104 Series
Electric Actuator

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1 INTRODUCTION

The 104 Series Rotary Actuator is a field-proven proportional actuator designed for universal mounting for a variety of applications and mounts directly to Briggs and Stratton or Kohler gas and smaller 2 cylinder engines.

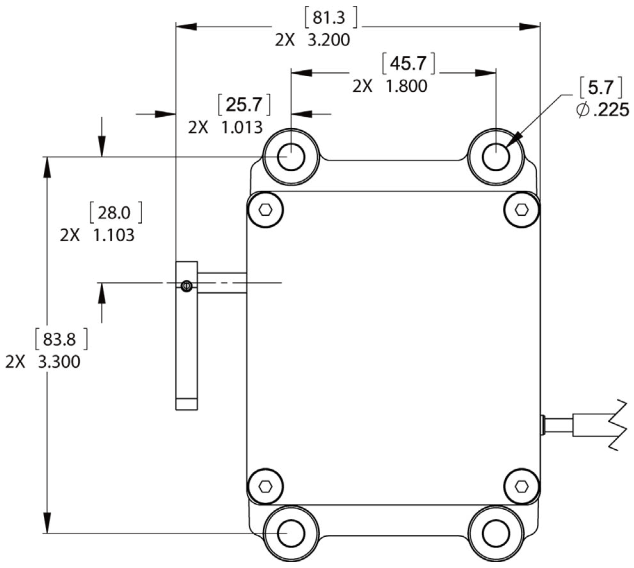
When de-energized, the 104 Series electric actuator returns to the zero position. This is accomplished by an internal spring that returns the throttle body valve to the no-fuel position when the actuator is de-energized.

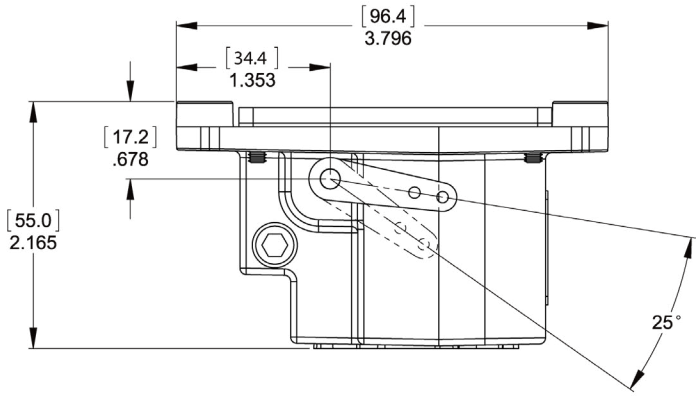
2 SPECIFICATIONS

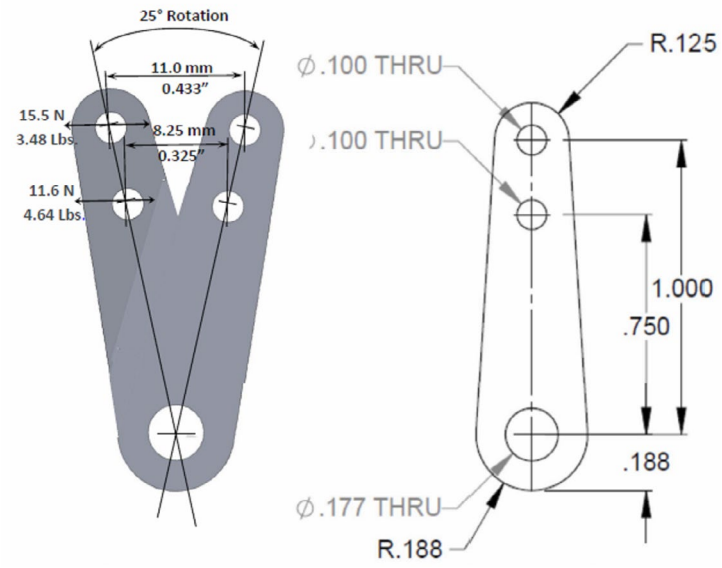
PERFORMANCE	
Available Torque	0.29 lb-ft MAX (0.4 N m)
Maximum Angular Travel	25° ±1° CW/CCW
Response Time	25 ms
ELECTRICAL POWER INPUT	
Operating Voltage	12 V DC
Normal Operating Current	1.94 A @ 12 V DC
Maximum Current (Continuous)	2.74 A @ 12 V DC

