

GSOV25
Gas Shutoff Valve

Installation and Operation Manual



General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.



Revisions

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Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.



Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual **26455**, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, to verify whether this translation is up to date. Out-of-date translations are marked with . Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Revisions— A bold, black line alongside the text identifies changes in this publication since the last revision.

Woodward reserves the right to update any portion of this publication at any time. Information provided by Woodward is believed to be correct and reliable. However, no responsibility is assumed by Woodward unless otherwise expressly undertaken.

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Warnings and Notices

Important Definitions



This is the safety alert symbol used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER** - Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
- **WARNING** - Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
- **CAUTION** - Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
- **NOTICE** - Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT** - Designates an operating tip or maintenance suggestion.

WARNING

**Overspeed /
Overtemperature /
Overpressure**

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

WARNING

**Personal Protective
Equipment**

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- Eye Protection
- Hearing Protection
- Hard Hat
- Gloves
- Safety Boots
- Respirator

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).
- Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.
- Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual **82715**, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
 - Do not touch any part of the PCB except the edges.
 - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
 - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Regulatory Compliance

European Compliance for CE Marking:

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

Pressure Equipment Directive: Directive 2014/68/EU on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.
 PED Category II
 PED Module H - Full Quality Assurance,
 CE-0041-PED-H-WDI 001-16-USA, Bureau Veritas UK Ltd (0041)

Other European and International Compliance:

Compliance with the following European Directives or standards does not qualify this product for application of the CE Marking.

ATEX: This assembly is ATEX compliant per the compliance of the individual components below:
 Solenoid Valve – II 2G Ex d IIB T3 Gb, II 3G Ex nA IIC T3 Gc
 Proximity Switch – II 2G Ex d IIC Gb T3

Machinery Directive: Compliance as a safety with 2006/42/EC COUNCIL DIRECTIVE of 17 May 2006 on the approximation of the laws of the Member States relating to machinery.

North American Compliance:

CSA: CSA Certified for Class I, Division 1, Groups C and D, and Groups C, and D, T3 at 105 °C Ambient for use in Canada
 Certificate: 160584-1125151

SIL Compliance:



GSOV25– Certified SIL 2 Capable for Product Function in safety instrumented systems. Evaluated to IEC 61508 Parts 1-7. Refer to the instructions of this Installation and Operation Manual, Chapter 4 Safety Management.
 SIL Certificate WOO 1512060 C001

Special Conditions for Safe Use:

Wiring must be in accordance with North American Class I, Division 1, or European Zone 1, Category 2 wiring methods as applicable, and in accordance with the authority having jurisdiction.

Field Wiring must be suitable for at least 90 °C and 10 °C above the maximum fluid and ambient temperatures.

Connect ground terminal to earth ground.

The GSOV25 is certified to a Zone 1-Category 2 / Division 1 method of protection. Wiring methods must comply with the Zone 1-Category 2 / Division 1 methods of protection when installed in a Zone 2 / Division 2 classified atmosphere.

**WARNING**

EXPLOSION HAZARD—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or Zone 1.

**AVERTISSEMENT**

RISQUE D'EXPLOSION—Ne pas raccorder ni débrancher tant que l'installation est sous tension, sauf en cas l'ambiance est décidément non dangereuse.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 1 ou de Zone 1.

Chapter 1.

General Information

Introduction



WARNING

The shutoff valve is a critical component for protection against equipment failure or turbine overspeed. Routine inspection is necessary for the protection of the turbine and the turbine operators.

The High Speed Gas Shutoff Valve (GSOV25) is designed to terminate the turbine fuel supply should the electronic fuel control or sequencer interrupt the permissive electrical signal.

Gas supply plumbing must not be pressure tested with water. Doing so may cause damage to the shutoff valve, resulting in a failure to actuate properly.

Because of the critical function of this component, it is mandatory that the turbine operators regularly monitor the condition of the valve. It should be inspected regularly during all turbine maintenance intervals.

To verify proper operation during shutdown conditions:

- Ensure that the solenoid operator is de-energized.
- Verify that gas supply pressure in excess of 1034 kPa (150 psig) is present at the inlet flange.
- Check for leakage through the main valve mechanism by measuring the leakage flow rate from the vent connection. Leakage in excess of 1000 cm³/min may indicate valve seat wear or a possible malfunction. The valve should be removed from service and tested to ensure that the primary valve seat is not leaking.

Woodward recommends the installation of two shutoff valves per API-616.

Shutoff Valve Description

The GSOV25 is a normally-closed, three-stage device, designed to terminate fuel flow in less than 85 ms at 4136 kPa (600 psig), and in less than 100 ms at 6200 kPa (900 psig), after interruption of the electrical supply current. Valve closure is due to the stored energy of a coiled spring in the primary stage.

The valve is compatible with most gaseous fuels, including natural gas, propane, ethane, and methane. All-stainless steel components with Viton seal materials accommodate most fuel contaminants.

