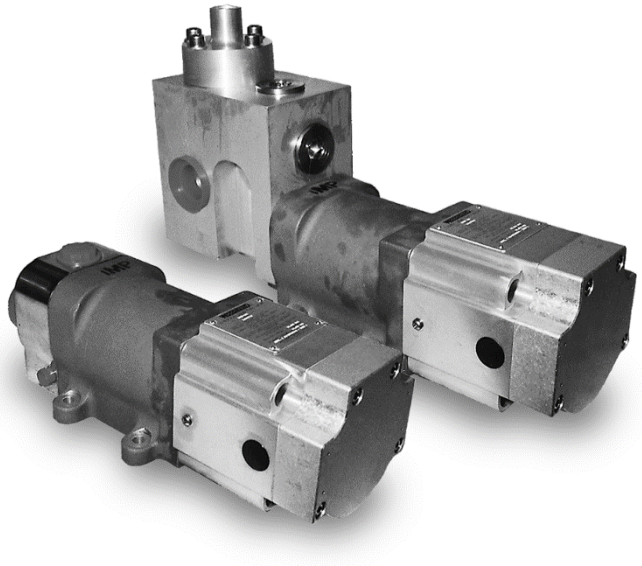
WOODWARD

Product Manual 26162
(Revision N, 4/2025)
Original Instructions



LQ25T and LQ Bypass Valve Actuator Assemblies

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.

Woodward Industrial Support: Get Help

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:

The original source of this publication may have been updated since this translation was made. The latest version of most publications is available on the Woodward website.

Woodward Industrial Support: Get Help

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 26162

Contents

Illustrations and Tables

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.

Regulatory Compliance

European Compliance for CE Marking:
These listings are limited only to those units bearing the CE Marking and certification agency shown:

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

ATEX – Potentially Explosive Atmospheres Directive: 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 1: II 2 G, Ex db IIC 160C (T3) Gb ITS 16ATEX8458X
Zone 2: II 3 G, Ex nA IIC T3 Gc

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

EMC Directive: Not applicable to this product. Electromagnetic, EMC, passive devices are excluded from the scope of the 2014/30/EU Directive.

ATEX Directive: Exempt from the non-electrical portion of the ATEX Directive 2014/34/EU due to no potential ignition sources per
EN ISO 80079-36:2016 for Category 2.

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.

RoHS Directive Restriction of Hazardous Substances 2011/65/EU:
Woodward Turbomachinery Systems products are intended exclusively for sale and use only as a part of Large Scale Fixed Installations per the meaning of Art.2.4(e) of directive 2011/65/EU. This fulfills the requirements stated in Art.2.4(c) and as such the product is excluded from the scope of RoHS2.

Other International Compliance:

IECEx: Certified for use in explosive atmospheres per Certificate:
IECEx ETL 16.0010X Ex db IIC 160C (T3) Gb

North American Compliance:
These listings are limited only to those units bearing the CSA identification and the specific hazardous locations ratings.

CSA (-28C min ambient rating): CSA Certified for Class I, Division 1, Groups C & D, T3C at 103 °C Ambient and Class I, Division 2, Groups A, B, C & D, T3C at 103 °C Ambient for use in Canada and the United States.
Certificate 1136436

CSA (-40C min ambient rating): CSA Certified for Class I, Division 2, Groups A, B, C, & D, T3C at 103 °C Ambient. For use in Canada and the United States.
Certificate 1136436

Special Conditions for Safe Use

The width of the flameproof joints is superior to that specified in the table of IEC 60079-1. Contact the manufacturer for information on the dimensions of the flameproof joints. Field repair of flamepaths is prohibited. Return to manufacturer for repair and maintenance.

Field wiring must be suitable for at least 90°C and 10°C above the maximum fluid and ambient temperatures.
Fasteners used to retain the flameproof enclosure shall have a mechanical properties greater than or equal to that required for stainless steel metric socket head cap screws grade A2-70 per ISO 4762 and ISO 3506-1. This includes the eight stainless steel socket cap cover screws

Instructions for Potential Electrostatic Charging Hazard:
The risk of electrostatic discharge for painted units is reduced by permanent installation, proper connection of the equipotential ground lugs, and care when cleaning. Painted units must not be cleaned or wiped off/against unless the area is known to be non-hazardous.

To assure IP66 ingress protection, use appropriately rated conduit sealing methods that meet IEC 60079-14 requirements

Wiring must be in accordance with North American Class I, Division 1 or 2, or European/international Zone 1, Category 2 or Zone 2, Category 3 wiring methods as applicable, and in accordance with the authority having jurisdiction.

⚠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 2 or Zone 1 or 2 applications.

⚠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 2 ou Zone 1 ou 2.

Chapter 1.
General Information

Introduction

The LQ25T or LQ Bypass Valve/Actuator Assemblies with the GS3/LQ Valve Driver or LQ Digital Driver integrated liquid fuel metering systems feature valve position control, all-electric actuation, fuel bypass, fuel flow regulation, and fault indication. These systems may allow multiple independent metered flow paths with a single pump.

The LQ Valve assemblies are brushless dc limited-angle torquers which position a metering port for liquid fuel control. The LQ actuators are directly coupled to both the metering port and position feedback resolvers (single or dual). There are no intervening gears, linkages, or flex couplings. The high torque actuator and shearing action of the shoe on the rotor valve provide a high degree of contamination resistance.

⚠WARNING

The controlling device, not the Driver(s) or Valve(s), sets turbine stability and response. Follow the instructions for the controlling device while setting up the turbine control system. Failure to follow instructions can cause personal injury and/or property damage.

Turbine manufacturer's requirements for fuel flow to the turbine can vary considerably depending on fuel pressures, fuel types, fuel and ambient temperatures, turbine size, etc. Contact Woodward for information on predicting fuel flow through the LQ Valves as a function of command input signal from the driver. This fuel flow information may be critical to the proper operation of your gas turbine and may be required information for the electronic control system to accelerate and/or decelerate the turbine properly.

IMPORTANT

For complete information on drivers, see manual 26159 or 26329 for the digital driver and manual 40175 for the analog driver.

System Accuracy

Total positioning accuracy depends on the calibrated stroke as follows:

Analog Driver

The positional accuracy of the analog driver is 0.7 degrees including temp drift. The accuracy of the 4–20 mA feedback is 0.2 mA (1% of full scale).

