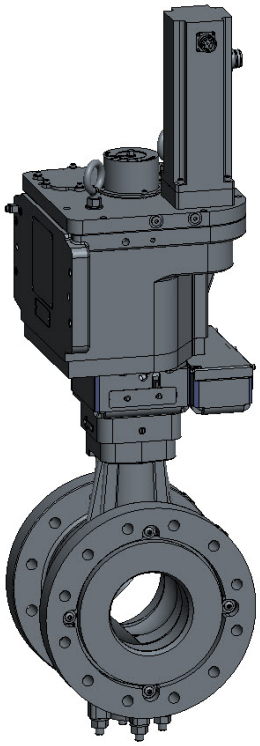
WOODWARD

Product Manual 26689
Revision AB, 5/2025
Original Instructions



GSxE
Rotary Control Valve with Electric Actuation

75 mm / 3-inch, 100 mm / 4-inch,
150 mm / 6-inch, 200 mm / 8-inch

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

This publication may have been revised or updated since this copy was produced. The latest version of most publications is available on the Woodward website.

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If your publication is not there, please contact your customer service representative to get the latest copy.

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:

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Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

If your publication is not on the Woodward website, please contact your customer service representative to get the latest copy.

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

Manual 26689

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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, as 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. After removing the old PCB from the control cabinet, immediately place it in the antistatic protective bag.

Regulatory Compliance

European Compliance for CE Marking

Pressure Equipment Directive GSxE Valves: Directive 2014/68/EU on the harmonisation of the laws of the Member States relating to making pressure equipment available on the market.
GS75E, GS100E: PED Category II
GS150E, GS200E: PED Category III
PED Module H – Full Quality Assurance

ATEX Directive LERA Actuator: 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.
Zone 2, Category 3, Group II G, Ex nA IIC T3 Gc

EMC Directive LERA Actuator: Declared to Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility, EMC.

Other European Compliance

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

ATEX Directive (all sizes GSxE): Exempt from the non-electrical portion of the ATEX 2014/34/EU due to no potential ignition sources per EN 13463-1.

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

Other International Compliance

IECEx LERA Actuator: Certified for use in hazardous locations
IECEx CSA 14.0019X Ex nA IIC T3 Gc IP65

North American Compliance

Suitability for use in North American Hazardous Locations is the result of compliance of the individual components:

LERA Actuator: **LERA = Large Electric Rotary Actuator**
CSA Certified for Class I, Division 2, Groups A, B, C, & D, T3 at 82 °C Ambient.
For use in Canada and the United States.
Certificate 160584-2558716

SIL Compliance:

GSXE – Certified SIL 3 Capable for safe position fuel shut off in safety instrumented systems.
Evaluated to IEC 61508 Parts 1-2. Refer to the Instructions of this Installation and Operation Manual, Chapter 6 Safety Management.
SIL Certificate WOO 1503119 C001

Special Conditions for Safe Use

IP65 is dependent upon use of the proper mating electrical connectors. This product is designed for use with four dedicated cables that connect the Digital Valve Positioner to the GSxE assembly. Please contact Woodward for the appropriate cable configuration.
Wiring must be in accordance with North American Class I, Division 2 wiring methods as applicable and in accordance with the authority having jurisdiction.

To be used only with the Woodward Digital Valve Positioner (DVP).

Compliance with the Machinery Directive 2006/42/EC noise measurement and mitigation requirements is the responsibility of the manufacturer of the machinery into which this product is incorporated.

⚠WARNING

HOT SURFACE HAZARD-T3 reflects the surface temperature conditions of the LERA actuator. The surface temperature of the valve body approaches the maximum temperature of the applied process media. It is the responsibility of the user to ensure that the external environment contains no hazardous gases capable of ignition in the range of the process media temperatures.

⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 2 applications.

⚠AVERTISSEMENT

RISQUE D'EXPLOSION—Ne pas enlever les couvercles, ni raccorder / débrancher les prises électriques, sans vous en assurez auparavant que le système a bien été mis hors tension; ou que vous situez bien dans une zone non explosive.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, applications Division 2.

⚠WARNING

EXTERNAL FIRE PROTECTION—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.

Chapter 1.
General Information

Introduction

The GSxE Rotary Control Valve with Electric Actuation controls the flow or regulates the pressure of gas fuel to the combustion system of an industrial or utility gas turbine. The integral electric actuator consists of a brushless DC motor, resolver for motor commutation and position sensing, valve stem resolver for motor resolver verification, fail-safe spring for fail-safe operation, and a hydraulic damper shock for fail-safe operations. The GSxE utilizes a device (ID Module) containing all the configuration and calibration information that is read by the Digital Valve Positioner (DVP) when the valve/actuator is connected and powered on.

This valve is intended to operate only with a Woodward Digital Valve Positioner (DVP). Contact your Woodward sales representative for part numbers for your specific applications.

GSxE Rotary Control Valve Specifications

Description	3, 4, 6, and 8-inch (75, 100, 150, and 200 mm) electrically actuated gas metering valves
Mean Time Between Failure (MTBF)	149 000 hours operation combined metering valve per valve/actuator/DVP/cable subsystem
Ambient Temperature Range	(–29 to +82) °C / (–20 to +180) °F
LERA ACTUATOR	**(Large Electric Rotary Actuator)**
Description	Brushless DC motor with dual position feedback sensors
Motor Coil	Class H insulation
Failure Mode	Spring type to drive valve to safe position with loss of signal (Fail Close)
Bandwidth	30 rad/s with no more than 3 dB attenuation and less than 180 degrees phase loss at ±2% magnitude and minimum supply voltage at DVP
Hysteresis	0.5% of point (measured from 10% - 100%)
Response Time	350 ms (measured from 90% to 10% during a 100% to 0% step), 650 ms (measured from 10% to 90% during a 0% to 100% step)
Visual Position Indication	Yes
Ingress Protection	IP65
DVP Input Voltage (typical)	125 / 250 VDC
DVP Input Voltage (max)	300 VDC
DVP Input Voltage (min)	112.5 VDC (for full dynamic performance) 90 VDC minimum functional voltage
Steady State Current	12 A maximum
Transient Current	40 A maximum
Failsafe Trip Times	350 ms (powered, measured from 100% to 0%) 350 ms (unpowered, measured from 100% to 0%, above 16 °C/60 °F) [3", 4", & 6" valves] 600 ms (unpowered, measured from 100% to 0%, above 16 °C/60 °F) [8" valves]

PORTED BALL VALVE	
Process Fluid	Natural gas
Gas Filtration	25 µm absolute at 75 beta requirement
Connections	ANSI Class 300 # RF flanges ANSI Class 600 # RF flanges Overboard Vent Drain (OBVD) (see outline drawing)
Min Process Fluid Temperature	–29 °C (–20 °F)
Max Process Fluid Temperature	260 °C (500 °F)
Max Thermal Shock	Differential of 37.8° C (100° F) within valve due to thermal transient
Min Working Pressure	0 kPa (0 psig)
Max Working Pressure	3.45 MPa (500 psid) [3", 4", & 6" valves] 4.00 MPa (580 psid) [8" valves] (See Operational Range Chart)
Max Process Fluid Containment Pressure:	• Class 300 (WCC) flanges: See ASME B16.34, Table 2-1.2 (VII-2-1.2) • Class 300 (CF8M) flanges: See ASME B16.34, Table 2-2.2 (VII-2-2.2) • Class 600 (WCC) flanges: See ASME B16.34, Table 2-1.2 (VII-2-1.2) 3", 4" & 6" valves follow Class 300 limits 8" valve follow Class 600 limits • Class 600 (CF8M) flanges: See ASME B16.34, Table 2-2.2 (VII-2-2.2) 3", 4" & 6" valves follow Class 300 limits* 8" valve follow Class 600 limits
Proof Test Pressure	Per ASME B16.34
Burst Pressure	2.4x maximum operating pressure
Overboard Leakage	<20 sccm as shipped (see OBVD Port section)
Trim Sizes	75 mm—3-inch 100 mm—4-inch 150 mm—6-inch 200 mm—8-inch

Note: For trim sizes in Cv maximum, see Table 3-4.

NOTICE

Damage to GSxE could result if maximum working pressure is exceeded.

*Certain class 600 part numbers have been qualified above class 300 limits. See product nameplate for pressure and temperature ratings.

