AMERICAN CONTROL ELECTRONICS™

An ISO 9001:2008 Certified Company

MGB400

4Q SCR Chassis Microprocessor-based Adjustable Speed Drive with Speed or Torque Mode for PMDC Brushed Motors

Specifications

Model	Line Voltage (VAC)	Armature Voltage Range (VDC)	Continuous Armature Current (Amps)	Armature Horsepower Range
MGB400-1.5	115	0 - 90	1.5	1/50 - 1/8
	230	0 - 180		1/25 - 1/4
MGB400-11	115	0 - 90	11.0*	1/8 - 1
	230	0 - 180		1/4 - 2

* Heat sink kit 223-0159 must be used when the output is over 8 amps.

AC Line Voltage.....115/230 VAC ± 10%, 50/60 Hz, single phase
AC Line Current.....0 - 15 Amps
Form Factor.....1.37 at base speed
Load Regulation.....1% base speed
Speed Range.....50:1
Acceleration Time Range.....0.25 seconds
Deceleration Time Range.....0.25 seconds
Analog Input Voltage Range (Signal must be isolated).....0 to ± 10 VDC
Input Impedance (COM to SIG).....>100K ohms
Vibration *(0 - 50 Hz)*.....0.5G maximum
(>50 Hz).....0.1G maximum
Surrounding Air Temperature Range.....10°C - 50°C
Weight.....0.62 lbs (0.28 kg)
Safety Certifications.....cULus Recognized, UL 61800-5-1, File # E132235

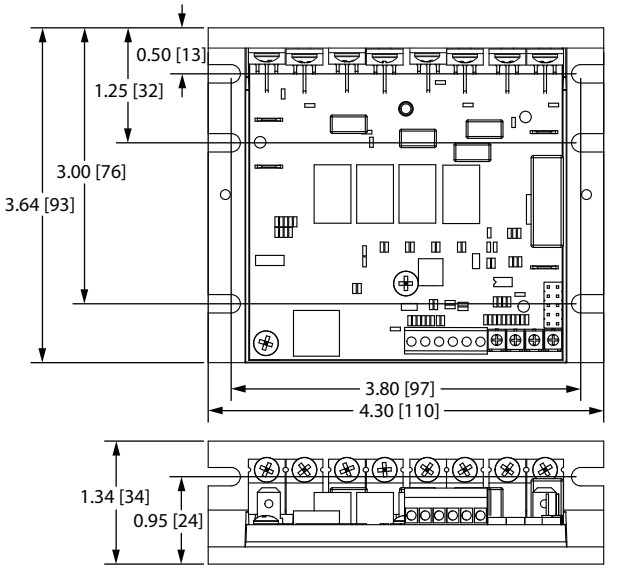
WARNING: The circuits connected to terminals COM, AX1, AX2, SIG, and +V are NOT isolated from power circuits by Protective Separation in accordance with UL 61800-5-1. Protective separation to protect these circuits against direct contact is to be supplied by the end user.

