

Glo-Tech™ System

Hot Valve with R-Series Electric Actuator



Applications

Woodward's Glo-Tech™ hot valve/actuator system provides precise control of high-temperature gases in an on-engine environment. The Glo-Tech includes a high-temperature butterfly-type rotary valve controlled by an electric actuator designed for use in reciprocating engine applications. These applications may include: fuel throttles, wastegates, exhaust gas recirculation (EGR), compressor recirculation (bypass), waste heat recovery (WHR), and exhaust throttles.

Description

The Glo-Tech hot valve system is a high-temperature butterfly valve and electric actuator combination that can be used to regulate high-temperature gases in single and two-stage turbocharged reciprocating engines. The valve is designed to be positioned by an R-Series electric rotary actuator through an anti-backlash coupling capable of handling considerable misalignment. Valve sizes range from 40 mm to 220 mm and are constructed using stainless steel and other high-temperature alloys, allowing them to handle continuous gas temperatures between 200 °C and 780 °C. Two basic valve configurations are available: a swing-through, non-contacting version and a sharp-edge contacting version capable of handling up to 10 bar ΔP of pressure across the valve.

The R-Series actuator accepts a position command signal from some other controlling device to position the valve. The actuator's output shaft is moved to match the requested position. Internal electronic feedback assures the output shaft moves precisely to the requested position. These actuators accept either a (4 to 20) mA, (0 to 200) mA, or PWM (pulse width modulated) command signal while providing a 4 to 20 mA output shaft position signal that external devices can use as direct feedback of the output shaft's position. Three discrete inputs select the type of command input signal to be used and the direction of the output shaft on an increase of command signal. A single discrete output indicates fault conditions within the actuator. A key-switch input safely powers down the internal control module and motor while keeping the unit connected to the system's power source. An access plate allows electrical connections to be made directly on the control module in the actuator housing, and all wiring goes through gland nuts to maintain an ingress protection rating of IP67. The actuators are able to operate over a temperature range of -40 °C to +105 °C.

Refer to the Glo-Tech manual for more detailed information.

Diesel and gas engine exhaust applications

Valve

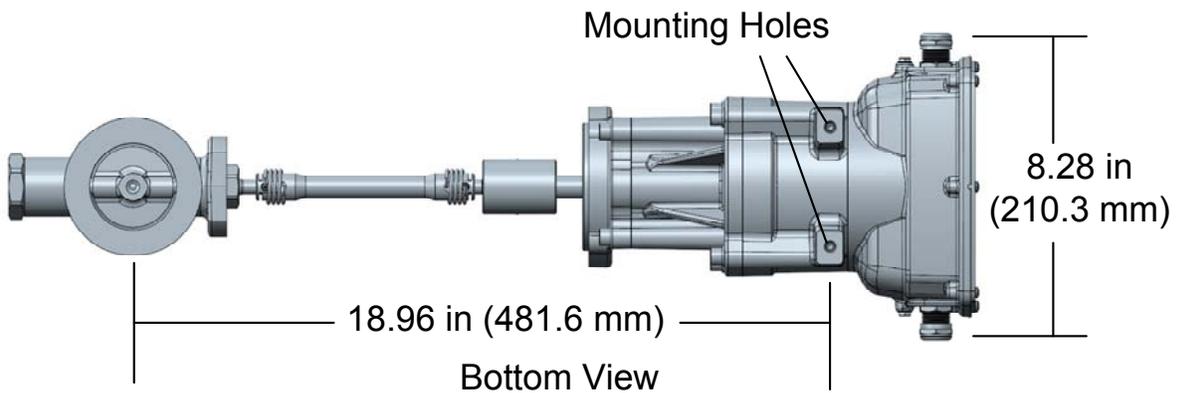
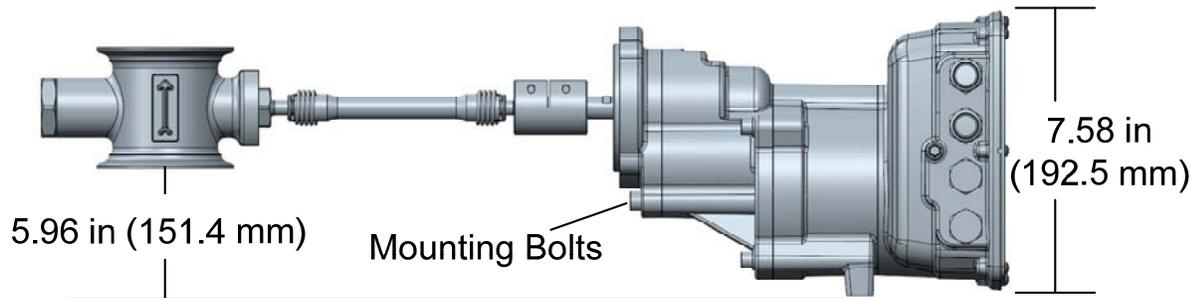
- 780 °C max, 650 °C standard gas temp
- 0.1 bar to 10 bar differential pressure
- 40 mm to 220 mm valve size range
- High-leak, non-contacting and low-leak contacting valve configurations
- Decades of "hot valve" experience