Digital Driver

The positioning accuracy of the digital driver using the RS-485 (digital) demand input is 0.1 degree including temp drift. The positioning accuracy of the digital driver using the analog (4–20 mA) demand input is 0.1 + (0.0179 x span*). The rotary valve travel for the LQ25T and LQ25 Bypass is 66 degrees, giving a positional accuracy of 1.281 degrees.

*—span = range of travel in angular degrees

System Position Bandwidth and Damping

Digital Driver

System bandwidth is 40 rad/s (6.4 Hz). The frequency response mimics a two-pole linear system, with the bandwidth corresponding to –6 dB gain. The damping factor is set to 1. Equivalent dead time does not exceed 20 ms, which includes all effects, such as communications, processing time, mechanical times, etc.

LQ25T Fuel Metering Valve

The LQ25T Liquid Fuel Valve has all-electric actuation. The actuation, metering, and feedback are integrated on the motor rotor. Feedback is given by either one single-speed resolver, one three-speed resolver, or dual three-speed resolvers. Regulation is achieved through an integral, single stage, throttling differential pressure regulator.

The valve is intended for use on industrial gas turbines in the 6000 to 42 000 kW power range. Specifically, this design will operate in conjunction with any type of “pressure source” fuel system (centrifugal type pump or bypassing system on a positive displacement pump that controls inlet pressure to this valve). Flow metering is implemented with the use of an electrically actuated rotary plate and shoe-type valve with electrical dual-position feedback. There are three port sizes for the LQ25T: the 65 mm² (0.1 in²) port is designed for maximum fuel flows of 1814 to 3402 kg/h (4000 to 7500 lb/h), the 129 mm² (0.2 in²) port is designed for maximum fuel flows of 3742 to 6804 kg/h (8250 to 15 000 lb/h), and the 194 mm² (0.3 in²) port is designed for maximum fuel flows of 8165 to 9979 kg/h (18 000 to 22 000 lb/h). The minimum metered flow of the LQ25T is 45 kg/h (100 lb/h). These flows assume a specific gravity of 0.77. All materials of the LQ25T are corrosion resistant or protected against corrosion.

The valve is designed to automatically purge trapped air or fuel vapor within the internal passages. No provision for manual bleeding of the valves in required. The valve is self-cleaning, with a shear action metering section.

In addition to the base metering valve, the LQ25T has a dual-resolver option. The dual-resolver option provides redundant feedback devices in order to have a backup if a resolver fails.

The LQ25T will be commanded to a minimum flow position in the event of a detected failure within the valve or driver assemblies. Loss of electrical power results in the valve moving towards the minimum flow or full closed position or holding at the last commanded position.

Operation Of the LQ25T Valve

The LQ25T Liquid Fuel Metering Valve meters fuel as a function of the angular position of its ported metering sleeve/shaft. The metering sleeve/shaft is positioned by the integrated, brushless, dc, limited angle torquer motor (LAT). A resolver or dual resolvers, mounted directly on the shaft of the valve, provide valve position feedback.

To accurately meter fuel, the valve maintains a constant pressure drop across the fuel metering port in the metering sleeve/shaft. The valve regulates the intermediate pressure to (P2) to maintain this constant pressure differential by positioning the throttling regulator piston.

Given the constant pressure differential within the fuel valve, the fuel flow through the metering port is always proportional to the area of the port opening. Fuel flow through the metering port of the valve is described by the following equation:

$$MassFuelFlow = k \times Area \times \sqrt{\Delta P \times SG}$$

Under operating conditions, fuel at the system pressure (P1) flows to the metering sleeve/shaft and to one side of the regulator piston. Metered fuel at the intermediate pressure (P2) is directed to the regulator metering ports and through a damping orifice (P2d) to the other side of the regulator piston. The regulator metering ports’ effective area is such that the metered flow is throttled from the intermediate pressure (P2) to the outlet pressure (PN).

The piston takes a position at which the force from pressure P1 acting on the piston’s effective area is equal to the sum of the forces from the pressure P2d acting on the piston’s effective area and the force from the delta P spring. When the balance of forces has been established, the difference between the spring force acting on the piston is equal to the difference between the pressures (P1–P2d) acting on equal effective areas, and the pressure drop across the regulator metering ports is the difference between P2 and PN.

By varying the force of the ΔP spring, the pressure difference (typically 345 kPa/3.45 bar/50 psid) can be adjusted to suit the requirements of a particular application.

As long as the inlet pressure (P1) is sufficiently high (typically greater than 827 kPa/8.27 bar/120 psid), the intermediate pressure (P2) is maintained and the metered flow is unaffected by the valve downstream pressure (PN).

