ENGINE GOVERNING SYSTEMS
EC 1-10251 CONTROLLER

General

The EC-1-10251 controller for the ECO-D actuators is an all solid-state design which results in a fast, stable engine response to speed or load changes. The controller measures proportional (amount of offspeed), integral (time of offspeed) and derivate (rate of change of offspeed) to ensure optimum performance. This feature allows for very stable engine operation at various load levels.

The controller electronics are conformally coated to provide resistance against, water y dust. Mounting holes are provided on the control board ease of panel installation. Set up of the controller is very simple since these are only speed and gain adjustments.

Standard Features

- All electric
- Mounts in any position
- Hight reliability
- Temperature stable
- Compatible with gas or diesel engines

Failsafe

The ECO-D Governor has an internal FAILSAFE circuit that instantly reacts to:

- Interruption of the DC power to spring return actuator to minimum fuel position.

- Loss of speed reference signal to spring return the actuator to minimum fuel position.

Speed Sensing

The ECO-D all-electric governor requires a frequency signal to read engine speed. Typically, a hole is drilled and tapped in the flywheel housing perpendicular to the crankshaft. A magnetic pickup is inserted into the flywheel housing for sensing the teeth on the ring gear.

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Controller Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Output Current @ 12 VDC</td>
<td>6.0 Amperes</td>
</tr>
<tr>
<td>Max. Output Current @ 24 VDC</td>
<td>5.0 Amperes</td>
</tr>
<tr>
<td>Weight</td>
<td>0.320 Pounds, 0.145 Kilograms</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>12 / 24 VDC ± 20%</td>
</tr>
<tr>
<td>Ambient Operating Temperature</td>
<td>-40° to + 180° F (-40° to + 85° C)</td>
</tr>
<tr>
<td>Sealing</td>
<td>Oil, water and dust resistant</td>
</tr>
<tr>
<td>Connections</td>
<td>¼ faston male</td>
</tr>
<tr>
<td>Input Signal Frequency from Magnetic Pickup</td>
<td>Engine RPM x Number of gear teeth on flywheel / 60</td>
</tr>
<tr>
<td>Input Signal Voltage from Magnetic Pickup</td>
<td>2.5 VAC RMS minimum during cranking</td>
</tr>
<tr>
<td>Steady State Speed Band</td>
<td>± 0.25%</td>
</tr>
<tr>
<td>Controller Adjustments</td>
<td>Gain, Droop, Stability and Speed.</td>
</tr>
</tbody>
</table>
Typical Wiring Diagram

EC 1-10251 D CONTROLLER

- CONTROLLER
- AUXILIAR
- DROOP STABILITY
- GAIN
- SPEED
- MAGNETIC PICKUP
- GEAR
- ACTUATOR
- BATTERY

ECO-D Products
Typical Wiring Diagram

EC 1-10251 Z CONTROLLER

CONTROL UNIT
MODEL: EC-1-10251
VOLTAGE: 0-12 - 0-24
SERIAL N°: Eco-D

MAGNETIC PICKUP
GEAR

ACTUATOR

BATTERY

(-) (+)

Red Wire
Black Wire
Blue Light Wire
GND
Brown Wire

Blue Wire

SPEED
GAIN
STABILITY
DROOP
Typical Wiring Diagram

ESD5500E CONTROLLER

- **Actuator**
  - Magnetic Pick-Up
  - Battery
  - Optional Actuator Cable Shielding to Meet CE Directive

- **Battery**
  - Fuse 15A Max

- **Stability**
  - Gain

- **Dead Time Compensation Jumper**

- **Switch Positions Shown in Factory Set Positions**

- **Switch Profile**

- **Starting Fuel**

- **S Speed Ramp**

- **Idle**

- **Droop**

- **Accessory Input**
  - Add Jumper for 12V Battery or Actuator Currents Above 5A

- **Ground Reference**

- **Close for Droop**

- **Close for Idle**

- **Accessories Power Supply**

- **Accessories Output**

- **CW**

- **S1**

*See specific actuator publication for proper wiring of actuator based on battery voltage.*
Typical Wiring Diagram

ESD5100 CONTROLLER
INTRODUCTION

The Eco-D 250 series actuator is a rotary output, linear torque, computer designed, proportional servo, to provide improved engine performance and quick response for engine governing system. The speed of operation of the actuator is faster than competitive units. This rotary throttle positioning device is an ideal choice for engines typically up to a 500 horsepower rating. Applications include most block pumps, with or without mechanical governors, distributor type pumps or medium sized carbureted engines. The actuator was designed for failsafe operation. An internal spring returns the throttle to shut off position when the actuator is de-energized. This design combines fast operation, wider rotation angles and reliability. The actuator can operate from 12, 24 or 32 volt battery supplies.

DESCRIPTION

The actuator is an electromagnetic servo device. An AC frequency signal is generated by an magnetic speed sensor, which is proportional to engine speed. This signal is sent to the electronic speed control unit and compared with the preset engine speed setting. If the both signals do not remain identical, a change in current from the speed control unit changes the magnetic force in the actuator which, in turn, causes angular rotation of the actuator shaft, adjusting the fuel to the engine and cause the engine speed to be equal to the preset engine speed setting. Shaft rotation is proportional to the amount of the actuator current counterbalanced by the internal spring. The actuator housing is designed to protect it against engine environment. No maintenance is necessary.