Actuator

- High-torque, low-current electric actuator
- High-resolution valve positioning
- Robust control capability maintains precise, stable control over a wide range of friction
- -40 °C to +105 °C actuator operating range
- Accurate, non-contacting, position sensing
- Custom cabling options

Installation

All input and output signals run through two M20 threaded ports, using cable glands as needed to maintain the Class I, Division 2 and Type 4 enclosure rainproof. Field wiring is connected to internal screw-less cage-clamp-style terminal blocks.



Example Outline Drawing for the 60 mm Valve Configuration
(Do not use for construction)

Valve size, valve drive distance, and standoff bracket configuration depend on specific application requirements.

Specifications

Valve

Inlet Pressure (max)	10 bar (145 psig)
Pressure Differential (max)	10 bar (145 psid)
Misalignment between valve and actuator (max)	2 degrees maximum in any direction between valve and actuator axis

Actuator Inputs and Outputs

Power Input	18–32 Vdc with out-of-range diagnostics R-11 = 24 W continuous, 89 W max R-30 = 24 W continuous, 89 W max
Electrical Current	R-11 = 1.0 A continuous, 3.7 A transient R-30 = 1.0 A continuous, 3.7 A transient
Command Input	PWM: (8.4 to 32) V, (100 to 3000) Hz (accepts push-pull and high-side or low-side open collector) Analog: (0 to 200) mA, (4 to 20) mA
Output Shaft Rotation	73 degrees \pm 2 degrees
Position Feedback Output	(4 to 20) mA corresponding to (0 to 100) % travel
Discrete Input	Key-switch low power standby mode. Applying input power to the key-switch input activates the actuator, making it ready to position in less than 300 ms. Removing the key-switch input power safely shuts down the actuator, and its power draw is less than 2 mA.
Discrete Output	Normally "ON" and turns "OFF" to indicate a detected fault (high-side or low-side drive – factory configured)

Performance

Accuracy	\pm 1.36 % over the full rotational travel and temperature range + input signal error
Max Slew Time (10% to 90% travel)	R-11 = 75 ms R-30 = 105 ms
Small Signal Bandwidth	6 Hz (minimum)
Repeatability	\leq 1.0 % of full stroke at 25 °C
Gearbox Backlash	< 0.5 degrees

Environmental

Gas Inlet Temperature	(–40 to +780) °C / (–40 to +1436) °F valve only
Ambient Temperature	(–30 to +105) °C / (–22 to +221) °F entire assembly
Storage Temperature	(–40 to +125) °C, unpowered, entire assembly
Mechanical Vibration	US MIL-STD-202F, procedure 214A: TC(F), SAE J1455 Engine Data 0.3 G ² /Hz Random, 10 Hz to 2000 Hz, 3 hours/axis, 22.1 Grms
Mechanical Shock	40 G peak, 11 ms duration, saw-tooth pulse (test derived from US MIL-STD 810C, M516.5, Procedure 1)
Ingress Protection	IP67 per IEC 60529, NEMA Type 4 enclosure
Humidity	95 % Relative Humidity—12 hours at 60 °C and 7 hours at 25 °C with 5 hours of transition for 5 complete cycles
Chemical Resistance	The actuator uses materials proven capable of withstanding normal engine environment chemicals per SAE J1455, such as diesel fuel, engine oil, and antifreeze.

Regulatory Compliance

European Compliance for CE Mark:

- EMC Directive: Declared to 2004/108/EC COUNCIL DIRECTIVE of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Other European Compliance:

- Designed to Machinery Directive: Compliance as partly completed machinery with Directive 2006/42/EC of the European Parliament and the Council of 17 May 2006 on machinery.

Agency Listings:

- Designed to CSA standards for ordinary locations
- Designed to CSA Class I, Division 2 component listing



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