Analogue Speed Governors

ESD-5100 Series

Features and Benefits

- Simple Installation and Adjustment
- Isochronous, Droop, & Variable Speed Operation
- Adjustable PID
- Idle Speed Circuit
- Auxiliary Accessory Input
- 10 Amp Drive Circuit
- Inputs for Accessories

Manufactured by:
Governors America Corp.

Speed Control Unit

The **ESD-5100 Series** electronic speed device is designed to control engine speed with fast and precise response to transient load changes. This closed loop control, when connected to a proportional electric actuator and supplied with a magnetic speed sensor signal, will control a wide variety of engines in an isochronous or droop mode. It is designed for high reliability and built ruggedly to withstand the engine environment.

Simplicity of installation and adjustment was foremost in the design. Non-interacting performance controls allow near optimum response to be easily obtained.

Other features include adjustable droop and idle operation, inputs for accessories used in multi-engine or special applications, protection against reverse battery voltage, transient voltages, accidental short circuit of the actuator and fail safe design in the event of loss of speed sensor signal or battery supply.

Description

Engine speed information for the speed control unit is usuallyreceived from a magnetic speed sensor. Any other signal-generating device may be used provided that the generated frequency is proportional to engine speed and meets the voltage input and frequency range specification. The speed sensor is typically mounted in close proximity to an engine driven ferrous gear, usually the engine ring gear. As the teeth of the gear pass the magnetic sensor, a signal is generated which is proportional to engine speed.

Signal strength must be within the range of the input amplifier. An amplitude of 0.5 to 50 volts RMS is required to allow the unit to function within its design specifications. The speed signal is applied to Terminals C and D on the ESD's. Between these terminals there is an input impedance of over 33,000 Ω. Terminal D is internally connected to Terminal E, battery negative. Only one end of the cable shield should be connected.

When a speed sensor signal is received by the ESD, the signal is amplified and shaped by an internal circuit to provide an analog speed signal. If the speed sensor monitor does not detect a speed sensor signal, the output circuit on the ESD will turn off all current to the actuator.

A summing circuit receives the speed sensor signal along with the speed adjust set point input. The speed range has a ratio of 9:1 and is adjusted with by the 25-turn SPEED potentiometer. The output from the summing circuit is the input to the dynamic control section of the speed control unit. The dynamic control circuit, of which the GAIN and STABILITY adjustments are part of, has a control function that will provide isochronous and stable performance for most engine types and fuel systems.

The ESD's circuit is influenced by the GAIN and STABILITY performance adjustments. The governor system sensitivity is increased with clockwise relation of the GAIN adjustment. The GAIN adjustment has a range of 33:1. The STABILITY adjustment, when advanced clockwise, increases the time rate of response of the governor system to match the various time constants of a wide variety of engines. The ESD is a PID device, the "D", derivative portion can be varied when required. (See instability section in PIB1000.)

During the engine cranking cycle, the actuator becomes fully energized and moves to the maximum fuel position. The actuator will remain in this state during engine cranking and acceleration. While the engine is at steady load, the actuator will be energized with sufficient current to maintain the governor speed set point.

The output circuit provides switching current at a frequency of about 500 Hz. to drive the actuator. Since the switching frequency is well beyond the natural frequency of the actuator, there is no visible motion of the actuator output shaft.

Switching the output transistors reduces its internal power dissipation for efficient power control. The output circuit can provide current up to 10 Amps continuous at 25°C for 12 and 24 VDC battery systems. The actuator responds to the average current to position the engine fuel control lever.

In standard operation, the ESD's performance is isochronous. Droop governing can be selected by connecting Terminals K and L and the percent of droop governing can be varied with the DROOP adjustment control. Connecting Terminals G and H can increase the droop range. The ESD has several performance and protection features, which enhance the governor system. A speed anticipation circuit minimizes speed overshoot on engine startup or when large increments of load are applied to the engine. Engine idle speed can be remotely selected and is adjustable.