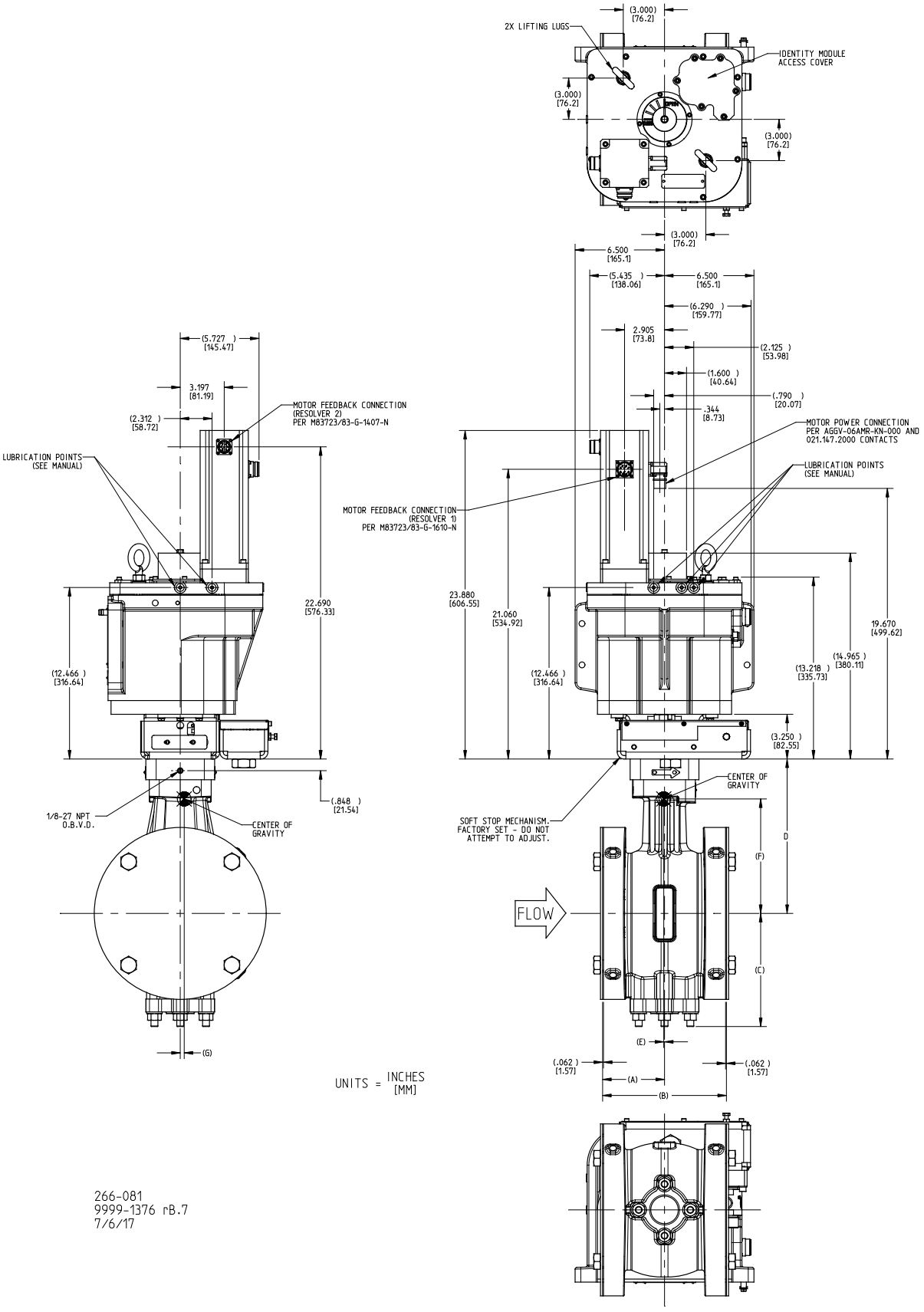
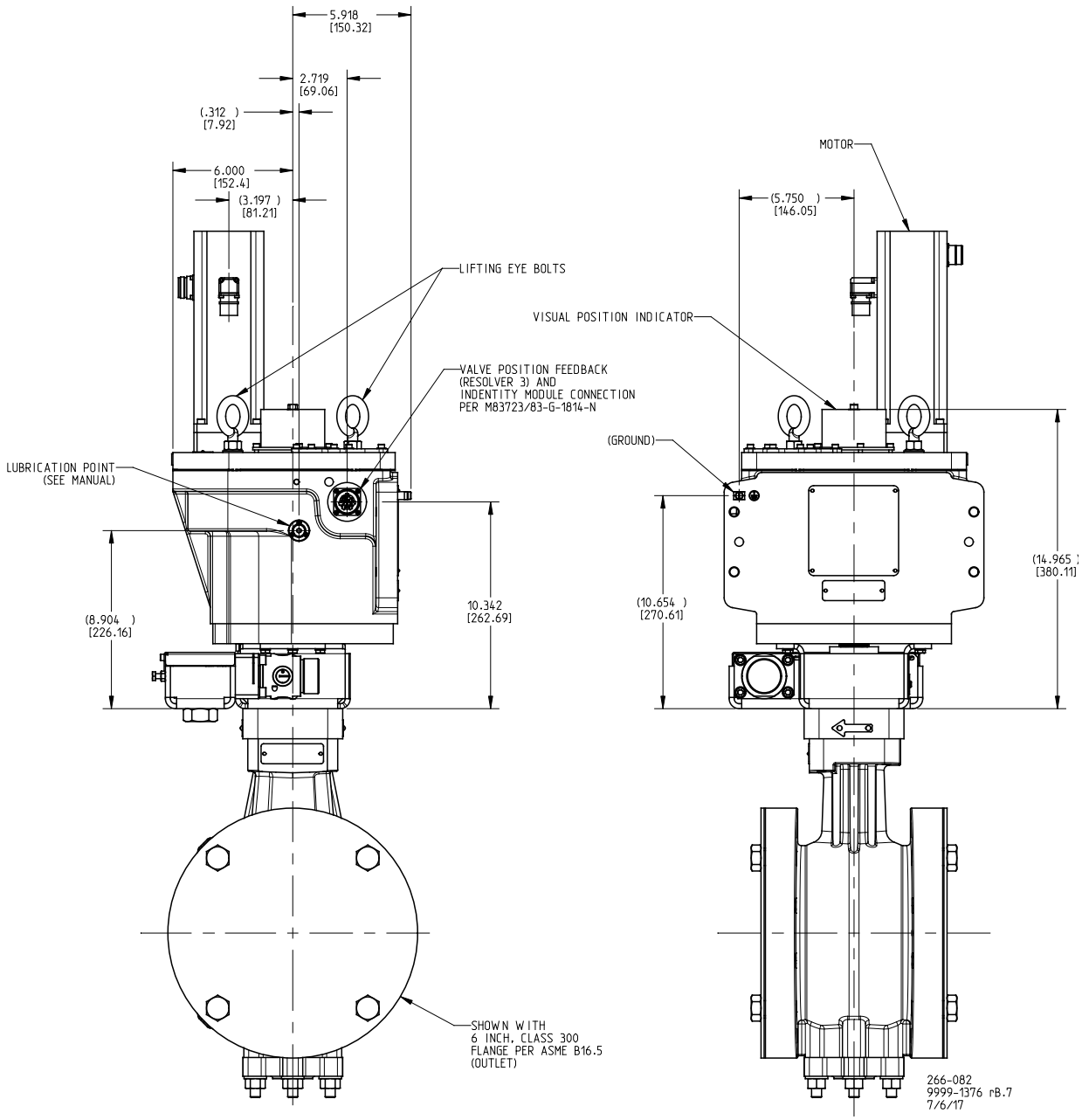


Figure 1-1a. Outline Drawing (GSxE)



DIMENSION TABLE									
							CENTER OF GRAVITY		
SIZE	CLASS	WEIGHT	DIM "A"	DIM "B"	DIM "C"	DIM "D"	DIM "E"	DIM "F"	DIM "G"
3 INCH	300	198.1 LBS [89.9 KG]	(3.25) [82.5]	(6.50) [165.1]	(6.42) [163.2]	(9.45) [240.0]	(.04) [1.0]	(11.43) [290.3]	(.45) [11.4]
4 INCH	300	229.4 LBS [104.1 KG]	(3.81) [96.7]	(7.62) [193.5]	(7.00) [177.8]	(10.00) [254.1]	(.04) [1.0]	(10.23) [259.7]	(.39) [9.9]
6 INCH	300	299.2 LBS [135.7 KG]	(4.50) [114.3]	(9.00) [228.6]	(8.22) [208.8]	(11.23) [285.1]	(.06) [1.5]	(8.45) [214.5]	(.29) [7.4]
8 INCH	300	437.5 LBS [198.4 KG]	(4.78) [121.4]	(9.56) [242.8]	(9.08) [230.6]	(12.83) [325.7]	(.08) [2.0]	(6.50 [165.1]	(.19) [4.8]
3 INCH	600	202.6 LBS [91.9 KG]	(3.25) [82.5]	(6.50) [165.1]	(6.420 [163.0]	(9.45) [240.0]	(.04) [1.0]	(11.19) [284.3]	(.44) [11.1]
4 INCH	600	249.3 LBS [113.1 KG]	(3.81) [96.7]	(7.62) [193.5]	(7.00) [177.8]	(10.00) [254.1]	(.04) [1.0]	(9.36) [237.8]	(.35) [8.9]
6 INCH	600	352.7 LBS [159.9 KG]	(4.50) [114.3]	(9.00) [228.6]	(8.22) [208.8]	(11.23) [285.1]	(.06) [1.5]	(7.14) [181.3]	(.24) [9.1]
8 INCH	600	470.0 LBS [213.2 KG]	(4.78) [121.4]	(9.56) [242.8]	(9.08) [230.6]	(12.83) [325.7]	(.08) [2.0]	(5.99) [152.3]	(.17) [4.3]

Figure 1-1b. Outline Drawing (GSxE)