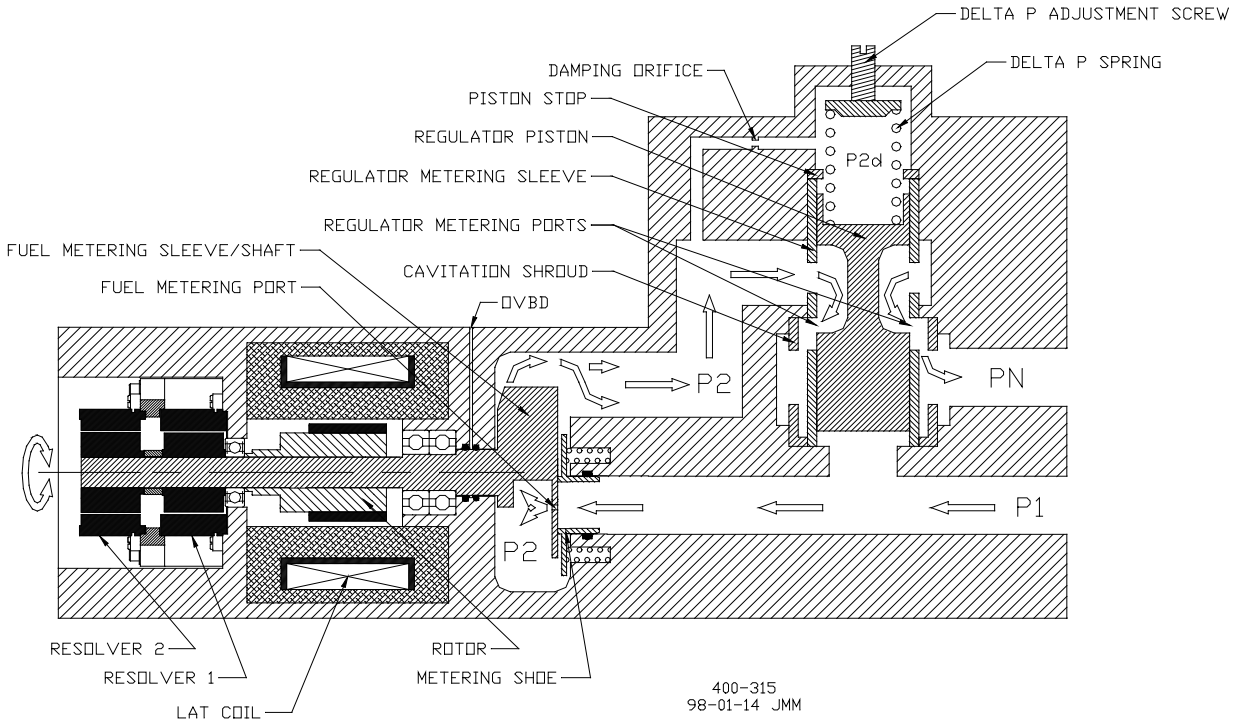


Figure 1-1. LQ25T Valve Schematic

LQ Bypass Valve

The LQ Bypass Valve is an electrically-actuated fuel flow-throttling valve. This modulating, two-way valve assembly is used to control the discharge pressure of a positive displacement fuel pump by bypassing flow to a low-pressure volume. It is used in conjunction with an electronic pressure control system and fuel pressure transducers (not included) to enable pump pressure to be accurately scheduled as a function of other system parameters. The actuation, metering, and feedback are integrated on the motor rotor. Flow direction is reversed through the LQ Bypass Valve to reduce cavitation erosion damage within the valve.

The valve is intended for use on industrial gas turbines in the 1000 to 42 000 kW power range. Flow metering is implemented with the use of an electrically actuated rotary plate and shoe-type valve with electrical dual position feedback.

The valve is designed to automatically purge trapped air or fuel vapor within the internal passages. No provision for manual bleeding of the valves is required. The valve is self-cleaning, with a shear action metering section.

The Bypass Valve is commanded to maximum flow position whenever possible in the event of a detected failure within the valve or driver assemblies. Loss of electrical power will result in the bypass valve moving towards the maximum flow or full open position, or holding at the last commanded position.

Operation of the LQ Bypass Valve

Flow direction is reversed in the LQ Bypass valve as compared to the LQ25T, and there is no ΔP section as metering accuracy is not as critical. A cavitation shield is included to reduce cavitation erosion damage within the valve.

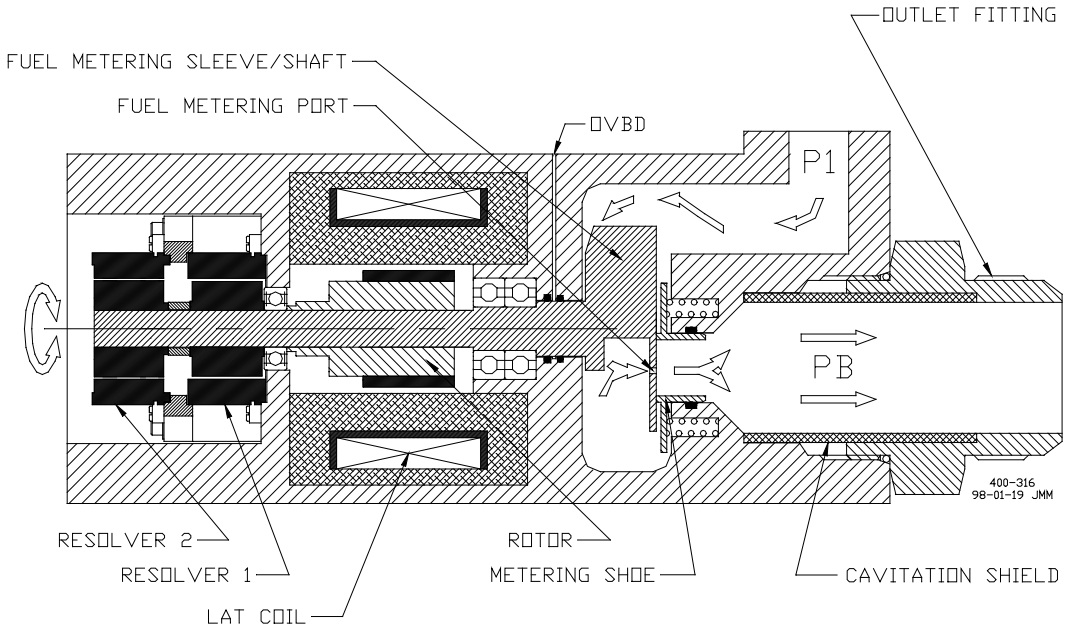


Figure 1-2. LQ Bypass Valve Schematic

Chapter 2.
Installation

⚠WARNING

Lifting Hazard

Carefully review the lifting diagram (Figures 2-2 and 2-3) for lift locations, weight, and center of gravity before moving the valve. Do not lift or handle the valve by electrical connections or conduit. The significant weight of the valve poses a crushing hazard that could result in personal injury or death. Improper handling may also damage the performance of the valve.

⚠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

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

⚠CAUTION

Due to typical noise levels in turbine or engine environments, hearing protection should be worn when working on or around the LQ25T or LQ Bypass valves.

⚠CAUTION

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.

LQ Valve Unpacking

Use care when unpacking the LQ Valve. Abuse can damage seals, installation surfaces, and factory adjustments. Notify the shipper and Woodward when you find damage.

LQ25T Valve Mounting

The valve should be mounted as close to the turbine as practical in order to minimize the volume of fuel between the valve and the turbine. Ensure that the valve is not mounted in an area that would exceed the temperature limits specified in Chapter 3: Detailed Specifications. The LQ25T valve should be mounted to a thermally conductive surface to conduct heat away from the actuator and maintain proper coil temperature.

See Figure 2-2 for dimensions of the LQ25T mounting hole pattern. The valve should be securely attached to a clean, flat, rigid surface that will not exceed the vibration limits specified in Chapter 3: Detailed Specifications.