ENVIRONMENT	
Operating Temperature Range	-65 to +200 °F (-54 to +95 °C)
Relative Humidity	up to 100%
PHYSICAL	
Dimensions	See Section 3, Dimensions
Weight	1.2 lbf (0.54 kgf)
Mounting	Any Position, electrical connector at the top preferred
RELIABILITY	
Vibration	Up to 7.5 g, 50 - 500 Hz
Testing	100 % Tested

3 DIMENSIONS







4 INSTALLATION

MOUNTING

The actuator must be rigidly mounted as close as possible to the fuel control lever of the engine. Vibration from the engine will not affect the operation of the actuator. The preferred mounting is with the electrical connector at the top. Applications with the actuator upside down, on its back, or sideways should be avoided.

LINKAGE

Arrangement of the linkage for actuation of the engine fuel control is an important application consideration.

For proportional actuators to operate with linear control systems, 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 for linear fuel control.

For proportional actuators to operate with non-linear systems, it is important to obtain a non-linear relationship between actuator stroke and fuel delivery. Carbureted or other non-linear fuel systems require a non-linear fuel linkage configuration. A non-linear fuel system results when more engine power is developed for a given stroke at positions of low fuel settings rather than at high fuel settings. In this case the levers should be parallel at full load.

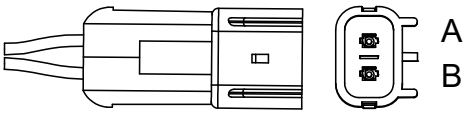
In general, the linkage should be adjusted so that the fuel control lever minimum and maximum fuel stops are used rather than the actuator internal mechanical stops. The actuator should be adjusted so that it operates over at least one half (12 degrees) of its available travel.

5 WIRING

Actuator cable harnesses with lengths greater than 10 ft. (3 meters) from the actuator to the speed control unit may introduce current losses which can restrict full rotation of the actuator. In this case, use of a larger gauge wire is required.

For applications where EMI is of concern, twisted, shielded cable for the actuator is recommended. Twisting of the cable alone will substantially reduce EMI.

Packard Connector



TERMINAL	NOTES	WIRE
A	Red Wire	16 AWG
B	White Wire	16 AWG

6 BEFORE STARTING THE ENGINE

Before starting the engine, you must confirm that the linkage is not binding and that friction is minimal by pushing the actuator to the full fuel position and then release. It should return instantly to the no-fuel position without any binding.

7 LINKAGE OPTIMIZATION

MEASURING ACTUATOR CURRENT / VOLTAGE

Once the engine has been started, the linkage can be optimized. First, an accurate reading of the actuator's current or voltage is required. Insert an ammeter in one of the wires between the speed control unit and the actuator or measure the voltage across the actuator. Take a reading at no load and another at full load. The range and the starting current or voltage are important for optimizing the linkage system. Typical values are shown in the following table for 12 volt systems.

MEASUREMENT	NO LOAD	FULL LOAD
Actuator Current	2.5A	4A
Actuator Voltage	4V	6V

INCREASING ACTUATOR VOLTAGE OR CURRENT RANGE

To increase the range of the actuator voltage or current, move the linkage to a lower hole on the actuator lever. A lower range of actuator current than suggested can cause instability or poor performance.

ADJUSTING NO-LOAD CURRENT OR VOLTAGE

To increase or decrease the no load current or voltage, adjust the length of the link between the actuator and the engine fuel control.

NOTE 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 (12 degrees) of its stroke will usually provide near optimum response.

8 TROUBLESHOOTING

If the governor system fails to operate, take the following measurements at the actuator mounted connector while moving the actuator through its stroke.

TERMINALS	RESISTANCE
Red to White (12 V)	2.1 Ω
Red to Housing	∞
White to Housing	∞

Energize the actuator to full fuel following the instructions in your control unit's installation manual, and manually move the actuator through its range. No binding or sticking should occur. If the actuator passes the tests, the problem is elsewhere in the system. See the troubleshooting section of your speed control units manual.