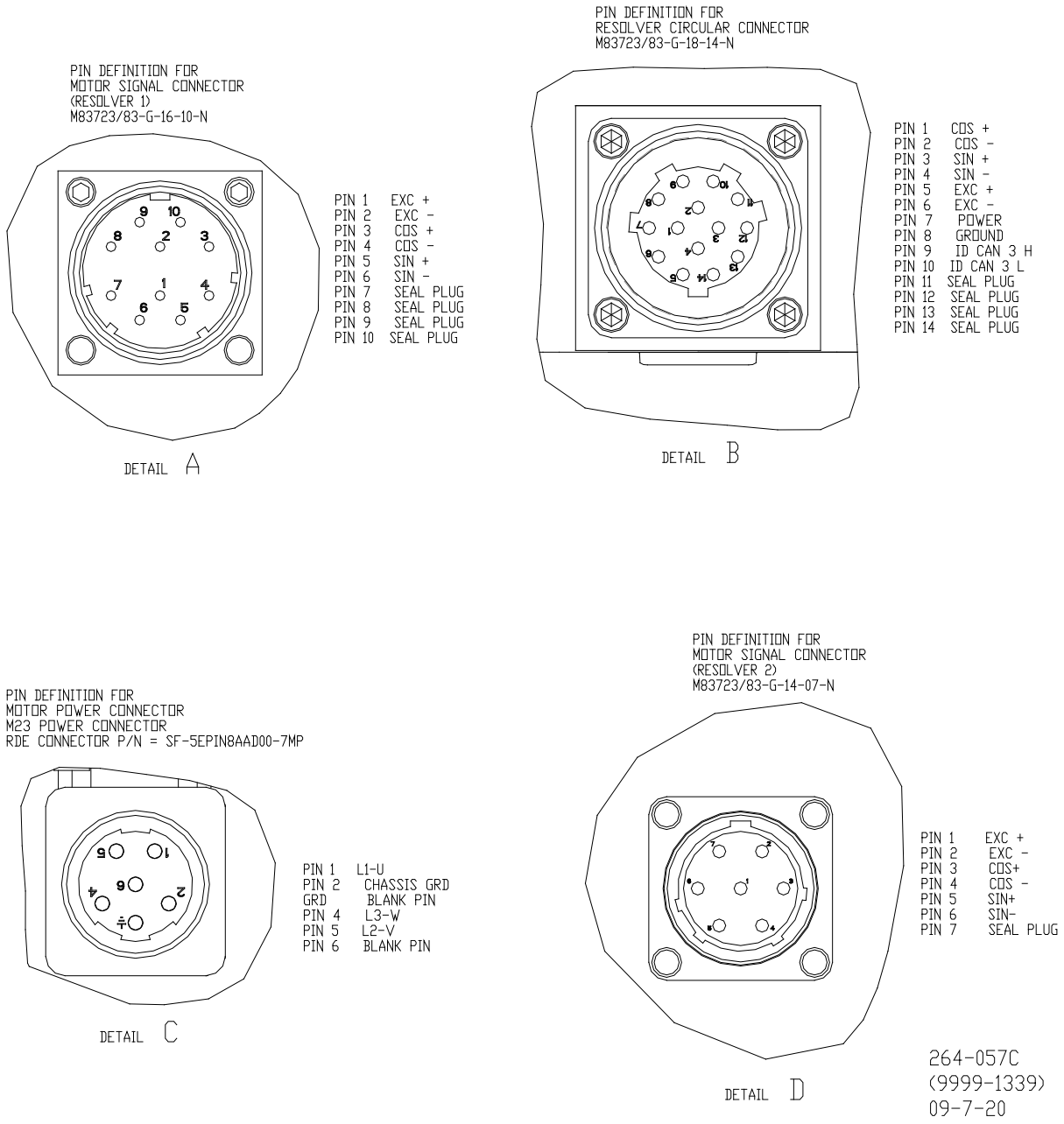


Figure 1-2. Connector Pin-outs

Chapter 2. Description

Large Electric Rotary Actuator (LERA)

The LERA consists of a brushless DC motor that provides torque, dual integral resolvers for motor commutation and position feedback to the controller, a valve stem (output shaft) resolver for motor resolver verification, and a high-efficiency gear train for rotary output. The actuator also contains a fail-safe spring designed to rotate the actuator if power is removed from the actuator. A hydraulic damper cushion is designed to dissipate motor rotor and gear train inertia during fail-safe shutdown to prevent gear and bearing damage. The actuator has lifting eyes to aid installation.

Brushless DC Motor

The motor used on the GSxE is a permanent magnet, electrically commutated, brushless DC motor. The motor is a permanently lubricated assembly.

Resolver Position Feedback Sensors

The primary position feedback transducer is dual resolvers that are integral to the DC brushless motor. The actuator also has a valve stem (actuator output shaft) resolver. This resolver is used to perform a watchdog function of the primary motor control, to prevent runaway conditions and to ensure that the primary motor resolvers are reading correctly. Parameter files are loaded onto the DVP to specifically match the valve characteristics to obtain the most accurate position sensing.

Hydraulic Damper Cushion

Integral to the valve/actuator is a hydraulic damper cushion. This provides a method for dissipating the inertial energy of the gear train during a loss of power or fail-safe trip condition. This will occur only on loss of power, certain wiring faults, and in rare cases, internal fault conditions within the positioner. The hydraulic damper cushion mechanism is not used when the positioner is controlling the actuator. Although the positioner will rapidly drive the actuator towards the minimum position, it also decelerates the actuator as the actuator approaches the mechanical minimum stop. Under the control of the positioner, the actuator should not reach the mechanical minimum stop at a high velocity.

Valve

The rotary control valve consists of a valve housing, ported metering ball, metering shoe, bonnet, and actuator adapter yoke. The metering elements of these valves are a ported ball and cylindrical shoe. The ball is ported to provide a square law area versus position flow characteristics from 0% to 100% stroke.

Chapter 3.
Installation

General

⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 2 applications.

⚠AVERTISSEMENT

RISQUE D'EXPLOSION—Ne pas enlever les couvercles, ni raccorder / débrancher les prises électriques, sans vous en assurez auparavant que le système a bien été mis hors tension; ou que vous situez bien dans une zone non explosive.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, applications Division 2.

⚠WARNING

The surface temperature of the GSxE approaches the maximum temperature of the applied process media. It is the responsibility of the user to ensure that the external environment contains no hazardous gases capable of ignition in the range of the process media temperatures.

⚠WARNING

The metering ball within the valve has a high spring force and sharp elements. To prevent serious injury, DO NOT place hands or fingers or any object inside the valve.

Be sure to check proper operation of the valve before connecting it to the piping, to verify ball rotation.

If operating the valve prior to connection with the piping to verify metering ball rotation:

- Properly install electrical connectors per these instructions.
- Verify rotation using the visual position indicator.
- DO NOT place hands or any object inside the valve. A flashlight may be used externally to aid in viewing the metering ball.

See the outline drawings (Figure 1-1) for:

- Overall dimensions
- Process piping flange locations
- Electrical connections
- Lift points and center of gravity
- Overboard vent drain (OBVD) port

Installation attitude does not affect actuator or fuel valve performance, but a vertical position is generally preferred to conserve floor space as well as provide ease of making electrical and fuel connections. The GSxE is designed for support by the piping flanges alone; additional supports are neither needed nor recommended. Do not use this valve to provide support to any other component in the system. The piping should be aligned and adequately supported such that excessive piping loads are not transmitted to the valve body.

⚠WARNING

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the GSxE Rotary Control Valve.

⚠WARNING

The surface of this product can become hot 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

Lift or handle the valve only by using the lifting eyes.

⚠WARNING

Do not remove the lifting eyes from the actuator due to their sealing function.

⚠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.

⚠WARNING

Do not operate the valve without proper support for the inlet sleeve. IF BENCH TESTING THE VALVE, ENSURE THAT ASME/ANSI RATED FLANGES ARE GASKETED AND INSTALLED OVER THE INLET AND DISCHARGE FLANGES WITH THE BOLTS PROPERLY TORQUED. The inlet retaining sleeve screws by themselves (circled in red) are not designed to hold pressure loads. Failure to comply with this warning may result in personal injury. Do not place hands inside valve body during inspection, cleaning, or operation.

Inlet sleeve assembly screws (circled in red) are not designed to hold pressure loads. If bench testing, do not apply pressure to the valve without ANSI flanges (see below figures).

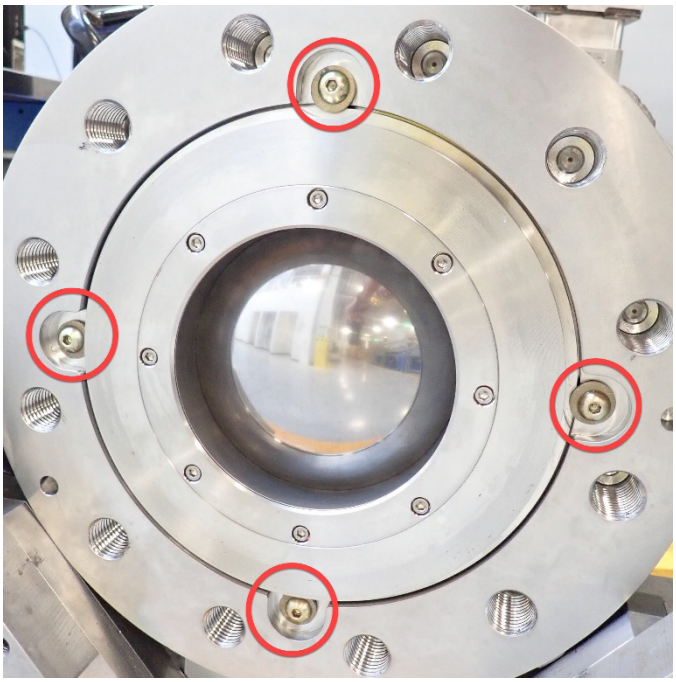


Figure 3-1. Inlet Sleeve Assembly Screws

Raised face inlet sleeves should be secured with a blind flange or welding neck flange when bench testing.