Connect inlet, outlet, and overboard lines to the valve. The inlet port receives pressurized fuel from the pump. The outlet line should be attached to the fuel line(s) going to the turbine combustors. The bypass line must be connected back to the fuel storage tank. The overboard (OVBD) drain port depicted in Figure 2-2 is a vent between dual redundant shaft seals. It must be connected by means of rigid steel piping to a fuel collection, purge, vent, or flare off system so as not to be exposed to danger of obstruction, physical damage, or back pressure in excess of 69 kPa (0.69 bar/10 psig).

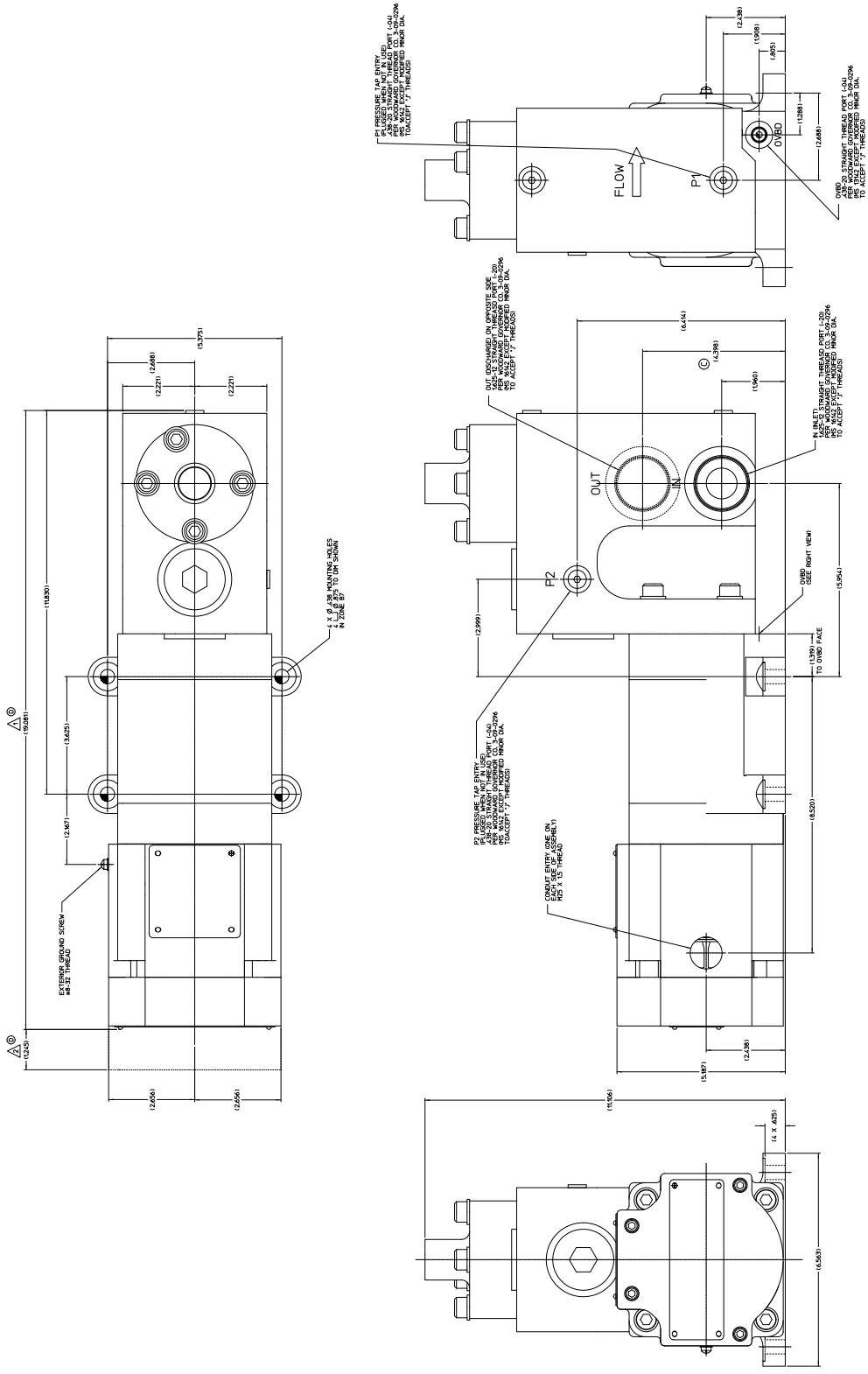


Figure 2-2a. LQ25T Outline Drawing – Single Resolver

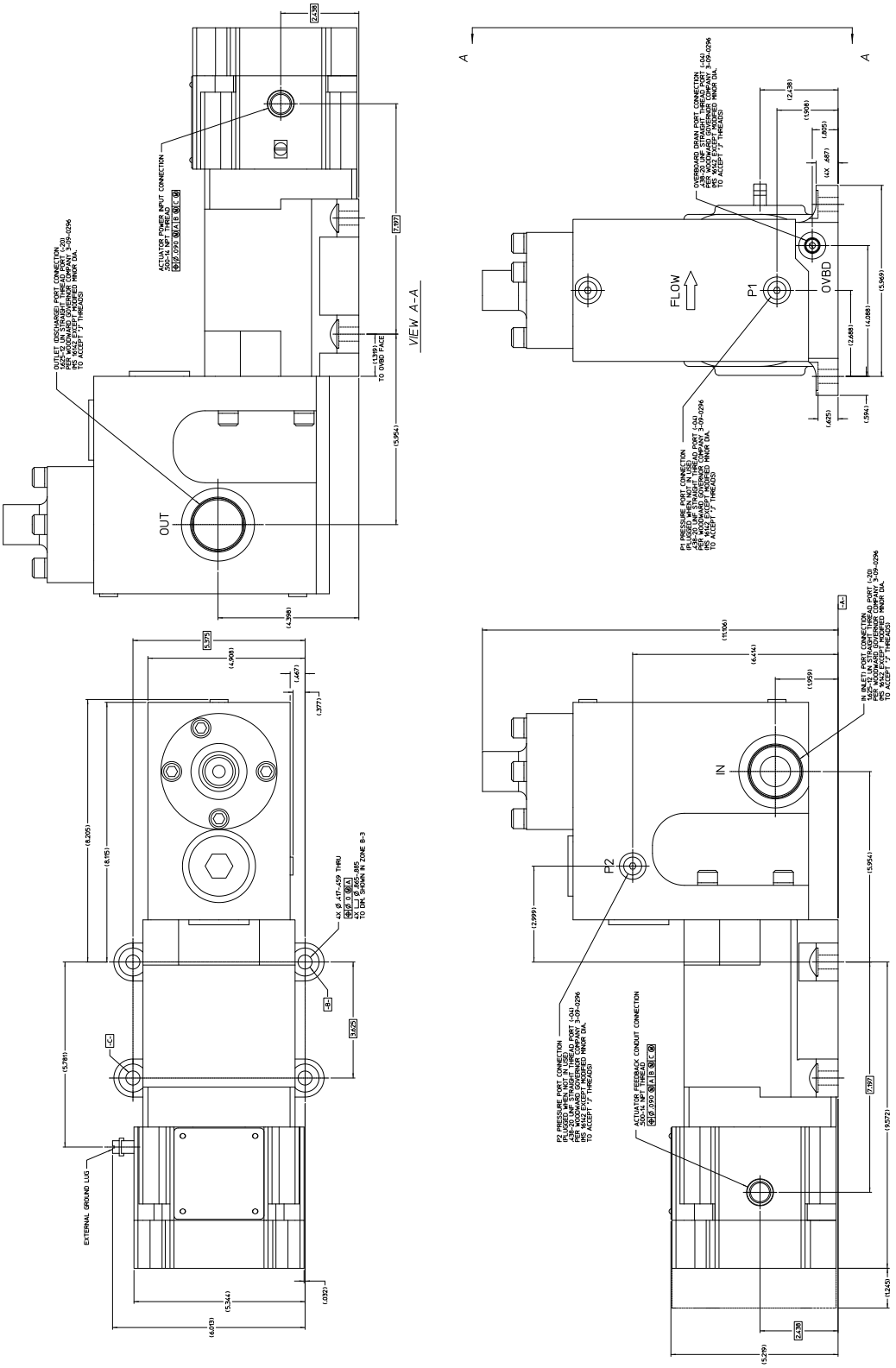


Figure 2-2b. LQ25T Outline Drawing - Single Resolver

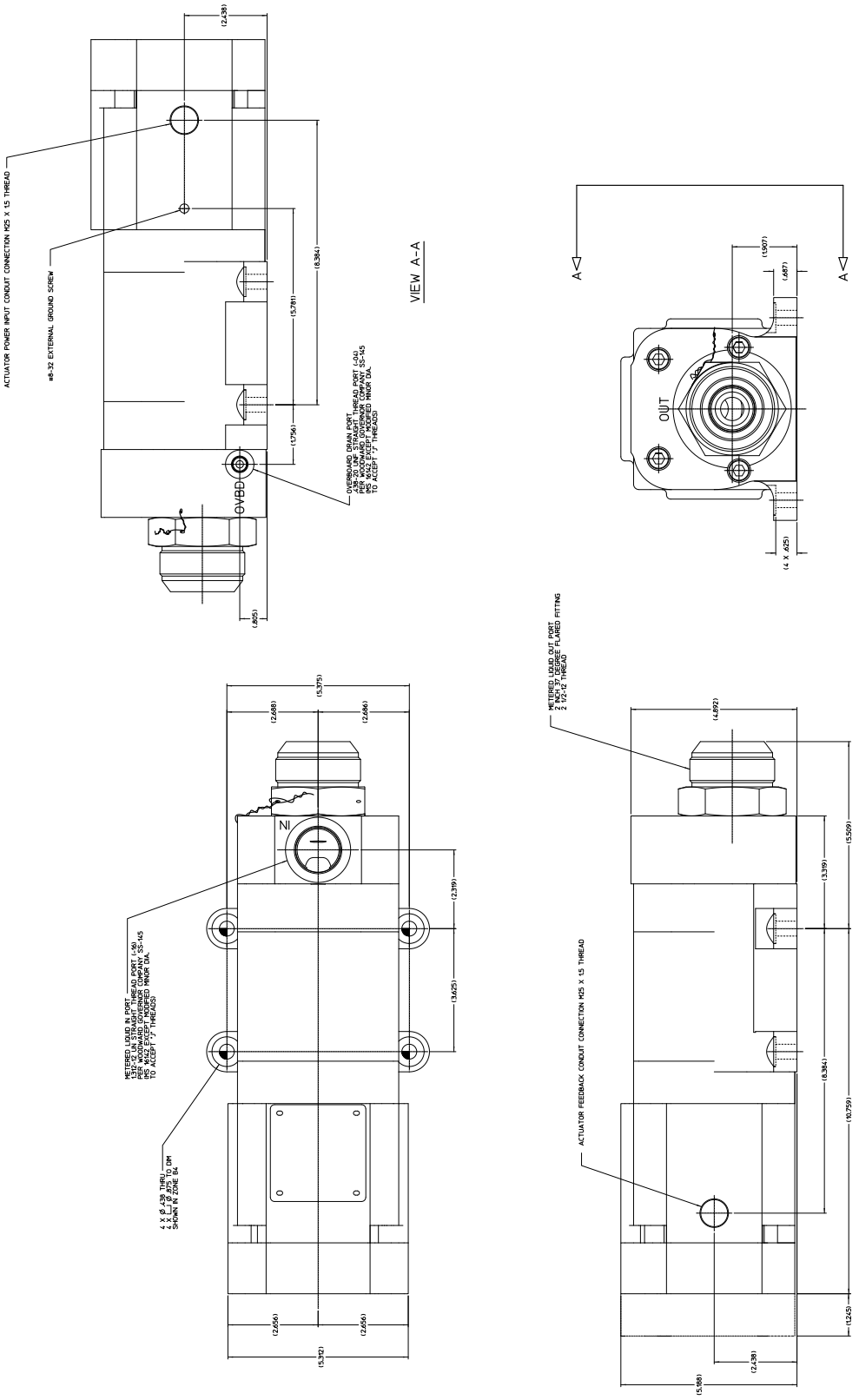


Figure 2-3a. LQ Bypass Outline Drawing - Dual Resolver

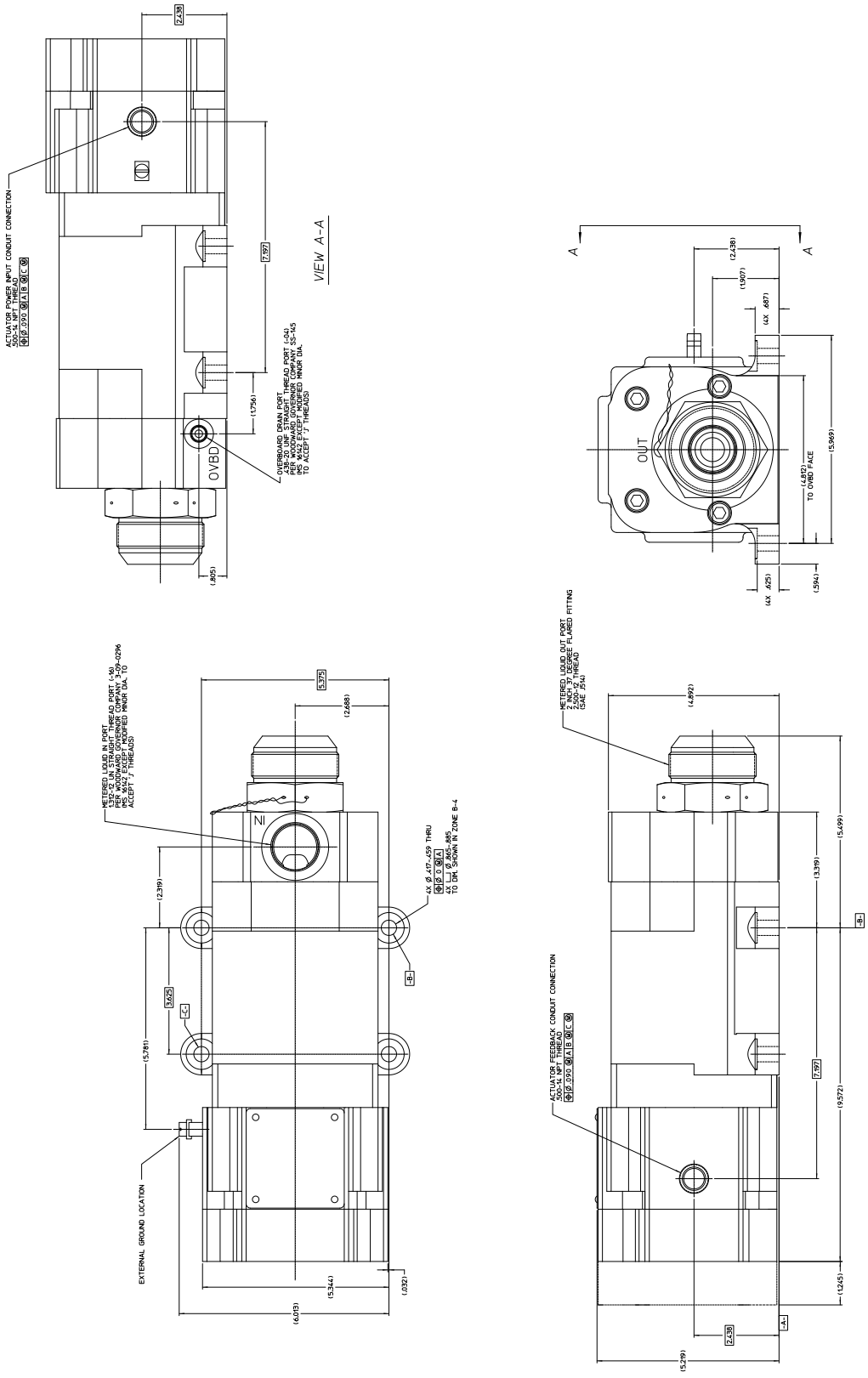


Figure 2-3b. LQ Bypass Outline Drawing - Single Resolver

⚠WARNING

Do not plug the overboard drain as this may cause fuel to enter the LQ25T actuator, resulting in a hazardous condition with the potential to cause personal injury and/or damage to the actuator.

The overboard drain piping must be sufficiently sloped to eliminate the possibility of stagnant water which could freeze and plug the drain, resulting in a hazardous condition with the potential to cause personal injury and/or damage to the valve.

