HUEGLI TECH AG (LTD)
The Engine & Genset Control Company
Langenthal Switzerland
www.huegli-tech.com

ESD-2200 Series Speed Control Unit

- **Single engine isochronous operation**
- **Precise speed control**
- **Easy installation and adjustment**
- **Adjustable PID functions**
- **Extremely rugged, hard potted**
- **High performance design**

INTRODUCTION

The **ESD-2200** Series speed control unit is an all-electronic device 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 it's hard potted 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 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 usually received 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 of the speed control unit. Between these terminals there is an input impedance of over 33,000 ohms. Terminal D is internally connected to Terminal F, battery negative. Termination of the speed sensor shield may be made at Terminal D. Only one end of the cable shield should be connected.

When a speed sensor signal is received by the controller, 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 of the speed control unit 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 7:1 and is adjusted with a 25-turn 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, has a control function that will provide isochronous and stable performance for most engine types and fuel systems.

The speed control unit 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 linear 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 speed control unit is a PID device, the "D", derivative portion can be varied when required (See ESD-2200 Series – Technical Information).

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 setpoint.

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 battery voltages up to 32 VDC to drive the actuator. The actuator responds to the average current to position the engine fuel control lever.

The speed control unit 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.

The ESD-2200 Series speed control unit is compatible with GOVERNORS AMERICA CORP. proportional electric actuators (except the ACB-2001) as well as those from other manufacturers.

ESD-2200 SERIES SPEED CONTROL UNITS

ESD-2210-12 ..... Standard unit, 12V
ESD-2210-24 ..... Standard unit, 24V
ESD-2225-12 ..... Expanded speed range to 9400Hz.
ESD-2244-12 ..... Light Force, 12V
ESD-2244-24 ..... Light Force, 24V

SPECIFICATIONS

PERFORMANCE

Isochronous Operation/Steady State Stability ..... ±0.25% or better
Speed Range/Governor ..... 1K-7.5K Hz continuous
Speed Drift with Temperature ..... ±1% Maximum
Speed Trim Range ..... ± 250 Hz. Typical
Terminal A Sensitivity ..... 130 Hz., ± 15 Hz / Volt @ 5.1K Impedance

ENVIRONMENTAL

Ambient Operating Temperature Range ..... -40 to +180°F (-40° to +85°C)
Relative Humidity ..... up to 100%
All Surface Finishes ..... Fungus Proof and Corrosion Resistant

INPUT POWER

Supply ..... -12; 8-20VDC, -24; 16-32VDC (Transient and Reverse Voltage Protected)*
Polarity ..... Negative Ground (Case Isolated)
Power Consumption ..... 60 mA continuous plus actuator current
Actuator Current Range @ 77°F (25°C) ..... 10Amps continuous
Speed Senior Signal ..... 0.5-50 Volts RMS

RELIABILITY

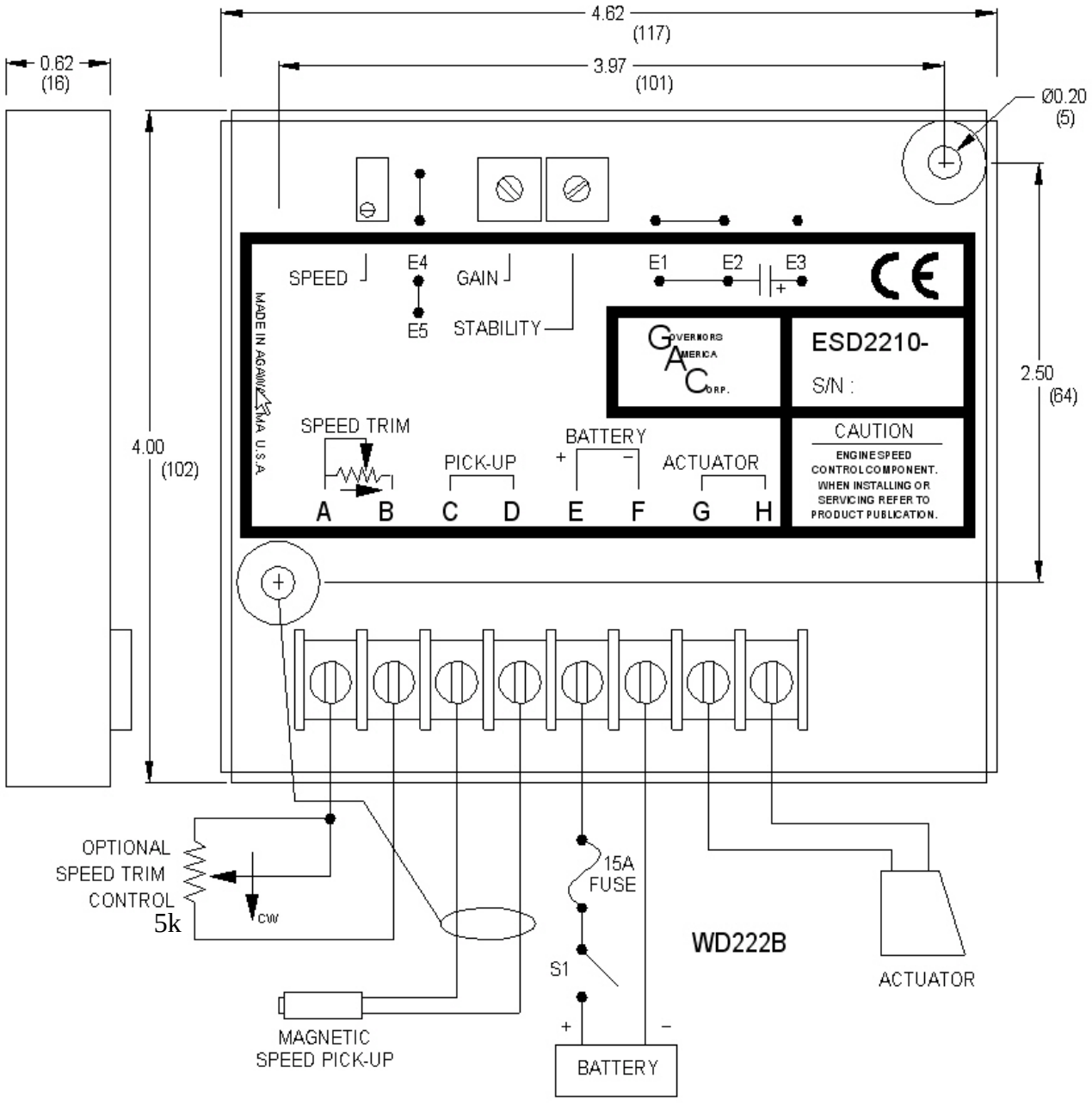
Vibration ..... 5G @ 20-500 Hz
Testing ..... 100% Functionally Tested

PHYSICAL

Dimensions ..... See Outline (DIAGRAM 1)
Weight ..... 12 oz. (347 grams)
Mounting ..... Any Position, Vertical Preferred

* Reverse voltage is protected against by a parallel diode. A 15 Amp fuse must be installed in the positive battery lead. See Diagram 1.

DIAGRAM 1. SYSTEM WIRING/OUTLINE



See specific actuator publication for proper wiring of actuator connector for battery voltage used.