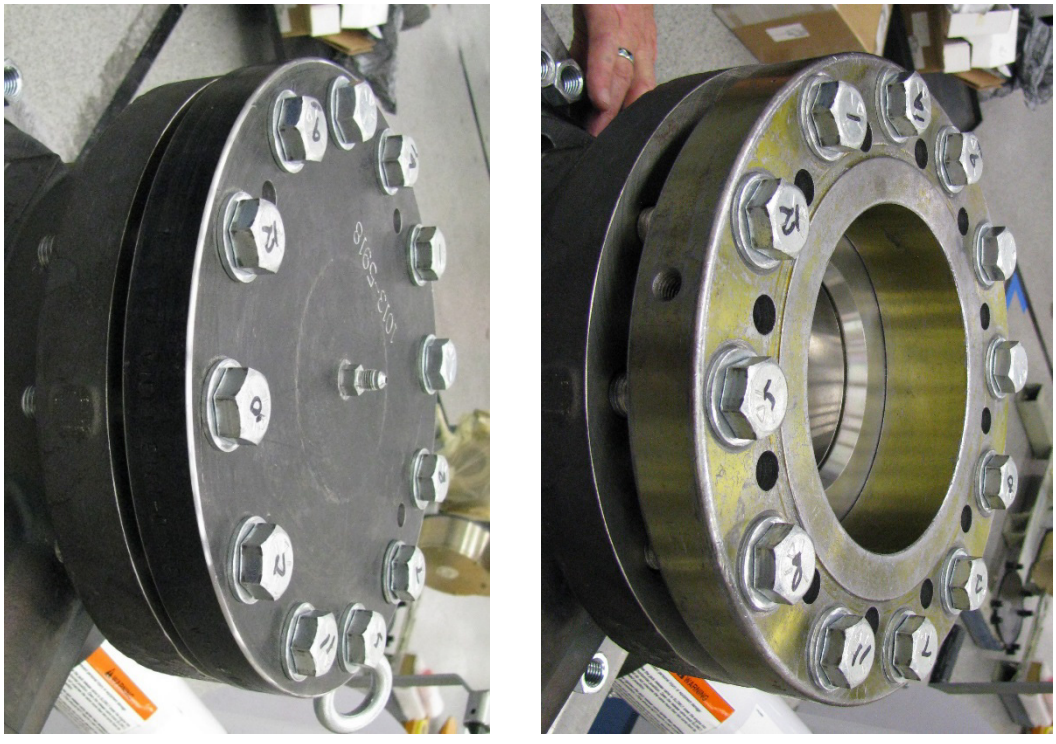


Figure 3-2. Raised Face Inlet Sleeves

Piping Installation

Refer to ANSI B16.5 for details of flange, gasket, and bolt types and dimensions.

Verify that the process piping face-to-face dimensions meet the requirements of the outline drawings (Figure 1-1) within standard piping tolerances. The valve should mount between the piping interfaces such that the flange bolts can be installed with only manual pressure applied to align the flanges. Mechanical devices such as hydraulic or mechanical jacks, pulleys, chain-falls, or similar equipment should never be used to force the piping system to align with the valve flanges.

ASTM/ASME grade bolts or studs should be used to install the valve into the process piping. The bolt length and diameter shall conform to the following table according to the valve flange size and class. All threaded flange connections are UNC.

Table 3-1. Flange, Gasket, Bolt Types and Dimensions

Flange Class	Nominal Pipe Size	Number of Bolts	Diameter of Bolts	Stud Length	Machine Bolt Length
300	75 mm 3 inch	8	19 mm 0.75 inch	N/A	57.1 mm 2.25 inch
300	100 mm 4 inch	8	19 mm 0.75 inch	114.3 mm 4.5 inches	63.5 mm 2.5 inch
300	150 mm 6 inch	12	19 mm 0.75 inch	114.3 mm 4.5 inches	69.8 mm 2.75 inch
300	200 mm 8 inch	12	22.2 mm 0.875 inch	N/A	69.8 mm 2.75 inch
600	75 mm 3 inch	8	19 mm 0.75 inch	N/A	69.8 mm 2.75 inch
600	100 mm 4 inch	8	22.2 mm 0.875 inch	N/A	82.5 mm 3.25 inch
600	150 mm 6 inch	12	25.4 mm 1 inch	N/A	101.6 mm 4 inch
600	200 mm 8 inch	12	28.5 mm 1.125 inch	N/A	101.6 mm 4 inch

Flange gasket materials should conform to ANSI B16.20. The user should select a gasket material which will withstand the expected bolt loading without injurious crushing, and which is suitable for the service conditions.

When installing the valve into the process piping, it is important to properly torque the studs/bolts in the appropriate sequence in order to keep the flanges of the mating hardware parallel to each other. A multi-step torque method is recommended.

Bolt Tightening Sequence for 8-Bolt Flanges

NOTICE

Note the flow direction arrow on the valve body. It is important to assemble and complete the torquing of the INLET side of the valve to the pipework first. Internal damage to the valve may result if the inlet side of the valve is not tightened before the outlet side. Never loosen the INLET flange bolts when aligning the OUTLET flange to the pipework or internal damage to the valve may result.

During all of the following steps, keep an even gap between flanges around the circumference.

1. Assemble the valve in the pipework and hand-tighten all nuts and bolts.
2. On the inlet side only, tighten the bolts to 25% recommended torque following the sequence in Figure 3-3.
3. On the inlet side only, tighten the bolts to 75% recommended torque following the sequence in Figure 3-3.
4. On the inlet side only, tighten the bolts to 100% recommended torque following the sequence in Figure 3-3.
5. Continue tightening until nuts do not move under 100% recommended torque.
6. Repeat steps 2, 3, and 4 for the outlet side.

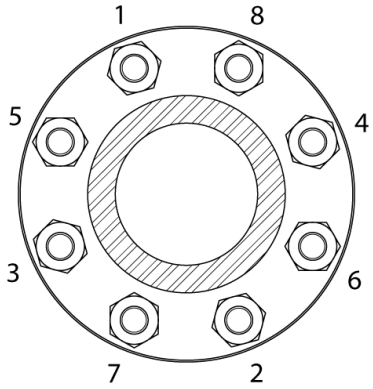


Figure 3-3. Bolt Tightening Sequence (8-Bolt Flanges)

Bolt Tightening Sequence for 12-Bolt Flanges

During all of the following steps, keep an even gap between flanges around the circumference.

1. Assemble the valve in the pipework and hand-tighten all nuts and bolts.
2. On the inlet side only, tighten the bolts to 25% recommended torque following the sequence in Figure 3-4.
3. On the inlet side only, tighten the bolts to 75% recommended torque following the sequence in Figure 3-4.
4. On the inlet side only, tighten the bolts to 100% recommended torque following the sequence in Figure 3-4.
5. Continue tightening until nuts do not move under 100% recommended torque.
6. Repeat steps 2, 3, and 4 for the outlet side.

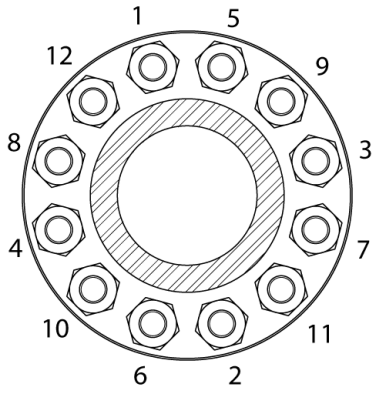


Figure 3-4. Bolt Tightening Sequence (12-Bolt Flanges)

Do not insulate the valve or actuator.

Shoe Retaining Bolts

The shoe retaining bolts are used to hold the shoe in place during shipping and transportation. If the valve is removed from the pipework, the shoe retaining bolts should be re-torqued.

Table 3-2. Shoe Retaining Bolt Torque Recommendations

Valve Size	Shoe Retaining Bolt Torque
75 mm 3 inch	7.3 - 8.5 N m 65 - 75 IN. LB.
100 mm 4 inch	7.3 - 8.5 N m 65 - 75 IN. LB.
150 mm 6 inch	10.2 - 11.3 N m 90 - 100 IN. LB.
200 mm 8 inch	21.5 - 22.6 N m 190 - 200 IN. LB.

IMPORTANT

The shoe retaining bolts are only used to prevent movement of the shoe and shoe carrier during shipping and transportation when not installed in pipework. The bolts DO NOT affect seat leakage when installed in pipework.