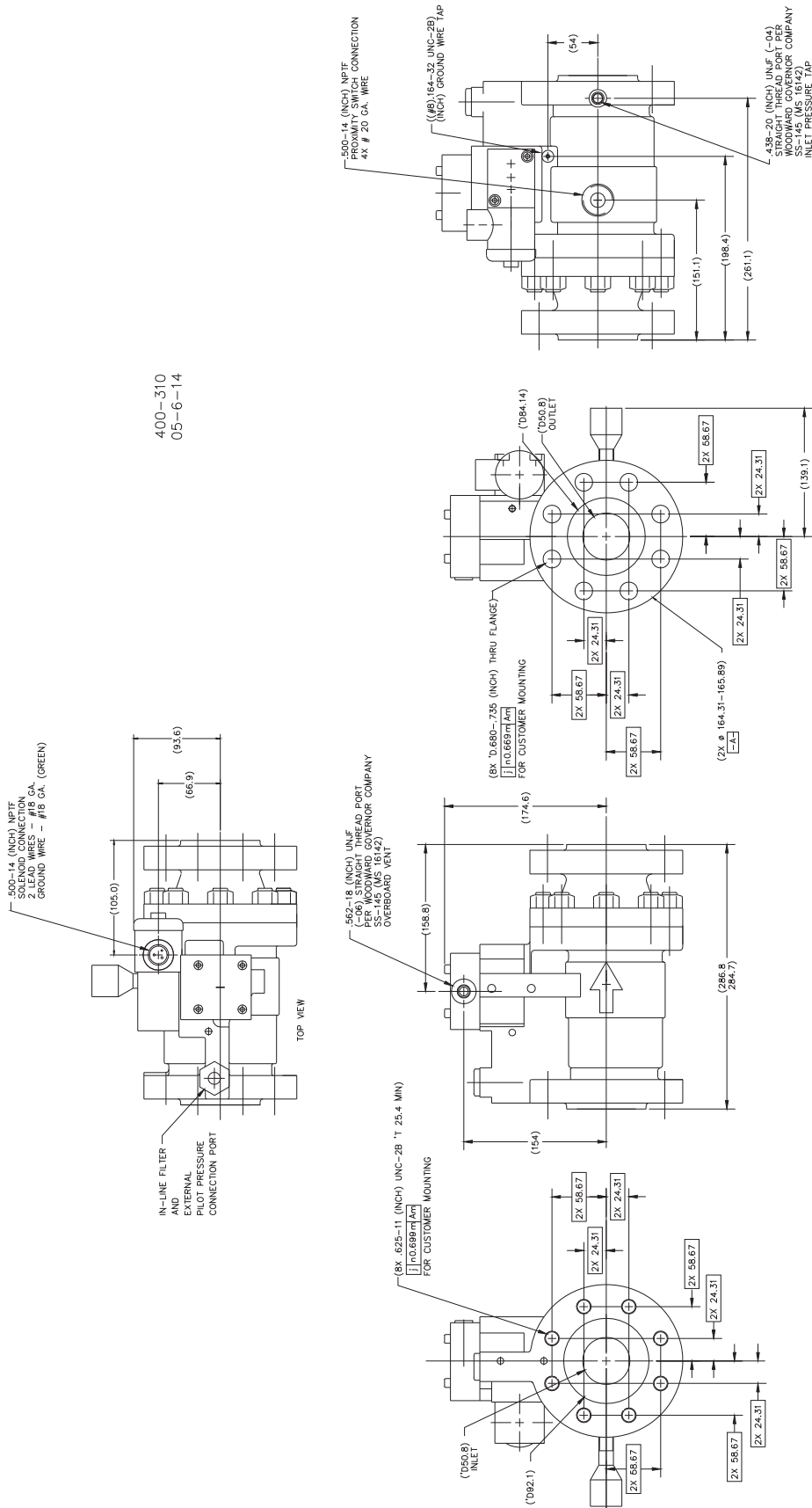
An integral 40 µm (nominal) filter protects the first and second stage components from damage due to particulate contamination. Flow through the primary stage is not filtered.

The shutoff valve is constructed of corrosion-resistant materials. The valve weighs 33 kg (72 lb). The valve will positively seal in a reverse-pressure condition up to 1379 kPa (200 psig).

The valve is designed to be NACE compliant per NACE MR0175-94 sulfide stress cracking resistant metallic materials for oilfield equipment, NACE International.

GSOV25 Specifications

Closing Time	less than 85 ms @ 4136 kPa (600 psig) less than 100 ms @ 6200 kPa (900 psig)
Opening Time	less than 300 ms
Minimum Allowed Actuation Pressure	1034 kPa (150 psig)
Maximum Allowed Valve Gas Pressure	6200 kPa (900 psig)
Valve Proof Pressure	9308 kPa (1350 psig)
Valve Burst Pressure	34 475 kPa (5000 psig)
Maximum Allowed Vent Back Pressure	690 kPa (100 psig) but must be less than (Pinlet—690 kPa / 100 psig)
Maximum Allowed Reverse Flow Pressure	1379 kPa (200 psig)
Valve Leakage Rating	ANSI/FCI 70-2-1991 Class VI
Maximum Allowed Vent Leakage	less than 1000 cm ³ /min steady state
Internal Filtration for Solenoid	40 μm
Maximum Allowed Solid Particle Contaminants in Fuel	less than 10 μm, 30 ppm by volume maximum greater than 10 μm, 0.3 ppm by volume maximum
Valve Weight	33 kg (72 lb)
Fuel Compatibility	Natural gas, propane, ethane, methane, or most typical gas fuels
Operating Temperature Range	(-20 to +150) °C / (-4 to +302) °F
Design Life	20 000 cycles
Solenoid Power Consumption	10 W nominal
Proximity Switch Contact Ratings	0.5 A @ 24 Vdc



400-310
05-6-14

Figure 1-1. Outline Drawing of Gas Shutoff Valve (GSOV25)

Chapter 2. Installation

Receiving

The GSOV25 gas shutoff valve is tested with dry air and then packed in a foam-filled box for shipment. The unit may be stored for an extended period in the original container.

! WARNING

EXPLOSION HAZARD—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or Zone 1.

! AVERTISSEMENT

RISQUE D'EXPLOSION—Ne pas raccorder ni débrancher tant que l'installation est sous tension, sauf en cas l'ambiance est décidément non dangereuse.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 1 ou de Zone 1.

! WARNING

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the GSOV25 valve.

! WARNING

The surface of this product can become hot enough or cold enough to be a hazard. Use protective gear for product handling in these circumstances. Temperature ratings are included in the specification section of this manual.

! WARNING

External fire protection is not provided in the scope of this product. It is the responsibility of the user to satisfy any applicable requirements for their system.

Installation

The valve is designed for installation between two standard 2-inch (51 mm), 600-pound (272 kg) flanges per ANSI B16.5. The inlet flange is threaded for eight 0.625 inch-11 UNC x 3.5 or 4 inch (approx. 16 mm x 89–102 mm) bolts. The discharge flange has eight 0.688 inch (17.5 mm) through holes. The installer must supply gaskets as required to assure a leak-proof seal at both inlet and outlet flanges. Refer to ASME B16.5 for details of flange, gasket, and bolt types and dimensions.