Safety Warnings

READ ALL SAFETY WARNINGS BEFORE INSTALLING THIS EQUIPMENT

- **DO NOT INSTALL, REMOVE, OR REWIRE THIS EQUIPMENT WITH POWER APPLIED.** Have a qualified electrical technician install, adjust and service this equipment. Follow the National Electrical Code and all other applicable electrical and safety codes, including the provisions of the Occupational Safety and Health Act (OSHA), when installing equipment.
- **Circuit potentials are at 115 or 230 VAC above earth ground**. Avoid direct contact with the printed circuit board or with circuit elements to prevent the risk of serious injury or fatality. Use a non-metallic screwdriver for adjusting the calibration trim pots. Use approved personal protection equipment and insulated tools if working on this drive with power applied.
- Reduce the chance of an electrical fire, shock, or explosion by using proper grounding, over-current protection, thermal protection, and enclosure. Follow sound maintenance procedures.
- **ACE strongly recommends the installation of a master power switch in the line voltage input.** The switch contacts should be rated for 250 VAC and 200% of motor nameplate current.
- **Removing AC line power is the only acceptable method for emergency stopping.** Do not use regenerative braking, decelerating to minimum speed, or coasting to a stop for emergency stopping. They may not stop a drive that is malfunctioning. Removing AC line power is the only acceptable method for emergency stopping.
- Line starting and stopping (applying and removing AC line voltage) is recommended for infrequent starting and stopping of a drive only. Regenerative braking, decelerating to minimum speed, or coasting to a stop is recommended for frequent starts and stops. Frequent starting and stopping can produce high torque. This may cause damage to motors.
- **Do not disconnect any of the motor leads from the drive** unless power is removed or the drive is disabled. Opening any one lead while the drive is running may destroy the drive.
- Under no circumstances should power and logic level wires be bundled together.
- Be sure potentiometer tabs do no make contact with the potentiometer's body. Grounding the input will cause damage to the drive.
- This product does not contain speed sensitive overload protection, thermal memory retention, or provisions to receive and act upon signals from remote devices for over temperature protection. If motor protection is needed in the end-use product, it needs to be provided by additional equipment in accordance with NEC standards.
- This product does not have internal solid state motor overload protection. It does not contain speed-sensitive overload protection, thermal memory retention, or provisions to receive and act upon signals from remote devices for over temperature protection. If motor protection is needed in the end-use product, it needs to be provided by additional equipment in accordance with NEC standards.

Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Installation

SCCR (Short Circuit Current Rating): MGB400 series drives are suitable for use on a circuit capable of delivering not more than 5,000 RMS symmetrical amperes, 115/230 volts maximum.

Branch Circuit Protection: Class J, Class CC, or Class T fuses are to be rated with a minimum of 230 VAC and a maximum current rating of 40 amps. Circuit breakers are to be rated at a minimum of 230 VAC with a maximum current rating of 30 amps.

Mounting

- **Install the drive in a Pollution Degree 2 environment only.**
- Drive components are sensitive to electrostatic discharge. Avoid direct contact with the circuit board. Hold the drive by the chassis only.
- Protect the drive from dirt, moisture, and accidental contact.
- Provide sufficient room for access to the terminal block and calibration trim pots.
- Mount the drive away from heat sources. Operate the drive within the specified ambient operating temperature range.
- Prevent loose connections by avoiding excessive vibration of the drive.
- Mount the drive with its board in either a horizontal or vertical plane. Eight 0.19" (5 mm) wide slots in the chassis accept #8 pan head screws. Fasten either the large base or the narrow flange of the chassis to the subplate.
- The chassis should be earth grounded. Connect the ground to the green screw on the chassis.

Heat Sinking: The MGB400-11 requires an additional heat sink when the continuous armature current is above 8 amps. Use heat sink kit part number 223-0159. Use a thermally conductive heat sink compound (such as Dow Corning 340® Heat Sink Compound) between the chassis and the heat sink surface for optimal heat transfer.

Wiring: 60°C wire was used in UL evaluation of the power wiring terminals (L1, L2, A1, A2). Use 18 - 24 AWG wire for logic wiring. Use 14 AWG wire for AC line (L1, L2) and motor (A1, A2) wiring.

Shielding Guidelines: As a general rule, it is recommended to shield all conductors. If it is not practical to shield power conductors, it is recommended to shield all logic-level leads. If shielding of logic-level leads is not practical, the user should twist all logic leads with themselves to minimize induced noise. Refer to the user's manual for details on earth grounding shielded wires and filtering.

