

# Power Drive Systems

## Generator Control Specialists

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### INTRODUCTION – ACB275 Series Electric Actuator

The ACB275 Series Electric Actuator is designed to mount directly on a Bosch “P” size fuel injection pump in place of the mechanical governor. When the ACB275 is installed on the fuel pump, an integral high performance fuel control system without external linkages or brackets results. An external fuel shut off is provided to manually override the actuator’s control. Also provided is an adjustable internal maximum fuel limit.

The ACB275 Series is a second-generation design that is more powerful than its predecessor and is able to control up to 12 cylinder pumps. The actuator was designed with two isolated chambers. The upper chamber is wet with oil and contains the actuator linkage. The lower chamber contains the electro-magnetic components. This design eliminates the possibility of any magnetic particles collecting and jamming the actuator. Unreliable devices such as bellows and sliding seals are not used so that no maintenance is required. The actuator typically outlasts the engine’s life.

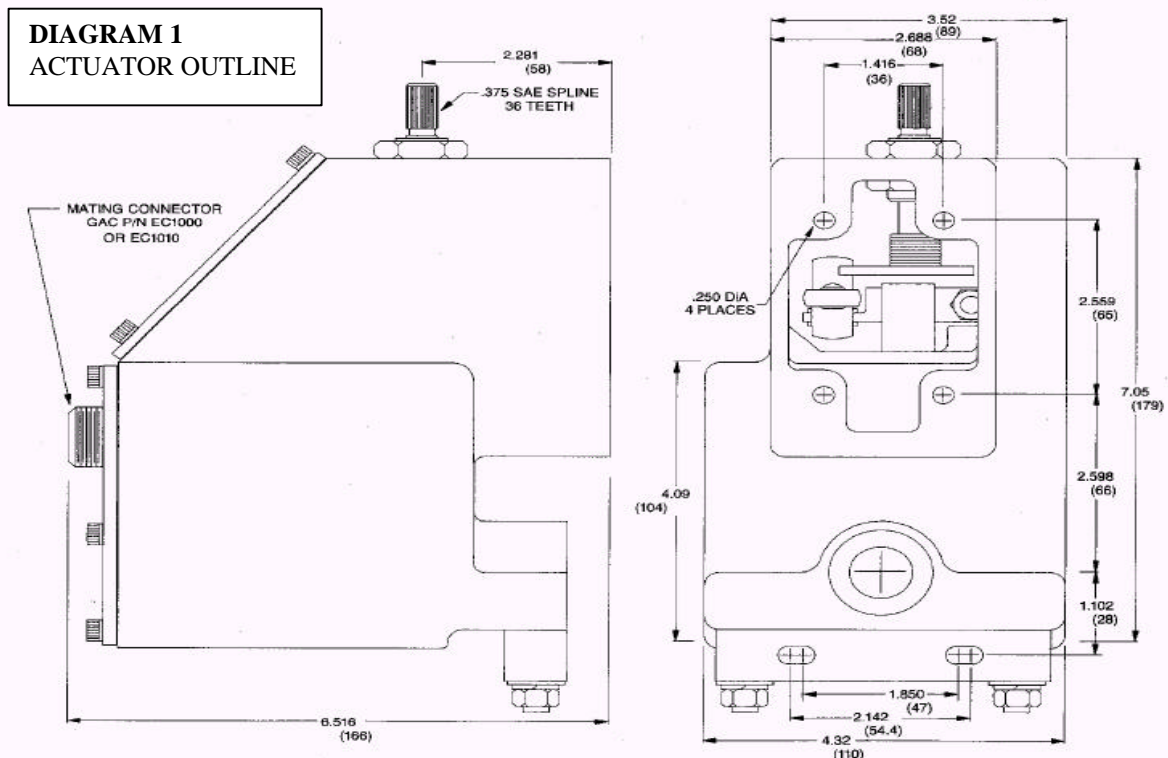
Presently, there are two actuators in the ACB275 Series. The ACB275H has the shut off shaft located on the top of the actuator. The ACB275F has the top mounted shut off shaft and includes a rack position sensor. This model must be used with a GAC control unit that reads the sensor.