The 0.438-20 (-04) port, located on the side of the inlet flange, is provided as a pressure tap. In systems where redundant shutoff valves are used, the port may be connected to a normally-open vent valve. This arrangement will relieve trapped fuel pressure between the shutoff valves as well as any leakage which may occur across the first shutoff valve.

The recommended method for lifting the GSOV25 is with a lifting strap.

The 0.562 inch-18 (-06) port on the pilot section boss should be connected to a gas-collection header and vented to a non-hazardous area.

During opening transients, flow can be expected from the -06 vent port. During steady-state operation (open or closed) flow from the vent port should not exceed 1000 cm³/min. Flow in excess of this may be a sign of primary-seal or pilot-stage leakage. Back pressure on the vent connection should not exceed 690 kPa

(100 psig) for inlet pressures above 1379 kPa (200 psig), and should be 0 for inlet pressures less than 1379 kPa (200 psig).

Electrical Connections

NOTICE

Due to the hazardous location listings associated with this product, proper wire type and wiring practices are critical to operation.

Do not connect any cable grounds to “instrument ground”, “control ground”, or any non-earth ground system.

NOTICE

For devices that list more than one method of protection, it is the installer’s responsibility to permanently mark all applicable nameplates to show which method of protection is used in the installation of that device (per IEC/EN 60079-0).

Solenoid Valve

The shutoff valve is available in 24 V (dc) [(21 to 30) V (dc)] and 125 V (dc) [(90 to 140) V (dc)] models. A 0.500 inch-14 (12.7 mm) NPTF conduit adapter is provided for the electrical connection. Connect the two wires extending from the conduit connector to the proper supply voltage. Polarity is not important. The green wire should be connected to ground. Nominal power consumption for all models is 10 W. Maximum power consumption is 50 W. See Figure 2-1.

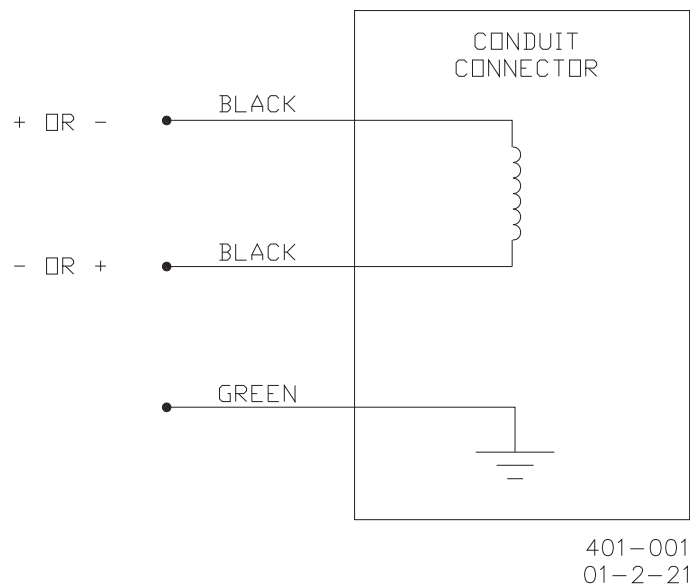


Figure 2-1. Solenoid Wiring Diagram

IMPORTANT

To rotate or re-position the solenoid coil conduit housing: Remove the thin cap nut and loosen the large circular nut by turning it counterclockwise. Rotate the conduit housing to the desired position and tighten the circular nut by hand only. Do not use a tool on the circular nut, which could cause over-tightening. Re-install the thin cap nut and torque to 16–20 N•m (12–15 lb-ft).

Proximity Switch

The proximity switch is designed to inform the operator when the valve is fully closed. Any intermediate positions will be indicated as valve open. The proximity switch a single pole, dual throw type with Form C contacts. The contacts are rated for 0.5 A at 24 V (dc). There are four colored leads extending from the switch housing. Red is the normally closed contact, blue is the normally open contact, black is common, and green is the case ground. The switch may be wired to use one or both contacts.

See the Maintenance section of this manual for more information on the proximity switch.

Maintenance

If properly maintained and operated within its design limits, the GSOV25 will operate up to 50 000 hours or 20 000 cycles before requiring repair or overhaul. The following maintenance checks should be completed at the prescribed intervals.

WARNING

Prior to performing any maintenance on the GSOV25, inlet and outlet gas pressure must be relieved. Failure to remove gas pressure from the inlet and discharge of the valve may result in equipment damage, personal injury, or death.

WARNING

EXPLOSION HAZARD—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or Zone 1.

Electrical power must be removed from the GSOV25 whenever working on or near the solenoid or proximity switch.

Pilot Filter

To ensure optimum performance of the valve, the pilot-section filter should be removed and cleaned at least once per year or more often if system contamination levels are higher than normal. See Figure 1-1 (outline drawing) for the location of the pilot filter. Remove the pilot filter by turning counterclockwise on the 1.000 inch (25.40 mm) hex head nut. The filter may be cleaned ultrasonically or back-flushed with light solvent. Inspect the O-ring seals and replace as necessary. The upper O-ring is Woodward part number 1355-169, and the lower O-ring is part number is 1355-111. Lightly lubricate the O-rings with petroleum jelly and torque pilot filter nut to 23 N•m (200 lb-in) after re-assembly.

Vent Leakage

Diligent monitoring of the vent connection leakage can provide early warning of seal degradation or internal contamination of the valve which may result in unreliable valve operation.

If vent leakage exceeds 1000 cm³/min when the valve is closed, either the solenoid, the second stage ball seat, or the internal seals are leaking. If a spare solenoid is available, replace it to determine its effect on leakage. If replacing the solenoid does not correct the leakage problem, the valve should be returned to Woodward for repair.

If vent leakage exceeds 1000 cm³/min when the valve is open, the most likely cause is a damaged second-stage face seal. This face seal can be removed and inverted 180 degrees to provide a new sealing surface. See the maintenance section on the second stage seal for this procedure. The solenoid is a possible secondary cause and can be replaced to determine its effect.