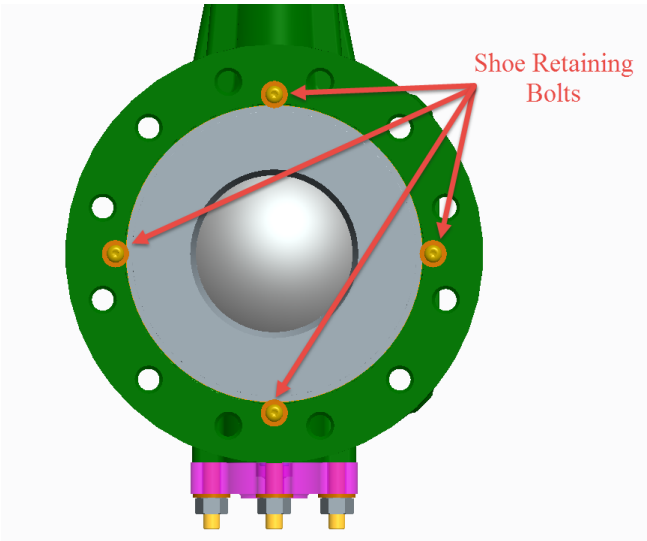


Figure 3-5. Shoe Retaining Bolt Locations

Allowable Flange Loads

Piping loads that can be considered “typical” have been used in the design of the housing to ensure that there is not an adverse effect from the stresses applied to the housing from the inlet and outlet piping. The loads which were used in the design of these housings are in the table below and apply by valve size regardless of flange class. It is the customer’s responsibility to ensure that the predicted and actual flange loads are within the specified limits.

Table 3-3. Flange Load Limits

Valve Size	Maximum Axial Pipe Force	Maximum Pipe Moment
75 mm	5400 N	3300 N·m
3 inch	1214 lb	2434 lb-ft
100 mm	7200 N	4400 N·m
4 inch	1618.6 lb	3245.3 lb-ft
150 mm	11000 N	6600 N·m
6 inch	2472.9 lb	4867.9 lb-ft
200 mm	14300 N	8600 N·m
8 inch	3214.8 lb	6343 lb-ft

Overboard Vent Drain (OBVD) Installation

The OBVD must be vented to a safe location. The location and size of this port is shown in the outline drawing, Figure 1-1a.

NOTICE

Never plug the OBVD port. Plugging the OBVD port may cause damage to the seals.

Electrical Connections

NOTICE

Do not connect any cable grounds to "instrument ground", "control ground", or any non-earth ground system. Make all required electrical connections based on the wiring diagrams (Figure 1-2).

This product is designed for use with four dedicated cables that connect the Digital Valve Positioner to the GSxE assembly. Please contact Woodward for the appropriate cable configuration.

⚠WARNING

The GSxE valve is to be used only with the Woodward Digital Valve Positioner (DVP).

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

Power Connector

The mating power cable connector shall be installed hand-tight followed by a final torque of 2.5 N·m (22 lb-in) to meet the IP rating.

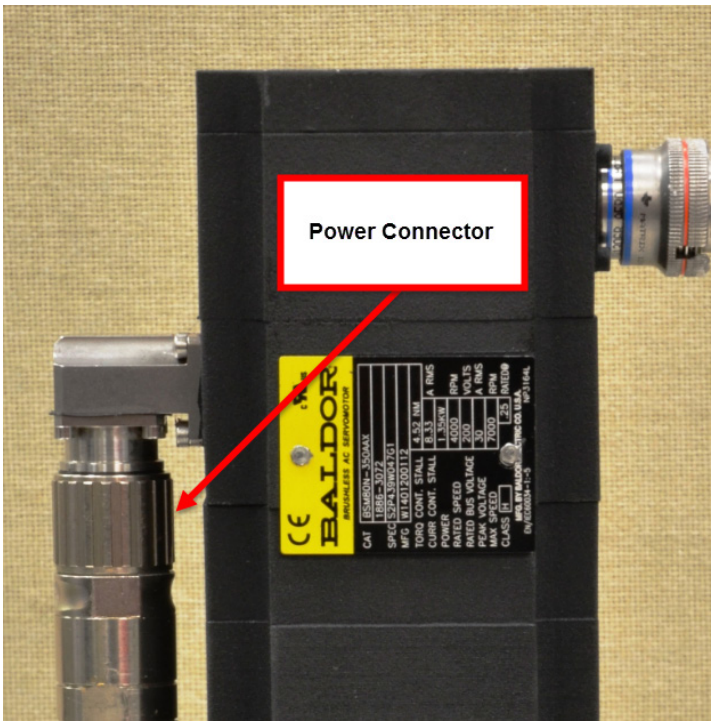


Figure 3-6. Power Connector

Motor Resolver Connectors (Two Resolvers)

Install these two mating cable connectors by hand, so that the red line is no longer visible and the connector cannot be turned any further.

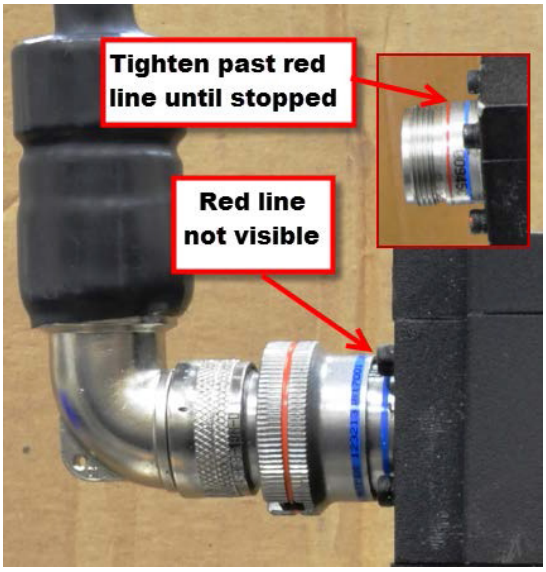


Figure 3-7. Motor Resolver Mating Connector

ID Module/Shaft Resolver Actuator Connector

Install the mating cable connector by hand, so that the red line is no longer visible and the connector cannot be turned any further.

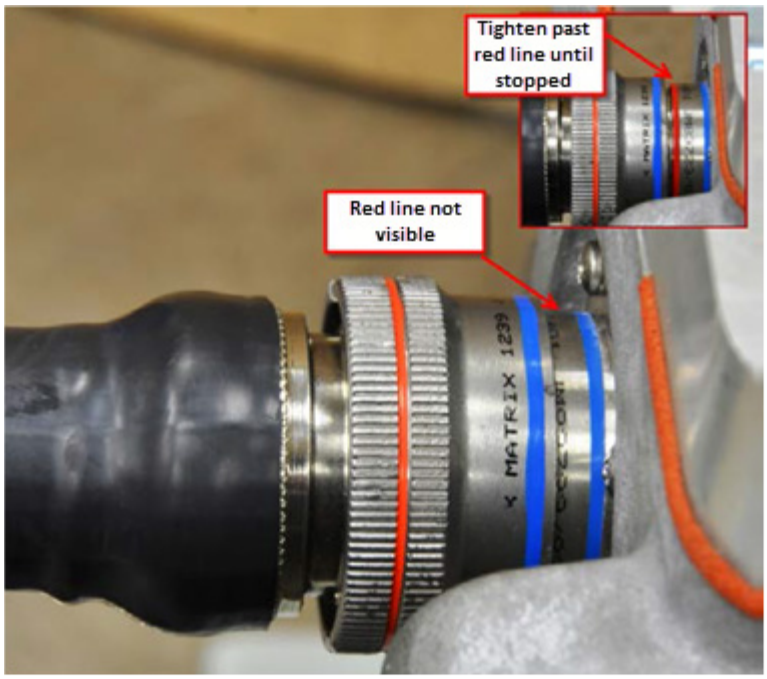


Figure 3-8. ID Module/Shaft Resolver Mating Connector

Valve Characteristics Data

Table 3-4. GSxE Flow Characteristics

	GS75E		GS100E		GS150E		GS200E	
Position %	**Cv**	**Xt**	**Cv**	**Xt**	**Cv**	**Xt**	**Cv**	**Xt**
100	222.94	0.242	398.96	0.28	797.40	0.29	1278.33	0.34
90	132.71	0.447	253.37	0.40	512.60	0.40	836.59	0.45
80	88.48	0.575	170.51	0.51	348.40	0.52	567.51	0.58
70	59.26	0.736	113.67	0.66	240.20	0.64	393.72	0.72
60	39.86	0.866	75.74	0.83	164.00	0.76	270.54	0.83
50	25.84	0.941	49.52	0.92	108.80	0.82	179.93	0.88
40	15.40	0.924	30.40	0.92	67.90	0.79	107.91	0.88
30	7.47	0.950	15.81	0.96	36.50	0.77	54.84	0.90
20	2.33	0.957	5.88	0.97	14.30	0.43	19.09	0.89
10	0.11	0.973	0.80	0.95	2.48	0.74	64.05	1.84

Flow deviation will not exceed that allowed by paragraph four of ISA-75.11 (R2002).

