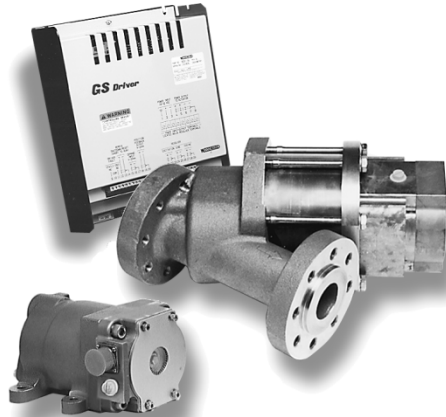


# GS10 Gas Metering System

## Fuel Valves and Electronic Controllers

### Applications

Woodward GS series gas fuel metering systems are designed for use on industrial gas turbines in the 200 kW to 30 MW output power range. The assemblies provide reliable, cost effective interfaces between electronic engine control systems and gas turbines used in power generation, compressor, and mechanical drive applications. The GS10 valves utilize corrosion-resistant, shear-type metering components that are positioned by integral high-torque actuators to assure extended operation in all types of gaseous fuel service. The GS10 valves are compatible with natural gas, sour gas, LP gas, methane, propane, butane, and hydrogen.



### Description

Accurate flow control is achieved by the use of a rotary plate valve integral with an electric actuator and a non-contacting position sensor. The use of rare earth permanent magnets in a highly efficient electromagnetic circuit minimizes package size. The integral brushless dc actuator and valve design eliminates the backlash associated with geared motors and avoids the resolution and cyclic oscillation problems incurred with stepping motors.

Each valve is supplied with a remote electronic interface unit (the GS driver) which accepts a 4 to 20 mA position command signal and operates with an 18 to 32 Vdc power supply.

The GS10 rotary plate valve achieves a self-cleaning, shear-type metering action. The valve metering sleeve is integral with the actuator rotor, resulting in gas metering with a single moving part. Optimal flow versus input signal characteristics are achieved on each valve by precision EDM manufacture of the valve metering port. The GS10 valves can achieve flow turn down ratios in excess of 100 to 1.

Each valve is supplied with a GS Driver which performs the following functions:

- Fast and accurate closed loop position control of the gas valve in response to a 4 to 20 mA input command signal
- Valve position indication signal (4 to 20 mA)
- Remote shut-down command input
- Valve/Driver Fault output

The GS driver may be located up to 100 meters from the valve assembly to avoid exposure to hazardous gases and harsh environments.

- Contaminant-resistant self-cleaning rotary plate valves
- All-electric actuation
- Single moving part
- Vibration tolerant, wide temperature range
- Fast response & high accuracy flow control
- No field adjustments or rigging
- Standard 4–20 mA interface with discrete fault output and shutdown
- Models are available with certification for North American Hazardous Locations

Gas fuel flow control is normally achieved by the accurate scheduling of metering valve port area, based on assumed values for gas properties, pressures, and temperatures. The GS10 valve is factory calibrated under actual flow conditions to provide an accurate valve metering area to the input signal demand. Actual fuel flow depends on the valve area, gas pressures, gas temperature, and the gas itself. Fuel flow equations for the GS10 valve are located in the GS manual and available software program. These tools are easily used to set up the GS10 valves for any site specific conditions.

## Valve Size

The GS10 valve is suitable for gas turbines in the 2 MW to 15 MW output power range, depending on the available fuel gas properties and conditions. The rotary plate valve and actuator are located within a single low-carbon steel housing with 2 inch raised face flanged gas connections at standard flange-to-flange dimensions. GS10 valves are available with metering port sizes of either 0.5 in<sup>2</sup> (323 mm<sup>2</sup>) or 1.0 in<sup>2</sup> (645 mm<sup>2</sup>).