IMPORTANT

Leakage exceeding 20 cm^3/min from the overboard drain line indicates a worn or damaged shaft seal in the LQ25 valve and should be investigated immediately. Special tooling is required to replace the shaft seal. Contact Woodward for service.

Table 2-1. LQ25T Fuel Connections

Inlet	1.625-12 SAE Straight Thread Port (-20)
Outlet	1.625-12 SAE Straight Thread Port (-20)
OVBD	0.438-20 SAE Straight Thread Port (-04) (Overboard Drain Port)

LQ25T Wiring

⚠WARNING

Access Cover Installation

Take care not to damage the cover seal or flamepath surfaces when removing or installing the cover. Do not use pry bars or similar tools, as they may gouge or damage the cylindrical flamepath. Slowly pull (to uninstall) or push (to install) the cover squarely to avoid binding.

Prior to service in a hazardous location, the access cover fasteners (M6 socket head cap) must be re-installed with a torque of 84 in-lb (9.5 Nm). See outline drawings (Figures 2-2 and 2-3).

Proper care and installation of the cover are critical to the hazardous location listings associated with this product, specifically flameproof/explosion proof protection and ingress protection (IP).

The driver must be mounted close enough to the LQ25T valve and the driver power supply to meet wire length requirements specified in the driver manual.

Make electrical connections between the valve and driver according to the LQ25T wiring diagram (Figure 2-4 for dual resolvers to a digital driver, Figure 2-5 for single resolver to digital driver, or Figure 2-6 for single resolver to analog driver).

Connect the ground terminal of the actuator to earth ground. This is to be the same grounding system as the driver's earth ground.

Cable Connections

Wiring for the driver power output to the actuator must be suitable for at least 90 °C, and 10 °C above maximum fluid and ambient temperature.

Resolver wiring is non-incendive and may be installed in accordance with wiring methods suitable for ordinary locations.

All shielded cable must be twisted conductor pairs with either a foil or a braided shield. All signal lines should be shielded to prevent picking up stray signals from nearby equipment. Connect the shields as shown in the Plant Wiring Diagram (Figures 2-7 through 2-9—for single resolver, resolver 2 is not connected). Wire exposed beyond the shield must be as short as possible.

IMPORTANT

Connect cable shields to earth ground. Do not connect any cable shields to "instrument ground", "control ground", or any non-earth ground system.