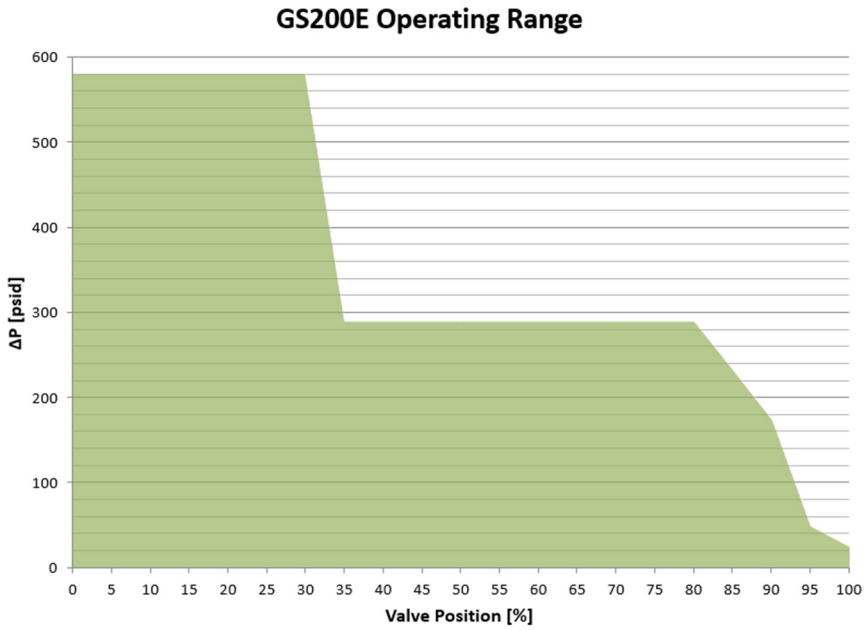


Figure 3-9. GS200E Operating Range Chart

Calibration

The actuator and controller perform an automatic rigging procedure. When the actuator controller is activated, it performs an automatic rigging procedure that checks system health and verifies the value is in the proper position. No additional steps are required from the operator.

Valve/Actuator Configuration Settings

The GSxE utilizes a device (ID Module) containing all the configuration and calibration information that is read by the Digital Valve Positioner (DVP) when the valve/actuator is connected and powered up. Initial configuration settings for the valve/actuator do not need to be entered into the DVP due to the ID Module communicating directly with the positioner. However, in the unlikely event that the configuration settings must be entered manually, the following tables outline the necessary configuration settings for the GSxE. These configuration settings are broken up into three groups: User Configuration Parameters, Valve Part Number Specific Parameters, and Valve Serial Number Specific Parameters. Some of the configuration settings include factory calibration information. Please contact Woodward with the valve part number and serial number for the data containing the specific calibration and configuration settings if the need arises. Many of these parameters are accessible via the Woodward Service Tool.

User Configuration Parameters

The User Configuration Parameters are used in the DVP to define the interface between the DVP and the turbine control system. Examples of these include the demand type selection, analog input scaling, discrete input and output configurations, etc. For a complete description of all the options for the User Configuration Parameters, please see the DVP product manual.

Valve Part Number Specific Parameters

These parameters define the settings based on a particular valve type (part number). Every valve of the same type, regardless of serial number, will have the same settings. Please refer to the table below for a definition of these settings. For instructions on how to enter these values, please refer to the DVP manual.

NOTICE

Please contact Woodward for the correct settings for your application.

Table 3-5. Valve Part Number Specific Parameters

Parameter Name	Description	Value/Units
ValveTypeId.		
IdModuleVersion	Parameter set version	1 = Rev 0 2 = Rev 1, etc.
ValveType	Selects valve type	34 = GS150
ValveProductCode	Upper level part number of valve assembly	"xxxx-xxxx" *Read or input correct number*
ValveProductRev	EC Revision of Valve Assembly	1 = NEW 2 = A 3 = B, etc. 100 = Rev 0 101 = Rev 1, etc.
BLDCPosStateParams.		
MinCheckCurrent	Current to close valve during min startup check	amps
MaxCheckCurrent	Current to preload valve in opening direction during min startup check	amps
MotorDirectioncheckLimit	Min movement in the closing direction during startup check to avoid a motor direction error	% of electrical revolution
SetPosZeroCutOffParams.		
Mode	Turns on or off the zero cut off function	0 = Off 1 = On
LowLimit	Zero cut off will be turned on below this stroke	%

Parameter Name	Description	Value/Units
HighLimit	Zero cut off will be turned off above this limit	%
DelayTime	Delay time before zero cut off is turned on	ms
ModelPositionErrParams.		
PosErrMotorAlarmTime	Motor resolver delay time before a position error is flagged as an alarm	sec
PosErrMotorAlarmLimit	Alarm limit for error allowed between the position demand and the motor resolver feedback	%
PosErrMotorShutdownTime	Motor resolver delay time before a position error creates a shutdown	sec
PosErrMotorShutdownLimit	Shutdown limit for error allowed between the position demand and the motor resolver feedback	%
PosErrShaftAlarmTime	Shaft resolver delay time before a position error is flagged as an alarm	sec
PosErrShaftAlarmLimit	Alarm limit for error allowed between the position demand and the shaft resolver feedback	%
PosErrShaftShutdownTime	Shaft resolver delay time before a position error creates a shutdown	sec
PosErrShaftShutdownLimit	Shutdown limit for error allowed between the position demand and the shaft resolver feedback	%
NoiseFilterParams.		
NoiseFilterMode	Selects noise filter mode	
Bandwidth	Input noise filter bandwidth	Hz
Damping	Input noise filter damping	Typical 2nd order response is 1.0
Threshold	Below this threshold the gain setting will be used, above this threshold the gain setting will be set to 1.0	%
Gain		
PaceMakerParams.		
Mode	Turns on or off the pace maker function	0 = Off 1 = On
DelayTime	Delay time between pace maker pulses	min
PositionStep	Position demand magnitude for the pace maker pulse	%
ImpulseHalfDuration	Time pulse remains high, also time pulse remains low	ms

Valve Serial Number Specific Parameters

Each valve, regardless of valve type or part number, will have a set of unique settings corresponding to the calibration process done on each unit at the factory. Refer to the table below for a definition of these settings. Please contact Woodward if these values need to be entered into the DVP.

Table 3-6. Valve Serial Number Specific Parameters

Parameter Name	Description	Value
ValveTypeId.		
ValveSerialNum	Valve assembly serial number	Factory Calibrated
ResolverScalingParms.		
Shaft1Resolver	Secondary resolver calibration	Factory Calibrated
BLDCPosStateParams.		
MinCheckMotorResMin	Startup diagnostic limit	Factory Calibrated
MinCheckMotorResMax	Startup diagnostic limit	Factory Calibrated
MinCheckShaftResMin	Startup diagnostic limit	Factory Calibrated
MinCheckShaftResMax	Startup diagnostic limit	Factory Calibrated
MaxCheckMotorResMin	Startup diagnostic limit	Factory Calibrated
MaxCheckMotorResMax	Startup diagnostic limit	Factory Calibrated
MaxCheckShaftResMin	Startup diagnostic limit	Factory Calibrated
MaxCheckShaftResMax	Startup diagnostic limit	Factory Calibrated
MotorResolverOffset	Startup diagnostic limit	Factory Calibrated
SetPosOffsetParams.Offset	Calibration position offset	Factory Calibrated

Chapter 4.
Maintenance

The only maintenance required for the GSxE Rotary Control Valve is:

- Lubricate the actuator gears and bearings and inspect the overboard vent drain every 12 months, in accordance with the descriptions below.
- Woodward recommends the valve to be overhauled prior to 64k operational hours, 8 years, or after 500 unpowered trips (loss of power to the DVP while the valve is open), whichever occurs first.

No field maintenance or repair is possible.

⚠WARNING

Lift or handle the valve only by using the lifting eyes.

⚠WARNING

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the GSxE Rotary Control Valve.

⚠WARNING

The surface of this product can become hot 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

Do not disassemble the GSxE Rotary Control valve due to dangerous forces contained in the springs. All disassembly shall be performed only by Woodward or an Authorized Service Center.

NOTICE

Use only Woodward-approved grease to lubricate the gear train and bearings in this actuator. Use of any other grease will reduce performance and reliability and will void the product warranty. Woodward lubrication kits are available as part number 8923-3303.

NOTICE

DO NOT adjust the hydraulic damper setting from the factory-optimized level. Adjustment by unqualified operators may damage the valve and actuator components, affecting valve performance.

Actuator Lubrication Procedure

Lubricating the Gear Box Assembly

⚠CAUTION **To prevent injury, wear protective gloves and safety glasses in accordance with the MSDS for the specific lubricant.**

1. Clean the outside of the actuator to ensure that no debris gets inside the actuator during the lubrication process. Any debris in the bearings will reduce actuator life.
2. Remove each of the 6 grease port plugs (do only one at a time all the way through this procedure and repeat for the remaining plugs until all 6 are done) with a 3/16 inch hex wrench (Figure 4-1).
3. Set the plug aside and keep clean, ensuring that the inside plug surface is not scratched or marred.
4. Attach the thread connector of the grease syringe to the threaded bearing grease port. The fitting should be fully seated (Figure 4-1).
5. Inject the entire Woodward-approved grease kit 8923-3303 into each of the six bearing grease ports.
6. Remove the grease syringe from the bearing port and install the bearing port plug. Torque to (4.3 to 4.7) N·m / (38 to 42) lb-in.