Solenoid Valve

There is no regular maintenance required on the solenoid valve, but the following information can be used to troubleshoot problems related to the solenoid valve.

IMPORTANT

Currently there are two solenoid voltages available: 24 V (dc) and 125 V (dc). Be sure to specify the correct part number for the top-level valve when ordering a replacement solenoid.

The typical dc resistance of the 24 V (dc) coil is 56 Ω and 1.5 k Ω for the 125 V (dc) version. Nominal current draw of the 24 V (dc) coil is 400 mA and 80 mA for the 125 V (dc) coil.

The solenoid valve can be replaced in the field if necessary. Remove the solenoid from the GSOV25 by unscrewing the two 0.250-28 Allen head screws that hold the solenoid to the valve housing. Replace the three O-ring seals if necessary (Woodward part number 1355-101). The poppet section of the solenoid can be disassembled further and cleaned if necessary but this action is beyond the scope of this manual. If further disassembly is undertaken, take extreme care to insure proper re-assembly. Lightly lubricate the O-rings with petroleum jelly and torque the solenoid mounting screws to 9.2 N·m (81 lb-in) after re-assembly.

Routinely check the shutdown switches or relays to be sure they are capable of terminating the electrical supply to the solenoid. The shutoff valve should be used whenever possible to be sure it is operating satisfactorily.

Second Stage Face Seal

The second stage piston face seal is only actively sealing when the valve is in the open position (see Figure 3-1 for schematic and operating principle). If excessive vent leakage is observed while the valve is open, the second stage face seal may be damaged. The face seal can be inverted inside its housing to allow a new sealing surface to be used.

1. Remove piping from the overboard vent connection.
2. Remove only two of the 0.250-28 screws from the overboard vent cap. With the help of another person, slowly unscrew the remaining two screws, which will unload the spring force beneath the cap. The other person should preload the cap and spring slightly to prevent the cap from popping off at the end of the screw's engagement with the housing.
3. Turn the vent cap over and remove the circular face seal retainer. Remove the face seal from its groove, invert it to expose the new sealing surface, and re-install it in the groove.
4. Re-install the face seal retainer in the body housing, not in the vent cap. The face seal retainer should sit firmly in a counter bore in the top of the body housing.
5. Re-install the vent cap onto the housing. With the help of another person, slightly compress the spring to allow initial screw engagement. It may be necessary to lightly lubricate the underside of the face seal to keep it secure in its groove during this step. Pay close attention while the vent cap is engaging the face seal retainer to assure proper fit. Torque the four screws in a cross pattern to 9.2 N·m (81 lb-in).
6. Re-install the vent piping connections.

Proximity Switch

There is no regular maintenance required on the proximity switch, but the following information can be used to troubleshoot problems related to the proximity switch.

The switch contains a Form C contact with four leads extending from the switch. Red is the normally closed contact, blue is the normally open contact, black is common, and green is the case ground.

When the valve is closed, the dc resistance across the contacts should read:

- Normally closed (NC): open circuit
- Normally open (NO): 0.1 Ω to 1.0 Ω

When the valve is open, the dc resistance across the contacts should read:

- Normally closed (NC): 0.1 Ω to 1.0 Ω
- Normally open (NO): open circuit

If an erroneous or intermittent switch indication is observed, check the continuity of each switch contact as described above. Lightly tap the proximity switch with a wrench or small hammer. The proximity switch should not be affected by these small mechanical disturbances. If the contacts change state with a light tap or do not read the correct dc resistance as given above, replace the switch.

The proximity switch can be replaced in the field if necessary. The valve must be in the closed position to replace and set the new switch position.

1. Disconnect any wiring or conduit attached to the proximity switch.
2. Use an adjustable wrench on the 1.000 inch (25.40 mm) hex of the proximity switch head and back the switch out of the body by turning counterclockwise.
3. Remove thread seal, washer, and jam nuts from the old switch and install them on the new switch. The Woodward part number for the thread seal is 1386-181.
4. Apply a small amount of Loctite 242 (removable) to the new switch threads and thread into the valve body until in bottoms out against main piston.
5. Mark the position of the switch relative to the body and then back the switch out 1/2 to 5/8 of a turn.
6. Torque the first jam nut to 20 N·m (15 lb-ft) while holding the hex head on the end of the proximity switch. Apply Loctite 242 on the threads just after the first jam nut. Torque the second jam nut against the first to 20 N·m (15 lb-ft), again while holding the switch hex head.
7. Re-assemble the switch wiring and conduit connections.

External Pilot Pressure Operation

The shutoff valve may be actuated open by either the inlet gas line supply pressure (normal operation) or by the optional Pilot Supply connection. The source of actuation pressure is determined by the position of a plug that can be installed on either side of the Pilot Filter. With the plug installed on the top (external side) of the Pilot Filter, the normal gas line supply pressure is used as the actuation media. If the plug is installed at the bottom (internal side) of the Pilot Filter, an external pilot pressure must be provided to the valve as the actuation media.

The minimum required pilot pressure to open the valve is 1034 kPa (150 psig). As gas line pressure increases above 2068 kPa (300 psig), the pilot pressure required to open the valve is given by the following equation:

$$\text{Pilot Pressure Required (psig)} = \text{gas line pressure} * 0.167 + 50$$

IMPORTANT

A Pilot Supply pressure of 1379 kPa (200 psig) will assure proper valve actuation for all inlet gas supply pressures up to the maximum valve rating of 6200 kPa (900 psig).

The Pilot Supply plug is normally installed on the top of the Pilot Filter. To switch to external Pilot Pressure operation, do the following:

1. Remove the .438-20 straight thread plug (-04) from the top of the Pilot Filter.
2. Remove the Pilot Filter itself from the valve housing.
3. Re-install the .438-20 plug into the lower side of the Pilot Filter. Verify that the O-ring seal on the plug is in good condition.
4. Re-install the Pilot Filter into the valve housing. Torque to 23 N·m (200 lb-in).
5. Plumb the external Pilot Pressure source to the .438-20 straight thread port connection on top of the Pilot Filter.

