

1 INTRODUCTION

GAC's 175 Series Integrated Pump Mounted Actuators are field proven proportional actuators designed to mount directly to fuel injection pumps in place of a mechanical governor to achieve an integrated proportional servo fuel package. The versatile design offers numerous options and mounting kits. Its fast response time of less than 35 ms (10 % - 90 %) also offers adjustable fuel limits.

Built with sealed components and no sliding parts, the design demonstrates outstanding reliability with no maintenance required. The 175 series supports Bosch-style P pump and BYC ASIMCO pumps designs.

- Connects directly to fuel rack in place of mechanical governor
- Analog or digital governors available
- Manual shut-off mechanism
- Fast response; < 35 ms (10 – 90 %)
- Right-hand rack



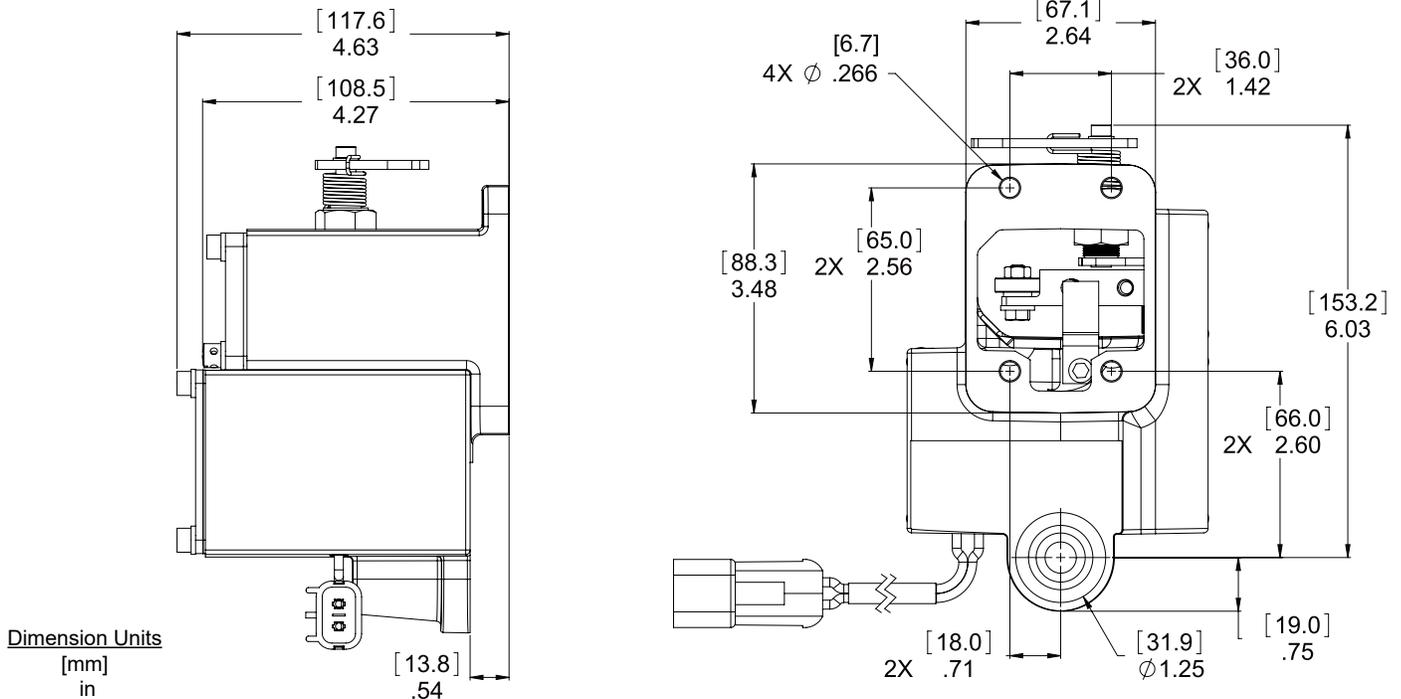
2 SELECTION CHART

PART NUMBER	DESCRIPTION	MANUAL SHUT OFF	FEED-BACK SENSOR	RETURN SPRING	BYC COMPATIBLE
ACD175A-12, -24	12 or 24 V DC with Packard Connector without Mating Connector / Double Rack Bearing / BYC ASIMCO installation kit KT283 included				
ADD175A-12, -24	12 or 24 V DC with Packard Connector without Mating Connector / Single / Bosch installation kit KT289 included				
ADD175SA-12, -24	12 or 24 V DC with Packard Connector without Mating Connector / Single / Generic installation kit KT270 included				
ADE175A-12, -24	12 or 24 V DC with Packard Connector with Mating Connector / Double Rack Bearing / Bosch installation kit KT289 included				
ADD175F-12, -24	12 or 24 V DC with Packard Connector without Mating Connector / Single Rack Bearing / Bosch installation kit KT289 Included / Novotechnik Position Feedback Sensor (Mating Connector EC1523 Not included)				

3 SPECIFICATIONS

PERFORMANCE		ENVIRONMENTAL	
Force	6.2 lbf-ft [27.5 N·m]	Operating Temperature	-40 to 200 °F [-40 to 95 °C]
Operating Stroke	0.80 in [21 mm]	Relative Humidity	Up to 100 %
Response Time (10-90%, 2-19 mm)	35 ms	Vibration	20 g @ 20 to 500Hz
Internal Sealing Pressure	2 bar (29 psi)	Shock	20 g @ 11 ms
ELECTRICAL POWER INPUT \ OUTPUT		All Surface Finishes	Fungus Proof and Corrosion Resistant
