PGPL Actuator/Driver

Hydraulic Powered Electric Actuator for Gas Engine or Steam Turbine Control

Applications

The PGPL Actuator is used on gas engines, as well as steam turbines, to replace PGPL, PGL, and PGD type governors, providing the advantages of electronic control with the convenience of the existing PG-type drive and linkage.

The actuator has its own 2.5 liter (2.6 quart) oil sump and does not need a separate oil supply.

The actuator operates with drive speeds from 200 to 1500 rpm. Applications with a high drive speed or high ambient temperatures may require a cooler.

The availability of a self-contained MPU will simplify the conversion of a PG-controlled engine to an electronically controlled engine. A gear which has been specifically designed to operate the MPU means that the electronic control will receive sharp, clean speed signals. Low speed applications may require override of the control's failsafe during startup.

Description

The PGPL Actuator/Driver is an electrohydraulic actuator with a proportional driver interface (purchased separately) which can be used with electronic controls providing a 0 to 200 mA position signal. The actuator is designed for use with Woodward 2301A series, 723-series, Peak® 150, and 505 digital controls.

The driver converts a given electrical signal into a mA output to the actuator. This then drives the output shaft position through the action of a torque motor and follower-type pilot valve. A contactless sensor located on the power cylinder provides the position feedback necessary for loop closure. Power cylinders with 16, 23, 39, and 79 J (12, 17, 29, and 58 ft-lb) outputs are available with linear output. Power cylinders with 16, 23, 39, and 79 N·m (12, 17, 29, and 58 lb-ft) outputs are also available with rotary output.

The PGPL Actuator/Driver uses all the standard PG governor bases as well as drive shaft options. The output shaft or rod end and rack position indicators are the same parts used in the PG governor and in the same relative position. The existing booster, remote heat exchanger, and remote servo options can be used.

The actuator may be equipped with a special gear and magnetic pickup, using the governor drive to sense engine speed. This permits an added convenience when converting from a PG hydraulic-mechanical governor to an electronic control system.

- Proportional electric/hydraulic actuator
- Rotary or linear output
- Works with all Woodward 0–200 mA output electronic controls
- Self-contained oil supply
- Integral magnetic pickup available (not listed)
- UL/cUL Listed

Specifications

Control Qualities

Hysteresis Within 3% of maximum stroke when measured over full travel.
Within 0.5% of maximum stroke when measured over 4% of full stroke at 0.1 Hz.

Temperature Drift Nominally ±4% of full stroke per 38 °C (100 °F).

Linearity Within 2.5% of full stroke.

Dynamic Performance

Frequency response (phase shift 45 degree lag)

	39 J/29 ft-lb	**23 J/17 ft-lb**	**16 J/12 ft-lb**
±1% actuator travel	2.5 Hz	3.3 Hz	4.0 Hz
±5% actuator travel	2.7 Hz	4.0 Hz	4.6Hz
10 to 90% slew rate	670 ms	420 ms	330 ms
90 to 10% slew rate	630 ms	430 ms	330 ms

with 896 kPa/130 psi, 0.812 inch pump, 400 rpm, and with 125 SUS viscosity oil at 66 °C/150 °F

Output

The actuator can be fitted with different servo options. Contact Woodward for a full list. Some common options are:

- **16 J (12 ft-lb) spring return pull to increase fuel. 25 mm (1 inch) linear stroke.**
  Max work over full stroke:
  17.6 J (13.0 ft-lb) in decrease direction
  23.6 J (17.4 ft-lb) in increase direction
- **23 J (17 ft-lb) differential pull or push to increase fuel. 25 to 51 mm (1 to 2 inch) linear stroke.**
  Max work over 25 mm (1 in) stroke:
  14.5 J (10.7 ft-lb) in both directions
- **39 and 79 J (29 and 58 ft-lb) differential pull to increase fuel. 25 mm (1 inch) linear stroke.**
  Max work over full stroke:
  47 or 73 J (35 or 54 ft-lb) depending on pump pressure
- **39 and 79 N·m (29 and 58 lb-ft) rotary output; 30° output shaft stroke with 1.00-48 serration standard.**
  Max work over full stroke:
  47 N·m (35 lb-ft) depending on pump pressure
  16 N·m (12 lb-ft) is .750 to 48

The linear output servos can be mounted with the output shaft in various quadrants, and can be remotely mounted. Usable stroke and work is 2/3 of the maximum values.

Electrical Specifications

Electrical Connector 0.500-14 NPTF conduit with 1.2 m (48 in) lead wire. One on cover for torque motor and one on servo for feedback to the driver.

Coil Resistance 23–26 W at 20 °C

Actuator Construction

Base, Column, Power Block Cast iron

Feedback Housing Aluminum

Internal Parts Case-hardened steel

Pump PG spur gear. Drive speeds below 1000 rpm = 20.62 mm (0.812 inch) thick. Speeds above 1000 rpm = 14.27 mm (0.562 inch) thick. Relief valve set at 896 kPa (130 psi) standard. 1655 kPa (240 psi) is also available.

Drive/Base 1.125-48 serration, 0.625-36 serration, or keyed drive shafts. PG round, UG8, UG8-90 degree, or Alco base available. UG40 extend, Alco extend.

Weight 40 kg (89 lbs), dry weight [UG-90 degree base, 39 J (29 ft-lb) pull servo].

Vibration Resistance:

Actuator Vibration tested to WGC RV2 test procedure with an overall 7.648 GRMS. (In the axis parallel to the drive shaft, 7 G maximum.)

Driver Vibration tested to WGC RV5 test procedure with an overall 1.04 GRMS.