Connections

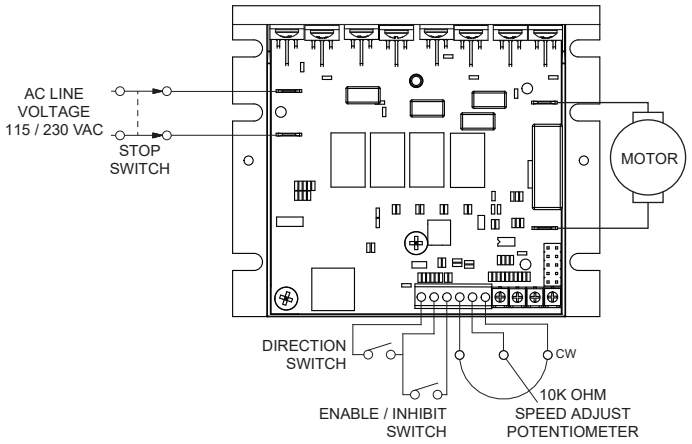
POWER

Line Input

Connect the AC line power leads to terminals L1 and L2, or to a double-pole, single-throw master power switch (recommended). The switch should be rated at a minimum of 250 VAC and 200% of motor current.

Motor

Connect the DC armature leads to terminals A1 and A2. If the motor does not spin in the desired direction, power down the drive and reverse these connections.



LOGIC

Speed Potentiometer

Use a 10K ohm, 1/4 W potentiometer for speed control. Connect the counter-clockwise end of the potentiometer to COM, wiper to SIG, and the clockwise end to +V. If the potentiometer works inversely of desired functionality, (i.e. to increase motor speed, you must turn the potentiometer counterclockwire), power off the drive and swap the COM and +V connections. To use an isolated analog signal instead, connect the signal negative (-) to COM and the signal reference (+) to SIG.

Direction (AX1)

Short terminals AX1 and COM to change the direction of The motor. If no direction switch is desired, leave this connection open.

Inhibit / Enable (AX2)

Short terminals AX2 and COM to stop the motor. Refer to jumpers 2 and 3 in the Startup section to determine if the switch is normally open or normally closed, and if the motor will regeneratively brake or coast to a stop. **Do not use the inhibit or enable for emergency stopping.**

Warning: The circuits connected to terminals AX1, AX2, COM, SIG, and +V are not isolated from the power circuits by Protective Separation in accordance with UL 61800-5-1. Protective separation to protect these circuits against direct contact is to be supplied by the end user.

Startup

JUMPERS

Jumper 1: Motor Voltage

OPEN / NO JUMPER - Leave these pins open if using a 180 VDC motor.
CLOSED / JUMPER - Place a jumper on these pins if using a 90 VDC motor.

Jumper 2: Speed or Torque Mode

OPEN / NO JUMPER - Speed Mode: The drive will do whatever current is necessary (up to the torque/current limit set by the CL trim pot) to achieve and maintain the commanded speed/voltage.
CLOSED / JUMPER - Torque Mode: The drive will do whatever voltage is necessary (up to the speed/voltage limit set by the MX SPD trim pot) to achieve and maintain the commanded current/torque.

Jumper 3: AX2 Terminal (Inhibit / Enable)

OPEN / NO JUMPER - Inhibit. The motor will regeneratively brake when told to stop using the AX2 terminal.
CLOSED / JUMPER - Enable. The motor will coast when told to stop using the AX2 terminal.

Jumper 4: Invert AX2 (Inhibit / Enable)

OPEN / NO JUMPER - Normal (Open to run / Close to stop).
CLOSED / JUMPER - Invert (Close to run / Open to stop).

Jumper 5: Current Limit Scale

OPEN / NO JUMPER - 10 A current limit scale. Leave these pins open if using a motor larger than 2.5 amps.
CLOSED / JUMPER - 2.5 A current limit scale. Place a jumper on these pins if using a motor smaller than 2.5 amps.

Jumpers 1, 2, and 5 may only be set while the drive is powered off or disabled.