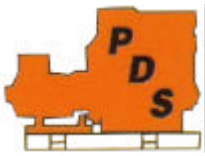
The ACB275 can be installed on Bosch “A”, MW, and “RP 21” size pumps by using special adaptor kits.

### SYSTEM DESCRIPTION

The actuator is an electromagnetic servo device, which can be integrated into a closed loop control system. An engine control system can be described as follows. An electrical signal is generated by a magnetic speed sensor which is proportional to engine speed. This signal is sent into the electronic speed control unit, which compares it to the preset engine setting. If the magnetic speed sensor signal and the preset engine speed setting are not equal, a change in current from the speed control unit to the actuator will change the magnetic force in the actuator. The rotation of the actuator shaft will then adjust the fuel to the engine and cause the engine to be equal to the preset engine speed setting. Shaft rotation is proportional to the amount of actuator current and counterbalance by the internal spring.

Since the design has no sliding parts and is totally sealed, outstanding reliability results. A single compression spring is used to improve reliability. No maintenance is necessary.





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### SPECIFICATIONS

#### PERFORMANCE

Force..... (See Diagram 2)..... 13.2 lb. Max (58.7 N)  
 Operating Stroke ..... 0.88 in max (22.5mm)  
 Internally adjustable

#### POWER INPUT

Operating Voltage ..... 12 or 24 VDC  
 Normal Operating current ..... 3A at 12 VDC  
 1.5A at 24 VDC  
 Maximum Current (Continuous) ..... 9A at 12 VDC  
 4.5A at 24 VDC

#### ENVIRONMENT

Operating temperature range..... -40° to +185°F (-40° to +85°C)  
 Relative Humidity ..... up to 100%  
 All surface finishes..... Fungus proof and corrosion resistant

#### PHYSICAL

Dimensions ..... see Diagram 1  
 Weight ..... 11 lb (4.9kg)  
 Mounting ..... Directly on RB3000 and 7000 fuel injection pumps  
 in place of the mechanical governor.  
 Requires camshaft bearing retainer kit.

#### RELIABILITY

Testing ..... 100%

#### MATING HARDWARE

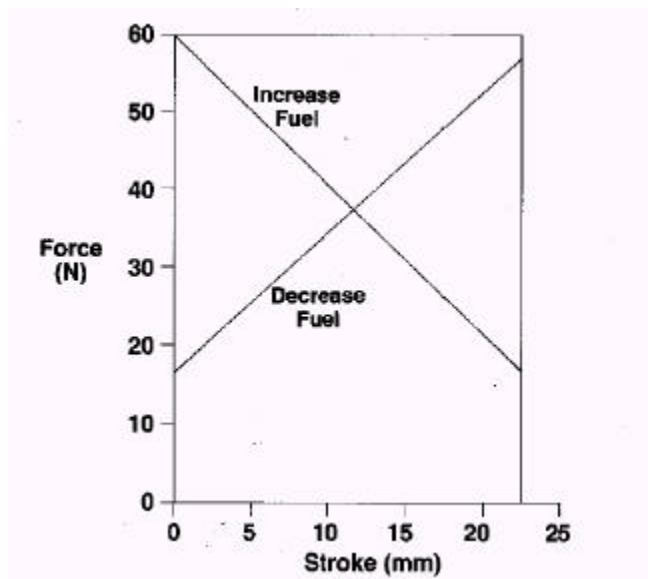
Connector..... EC1000 or EC1010  
 Shut off Lever ..... LE1400-4  
 Wiring Harness ..... CH1203, 12ft (4m)

#### CAMSHAFT BEARING RETAINER KITS

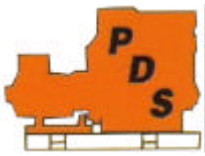
3000 Series Pump..... KT275  
 7000 Series Pump..... KT276

#### VARIATIONS

ACB275H ..... Top Mounted shut off  
 ACB275F ..... Rack position sensor, top mounted shut off



**DIAGRAM 2**  
 ACB Fuel Rack Force vs Stroke



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### INSTALLATION

#### Preparing the Fuel Pump

If the pump is equipped with a mechanical governor, it must be removed. GAC recommends that a qualified fuel injection shop do the modifications. The following procedure is intended to be a guide for a technician. Several types of mechanical governors are made for the "P" size pump. These steps are a generalized procedure.

