field.

The braking torque can be the same or different to the starting torque. Application of braking torque is done quickly and smoothly, without torque transients. All settings are pre-programmed using the soft starter control panel.

Compared to external braking systems, soft braking offers the following benefits:

- Full motor start torque available for braking
- Heavy duty rated
- Continuous motor thermal protection (fully operational during starting, running, braking & standby [stopped])
- Reduced cost (only reversing contactors and zero speed sensors are required)
- Simplified control

Model selection

Soft braking is available as a feature of the following AuCom soft starters:

	D.C. Braking	Soft Braking	Current Range	Voltage Range
CSXi			≤ 200 A	≤ 575 V
EMX3	•	•	≤ 1600 A	≤ 690 V
EMX4e			≤ 580 A	≤ 600 V
EMX4i	•	•	≤ 580 A	≤ 690 V

Application benefits

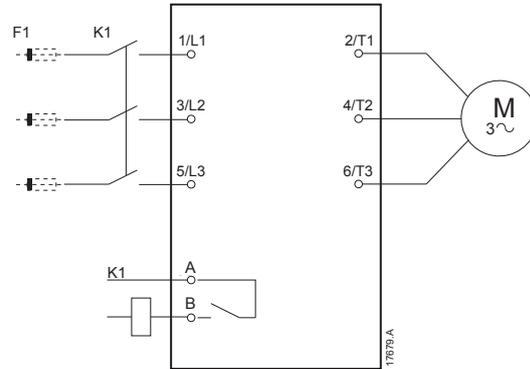
Braking offers a range of notable benefits across the following applications:

Applications	Key Braking Benefits
Band Saw	Standby time is eliminated, increasing production output Maintenance free, highly reliable operation Increased uptime from fast, simple setup and adjustment Reduced stopping time for increased safety Zero moving parts to wear out (unlike mechanical brakes), saving money Increased production rate in machine tools and high inertia loads Soft, smooth stopping prevents wear and tear on mechanical equipment Adjustable braking torque to match load size and required stop time Auto stop reduces motor heating (zero speed sensing option)
Centrifuge	
Chipper	
Circular Saw	
Conveyor	
Cut-off Saw	
Drum Sander	
Fan	
Grinder	
Planer	
Press	
Rock Crusher	
Rolling Mill	
Rubber Mill	
Shredder	
Wood Hog	

D.C. braking with EMX series starters

INSTALLATION TIPS

- High brake torque settings can result in peak currents up to motor DOL being drawn during braking. Ensure appropriate short circuit protection is installed in the motor branch circuit.
- Brake torque and time settings should be set so that the end of brake function coincides with the machine reaching zero speed. If the load is not purely inertial and thus likely to have variable braking requirements, a zero speed sensor can be used to co-ordinate the end of braking time with the load reaching zero speed.



Key	Description
K1	Main contactor (optional)
F1	Fuses or circuit breaker (optional)
A,B	Main contactor output