STARTUP

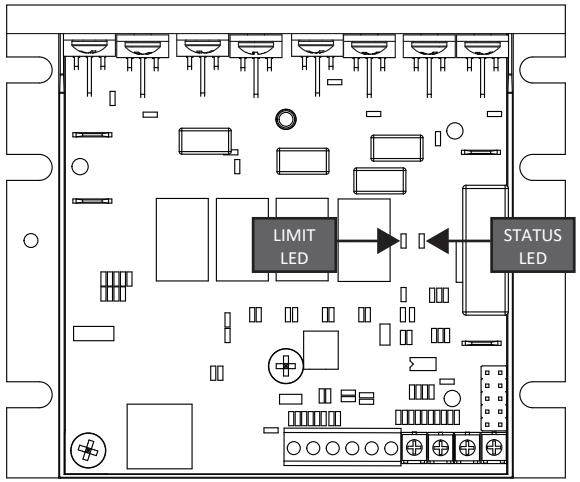
- Verify that no foreign conductive material is present on the printed circuit board.
- Ensure that all jumpers are properly set.

1. Turn the speed adjust potentiometer full counterclockwise (CCW).
2. Apply AC line voltage.
3. Make sure the drive is enabled / not inhibited.
4. Slowly advance the speed adjust potentiometer clockwise (CW) or increase the analog voltage signal. The motor slowly accelerates as the potentiometer is turned CW or as the analog voltage signal is increased. Continue until the desired speed is reached.
5. Remove AC line voltage from the drive to coast the motor to a stop.

LEDs

STATUS LED (Green)
Solid: AC line voltage is applied to the drive and the drive is enabled to run.
1 Flash: The drive is disabled or inhibited.
2 Flashes: Either Jumper 1, 2, or 5 was changed during operation. To change these settings, the drive must either be disabled or powered off.

LIMIT LED (Red)
Solid: The drive is in current limit. This means the motor is asking for more current (torque) than the drive is set to allow out. Either reduce the amount of torque required by the motor or raise the current limit output of the drive using the Torque (CL) trim pot.



Calibration

Offset (OFFST): The OFFST setting determines the minimum motor speed when the speed adjust potentiometer or analog voltage signal is set for minimum speed. To calibrate the OFFST:

1. Set the OFFST trim pot full CCW.
2. Set the speed adjust potentiometer or analog voltage signal for minimum speed.
3. Adjust OFFST trim pot until the desired minimum speed is reached.

Maximum Speed (MX SPD): The MX SPD setting determines the maximum motor speed when the speed adjust potentiometer is set for maximum speed. To calibrate the MX SPD:

1. Set the MX SPD trim pot full CCW.
2. Set the speed adjust potentiometer for maximum speed.
3. Adjust MX SPD trim pot until the desired maximum speed is reached.

Torque (CL): The CL setting determines the maximum torque for accelerating, driving, and decelerating the motor in both the forward and reverse directions.
To calibrate CL:

1. With the power disconnected from the drive, connect a DC ammeter in series with the armature.
2. Set the CL trim pot to minimum (full CCW).
3. Set the speed adjust potentiometer to maximum forward speed (full CW).
4. Carefully lock the motor armature. Be sure that the motor is firmly mounted.
5. Apply line power. The motor should be stopped.
6. Slowly adjust the CL trim pot CW until the armature current is 150% of motor rated armature current.
7. Turn the speed adjust potentiometer to minimum speed (full CCW).
8. Remove line power.
9. Remove the stall from the motor.
10. Remove the ammeter in series with the motor armature if it is no longer needed.

IR Compensation (IR): The IR setting determines the degree to which motor speed is held constant as the motor load changes. To calibrate the IR:

1. Set the IR trim pot full CCW.
2. Increase the speed adjust potentiometer until the motor runs at midspeed without load. A handheld tachometer may be used to measure motor speed.
3. Load the motor armature to its full load armature current rating. The motor should slow down.
4. While keeping the load on the motor, rotate the IR trim pot until the motor runs at the speed measured in step 2. If the motor oscillates (overcompensation), the IR trim pot may be set too high (CW). Turn the IR trim pot CCW to stabilize the motor.
5. Unload the motor.