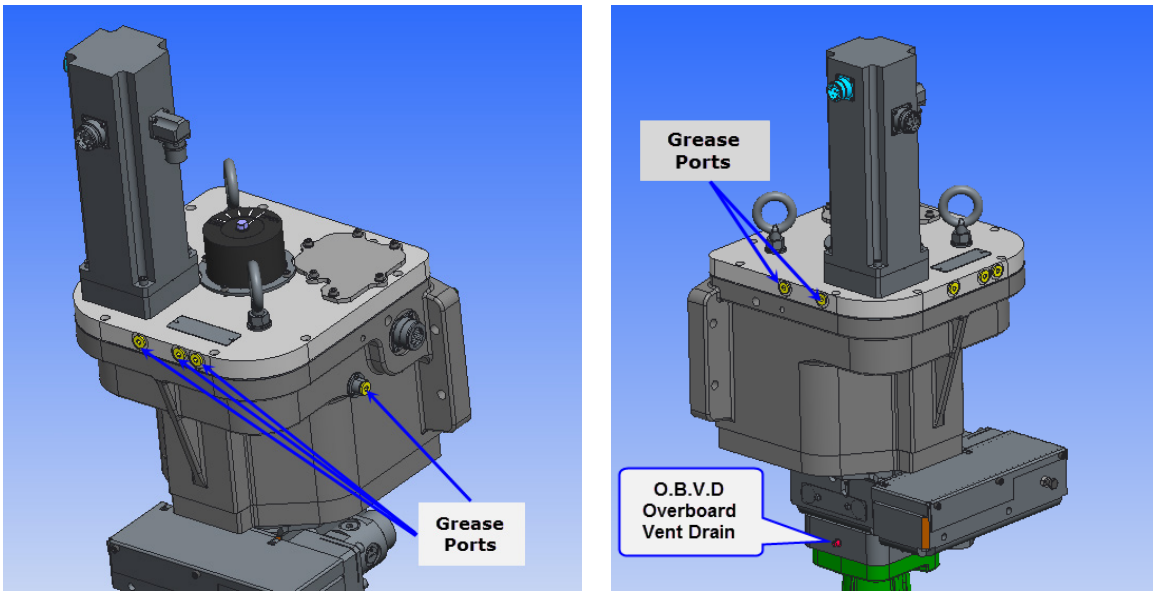


Figure 4-1. Grease Ports

⚠WARNING **To prevent possible serious personal injury or damage to equipment, be sure all electric power and gas pressure have been removed from the valve and actuator before beginning any maintenance.**

Overboard Vent Drain (OBVD) Inspection

There is an overboard vent drain that must be vented to a safe location. In normal operation, this vent should have very low leakage. However, if excessive leakage is detected from this vent port, contact a Woodward representative for assistance.

NOTICE

Never plug the OBVD port. Plugging the OBVD may cause damage to the seals.

Overboard Vent Drain Annual Inspections

Pressurize the valve section of the assembly to the rated pressure of 3447 kPa (500 psig) and perform the following inspections:

- Inspect external sealing surfaces for leakage using leak detect fluid (no leakage is permitted). These locations include the inlet and discharge flange connections, as well as the pilot sleeve/valve body interface.
- Inspect for excessive overboard vent leakage (100 cm^3/min maximum) from the OBVD Port.

Chapter 5. Troubleshooting

Faults in the fuel control or governing system are often associated with speed variations of the prime mover, but such speed variations do not always indicate fuel control or governing system faults. Therefore, when improper speed variations occur, check all components, including the engine or turbine, for proper operation. Refer to the applicable electronic control manuals for assistance in isolating the trouble. The following steps describe troubleshooting for the gas fuel control valve.

⚠WARNING

Do not disassemble the GSxE Rotary Control valve due to dangerous forces contained in the springs. All disassembly shall be performed only by Woodward or an Authorized Service Center.

NOTICE

If the valve is removed during troubleshooting, be sure to re-torque the shoe retaining bolts (see Piping Installation in Chapter 3).

NOTICE

DO NOT adjust the hydraulic damper setting from the factory-optimized level. Adjustment by unqualified operators may damage the valve and actuator components, affecting valve performance.

When requesting information or service help from Woodward, it is important to include the part number and serial number of the valve assembly in your communication.

⚠WARNING

To prevent possible serious personal injury, or damage to equipment, be sure all electric power and gas pressure have been removed from the valve and actuator before beginning any troubleshooting.

⚠WARNING

The valve has a high spring force and sharp elements. To prevent serious injury, DO NOT place hands or fingers inside the valve.

Table 5-1. Troubleshooting

Symptom	Possible Causes	Remedies
Valve will not open because the DVP will not reset	Motor wires not properly connected between DVP and actuator	Conduct continuity check.
	Resolver wires not properly connected between DVP and actuator	Conduct continuity check.
DVP will reset but valve will not open	Resolver sine wires high and low are flipped	Conduct continuity check.
	Resolver cosine wires high and low are flipped	Conduct continuity check.
	Resolver sine and cosine wires are swapped	Conduct continuity check.
Upon enabling, valve will open and then fail closed	Resolver sine and cosine wires are swapped, and sine wires high and low are flipped	Conduct continuity check.

Symptom	Possible Causes	Remedies
	Resolver sine and cosine wires are swapped, and cosine wires high and low are flipped	Conduct continuity check.
Poor flow accuracy	Characterization data in engine control does not match the valve	Verify characterization data matches the valve serial number.
	Build-up of contamination on the seat	Remove valve and inspect flow elements.
Poor position stability	One motor wire disconnected.	Conduct continuity check.
Valve stem resolver indicates position error	Incorrect parameter file loaded	Verify the parameter file matches the valve serial number.
	Valve stem resolver wires not properly connected between DVP and actuator	Contact manufacture for instructions or return to manufacturer for repair.
	Faulty resolver	Return to manufacturer for repair.
	Drive train failure	Return to manufacturer for repair.
High overboard vent leakage	Internal seals damaged	Return to manufacturer for repair.

⚠WARNING

The metering ball within the valve has a high spring force and sharp elements. To prevent serious injury, DO NOT place hands or fingers or any object inside the valve.

If the metering ball is not fully closed, removing any obstruction will release hazardous spring energy. Return the valve to the manufacturer for repair.

Table 5-2. Troubleshooting (Continued)

Symptom	Possible Causes	Remedies
High seat leakage	Damage to valve seat	Remove valve and inspect flow elements. Return to manufacturer for repair.
	Contamination buildup in seat	Remove valve and inspect flow elements. Return to manufacturer for repair.
	Valve not fully closed	Remove valve and verify port ball is not properly closed. Return to manufacturer for repair.
External gas fuel leakage	Piping flange gaskets missing or deteriorated	Replace gaskets.
	Piping flanges improperly aligned	Rework piping as needed to achieve alignment requirements detailed in Chapter 3.
	Piping flange bolts improperly torqued	Rework bolts as needed to achieve torque requirements detailed in Chapter 3.
	Packing missing or deteriorated	Return to manufacturer for repair.

If operating valve when not connected to the piping to verify metering ball rotation:

- Ensure electrical connectors are properly installed per these instructions.
- Verify rotation using the visual position indicator.
- DO NOT place hands or any object inside the valve. A flashlight may be used externally to aid in viewing the metering ball.

Chapter 6.
Safety Management

Product Variations Certified

The SIL rated GSxE for fuel shutoff is designed and certified to the functional safety standards according to IEC61508, Parts 1 through 7. Reference the product FMEDA: WOO 10-11-064 R002 V1R2.

The functional safety requirement in this manual applies to all GSxEs. The SIL rated GSxEs will have a DU FIT of less than 1241 FITS for Close to Trip Full Stroke.

The GSxE is certified for use in applications up to SIL 3 according to IEC61508.

The GSxE is designed and verified to withstand the worst-case (or greater) expected environmental conditions as listed in other sections of this manual.

Covered GSxE Versions

All GSxEs are SIL certified for the shutoff function.

SFF (Safe Failure Fraction) for the GSxE – Over Speed SIF

The GSxE is only one part of a shutoff system that supports an over-speed shutdown SIF (Safety Instrumented Function). This system consists of a speed sensor, a processing unit, and a fuel shutoff actuation sub-system of which the GSxE is a component.

The SFF (Safe Failure Fraction) for each subsystem should be calculated. The SFF summarizes the fraction of failures which lead to a safe state plus the fraction of failures which will be detected by diagnostic measures and lead to a defined safety action. This is reflected in the following formulas for SFF:

$$SFF = \lambda_{SD} + \lambda_{SU} + \lambda_{DD} / \lambda_{TOTAL}$$

where $\lambda_{TOTAL} = \lambda_{SD} + \lambda_{SU} + \lambda_{DD} + \lambda_{DU}$

The failure rates listed below, for only the GSxE, do not include failures due to wear-out of any components. They reflect random failures and include failures due to external events such as unexpected use. Reference the FMEDA: WOO 10-11-064 R002 V1R2 for detailed information concerning the SFF and PDF.

Table 6-1. Failure Rates according to IEC61508 in FIT

Device	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}
Full Stroke	0	145	0	1241
Full Stroke with PVST	145	0	609	632

According to IEC 61508 the architectural constraints of an element must be determined. This can be done by following the 1H approach according to 7.4.4.2 of IEC 61508 or the 2H approach according to 7.4.4.3 of IEC 61508. The 1H approach should be used for the GSxE.

Response Time Data

The GSxE full stroke response time is 0.6 seconds maximum from 100% position to fully close.

Limitations

When proper installation, maintenance, proof testing, and environmental limitations are observed, the useful life of the GSxE is 15 years. The GSxE can be refurbished and a product life of 30 years can be achieved.