GS DRIVER PARAMETERS	
Supply voltage to driver	18 to 32 Vdc
Maximum transient supply current	25.0 A for 0.20 seconds
Normal steady state input current	<4.0 A
Electrical connection	Via terminal blocks on driver assembly, stud for external ground Maximum separation of valve & driver 100 m
Valve position command signal	4 to 20 mA current signal into 249 $\Omega$ impedance
Valve indicated position signal	4 to 20 mA current signal into <500 $\Omega$ impedance
Shutdown/reset command	Close contact to run, open to close valve
System fault indication signal	1 Form C dry contact output
Ambient temperature capability	-5 to +131 °F (-20 to +55 °C)
GS driver dimensions	9.0 x 10.0 x 3.0 inches (229 x 254 x 76 mm)
Fault detection capabilities	Open or short circuit conditions within the valve assembly or wiring connections Input signal in excess of 20 mA Position loop error in excess of 5% of full scale for more than 0.250 seconds
Hazardous locations certifications	See back page

<b>GS10 VALVE PARAMETERS</b>	
Gas flow range <sup>1</sup>	25 to 15 000 lb/h (11 to 6804 kg/h)
Gas supply pressure range	100 to 750 psig (690 to 5170 kPa)
Minimum pressure differential	20 psid (138 kPa) minimum recommended for accurate flow characteristics
Gas filtration requirements	25 µm or better
Metering ports available (maximum area)	0.5 in <sup>2</sup> , 1.0 in <sup>2</sup> (323 mm <sup>2</sup> , 645 mm <sup>2</sup> )
Gas inlet & ambient temperature <sup>2</sup>	-20 to +248 °F (-29 to +120 °C)
Accuracy (% of port area)	±5.0% of actual or ±0.5% of maximum (greater of)
Metering valve leakage	<1.0% of rated maximum flow with gas at specified conditions when closed
Flow shut-off valve leakage	N/A
Flow shut-off valve response	N/A
Full travel slew time (closed loop position control)	<150 ms
Shut down slew time (@ 24 Vdc to driver)	<75 ms
Position loop bandwidth <sup>3</sup>	35 radians/second (typical)
Gas connections	2.00 in. RF flange per ANSI B16.5 Class 600 face to face dim. per ANSI S75.03
Overboard gas vent connection	Straight threaded port per SAE J514-4
Electrical connections	DIV 2—Actuator motor, one 0.500 inch NPT conduit connection, 3 leads, 72 inches (1.8 m) long minimum DIV 1—Wiring cavity with terminal blocks and two 0.5 inch NPT conduit connections
Assembly weight	114 lb (52 kg)
Vibration and shock	15 g vibration at 20 to 500 Hz per MIL-STD-810C Curve G in any plane, 20 g maximum shock per MIL-STD-810C Method 516.2 Procedure 1
Hazardous locations certifications	See back page

**Notes:**

- <sup>1</sup> Valve flow capacities are dependent on the gas properties, pressures, and temperatures available. Please consult Woodward for sizing software or assistance in selecting the correct valve for each application or if an application exceeds these published limits.
- <sup>2</sup> Dry gas required for temperatures below 0 °C (32 °F).
- <sup>3</sup> The system dynamics are approximately second order. Bandwidth is determined by magnitude response at -6 dB, 24 Vdc to GS Driver.

## Regulatory Compliance

### European Compliance for CE Marking (GS Driver only):

These listings are limited only to those units bearing the CE Marking.

**EMC Directive:** Declared to 89/336/EEC COUNCIL DIRECTIVE of 03 May  
**(GS Driver)** 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

**ATEX – Potentially Explosive Atmospheres Directive**  
**(GS Driver):** Declared to 94/9/EEC COUNCIL DIRECTIVE of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres.  
 LCIE 01.ATEX.6012 X Zone 2, Category 3, Group II G, EEx nC/L IIC T4

### Special Conditions for Safe Use:

The GS Driver must be mounted within an enclosure which ensures an IP54 protection degree as required by the European Standard EN 50021 (1999). The GS Driver must be connected to a GS10 Valve/Actuator.

### North American Compliance:

These listings are limited only to those units bearing the UL or CSA agency identification.

#### GS10 Valve

**CSA:** CSA Certified for Class I, Division 1, Groups C & D, T3C at 120 °C Ambient. For use in Canada and the United States.

#### GS Driver

**UL:** UL Listed for Class I, Division 2, Groups A, B, C & D, at 55 °C Ambient. For use in Canada and the United States.

**CSA:** CSA Certified for Class I, Division 1, Groups A, B, C & D, T4A at 55 °C Ambient. For use in Canada and the United States.



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#### Distributors & Service

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