INSTALLATION

The actuator must be rigidly mounted as close as possible to the throttle lever on the engine. Vibration from the engine do not affect the operation of the actuator. Low friction is mandatory and light weight linkage should be used to provide optimum control and fastest speed of response conditions. High quality rod end bearings should be used. High friction couls cause instability and require servicing. A proper linkage arrangement will allow the actuator to control the fuel control lever at minimum throttle and at maximum throttle with some excess travel beyond these positions for shut off and full fuel respectively. For operation with linear control system, it is important to obtain a linear relationship between actuator stroke and fuel delivery. The lever on the actuator should be nearly parallel to the pump lever at the mid fuel position (see fig 1). For operation with non-linear fuel control, such as carbureted, PT Pumps( Cummins), it is desirable to obtain a non-linear relationship between actuator stroke and fuel delivery. A non-linear fuel system results when more engine power is developed for a given stroke at position of low fuel settings than at high fuel settings. In this case, the levers should be parallel at full load (see fig 2).
ADJUSTMENTS

Reconfirm manually that the linkage is not binding and that friction is minimal. Before starting the engine, push the throttle to the full fuel position and release. It should return instantly to the shutoff position freely and re-check the installation to insure that all linkage and levers are securely fastened.

After the engine has been started, the linkage can be optimized by measuring the voltage across the actuator, at full load and at no load (suggested voltage values are shown in the table below).

<table>
<thead>
<tr>
<th>Current and Voltages Máx. Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Actuator 12V</strong></td>
</tr>
<tr>
<td>Full Load</td>
</tr>
<tr>
<td><strong>Actuator 24V</strong></td>
</tr>
<tr>
<td>Full Load</td>
</tr>
</tbody>
</table>

Warning:
If the measured voltage is over the indicated in our chart, you must change the linkage lever position, moving the end rod bearing toward the following hole far from the actuator axle, on this way you can reduce the actuator voltage.

A lower range of actuator voltage can cause instability or poor performance. To increase the range of the actuator voltage, move the linkage to a lower hole on the actuator lever. To increase or decrease the no load voltage adjust the length of the link between the levers.

If the ratio of the actuator lever length to throttle length is too large, there will be very little actuator actuator movement and speed control will tend to be unstable. Smaller angles of actuator travel may improve transient performance, but will reduce available force at the fuel control lever. Allowing the actuator to operate through at least one half of its stroke will usually provide near optimum response.

WARNING:
The engine should be provided with an independent shutdown mechanism to prevent loss of engine control which can cause equipment damage or personnel injury.
SPECIFICATIONS

Model: 250 Series
Available Torque: Max 2.2 lb.ft (2.9 N.m)
Maximum Operating Shaft Angular Travel: 25 Degree CW / CCW
Operating Voltages: 12 / 24 / 32 VDC
Nominal Operating Current: 2.8 A at 12 VDC / 1.4 A at 24 / 32 VDC
Maximum Current: 8.2 A at 12 VDC / 4.1 A at 24 VDC
Polarity: Case Isolated
Temperature Range: -70° to + 200° F (-55°C a 100°C)
Relative Humidity: Up to 100%
Case: Fungus Proof and Corrosion Resistant
Weight: 7.9 lb (3.6 Kg.)
Mounting: Any Position
Vibration: Up to 20 G @ 50 – 500 Hz
Testing: 100 % Tested

DIMENSIONES
MAGNETIC PICKUP

ESPECIFICATIONS:

Model: 010 - 601 / 010 - 602
Médiump Voltaje @ 1000 RPM *: 4.5 V
DC Resistance @ 25°C (Ohms ±10%): 530 Ohms
Inductance: 200 mH
Thread: 5/8” 18 UNF 2A
Length: 45 mm.
Material: NYLON
Maximum storage temperature: 125°C

Insulating resistance @300 Vca, ambient temperature 25±5°C > 100MW
* Voltage measured with 60 teeth gear, Ø160mm @ 1000 RPM being;
A = 2.54mm, H = 5.4mm, E = 0.5mm, Espesor = 30mm

INSTALLATION:

For good results:

1 - A > D
2 - H > D
3 - C > 3 x D
4 - E between 0.1 to 0.5 mm.
5 - Gear tickness > D
6 - Pole piece diameter (D = 2.7 mm.)

DIMENSIONS:
BEARINGS ROD ENDS

SPECIFICATION

Model: PH6S
Temperature Range: -22° at 65 ° F (-30°C at +180 °C)
Weight: 0.055 lb (0.025 Kg.)

DIMENSIONS

<table>
<thead>
<tr>
<th>B</th>
<th>C</th>
<th>D1</th>
<th>D2 Max.</th>
<th>D3</th>
<th>D4</th>
<th>H</th>
<th>L1</th>
<th>L2 Max.</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeters</td>
<td>6.5</td>
<td>9</td>
<td>6</td>
<td>19</td>
<td>M6X1</td>
<td>13</td>
<td>30</td>
<td>15</td>
<td>40</td>
</tr>
</tbody>
</table>

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