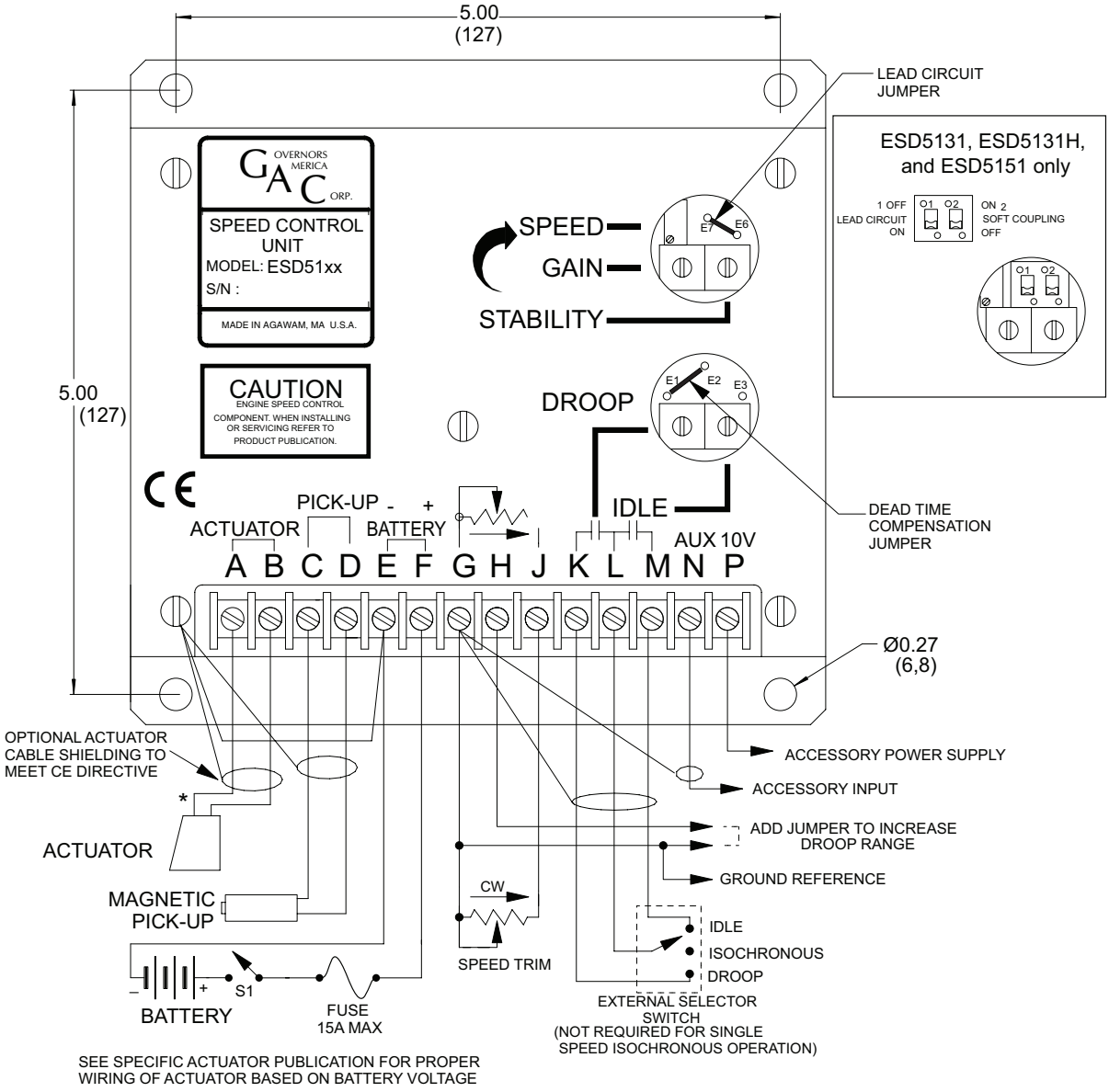
The **ESD-5100 Series** can accept accessory inputs (i.e., GAC's Load Sharing Modules & Synchroners) to achieve variable speed operation and multi-engine control. Protection against reverse battery voltage and transient voltages is provided. The design is fail safe in the event of loss of speed sensor signal or battery supply.

The **ESD-5100 Series** speed control unit is compatible with GOVERNORS AMERICA CORP. proportional electric actuators (except the 2001 Series) as well as those from other manufacturers.

Selection Chart

MODEL	CHARACTERISTICS
ESD-5111	Standard Unit
ESD-5119	EFC Reverse Acting
ESD-5120	EFC Forward Acting/Light Force
ESD-5120T	EFC Forward Action/Light Force/Temperature Compensated
ESD-5131	Soft Coupling Option/Speed Detection Circuit
ESD-5131H	Soft Coupling Option/Hard Potted
ESD-5150	4-20 mA Output

Diagram 1: System Wiring and Outline



Analogue Speed Governors

ESD-5100

Specifications

Performance

Isochronous Operation. . . .. ±0.25 % or better
Speed Range /Governor.....1K - 7.5K Hz Continuous
Speed Drift with Temperature..... ±0.5% Typical
Idle Adjust CW.....Min. 1200 Hz. Below set speed
Idle Adjust CCW.....Min. 4100 Hz. Below set speed
Droop Range.....1 - 5% Regulation
Droop Adj. Max. (K-L Jumpered).....
.....875 Hz., 75 Hz. per 1.0 A change
Droop Adj. Min. (K-L Jumpered).....
.....15 Hz., 6 Hz. per 1.0 A change
Speed Trim Range.....±200 Hz.
Remote Variable Speed Range.....
.....500 - 3.7 kHz. or any part thereof

Terminal Sensitivity

Terminal Sensitivity
J.....-115 Hz., ±15 Hz/Volt @ 5 K Impedance
L.....-735 Hz., ±60 Hz/Volt @ 65 K Impedance
N.....-148 Hz., ±10 Hz/Volt @ 1 M Impedance
P.....10 VDC Supply @ 20 ma Max

Physical

Dimensions.....See DIAGRAM 1
Weight.....1.2 lb. (0.545 kg)
Mounting.....Any Position, vertical preferred

Reliability

Vibration.....1G, 20-100 Hz
Testing.....100% Functionally Tested

Environmental

Ambient Operating Temperature Range.....
.....-40° to +185°F (-40° to +85°C)
Relative Humidity.....up to 95%
All Surface Finishes.....Fungus proof and corrosion resistance
RoHS Regulation.....Compliant

Input Power

DC Supply.....12 or 24 ± 20% VDC Battery Systems
(Transient and Reverse Voltage Protected)
Polarity.....Negative Ground (case isolated)
Power Consumption.....100 mA (No actuator current)
Speed Signal Range.....0.5 – 50 VAC
Actuator Current Range @ 77°F (25°C).....10 Amps continuous

Compliance/Standards

Agency. . .....CE Requirements

Local Distributor / Partner:

HUEGLI TECH
SWITZERLAND

HUEGLI TECH AG (LTD)
Murgenthalstrasse 30
4900 Langenthal Switzerland
Phone: +41 62 916 50 30
Fax: +41 62 916 50 35

e-mail: sales@huegli-tech.com
www.huegli-tech.com