For best noise immunity, run power wires and shielded signal wires in separate conduits or cable trays. See Woodward Manual 50532, *EMI Control in Electronic Governing Systems*, for more information.

Table 2-2. LQ25T Cable Connections

Connection	Dual Resolver Models	Single Resolver Models	Wire Type
Motor Power	M25 x 1.5	.500-14 NPT	Four 4 mm^2/12 AWG wires, 2 for positive and 2 for negative.
Resolver(s)	M25 x 1.5	.500-14 NPT	Each resolver: Three shielded twisted pairs or one shielded twisted six conductor cable for feedback.
Grounding	External and Internal via conduit ports	External and Internal via conduit ports	Suitable for wire size 10 to 4 mm^2 (8 to 12 AWG)

LQ Bypass Valve Mounting

The valve should be mounted as close to the pump between the valve and the engine's fuel metering valves as is practical. The bypassing outlet of the valve should be connected to 51 mm (2 inch) diameter steel or stainless steel pipe having a minimum straight length of 1.2 m (4 feet). Ensure that the valve is not mounted in an area that would exceed the temperature limits specified in Chapter 3: Detailed Specifications. The LQ Bypass valve must be mounted to a thermally conductive surface to conduct heat away from the actuator and maintain proper coil temperature.

See Figure 2-3 for dimensions of the LQ Bypass mounting hole pattern. The valve should be securely attached to a clean, flat, rigid surface that will not exceed the vibration limits specified in Chapter 3: Detailed Specifications.

Connect inlet, outlet, and overboard lines to the valve. The inlet port receives pressurized fuel from the pump. The outlet line must be connected back to the fuel storage tank with 51 mm (2 inch) diameter pipe having a minimum straight length of 1.2 meters (4 feet). This pipe must have between 690 and 1380 kPa (6.9 and 13.8 bar/100 and 200 psig) of back pressure whenever the bypass valve is flowing in order to reduce the risk of cavitation erosion. The overboard (OVBD) drain port depicted in Figure 2-3 is a vent between dual redundant shaft seals. It must be connected by means of rigid steel piping with a downward slope to a fuel collection, purge, vent-off, or flare-off system so as not to be exposed to danger of obstruction, physical damage, or back pressure in excess of 69 kPa (0.69 bar / 10 psig).

⚠WARNING

Do not plug the overboard drain as this may cause fuel to enter the LQ Bypass actuator, resulting in a hazardous condition with the potential to case personal injury and/or damage to the actuator.

The overboard drain piping must be sufficiently sloped to eliminate the possibility of stagnant water which could freeze and plug the drain, resulting in a hazardous condition with the potential to cause personal injury and/or damage to the valve.

WARNING

The fuel exiting the LQ Bypass Valve will be at high velocity and may cause cavitation erosion in the downstream piping, resulting in a major fuel leak and the associated environmental and fire/explosion hazards. The 690 to 1380 kPa (6.9 to 13.8 bar/100 to 200 psig) back pressure and outlet fitting are specifically designed to minimize this cavitation erosion potential. The 1.2 m (4 foot) straight length of 51 mm (2 inch) diameter steel or stainless steel pipe is required to minimize this erosion, but the pipe must be regularly inspected to ensure its integrity.

IMPORTANT

The 49 000 cm³ (49 L/3000 in³) volume between the LQ Bypass Valve and the engine's fuel metering valves is required to ensure accurate system pressure control and subsequent fuel control.

Leakage exceeding 20 cm³/min from the overboard drain line indicates a worn or damaged shaft seal in the LQ Bypass valve and should be investigated immediately. Special tooling is required to replace the shaft seal. Contact Woodward for service.

Table 2-3. LQ Bypass Fuel Connections

Inlet	1.312-12 SAE Straight Thread Port (-16)
Outlet	2 inch 37° flared fitting with 2.5-12 Thread Port (-32)
OVBD	0.438-20 SAE Straight Thread Port (-04) (Overboard Drain Port)

LQ Bypass Wiring

WARNING

Access Cover Installation

Take care not to damage the cover seal or flamepath surfaces when removing or installing the cover. Do not use pry bars or similar tools, as they may gouge or damage the cylindrical flamepath. Slowly pull (to uninstall) or push (to install) the cover squarely to avoid binding.

Prior to service in a hazardous location, the access cover fasteners (M6 socket head cap) must be re-installed with a torque of 84 in-lb (9.5 Nm). See outline drawings (Figures 2-2 and 2-3).

Proper care and installation of the cover are critical to the hazardous location listings associated with this product, specifically flameproof/explosion proof protection and ingress protection (IP).

The driver must be mounted close enough to the LQ Bypass valve and the driver power supply to meet wire length requirements specified in the driver manual.

Make electrical connections between the valve and driver according to the LQ Bypass wiring diagram (Figure 2-4, 2-5, or 2-6).

Connect ground terminal of actuator to earth ground. This must be the same grounding system as the driver's earth ground.

All shielded cable must be twisted conductor pairs with either a foil or a braided shield. All signal lines should be shielded to prevent picking up stray signals from nearby equipment. Connect the shields as shown in the Plant Wiring Diagram (Figure 2-7, 2-8, or 2-9). Wire exposed beyond the shield must be as short as possible.

IMPORTANT **Connect cable shields to earth ground. Do not connect any cable shields to "instrument ground", "control ground", or any non-earth ground system.**

For best noise immunity, run power wires and shielded signal wires in separate conduits or cable trays. See Woodward Manual 50532, *EMI Control in Electronic Governing Systems*, for more information.

Cable Connections

Wiring for the driver power output to the actuator must be suitable for at least 90 °C, and 10 °C above maximum fluid and ambient temperature.

Resolver wiring is non-incendive and may be installed in accordance with wiring methods suitable for ordinary locations.

