

PGG Governor

sets speed/power output from a remote location

Applications

The PGG is used for controlling speed or power output of engines where remote speed-setting capabilities with droop are required. It is especially useful in parallel generator-set applications where alternator frequencies must be matched, or the governor operated in droop mode for load distribution.

PGG governors are available with any of the PG output systems. Output ranges from 16 to 678 N·m (12 to 500 lb-ft) maximum work capacity, depending on the governor operating pressure and the output option selected. Most outputs provide 30 degrees of rotary travel. One inch (25 mm) of linear travel is also available.

The PGG governor is designed to operate the engine within a steady-state speed band of $\pm 0.25\%$ of rated speed. Special ballhead assemblies and pilot-valve porting options are available to match difficult control problems.

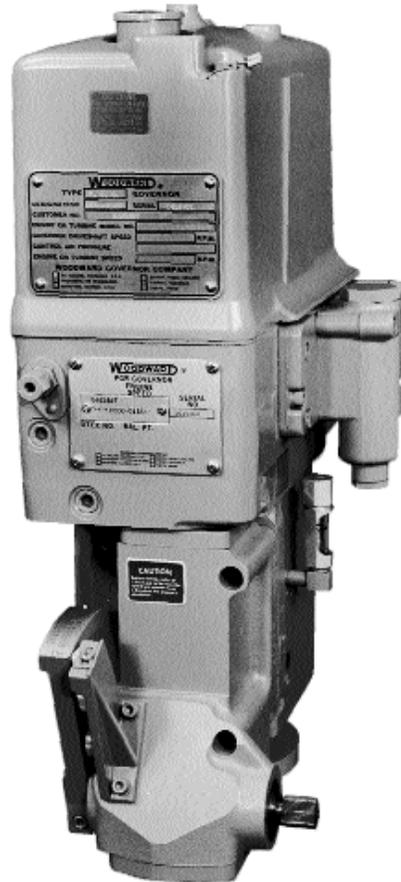
PG limiters to reduce smoke and enhance load change ability are available with PGG governors. Lube oil pressure and water pressure alarm and shutdown are also available. Oil heat exchangers allow PGG governor use in installations with extreme ambient temperatures.

Description

The PGG is a mechanical-hydraulic, pressure-compensated governor that combines a permanent-magnet, speed-setting motor for accurate remote speed adjustment with speed-droop adjustment and load-limit control features. Manual speed setting at the governor is also provided. Pressure-actuated or electric-solenoid shutdown is available in addition to other PG auxiliary devices.

The governor has a self-contained oil supply. The integral oil pump is driven by the governor drive shaft. PGG governors are available for clockwise, counterclockwise, or reversible governor drives. Oil pressure is maintained by a relief valve and accumulators. Oil flow to and from the governor power cylinder is controlled by a centrifugal flyweight and pilot-valve-plunger assembly. The power cylinder is mechanically linked to, and positions, the fuel racks or valve.

Adjustable load limit sets the maximum fuel position. The adjustment may be used to shutdown the engine or to otherwise limit the maximum fuel to the engine.



- Remote electrical speed setting
- Isochronous or droop operation—fully adjustable
- Adjustable load limit
- Adjustment position indicators
- Pneumatic or electric shutdown
- Compliant with applicable CE directives—Machinery Directive

PGG Auxiliary Devices

The PGG can be factory equipped with PG type auxiliary devices. Contact a Woodward representative for specific advice in selecting optional features. Publications are available to describe the functioning of auxiliary features.

Heat Exchanger

A heat exchanger helps maintain governor temperature below 93 °C (200 °F). Governor temperature depends on ambient temperature, radiation from surrounding devices, governor speed, and internal governor operating pressure. A heat exchanger is recommended with the PGG when drive exceeds 1000 rpm at 1379 kPa (200 psi) pressure or 1300 at 690 kPa (100 psi). See manual 36641, *Governor Oil Heat Exchanger*.

Booster Servomotor

As an aid for quick starts, an externally-mounted booster servomotor supplies immediate oil pressure to the governor. See manual 36684, *Booster Servomotor*.

Air Pressure Fuel Limiters

A manifold air pressure bias fuel limiter for turbo-supercharged engines limits engine fuel during acceleration as a function of air-manifold or air-box pressure. It ensures more complete combustion, reduces smoke, and improves efficiency during acceleration. See manual 36695, *PG Manifold Air Pressure Bias Fuel Limiter*.

Shutdown Solenoids

The electric solenoid can be equipped as de-energize or energize to shutdown. Various coils accommodate common dc voltages. Rectifiers can be included to enable 110 or 220 Vac for shutdown. See manual 36650, *Solenoid Operated Shutdown Assembly*.

An air-oil-water shutdown can be arranged to shut down with an increasing or decreasing pressure signal. See manual 36651, *Pressure Actuated Shutdown Assembly*.

Automatic Safety Shutdown & Alarms

The lube oil pressure failure and water pressure failure shutdown devices automatically either shut down the engine or trip and alarm switch when oil or water pressures fall below a safe value. See manual 36652, *Automatic Safety Shutdown and Alarms*.