Chapter 3

Principles of Operation

Introduction

Figures 3-1 and 3-2 illustrate the operating principle of the GSOV25 gas shutoff valve.

Valve Open

- Energize the **solenoid** with appropriate **voltage** [24 V (dc) or 125 V (dc)].
- The three-way **solenoid** connects P1 pressure to the **control land** of the **second stage piston** (1 >> 2).
- At pressures greater than 1034 kPa (150 psig), the **second stage piston** is driven to the end of its bore (4), opening the P1 pressure (3) to the **control land** of the **primary stage piston** (5), while simultaneously sealing the passage from the **vent connection** (4).
- The P1 pressure on the **primary stage piston control land** (5) overcomes the spring force of the return springs and drives the piston to the end of its bore, separating the piston from the **primary seal** (6).

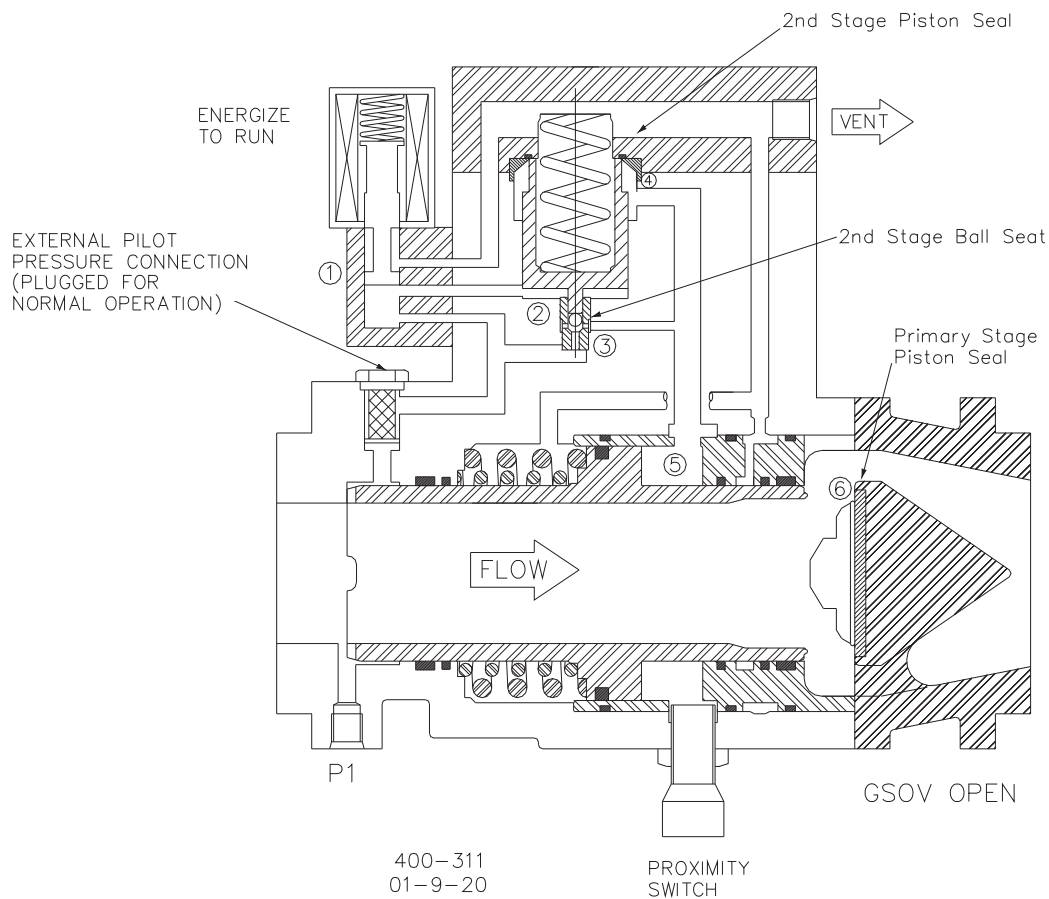


Figure 3-1. Energized—Valve Open

Valve Closed

- De-energize the **solenoid**.
- The three-way **solenoid** connects the pressure on the control land of the **second stage piston** to the **vent** (2 >> 1).
- The **spring** under the **second stage piston** overcomes the pressure on the control land and drives the **second stage piston** to the opposite end of its bore, seating the **second stage ball seat** and sealing the P1 pressure from the **primary stage piston control land** (3).
- As the **second stage piston** moves to the opposite end of its bore, the piston separates from the **second stage piston seal** and allows the pressure on the **primary stage control land** to vent (5 >> 4).
- The **primary stage return spring** overcomes the pressure on the **control land** and drives the **primary stage piston** against the **primary stage piston seal** (6).