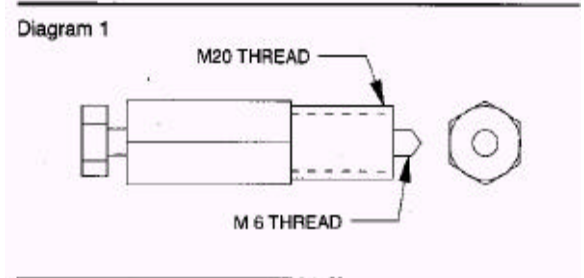
**NOTE: Be prepared to collect the oil that is in the mechanical governor.**

1. Remove the rear housing of the mechanical governor and disconnect the governor assembly from the fuel rack.
2. Remove the flyweight assembly with a tool like the one shown in Diagram 1.
3. Remove the intermediate governor housing. This leaves only the rack and camshaft protruding from the housing.
4. Install the appropriate camshaft bearing retainer kit following PIB 2031. This kit includes the correct shims to insure that the retainer plate rests on the bearing and also prevents oil from leaking out around the camshaft.

#### Camshaft Bearing Retainer Kits

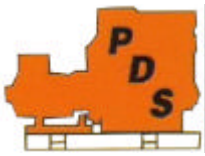
3000 pump .....	KT275
7000 pump .....	KT276

5. The oil drain hex plug located on the pump between the fuel rack and camshaft may be removed to allow any oil, which leaks from the fuel rack to drain into the pump.



#### Installing the Actuator

1. Remove the four screws that fasten the top cover (with label) to the actuator and expose the linkage to allow any oil which leaks from the fuel rack.
2. Remove the screw that attaches the ball bearing rod end to the lever. Do not remove or loosen the lever from the actuator shaft.
3. The opposite end of the linkage must be attached to the top of the fuel rack with the screw and lock nut provided. Tighten the screw and nut securely to 4.0 – 4.5 Nm. The linkage is preset to a specific length and locked. Any adjustment of rack travel must be made using the slot on the actuator lever.
4. The gasket supplied in the installation parts kit fits between the actuator and pump. Clean the mounting surfaces of the actuator and the pump. One side of the gasket is coated with adhesive. Peel off the backing and attach the gasket to the actuator. A small amount of gasket sealant, such as RTV silicone, is recommended for the pump side of the gasket.
5. Loosen the two M8 hex nuts that hold the lower mounting bar to the actuator.
6. place the actuator over the rack and linkage. Fit the lower part of the actuator onto the bearing retainer plate. Attach the actuator to the pump with four M5 22mm screws and washers through the upper mounting holes. Tighten these screws securely to 9 Nm so that the gasket is compressed evenly.
7. Push the lower mounting bar against the bearing retainer plate and tighten the two M6 nuts onto the studs that are in the pump to 10 Nm.
8. Tighten the two M8 nuts on the studs that hold the mounting bar onto the actuator to 20 Nm.
9. The linkage attached to the fuel rack must be free when moved from shut off to full fuel. Pull the linkage fully away from the pump. Push the linkage 1mm toward the pump and attach it to the slot in the actuator lever with the M5 screw, two flat washers, and locking nut. Tighten securely to 4Nm. The fuel rack should be 1mm or less away from its internal physical stop. The zero fuel stop of the system will now be provided by the actuator instead of inside the fuel pump.
10. Manually move the actuator lever and linkage through its full range of motion. No binding should be noticed. The stop plate on the linkage must not contact the inside of the housing.
11. A maximum fuel stop adjustment is located on the actuator lever. The set screw and lock nut may be adjusted to limit the travel on the fuel rack.
12. Push the linkage to the full fuel position and operate the manual shut off to insure that the shut off lever correctly contacts the stop plate and forces the linkage to zero fuel.
13. After the maximum fuel delivery has been adjusted on an engine or dynamometer, the top cover may be installed. Place the special sealing screw in the lower left hand corner. Lock wire the two covers together to prevent tampering.



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### WIRING

The EC1000 or EC1010 electrical connector that mates with the actuator must be prewired in a configuration to match the system voltage.