Operating Voltage	12 V DC or 24 V DC	PHYSICAL	
Nominal Operating Current	4.0 A (12 V DC) 2.0 A (24 V DC)	Dimensions	Approx 4.25 x 4.63 x 6.77 in [106.0 x 117.6 x 171.9 mm] See Section 4, Installation
MAX Continuous Current	5.8 A (12 V DC) 3.1 A (24 VDC)	Weight	4.75 lbf [2.2 kgf]
Nominal Coil Resistance	2.1 Ω Nominal (12 V) 7.1 Ω Nominal (24 V)		
Internal Sealing Pressure	2 bar (29 psi)		

4 DIMENSIONS



5 ADAPTER KITS

The following adapter kits are available in addition to those included with the actuator. See your GAC representative for details. See the [175 Series kit installation](#) document for a complete list of parts and instructions.

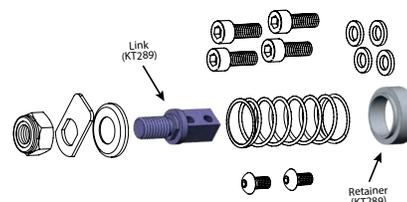
PUMP MOUNTING - ADAPTER KITS			Included with Actuator
PART NUMBER	PUMP TYPE	DESCRIPTION	
KT153	Motorpal Mi	Motorpal Mi Series - PPxM10P1i Fuel Injection Pumps - Plate, Linkage, and Mounting Hardware	
KT175-RS-R	Bosch RS/RSV	Bosch RS/RSV Governor / Right Hand Rack / Mounts Actuator Directly to Intermediary Mechanical Governor Housing - Adapter Plate, Linkage, Gasket, Hardware	
KT175-RS-R-ZEXEL	Zexel RS/RSV	Zexel RS/RSV Governor / Right Hand Rack / Mounts Actuator Directly to Intermediary Mechanical Governor Housing - Adapter Plate, Linkage, Gaskets (Governor Housing and Actuator), Hardware	
KT175A-R	Bosch A Pump	Bosch A Pump / Right Hand Rack - Includes Adapter Plate, Bearing Retainer (KT176A), Spring, Gaskets, Linkage, Hardware	
KT197	Bosch EDC	Bosch EDC Governor - Mounting Plate, Linkage, Gasket, Hardware	
KT275	Bosch P3000	Bosch P Pump 3000 Bearing Retainer Kit - Mounting Plate, Gasket, Shims, Hardware	
KT276	Bosch P7000	Bosch P Pump 7000 Bearing Retainer Kit - Mounting Plate, Gasket, Shims, Hardware	
KT283*	BYC 'P' Pump	Spare (Included with Actuator) - Hardware, Gasket, Shutoff Plate, Spring, Retainer, Linkage	
KT289*	BYC 'P' Pump	Spare (Included with Actuator) - Hardware, Gasket, Shutoff Plate, Spring, Retainer, Linkage [Note - KT289 includes contents of KT283]	
KT-BYC	BYC 'P' Pump	BYC ASIMCO Pumps - A, AD, P, P7100, PB197 - Adapter Plate, Gasket and Seal	