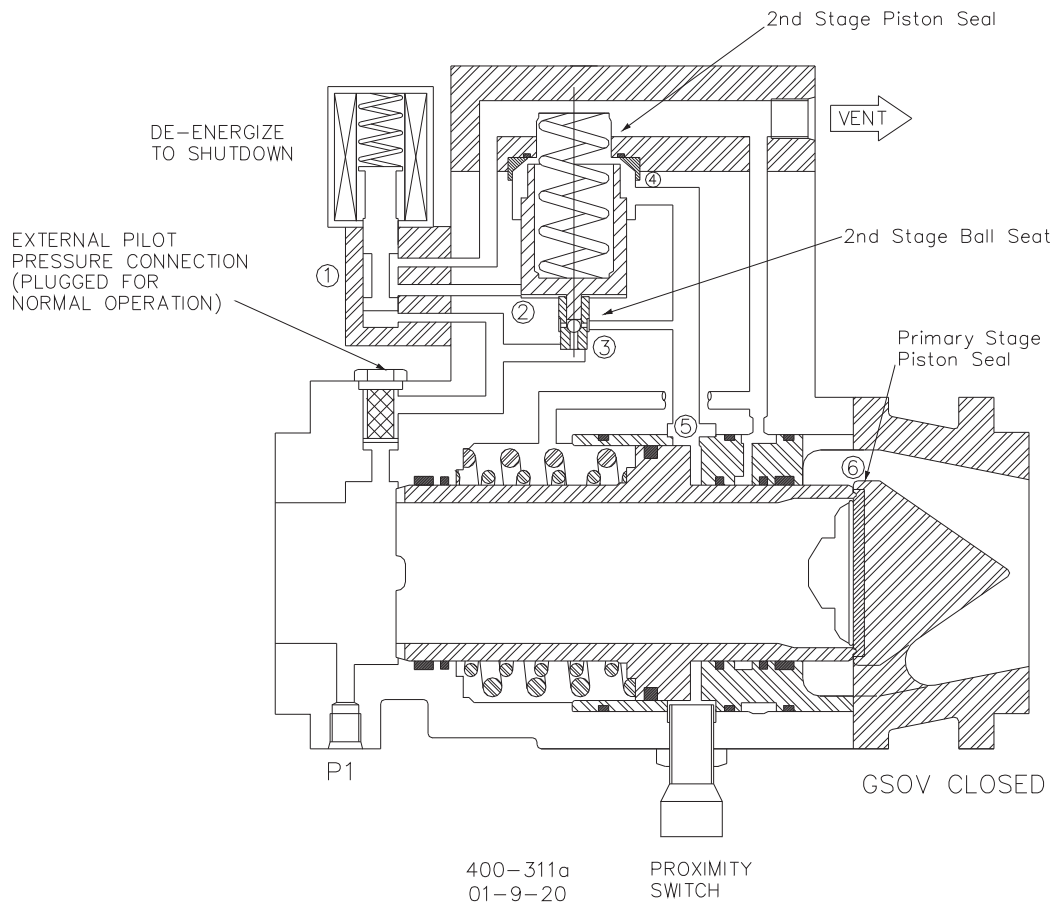


Figure 3-2. De-energized—Valve Closed

A 40 μm filter protects the pilot stage of the valve and the solenoid control valve from damage due to particulate contamination. No screen or filter is provided for the fuel flowing to the turbine.

The valve is either full ON or sealed tightly OFF.

Failsafe Principle

The GSOV25 gas shutoff valve consists of three stages of valving to operate. This design is necessary to ensure the high speed shutoff and maintain the low pressure drop/high flow rate valve. Each of the three stages is spring loaded with at least five times the force needed to ensure valve closure.

The first stage solenoid valve is a poppet-style solenoid, spring loaded with an Inconel spring to the closed position requiring a voltage supply to allow P1 pressure to the second stage piston control land.

The second stage piston assembly has a dual function for the valve. In the normally closed position, the piston is spring loaded to seal P1 pressure from the primary stage by seating a stainless steel ball, while simultaneously opening a large vent that allows any pressure from the primary stage to vent through a customer connection. A P1 pressure of greater than 1034 kPa (150 psig) is required at the second stage control land to overcome the spring force and move the piston to the opposite end of its bore. In this position the vent connection is sealed by an encapsulated O-ring/face seal while simultaneously allowing P1 pressure to fill the primary stage control land.

The primary stage piston is spring loaded to the closed position and seated against a Viton face seal. A P1 pressure of greater than 1034 kPa (150 psi) is required at the control land of the third stage piston to overcome the spring force and allow the piston to move to the open position.

Table 3-1. Failure Modes

Failure	Result
Loss of P1 Pressure	When P1 is less than 1034 kPa (150 psi), the spring force of the second stage piston overcomes the area/pressure of the control land, moving the piston to seal the P1 pressure from the third stage piston, and opens the vent connection which allows any trapped pressure at the third stage control land to vent through the customer-supplied connection. The spring loaded third stage piston will move to the closed position within the 85 ms time specification.
Loss of Voltage to Solenoid	As the voltage is removed from the solenoid, the spring-loaded poppet valve in the solenoid closes the P1 pressure to the second stage while opening a vent to allow any trapped pressure in this area to vent through a customer connection. When the spring loading of the second stage piston overcomes the area/pressure of the control land, the piston moves to seal the P1 pressure from the third stage piston and opens the vent connection which allows any trapped pressure at the third stage control land to vent through the customer-supplied connection. The spring-loaded third stage piston will move to the closed position within the 85 ms time specification.

