Applications

The PSG governor is a speed-droop governor for controlling speed of small diesel, gas, and gasoline engines or small steam and industrial gas turbines, isochronously or with droop.

The governor is used to control engines or turbines driving alternators, dc generators, pumps, or compressors. Pressure compensation provides the PSG governor with the necessary stability to control isochronously. Optimum adjustment is attained by the proper opening of the needle valve. The temperature-compensated speeder spring minimizes speed drift caused by temperature change.

The governor has its own oil pump powered by the drive shaft, and requires oil from an external source (usually engine lube oil). An oil supply from a separate sump can be used.

Rotation of the drive shaft can be in either direction. The PSG governor can be fitted with check valves to allow drive rotation in both directions.

The manual speed-setting shaft can be on either or both sides of the case. The terminal shaft can be from either or both sides of the case.

Description

The PSG governor provides hydraulic powered travel in the increase-fuel direction only. A return spring is used to provide travel in the decrease-fuel direction. The standard PSG cover provides for a vertical return spring in the governor. Governor models are available with horizontal return springs, or the governor can be fitted with a customer supplied external return spring.

Spring-driven and oil-damped ball heads are available to filter out torsional vibrations. A special temperature-compensated needle valve can be supplied to compensate for temperature effect on stability.

Droop

Droop may be set in some governors with a permanent movement of an adjustment inside the cover. Other governors are equipped with externally adjustable droop. External adjustment is available on either side of the case. Droop is adjustable from 0 to about 7 percent in all governors.

Speed Setting

Electric speed-adjusting motors or pneumatic speed setting is available for certain remote speed-setting applications. In most cases the speed-setting shaft does not extend from the case when other types of remote speed setting are used.
Specifications

SPEED SETTING

- **Manual**: Either or both sides of the case: plain or serrated shaft; less than 45 degrees shaft rotation for full speed
- **Motor**: 12 or 24 Vdc Pittman Motor. Converter boxes are available to change supply voltage to the proper voltage for a Pittman motor
- **Pneumatic**: Direct or reverse: 21 to 103 kPa (3 to 15 psi) most common signal; other signal ranges of 41 to 207 kPa (6 to 30 psi), 62 to 103 kPa (9 to 15 psi), 21 to 138 kPa (3 to 20 psi), 34 to 414 kPa (5 to 60 psi). Hydraulically damped against hunting due to air compressibility

GOVERNOR DRIVE

| Shaft | Splined  |
| Speed Range | 1200 to 4000 rpm  |
| Recommended Operation | 1400 to 3600 rpm  |
| Power Requirement | 249 W (1/3 hp) to turn drive shaft at normal operating speed and temperature  |
| Rotation | Clockwise, counterclockwise, or both  |

PILOT VALVE

| Plunger Movement | Balanced between ball head centrifugal force and speeder-spring force  |
| Bushing | Rotated as part of governor drive shaft  |
| Porting | Gain selection of 1, 2, or 4 round or 3 slotted  |

CONSTRUCTION

Case and base are cast iron, cover is aluminum or cast iron. Governors with aluminum cases are available.

MOUNTING

Install vertical or horizontal with power servo down.

CONTROL CHARACTERISTICS

- **Steady State Speed Band**: ±1/4 of 1% of rated speed
- **Typical Optimum Response**: 6.5% off speed with 0.8 s recovery time with full load change on a 50% per second accelerated engine
- **Recommended Variable Speed Control Range**: 1200 to 4000 rpm
- **Pressure Compensation**: Buffer spring 0.5 to 1.5 N-m (4.5 to 13 lb-in) with 1.1 N-m (9.6 lb-in) standard. Effective needle-valve opening up to 3 turns from closed
- **Droop**: From 0% to 7% over full output travel; internal or external adjustments. External adjustment includes lock screw and max and min stop screws
- **Spring and Oil Damped Ball Heads**: Undamped natural frequency selections of 100, 180, 200, 290, 400, and 550 cycles per minute
PSG GOVERNOR WITH PM MOTOR AND EXTERNAL RIGHT HAND DROOP

Outline Drawing

(Do not use for construction)
HYDRAULIC SYSTEM

Oil  From engine lubricating system or separate sump with foot valve

Supply Pressure  Minimum of 172 kPa (25 psi), max of 517 kPa (75 psi) from engine lubricating system. Maximum of 305 mm (12 inches) of suction lift from separate sump. Torque and work capacity values vary according to supply pressure

Relief Valve  Factory set for nominal 517, 1207, or 1896 kPa (75, 175, or 275 psi). Operating pressures are the relief valve pressures plus supply pressure to the pump

Flow at Normal Viscosity  Peak demand of 7.6 L/min (2 US gal/min) during transients. 1.3 L/min (0.35 US gal/min) during steady state

Filter  40 µm (nominal) for 7.6 L/min (2 US gal/min)

Viscosity  Must be between 50 and 3000 SUS. Normal performance is based on 100 to 300 SUS

OPERATING TEMPERATURE

Oil viscosity at operating temperature must stay within a 50 to 3000 SUS (Saybolt Universal Seconds) range. Ideal oil viscosity at operating temperature is between 100 and 300 SUS. Ambient temperature range is 29 °C to 93 °C (–20 °F to 200 °F). Consult Woodward if operating beyond these limits. Hydraulic fluid pour point must be below the lowest expected starting temperature.

OUTPUT

Terminal Shaft  Plain or serrated

Linkage  Engine torque output and terminal-shaft travel should be approximately linear

Return Spring  2.8, 5.6, or 8.5 N-m (25, 50, or 75 lb-in) torque at operating pressure of 690, 1379, or 2068 kPa (100, 200, or 300 psi) respectively

WEIGHT/MASS

Basic Manual Speed Setting Type  Cast iron weighs about 6.1 kg (13.5 lb). Aluminum case weighs about 4.3 kg (9.5 lb). Add about 0.7 kg (1.5 lb) for pneumatic or motor speed setting

REFERENCES

Manual 37017  PSG Governor with Cast Iron Case
Manual 37013  PSG Governor with Aluminum Case
Manual 03505  Speed Adjusting Synchronizing Motor
Application Note 50516  Governor Linkage for Butterfly Throttle Valves