* The difference between the KT283 and KT289 is the KT283 does not include components included with the fuel pump.

FUEL INJECTION MOUNTING KITS

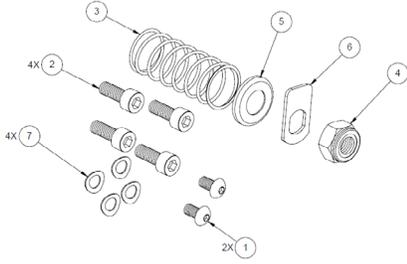
KT283 is specific to the BYC (ASIMCO) fuel injection pump where the retainer and link are included with the fuel pump.

KT289 comes with the retainer and link, giving the customer a choice of whether or not to use the link and retainer included with the pump.



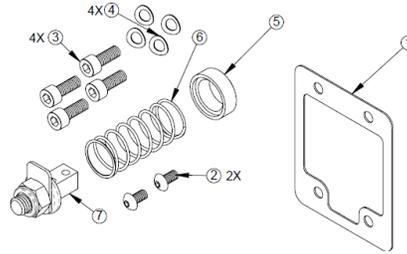
5 ADAPTER KITS (CONTINUED)

KT283 - INCLUDED WITH ACD175-XX



ITEM	PART	DESCRIPTION	QTY
1	HW05-550	Button head hex screw M5x10	2
2	HW05-566	Cap screw, M6x16	4
3	SP170	Rack return spring	1
4	HW07-710	Screw, plastic insert	1
5	RT171	Retainer spring	1
6	PL171	Shutoff plate	1
7	HW06-600	Spring washer M6	4

KT289 - INCLUDED WITH ADD175-XX AND ADE175-XX



ITEM	PART	DESCRIPTION	QTY
1	GA196	Gasket	1*
2	HW05-550	Button head hex screw M5x10	2
3	HW05-566	Cap screw, M6x16	4
4	HW06-600	Spring washer M6	4
5	RT172	Retainer spring	1
6	SP170	Rack return spring	1
7	LKS172	Assembly link	1

* KT289-1 does not contain gasket

6 INSTALLATION PREPARATION



- An overspeed shutdown device, independent of the governor system, should be used to prevent loss of engine control which may cause personal injury or equipment damage.
- Do not rely exclusively on the governor system electric actuator to prevent overspeed. A secondary shutoff device, such as a fuel solenoid must be used.

Before installing the actuator:

- Ensure paint or other debris does not enter the main shaft bore.
- The standard connection includes one bearing rolling on link piece provided in KT289. Two bearings are sometimes needed to accommodate height variances across different fuel pump models.
- Select models have GAC logo embossed on top cover. On some models, lock washers are used in place of flat washers to retain covers. Contact GAC if special accommodation is needed.
- If required, install a camshaft bearing retainer plate kit to support your pump assembly before installing the actuator. These kits are listed in section 5 [Installation Kits](#) of this manual. Installation instructions for each kit are available on the GAC website.

If the fuel injection pump is equipped with a mechanical governor, it must be removed.

NOTE: GAC recommends that this modification be performed by a qualified fuel injection service facility.

The following steps are generally required to remove an existing mechanical governor:

1. Remove the rear housing from the mechanical governor and disconnect the governor linkage from the pump fuel rack. Remove the flyweight assembly following Bosch instructions, using specialized Bosch tools (part number KDEP-2998, KDEP-2918, and KDEP-1068 tappet holding tool needed during reassembly) obtained from an authorized Bosch service center.
2. Remove the intermediate governor housing. This leaves only the rack and camshaft protruding from the pump.
3. Install the appropriate bearing retainer.