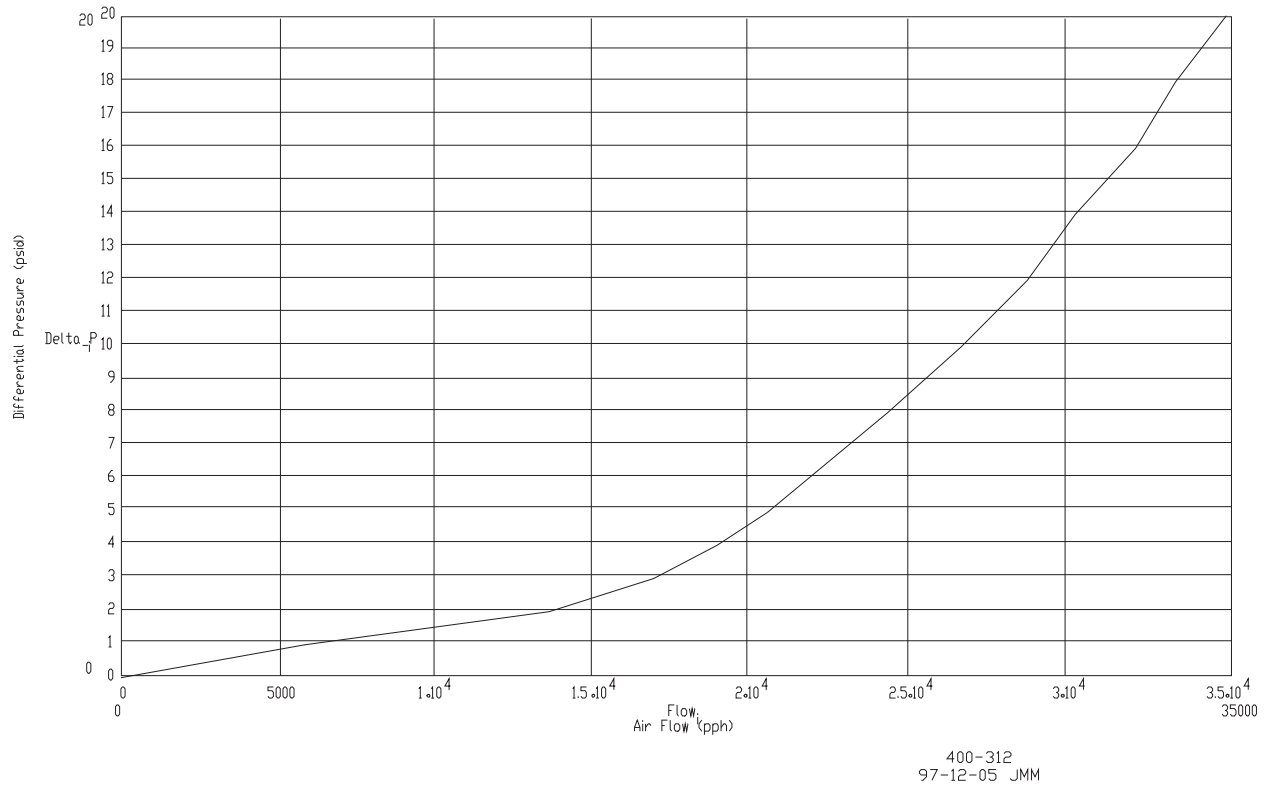


Figure 3-3. GSOV25 Delta P vs Flow

Chapter 4.

Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact the manufacturer or packager of your system.
- Contact the Woodward Full Service Distributor serving your area.
- Contact Woodward technical assistance (see “How to Contact Woodward” later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which course of action to pursue based on the available services listed in this chapter.

OEM or Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.
- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.
- A **Recognized Turbine Retrofitter (RTR)** is an independent company that does both steam and gas turbine control retrofits and upgrades globally, and can provide the full line of Woodward systems and components for the retrofits and overhauls, long term service contracts, emergency repairs, etc.

A current list of Woodward Business Partners is available at www.woodward.com/directory.

Product Service Options

The following factory options for servicing Woodward products are available through your local Full-Service Distributor or the OEM or Packager of the equipment system, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is originally shipped from Woodward or a service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime. This is a flat-rate program and includes the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205).

This option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned within 60 days, a credit for the core charge will be issued.

Flat Rate Repair: Flat Rate Repair is available for the majority of standard products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be. All repair work carries the standard Woodward service warranty (Woodward Product and Service Warranty 5-01-1205) on replaced parts and labor.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to you in "like-new" condition and carry with it the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205). This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:

- Return authorization number
- Name and location where the control is installed
- Name and phone number of contact person
- Complete Woodward part number(s) and serial number(s)
- Description of the problem
- Instructions describing the desired type of repair

Packing a Control

Use the following materials when returning a complete control:

- Protective caps on any connectors
- Antistatic protective bags on all electronic modules
- Packing materials that will not damage the surface of the unit
- At least 100 mm (4 inches) of tightly packed, industry-approved packing material
- A packing carton with double walls
- A strong tape around the outside of the carton for increased strength

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Replacement Parts

When ordering replacement parts for controls, include the following information:

- The part number(s) (XXXX-XXXX) that is on the enclosure nameplate
- The unit serial number, which is also on the nameplate

Engineering Services

Woodward offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact us via telephone, email us, or use our website: www.woodward.com.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at www.woodward.com/directory, which also contains the most current product support and contact information.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used in Electrical Power Systems	
Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany:	
Kempen	+49 (0) 21 52 14 51
Stuttgart	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

Products Used in Engine Systems	
Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
United States	+1 (970) 482-5811

Products Used in Industrial Turbomachinery Systems	
Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

General

Your Name _____

Site Location _____

Phone Number _____

Fax Number _____

Prime Mover Information

Manufacturer _____

Turbine Model Number _____

Type of Fuel (gas, steam, etc.) _____

Power Output Rating _____

Application (power generation, marine,
etc.) _____

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Control/Governor #2

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Control/Governor #3

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Symptoms

Description _____

If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.

Revision History

Changes in Revision AC—

- Added SIL2 Certification
- Updated PED Directive
- Updated Declarations

Changes in Revision AB—

- Updated ATEX compliance information
- Updated Declarations

Changes in Revision AA—

- Added note on how to re-position the conduit entry (page 6)

Changes in Revision Y—

- Updated Regulatory Compliance information

Changes in Revision W—


- Updated Declarations
- Added Notice to mark nameplates (page 5)

Changes in Revision V—

- Updated Regulatory Compliance information
- Updated Declarations

Declarations


EU DECLARATION OF CONFORMITY

EU DoC No.: 00125-04-CE-02-07
Manufacturer's Name: WOODWARD INC.
Manufacturer's Contact Address: 1041 Woodward Way
 Fort Collins, CO 80524 USA
Model Name(s)/Number(s): GSOV25 and GSOV25HT Fuel Isolation Valves
The object of the declaration described above is in conformity with the following relevant Union harmonization legislation: Directive 2014/34/EU on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
 Directive 2014/68/EU on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment
 PED Category II
Markings in addition to CE marking:  Category 2 Group II G, Ex d IIB T3
Applicable Standards: ASME Boiler and Pressure Vessel Code VIII, Div. 1, 2015
 EN 13463-1 :2009 ;Non-electrical equipment for potentially explosive atmospheres, Part 1: Basic method and requirements
 EN 13463-5 :2011: Non-electrical equipment for potentially explosive atmospheres-Part 5 : Protection by constructional safety "c"
 EN 60204-1: Electrical Equipment of Machines – Part 1: General Requirements
Conformity Assessment: PED Module H – Full Quality Assurance,
 CE-0041-PED-H-WDI 001-16-USA, Bureau Veritas UK Ltd (0041)
 Parklands, 825a Wilmslow Road, Didsbury, M20 2RE Manchester

This declaration of conformity is issued under the sole responsibility of the manufacturer
 We, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s).