Drive/Hydraulic Specifications

Drive Speed and Rotation — Drive speeds from 200 to 1000 rpm available with check valves for either clockwise or counterclockwise rotation. Speeds up to 1500 rpm maximum available with plugs for single direction only. Oil cooler may be required.

Drive Power Requirement — Drive will use 375 W (0.5 hp) typical maximum.

Hydraulic Supply — Self contained sump, 2.5 liter (2.6 quart) capacity. See Woodward manual 25071, *Oils for Hydraulic Controls*, for specific recommendations. In most cases, the same type and weight of oils used in the engine can be used in the actuator.

Operating Temperature:

Actuator — –29 to +104 °C (–20 to +220 °F), within the limits of the oil being used in the actuator.

Driver — –40 to +70 °C (–40 to +158 °F).

Optional Features

Heat Exchanger (remote only) — A heat exchanger helps maintain actuator temperature below 93 °C (200 °F). Actuator temperature depends on ambient temperature, actuator drive speed, operating internal pressure, etc. Remote heat exchangers are available upon request.

Booster Servomotor — A booster servomotor, mounted externally, uses start air to supply immediate oil pressure to the governor as an aid for quick starts.

MPU — Actuator can be fitted with one or two MPUs (magnetic pickups). The MPU option is not UL approved.

Note: The addition of a magnetic pickup to an existing actuator involves proper removal and reinstallation of the actuator base and pump. Therefore, this operation must be handled by an authorized Woodward representative.

Driver Enclosure

Cast Aluminum Box — Not intended for engine mounting

Power Required — 18–32 Vdc

Input to Driver — Will accept inputs (0–200 mA) from Woodward controls such as standard 2301A, 723, 505, Peak 150, etc. 3.6–4.4 Vdc from position sensor on actuator.

Output from Driver to Actuator — 0–200 mA dc to the torque motor coil. 12 Vdc excitation to the position sensor.

Position Sensor — Contactless Hall Effect sensor

Calibration — The PGPL Driver/Actuator is fully calibrated when shipped.

Position Output — 4–20 mA position output proportional to actuator position

Wire Lengths

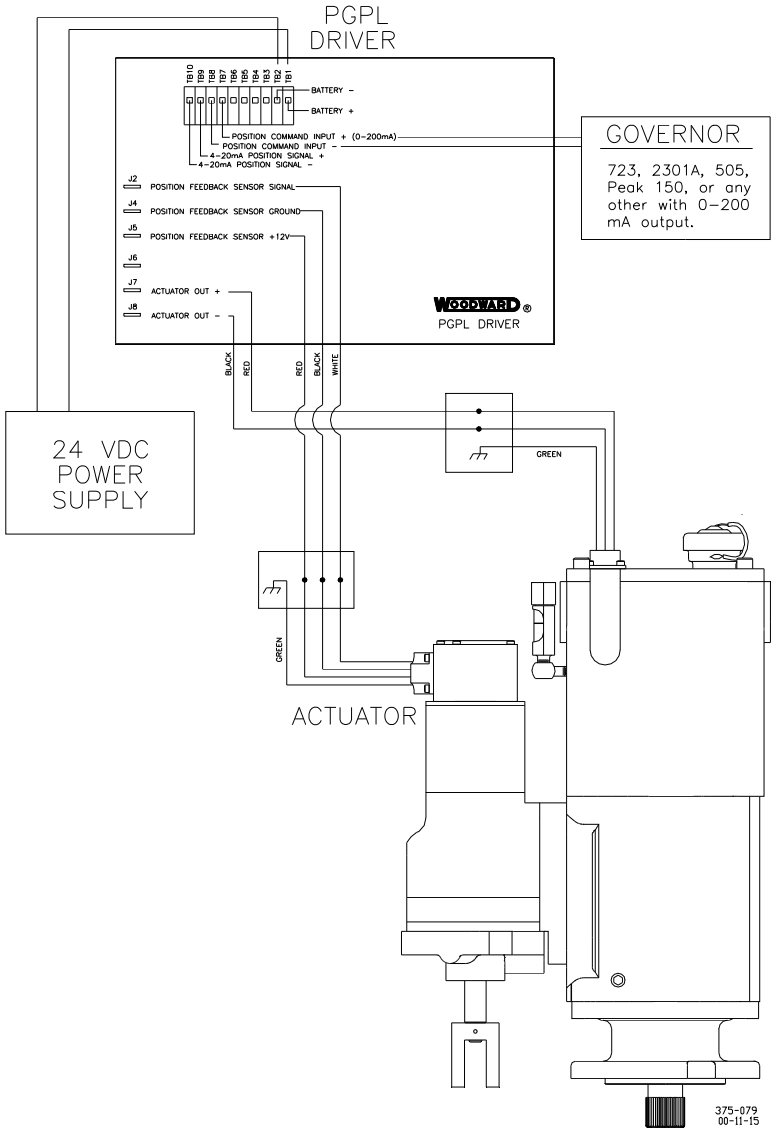
1.5 mm² (16 AWG) wire	
Battery to driver	457 m (1500 ft)
Driver to actuator	457 m (1500 ft)
2 mm² (14 AWG) wire	
Battery to driver	610 m (2000 ft)
Driver to actuator	610 m (2000 ft)

North American Hazardous Locations

UL approved for Class I, Division 2, Groups A, B, C, and D locations. Actuators with an MPU are not listed.

References

25071 *Oils for Hydraulic Controls*
25075 *Commercial Preservation Packaging for Storage of Mechanical-Hydraulic Controls*
50516 *Governor Linkage for Butterfly Throttle Valves*
36692 *PG Power Cylinder Assemblies*
36693 *PG Base Assemblies*
37519 *PGPL Actuator/Driver Manual*
50532 *EMI Control for Electronic Governing Systems*



System Wiring Overview

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