7 WIRING

The 175 Series Integral Electric Actuator is prewired for 12 or 24 V DC operation. Use the included cable harness or make up a cable harness to connect the actuator to the speed control unit.



Do not use the 175 Series actuator on a 32-volt system. Contact the GAC for any further assistance.

PACKARD CONNECTORS - CABLE HARNESS

DESCRIPTION	PART NUMBER
Actuator Mating Connector	EC1300
Actuator Mating Cable Harness (6 ft.)	CH1215

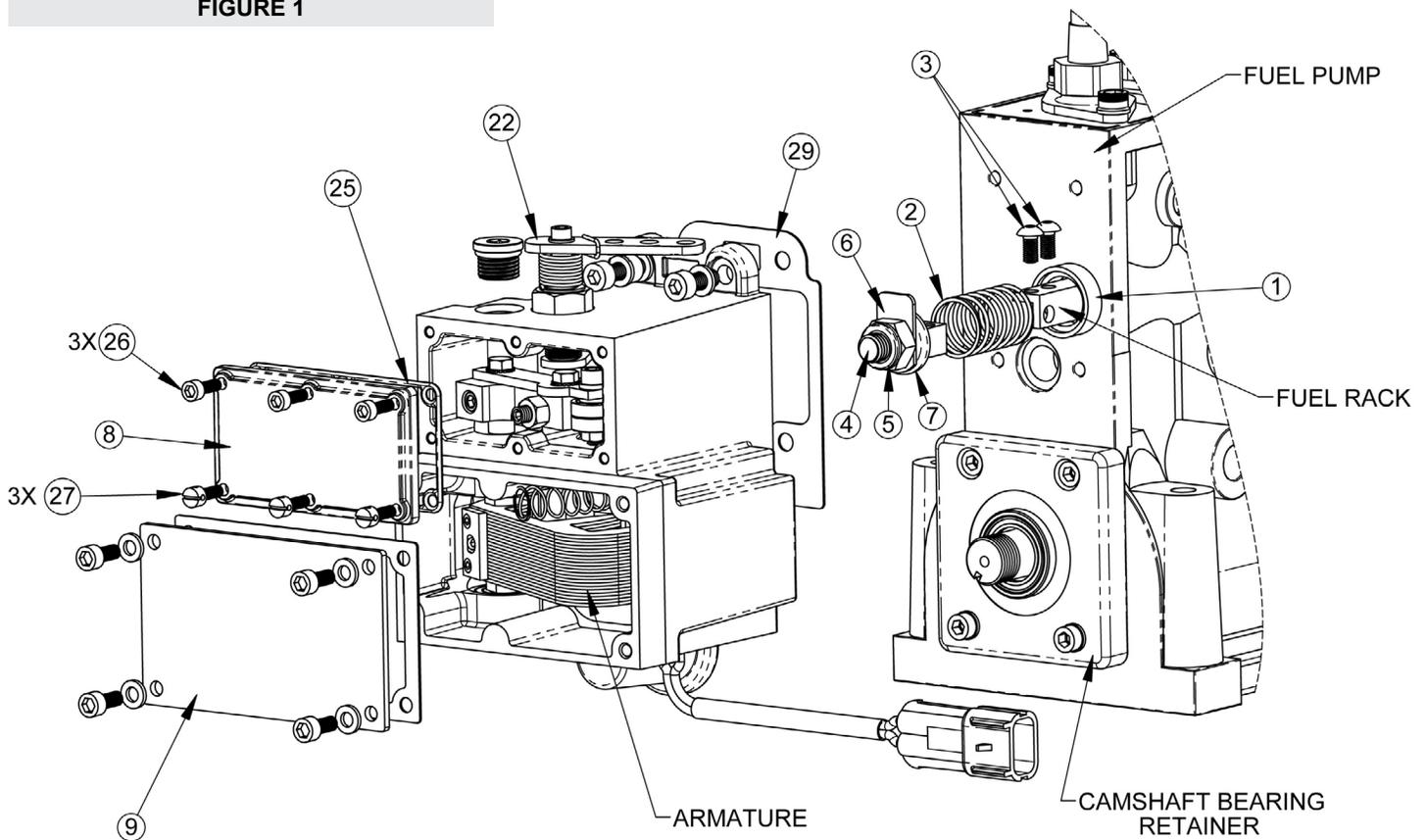
8 INSTALLING THE ACTUATOR

All hardware needed to attach the actuator to the pump is located in either kit KT283 or KT289, which are supplied with their related actuator.

1. Place the spring seat (Figure 1 (1)) over the fuel rack and slide it to the body of the fuel pump. Slide the fuel rack return spring (2) over the fuel rack and against the spring seat.
2. Attach the rack connection link assembly (4, 5, 6, 7) to the fuel rack with two M5 X 10 mm long retaining screws (3) coated with Loctite adhesive*. Torque the screws to 3-4 N·m.
3. Remove the upper actuator cover (8) and O-ring seal (25). Retain seal and hardware. Although the lower actuator cover (9) is shown here detached, it should not be removed.
4. Clean the actuator to pump mounting surface on the fuel pump so that it is free of any debris.

* GAC recommends using Primer Loctite SF7649 with Loctite 518 for best results .

FIGURE 1



8 INSTALLING THE ACTUATOR (CONTINUED)

IMPORTANT

Alternate tightening diagonally opposite mounting screws so the actuator is aligned properly.

8. To attach the lower mounting screws, insert a ball end hex wrench through the hex key access point (Figures 4 and 5) located on the operating lever and tighten the lower left mounting screw (Figure 6 (17L)) a few turns.
9. Pull the operating lever (Figure 4(37)) outward and slide the ball end hex wrench into the space between the operating lever and the access point in the housing of the actuator and tighten the right lower mounting screw (Figure 4 (17R)).
10. Once these two screws are fully engaged into the pump housing (do not tighten at this time) insert the two additional M6 X 16 mm long screws (Figure 2 (5)) and spring washers (16) into the top two mounting holes (Figure 5) of the actuator and thread into the pump housing.
11. Torque all four mounting screws to 5-6 N·m.
12. Verify that the fuel rack assembly moves in and out freely inside the upper cavity of the actuator.



Setting high fuel levels may cause the maximum fuel adjusting screw to hit the top cover, which can change the minimum fuel position. This could lead to a dangerous condition.

When setting fuel levels above 17 mm of actuator lever travel, ensure the adjusting screw does not contact the top cover in the minimum fuel position.