MANUFACTURER

Signature



Full Name

Christopher Perkins

Position

Engineering Manager

Place

Woodward, Fort Collins, CO, USA

Date

22-APR-2016

5-09-1183 Rev 24



EU Declaration of Conformity

We, the undersigned,

TopWorx
3300 Fern Valley Road
Louisville, Kentucky 40213
United States of America

With Certificate and Notification,

EC Type Examination Certificate
Baseefa 08ATEX0360X

SGS Baseefa Ltd., Rockhead Business Park, Staden Lane,
Buxton, Derbyshire SK17 9RZ

Quality Assurance Notification - Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN, UK
NB# 0518

Certify and declare under our sole responsibility that the following apparatus:

TopWorx Go Switch™

Model 7X-XXXXXX-XX1549

Ex db IIC T* Gb
Ex tb IIIC T* Db

Reference certificate for
specific markings

**Conforms to the essential requirements of the UNION Directive 2014/34/EU,
based on the following standards applied, of latest issues, including
amendments:**

EN 60079-0:2012/A11:2013

EN 60079-1:2014

EN 60079-31:2014

**The technical documentation is kept
at the following address:**

TopWorx
3300 Fern Valley Road
Louisville, Kentucky 40213
United States of America
+1.502.969.8000



J Pearce
Product Compliance

20 April 2016

Date

ES-03660-1 R5



G. W. LISK COMPANY, INC. 81983

ISO 9001, ISO 14001, AS 9100
& TS 16949 CERTIFIED

ESTABLISHED 1910


2 SOUTH ST. CLIFTON SPRINGS, NY 14432-1185

315-462-2811 FAX 315-462-7861 www.GWLISK.com

DECLARATION OF CONFORMITY
According to ISO/IEC 17050

Manufacturer's Name: G W. Lisk Co. Inc.

Manufacturer's Address: 2 South Street, Clifton Springs, NY, USA

Model Name(s)/Number(s): Solenoid Operated Valve Assemblies
Type: M3-XXXX-(XX)
II 2G Ex d IIB T3 Gb Sira1 IATEX1209X
 II 3G Ex nA IIC T3 Gc Sira1 IATEX4210X

Conformance to Directive(s): Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

Directive 94/9/EC until 19 Apr 2016
Directive 2014/34/EU from 20 April 2016
on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres.

Standards - ATEX: EN 60079-0:2009 - Explosive Atmospheres
- Part 0: Equipment General Requirements
(A review against EN60079-0:2012, AMD 11:2013, which is harmonized, shows no significant changes relevant to this equipment so EN60079-0:2009 continues to represent "State of the Art").

EN 60079-1:2007 - Explosive Atmospheres
- Part 1: Equipment Protection by Flameproof Enclosures "D"

EN 60079-15:2010 - Explosive Atmospheres
- Part 15: Equipment Protection by Type of Protection "N".

Standards - IECEx: IEC 60079-0:2007- Explosive Atmospheres
- Part 0: Equipment - General Requirements.
(A review against IEC 60079-0:2011, COR 2:2013, which is harmonized, shows no significant changes relevant to this equipment so IEC 60079-0:2007 continues to represent "State of the Art").

IEC 60079-1:2007 - Explosive Atmospheres
- Part 1: Equipment Protection by Flameproof Enclosures "D"
(A review against IEC 60079-1:2014, which is harmonized, shows no significant changes relevant to this equipment so IEC 60079-1:2007 continues to represent "State of the Art").

IEC 60079-15:2010 - Explosive Atmospheres
- Part 15: Equipment Protection by Type of Protection "N".

Common Standards: EN 61000-6-2: 2005/COR:2005 - Generic Standard - Immunity for Industrial Environments. Evaluation has determined that this design is inherently immune to electrostatic discharge and surge voltages

3rd Party Certifications: IECEx - SIR 11.0102X

Notified Body For Production: Baseefa
NB Number 1180
Rockhead Business Park
Staden Lane
Buxton, Derbyshire SK179RZ
United Kingdom
www.baseefa.com

On behalf of the above named company, I declare that on the date the equipment accompanied by this declaration is placed on the market, the equipment specified above conforms with all technical and regulatory requirements of the above listed Directive(s)

Signature

Anthony J Green

Certified Product Authority/Quality Engineer

Full Name

Position

Date

13 Jun 16

**DECLARATION OF INCORPORATION
Of Partly Completed Machinery
2006/42/EC**

File name: 00125-04-CE-MD-02-01
Manufacturer's Name: WOODWARD INC.

Contact Address: 1041 Woodward Way
Fort Collins, CO 80524 USA

Model Names: GSOV25 and GSOV25 HT Fuel Isolation Valves

This product complies, where applicable, with the following Essential Requirements of Annex I: 1.1, 1.3, 1.5, 1.6, 1.7

The relevant technical documentation is compiled in accordance with part B of Annex VII. Woodward shall transmit relevant information if required by a reasoned request by the national authorities. The method of transmittal shall be agreed upon by the applicable parties.

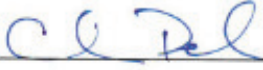
The person authorized to compile the technical documentation:

Name: Dominik Kania, Managing Director
Address: Woodward Poland Sp. z o.o., ul. Skarbowa 32, 32-005 Niepolomice, Poland

This product must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of this Directive, where appropriate.

The undersigned hereby declares, on behalf of Woodward Inc. of Loveland and Fort Collins, Colorado that the above referenced product is in conformity with Directive 2006/42/EC as partly completed machinery:

MANUFACTURER



Signature

Christopher Perkins

Full Name

Engineering Manager

Position

Woodward Inc., Fort Collins, CO, USA

Place

12-APR-2016

Date

Document: 5-09-1182 (rev. 16)

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication **40172**.



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PO Box 1519, Fort Collins CO 80522-1519, USA
1041 Woodward Way, Fort Collins CO 80524, USA
Phone +1 (970) 482-5811

Email and Website—www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches, as well as authorized distributors and other authorized service and sales facilities throughout the world.

Complete address / phone / fax / email information for all locations is available on our website.