ADJUSTMENTS

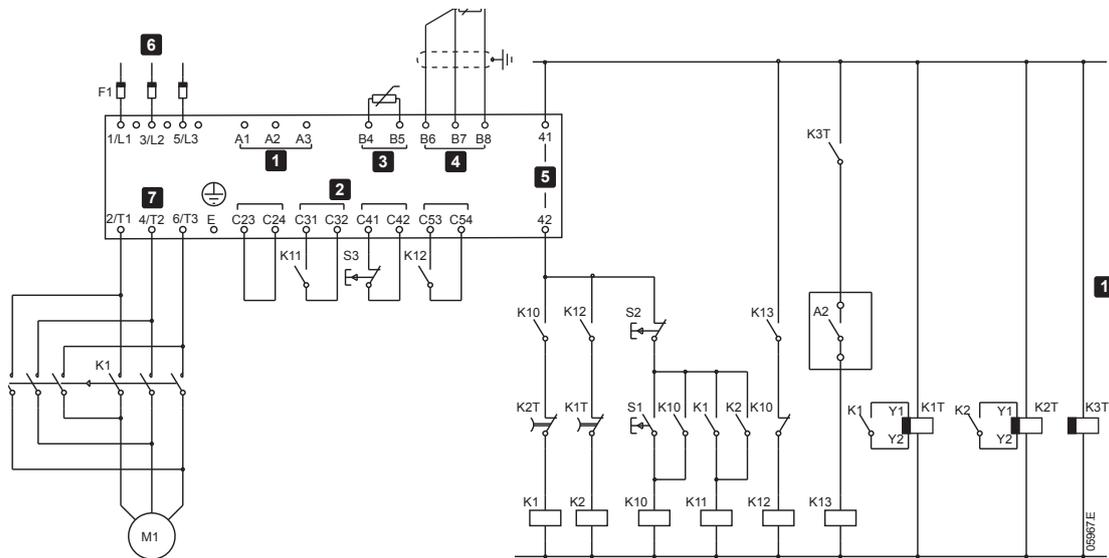
EMX3

Parameter	Required Setting
2L - Brake torque	According to application requirement
2M - Brake time	According to application requirement

EMX4i

Parameter	Required Setting
20 - D.C. brake torque	According to application requirement
2P - D.C. brake time	According to application requirement

Soft braking with EMX3



INSTALLATION TIPS

- Each start and brake cycle is equivalent to two starts. Select the starter model based on twice the number of intended starts per hour.
- Use the EMX3 dual parameter set function to enable separate programming of start and braking performance.

ADJUSTMENTS

The soft braking function is essentially a start in reverse. Use the EMX3 secondary motor start parameter set to control the braking function.

Parameter	Required Setting
9A - Dual thermal model	Single
10A - Start mode-2	Constant current
10D - Current limit-1	According to required braking torque

Key	Description
1	Control voltage (model dependent)
2	Remote control inputs
3	Motor thermistor input
4	RTD/PT 100 input
5	Relay outputs
6	Three-phase supply
7	Motor terminals
A2	Zero speed sensor
F1	Semiconductor fuses (optional)
K10	Run relay
K11	Brake relay
K13	Zero speed sensor relay
K1	Line contactor (run)
K2	Line contactor (brake)
K1T	Run delay timer
K2T	Brake delay timer
K3T	Zero speed sensor delay timer*
S1	Start contact
S2	Stop contact
S3	Reset contact

*The KT3 timer is only required if the zero speed sensor is the type that performs a self-test upon power-up and momentarily closes the output relay.

Soft braking with EMX4i

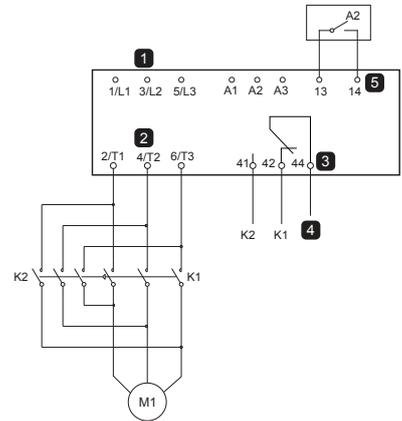
INSTALLATION TIPS

- Each start and brake cycle is equivalent to two starts. Select the starter model based on twice the number of intended starts per hour.

ADJUSTMENTS

The soft braking function is essentially a start in reverse. Use the following EMX4i settings to control the soft braking function:

Parameter	Required Setting
2I – Stop mode	Soft brake
2Q – Brake current limit	According to required braking torque
7A – Input A function	Zero speed sensor
8A – Relay A function	Soft brake relay



Key	Description
1	Three-phase supply
2	Motor terminals
3	Relay output A
4	K1/K2 coil supply
5	Programmable input A
K1	Line contactor (run)
K2	Line contactor (brake)
A2	Zero speed sensor

Notes

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