FIGURE 4

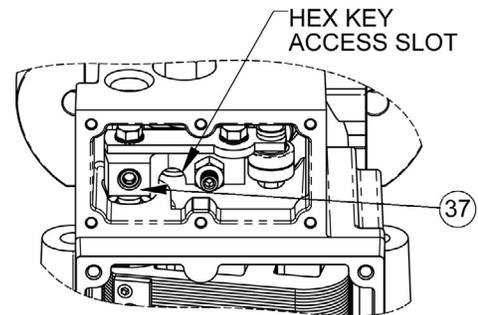


FIGURE 5

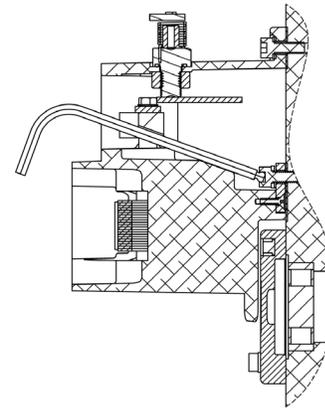
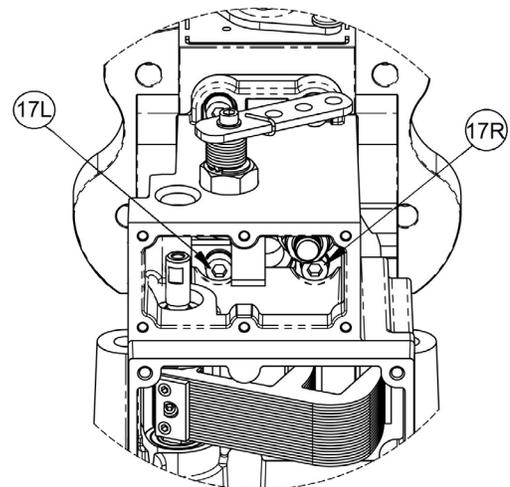
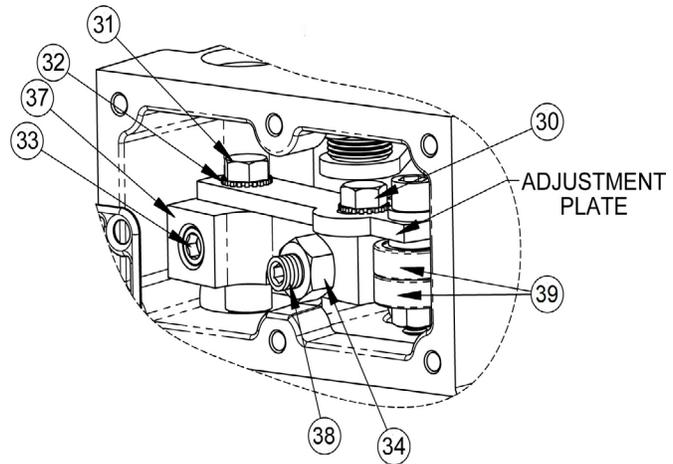


FIGURE 6



13. Carefully loosen screw (Figure 7(31)) and (30)) over the slotted portion of the adjustment plate so that the operating lever bearing assembly (39) can be moved away from the fuel rack connection link.
14. Ensure that the fuel rack is as far out of the pump as possible.
15. Rotate the operating lever (37) out from the actuator until it stops. The armature of the actuator will be in contact with the lower cover (Figure 1 (9)). Hold this position.
16. Rotate the adjustment plate and lever bearing assembly (Figure 7(39)) inward towards the fuel rack so that contact is made between the bearing and rack connection link.
17. Continue to push inwards an additional 1 - 2 mm, and, while holding this position, torque the operating lever assembly shaft screw (Figure 7 (31)) and screw (30) to 4-6 N·m.

FIGURE 7



18. Inspect the assembly to ensure all screws are tight and the fuel rack moves smoothly without any binding.
Push in the fuel rack manually to the full fuel position and rotate the fuel shut off lever (Figure 1(22)) to minimum fuel to confirm that the shut off lever contacts the metal plate (Figure 1 (6)) on the fuel rack connector assembly and forces the fuel rack to minimum position.
19. Use the maximum fuel adjustment set screw (Figure 7 (38)) on the operating lever to restrict the fuel rack travel.
20. With the fuel pump operating on the engine, the maximum fuel setting screw can be adjusted to provide specific horsepower. Once this setting is made, torque the locknut (Figure 7(34)) on the fuel adjustment screw to 5-6 N·m.
21. Rotate the manual shut off lever (Figure 1(22)) to the stop position and ensure that the fuel is completely shutoff and the engine stops.
22. With the engine shut down:
 - a. Apply Loctite 222 to each of the six screws (26, 27).
 - b. Seat the O-ring (25) into the upper chamber cover using silicone release compound or a light coating of grease to ensure the seal is fully engaged.



If the O-ring seal is damaged or deformed, discard and replace with a new one (GAC PN SE175).

- c. Install the upper chamber cover (Figure 1(8)) and O-ring seal (25) ensuring the seal is fully seated in the cover.
- d. Hand tighten the screws into the housing.



23. Ensure the cover does not hit the internal operating lever or the maximum fuel adjustment screw.
24. Torque cover screws in a criss-cross sequence to 20-22 lb-in [2-2.5 N·m]. Check for any oil leaks.
25. Lock-wire the lower screws for tamper resistance.