Management of Functional Safety

The GSxE is intended for use according to the requirements of a safety lifecycle management process such as IEC61508 or IEC61511. The safety performance numbers in this chapter can be used for the evaluation of the overall safety lifecycle.

Restrictions

The user must complete a full functional check of the GSxE after initial installation, and after any modification of the overall safety system. No modification shall be made to the GSxE unless directed by Woodward. This functional check should include as much of the safety system as possible, such as sensors, transmitters, actuators, and trip blocks. The results of any functional check shall be recorded for future review.

The GSxE must be used within the published specification in this manual.

Competence of Personnel

All personnel involved in the installation and maintenance of the GSxE must have appropriate training. Training and guidance materials are included in the GSxE manual 26689.

These personnel shall report back to Woodward any failures detected during operation that may impact functional safety.

Operation and Maintenance Practice

A periodic proof (functional) test of the GSxE is required to verify that any dangerous faults not detected by safety controller internal run-time diagnostics are detected. More information is in the “Proof Test” section below. The frequency of the proof test is determined by the overall safety system design, of which the GSxE is part of the safety system. The safety numbers are given in the following sections to help the system integrator determine the appropriate test interval.

The GSxE requires no special tools for operation or maintenance of the GSxE.

Installation and Site Acceptance Testing

Installation and use of the GSxE must conform to the guidelines and restrictions included in this manual. No other information is needed for installation, programming, and maintenance.

Functional Testing After Initial Installation

A functional test of the GSxE is required prior to use in a safety system. This should be done as part of the overall safety system installation check and should include all I/O interfaces to and from the GSxE. For guidance on the functional test, see the Proof Test procedure below.

Functional Testing After Changes

A functional test of the GSxE is required after making any changes that affect the safety system. Although there are functions in the GSxE that are not directly safety related, it is recommended that a functional test be performed after any change.

Proof Test (Functional Test)

The GSxE must be periodically proof tested to ensure there are no dangerous faults present that are not detected by on-line diagnostics. This proof test should be performed at least once per year.

Suggested Proof Test

The suggested proof test consists of a full stroke of the valve, shown in the table below.

Table 6-2. Suggested Proof Test Step/Action

Step	Action
1.	Bypass the safety function and take appropriate action to avoid a false trip.
2.	Interrupt or change the signal/supply to the actuator to force the actuator and valve to the Fail-Safe state and confirm that the Safe State was achieved and within the correct time.
3.	Restore the supply/signal to the actuator and inspect for any visible damage or contamination and confirm that the normal operating state was achieved.
4.	Inspect the valve for any leaks, visible damage or contamination.
5.	Remove the bypass and otherwise restore normal operation.

For the test to be effective, the movement of the valve must be confirmed. To confirm the effectiveness of the test, both the travel of the valve and slew rate must be monitored and compared to expected results to validate the testing.

Proof Test Coverage

Table 6-3. GSxE Proof Test Coverage

Application	Safety Function	$\lambda_{DU}PT^6$	Proof Test Coverage	
			No PVST	with PVST
Clean Service	Close on Trip – Full Stroke	286	77%	55%

The suggested proof test and proof test coverage is referenced in the product FMEDA; WOO 10-11-064 R002 V1R2.

Chapter 7.
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 current list of Woodward Business Partners is available at:
https://www.woodward.com/en/support/industrial/service-and-spare-parts/find-a-local-partner

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 (Woodward North American Terms and Conditions of Sale 5-09-0690) 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 North American Terms and Conditions of Sale 5-09-0690).

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 North American Terms and Conditions of Sale 5-09-0690) 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 North American Terms and Conditions of Sale 5-09-0690). 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 one of the Full-Service Distributors listed at **https://www.woodward.com/en/support/industrial/service-and-spare-parts/find-a-local-partner**

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at **https://www.woodward.com/support**, 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) 8818 5515
Germany	+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) 8818 5515
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) 8818 5515
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 AB—
- Replaced EU DoC

Changes in Revision AA—
- Revised bolt tightening sequence of 8-bolt and 12-bolt flanges in Chapter 3
- Added new Notice box to Chapter 3

Changes in Revision Y—
- Revised maintenance section (Chapter 4)

Changes in Revision W—
- Removed CE line from Pressure Equipment Directive GSxE Valves in Regulatory Compliance section
- Updated EU DoC
- Revised SIL Compliance

Changes in Revision V—
- Replaced EU DoC

Changes in Revision U—
- Updated new grease kit (part number 8923-3303) in Chapter 4
- Updates to Regulatory Compliance section
- Replaced DoC and DoI

Changes in Revision T—
- Added Warning on Page 15 regarding Bench Testing
- Added Figures 3-1, and 3-2 as examples to illustrate the warning on Bench Testing

Changes in Revision R—
- New Proof Test Pressure reference in Specifications table
- New note added to Chapter 1, pg. 9

Changes in Revision P—
- New drawings in Figures 1-1a and 1-1b
- New models in Figure 4-1

Changes in Revision N—
- Updated burst pressure specification

Changes in Revision M—
- Updated failsafe trip times in Specifications Table
- Updated certification information
- Replaced DOI

Changes in Revision L—
- Updated Class 600 values in max process fluid containment pressure

Changes in Revision K—
- Updated Regulatory and Compliance section
- Installed new Declarations in the Declaration section

Changes in Revision J—
- Updated GSxE Rotary Control Valve specifications

Changes in Revision H—
- Updated European Compliance for CE Marking in Regulatory and Compliance section
- Updated Other European Compliance in Regulatory and Compliance section
- Updated Other International Compliance in Regulatory and Compliance section
- Updated North American Compliance in Regulatory and Compliance section
- SIL-3 Certification added to the Regulatory and Compliance section
- Updated GSxE Rotary Valve Specifications in Chapter 1
- Updated Figure 1-1b
- Added captions to Tables 3-1 and 3-4
- Added Table 3-2
- Added Figure 3-7
- Added Chapter 6

Changes in Revision G—
- Changed Max Operating Pressure to 5.1 MPa (740 psig)
- Added Max (fwd) Differential Pressure
- Updated drawing line weights

Changes in Revision F—
- Added 4.00 MPa maximum working pressure for 200 mm

Changes in Revision E—
- Added 75 mm and 200 mm sizes
- Updated Declarations

Changes in Revision D—
- Major Compliance updates as marked

Changes in Revision C—
- Added Lifting Eyes callout to Figure 1-1b

Changes in Revision B—
- Added information on 4-inch valve
- Changed ingress protection rating to IP65
- Updated Figure 1-1
- Added information about bolt tightening sequence
- Added lifting eyes warning to Chapter 3
- Added additional connector information to Chapter 3

Changes in Revision A—
- Added Regulatory Compliance information
- Added Steady State and Transient Current specifications
- Updated Description
- Added additional warnings to installation Chapter 3
- Updated Notice in Chapter 4
- Showed location of OBVD in Figure 4-1
- Added disassembly warning to Chapter 5

Declarations

EU DECLARATION OF CONFORMITY

EU DoC No.:	00425-04-EU-02-01
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Contact Address:	1041 Woodward Way Fort Collins, CO 80524 USA
Model Name(s)/Number(s):	GS75E, GS100E, GS150E and GS200E Rotary Control Valve with the LERA – Large Electric Rotary Actuator
The object of the declaration described above is in conformity with the following relevant Union harmonization legislation:	**LERA Actuator:** Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC) **GS75E, GS100E, GS150E and GS200E Valves:** Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonization of the laws of the Member States relating to the making available on the market of pressure equipment GS75E, GS100E: PED Category II GS150E, GS200E: PED Category III
Markings in addition to CE marking:	Ex II 3 G, Ex nA IIC T3 Gc (LERA)
Applicable Standards:	
ATEX:	EN IEC 60079-0: 2018 Explosive Atmospheres - Part 0: Equipment – General Requirements EN60079-15: (2010) - Explosive Atmospheres - Part 15: Equipment protection by type of protection "n"
PED:	ASME Boiler and Pressure Vessel Code VIII, Div. 2, Part 5(2013)
EMC:	EN61000-6-4 : (2007/A1:2011) Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments EN61000-6-2 : (2005) Electromagnetic compatibility (EMC) -- Part 6-2: Generic standards - Immunity for industrial environments
Conformity Assessment:	PED Module H – Full Quality Assurance CE-0062-PED-H-WDI 001-25-USA-rev-A Bureau Veritas SAS (0062) 4 Place des Saisons, 92400 COURBEVOIE, FRANCE

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	Annette Lynch
Full Name	**Annette Lynch**
Position	**Engineering Manager**
Place	**Woodward, Fort Collins, CO, USA**
Date	15 April 2024

5-09-1183 Rev 43

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

File name:	00425-04-EU-02-02
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Address:	1041 Woodward Way Fort Collins, CO, USA, 80524
Model Names:	GS75E, GS100E, GS150E and GS200E Rotary Control Valve with LERA Electric Actuation
This product complies, where applicable, with the following Essential Requirements of Annex I:	1.1, 1.2, 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.

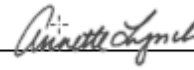
The person authorized to compile the technical documentation:

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

Annette Lynch
Full Name

Engineering Manager
Position

Woodward Inc., Fort Collins, CO, USA
Place

23 January 2023
Date

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Released

We appreciate your comments about the content of our publications.

Send comments to: industrial.support@woodward.com

Please reference publication 26689.

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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.