Specifications

Speed Setting

Speed Setting Motor	Permanent magnet type motor. At rest, the motor acts as a brake to resist speed change due to vibration. A revolution counter shows speed-setting position (zero is idle).
Speed Setting Voltage	24 Vdc, ± 6 V. Polarity is reversed to raise and lower the speed setting. This is accomplished by customer supplied wiring and DPDT switch.
Rate of Speed Change	Typically 730 rpm/min at 24 Vdc
Position Indicator Lights	Customer supplied wiring may include maximum and minimum indicator lights with the DPDT speed setting switch. Switch contacts in the PGG are provided.
Mating Electric Connector	14 pin
Manual Speed Setting	A friction clutch included in the speed-setting motor drive provides manual speed setting through an adjustment knob on the governor.
Max-Min Position Stops	Integral micro-switches are factory adjusted to stop the speed-setting motor at specified max and min speeds. Positive mechanical stops are provided for manual speed setting.

Droop Adjustment

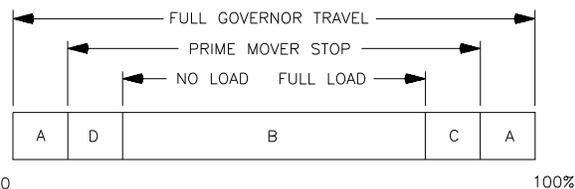
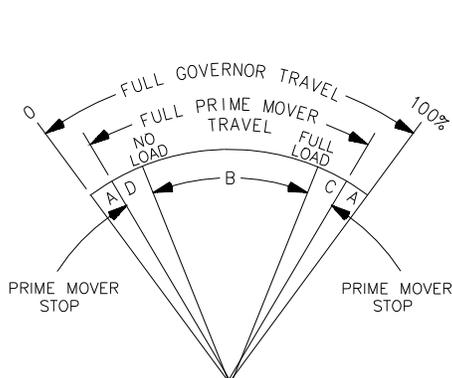
Droop	Using 270° maximum rotation of the droop adjusting knob (and with typical PG speeder spring and flyweights), droop is infinitely adjustable from 0 to 100 rpm maximum for the full governor stroke.
Droop Stop	A positive, minimum position stop provides zero droop at zero droop indicator position (0). Maximum droop is at 10 indicator position. Set zero droop on independent units to allow load change without changing speed. On applications where prime movers drive the same shaft or are in parallel in an electrical system, droop must be used and automatically divides and balances load between units. If one unit in the system has the capacity, its governor may be set for zero droop to regulate the frequency of the prime mover system and handle all load changes.

Load Limit Adjustment

Load Limit Dial adjustment limits governor power cylinder output to increase fuel. Adjustable from no limiting to shutdown.

Governor Output

Woodward recommends use of 60 to 70% travel from no load to full load.



- 0 100%
- A – OVERTRAVEL TO INSURE PRIME MOVER STOPS ARE REACHED.
 - B – NO LOAD TO FULL LOAD TRAVEL – NORMALLY 2/3 OF FULL GOVERNOR TRAVEL IS RECOMMENDED.
 - C – TRAVEL REQUIRED TO ACCELERATE THE PRIME MOVER.
 - D – TRAVEL REQUIRED TO DECELERATE OR SHUT DOWN PRIME MOVER.

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MAXIMUM WORK CAPACITY OVER FULL GOVERNOR TRAVEL OF 42° IS * . SEE ABOVE FOR RECOMMENDED GOVERNOR OUTPUT TRAVEL. IN SPECIAL APPLICATIONS MIN AND MAX PRIME MOVER STOPS MAY BE OUTSIDE THE GOVERNOR STOPS.

Composition/Weight

Construction Case and base are cast iron, internal parts are mild and case hardened steels.

Weight 39 to 54 kg (85 to 120 lb) depending on auxiliary devices and work output of 79 N·m (58 lb-ft) or less. 271 to 678 N·m (200 to 500 lb-ft) governors can weigh in excess of 227 kg (500 lb).

Governor Drive

Drive Shaft Rotation 1.125-48 serration is standard. Splined or keyed shafts are optional. Fixed clockwise, fixed counterclockwise, or reversible. Fixed rotation required for governor speed in excess of 1000 rpm.

Speed Range Maximum speed range is 200 to 1600 rpm. 250 to 1000 is the recommended speed range. Oil coolers may be required for governor operation at speeds in excess of 1000 rpm. (All speeds are governor drive speeds, not engine speeds.)

Drive Shaft Power Drive power for different types of PG governors will vary depending upon speed, internal pump pressure, pump volumetric displacement, pump efficiency, and oil viscosity. Contact Woodward if further information is required.

Hydraulic Supply

Oil Requirements SAE 10 to 50, depending on operating temperature. 100 to 200 SUS viscosity at operating temperature. Self-contained sump.

Ambient Temperature -29 to +99 °C (-20 to +210 °F). Oil coolers may be required at upper ambient temperature limits. Hydraulic oil in governor must be matched to operating temperatures.

Operating Pressure 690 kPa (100 psi) standard. 896 and 1379 kPa (130 and 200 psi) optional for increased work output. 1379 kPa (200 psi) governors often require oil coolers.

Installation

Mounting Base Configuration Various base configurations are available. See Woodward manual 36693, *PG Base Assemblies*.
Vertical

Regulatory Compliance

Other European Compliance:
Machinery Directive Compliant as partly completed machinery per 2006/42/EC.