Fabricate a cable harness to connect the speed control unit to the actuator. The recommended wire size of the cable harness is at least #16 gauge (1.5mm<sup>2</sup>) for 12 volt systems and #18 gauge (1.0mm<sup>2</sup>) for 24 volt systems. Larger gauge wire will be necessary for cable lengths greater than 12ft. (4m). Cable harness CH1203 is available from GAC.

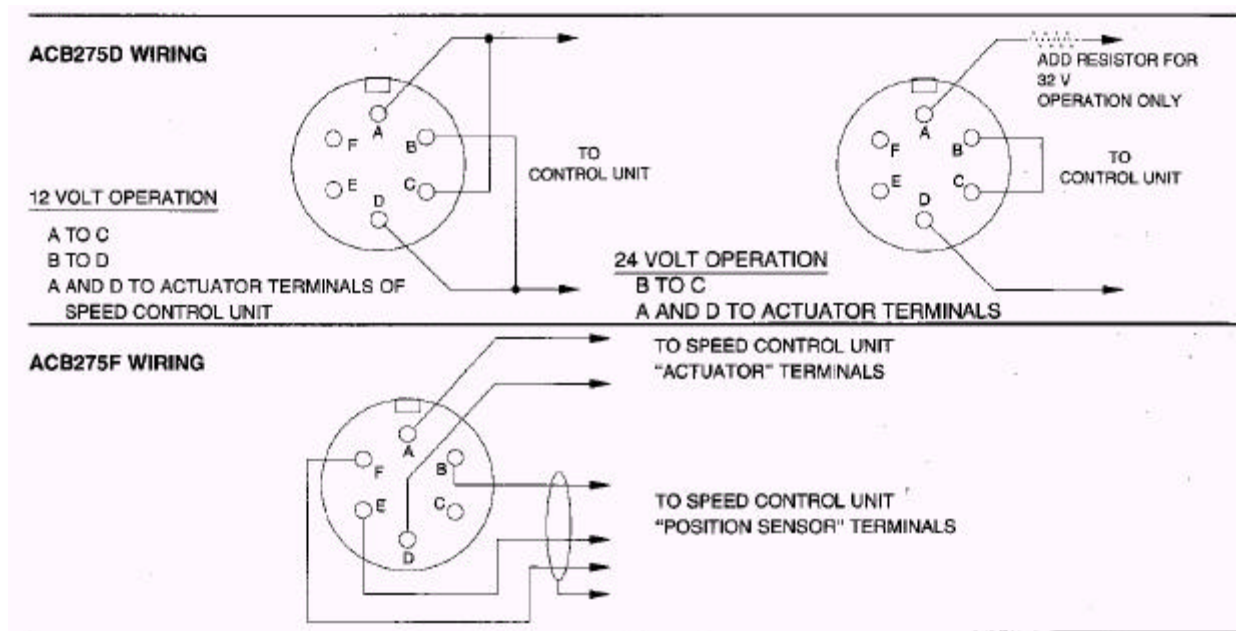
For 32 volt operation, wire the connector as shown for 24 volt operation and add a 1.5 ohm, 25V resistor in series with pin A of the actuator connector and the corresponding output terminal of the speed control unit.

Connect pin A and D to the speed control unit. Refer to applicable speed control unit publication for specific wiring information.

The ACB275F version of the actuator includes a rack position sensor. A GAC speed control unit that includes fuel management electronics is required to interface with this sensor. See the appropriate speed control unit literature for wiring information.

### CAUTION:

*The engine should be equipped with an independent shutdown device to prevent overspeed which can cause equipment damage or personal injury.*



### TROUBLESHOOTING

If the governor system fails to operate, make the following tests at the actuator mounted connector while moving the actuator through its stroke.

#### Measure the Resistance

A to B .....	2.5 ohms
C to D .....	2.5 ohms
A to C .....	Infinity
A to Housing .....	Infinity
C to Housing .....	Infinity
E to F .....	Infinity

Energize the actuator to full fuel (follow steps in control unit publication) and manually move the actuator through its range using the stop lever. No binding or sticking should occur.

If the actuator passes these tests, the problem is elsewhere in the system. Refer to the control unit troubleshooting publication.