Table 2-4. LQ Bypass Valve Cable Connections

Connection	Dual Resolver Models	Single Resolver Models	Wire Type
Motor Power	M25 x 1.5	.500-14 NPT	Four 4 mm^2/12 AWG wires, 2 for positive and 2 for negative.
Resolver(s)	M25 x 1.5	.500-14 NPT	Each resolver: Three shielded twisted pairs or one shielded twisted six conductor cable for feedback.
Grounding	External and Internal via conduit ports	External and Internal via conduit ports	Suitable for wire size 10 to 4 mm^2 (8 to 12 AWG)

General Wiring Instructions

Wiring to the Driver

Only a Woodward approved driver should be used with the LQ25. The appropriate driver may depend on the options installed and build revision of the valve. Contact Woodward for clarification if needed. Below is a guideline for reference:

Table 2-5. Driver Nomenclature, Reference, and Options

Driver	Manual	Compatible LQ25 Options
GS3/LQ Valve Driver	40175	1-Speed Resolver (spares only)
EM/LQ Digital Driver	26159	3-Speed Resolver (spares only)
DVP Digital Valve Positioner	26329	3-Speed Resolver

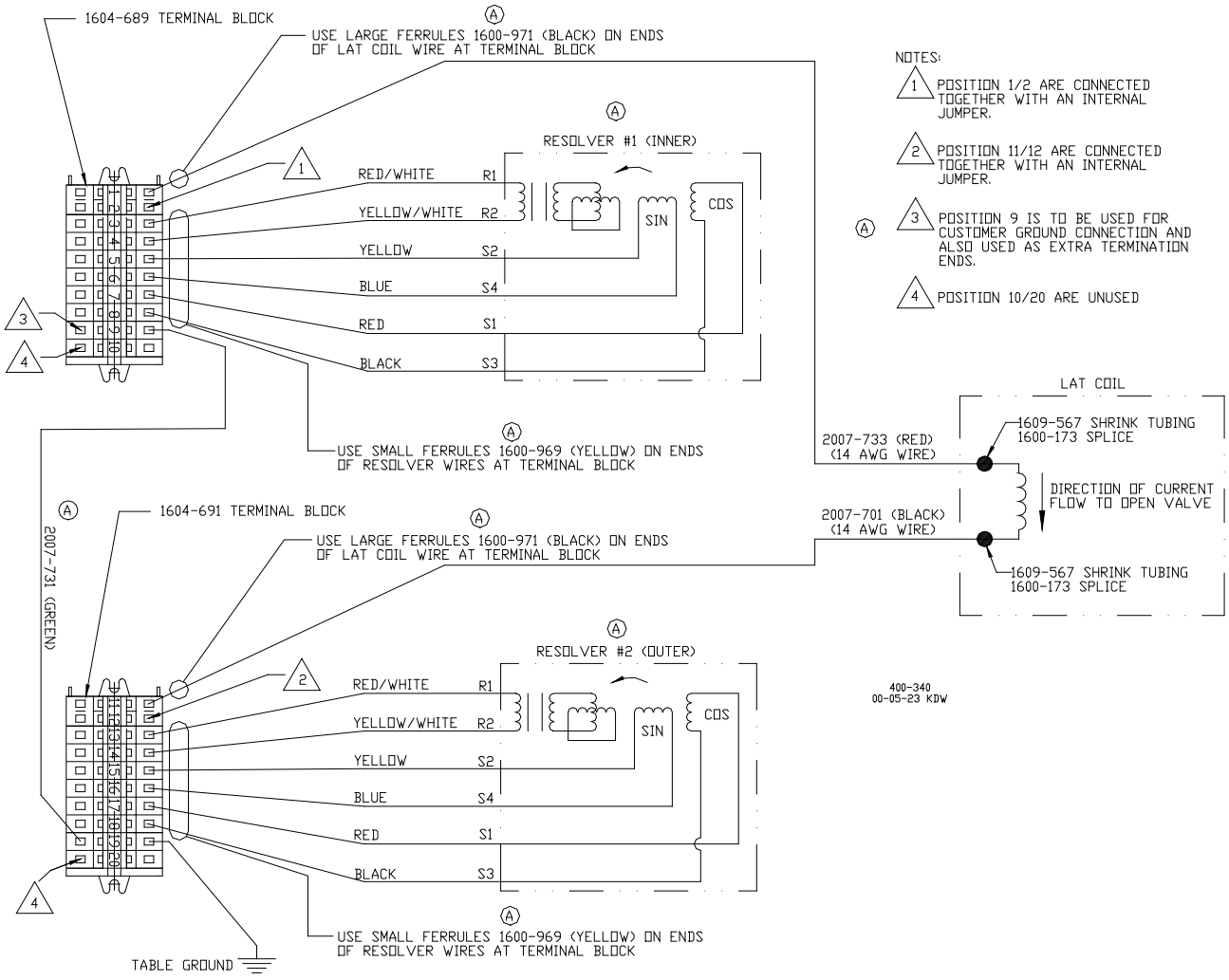


Figure 2-4. LQ25T and LQ Bypass Valve Wiring with Dual 3-speed Resolver
(Used with digital driver only)

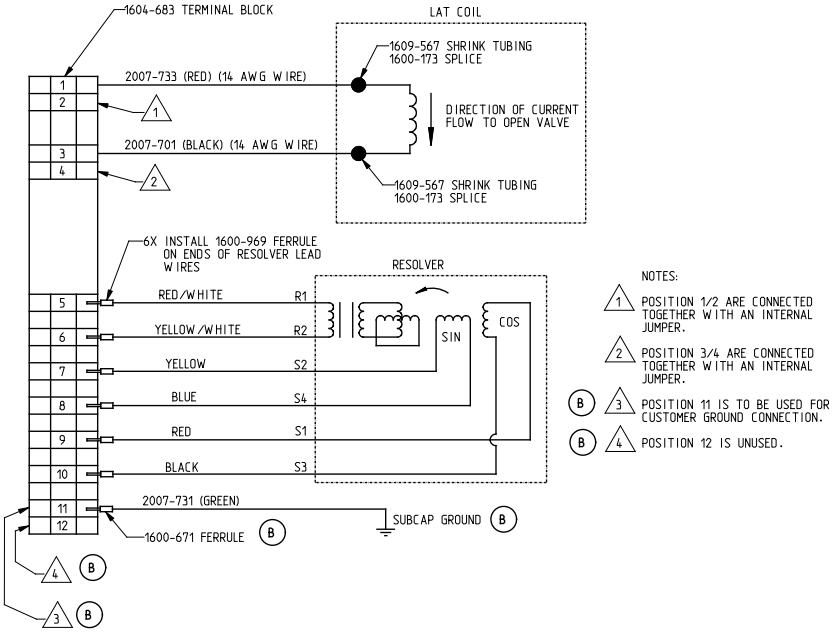


Figure 2-5. LQ25T and LQ Bypass Valve Wiring with Single 3-speed Resolver (Used with digital driver only)

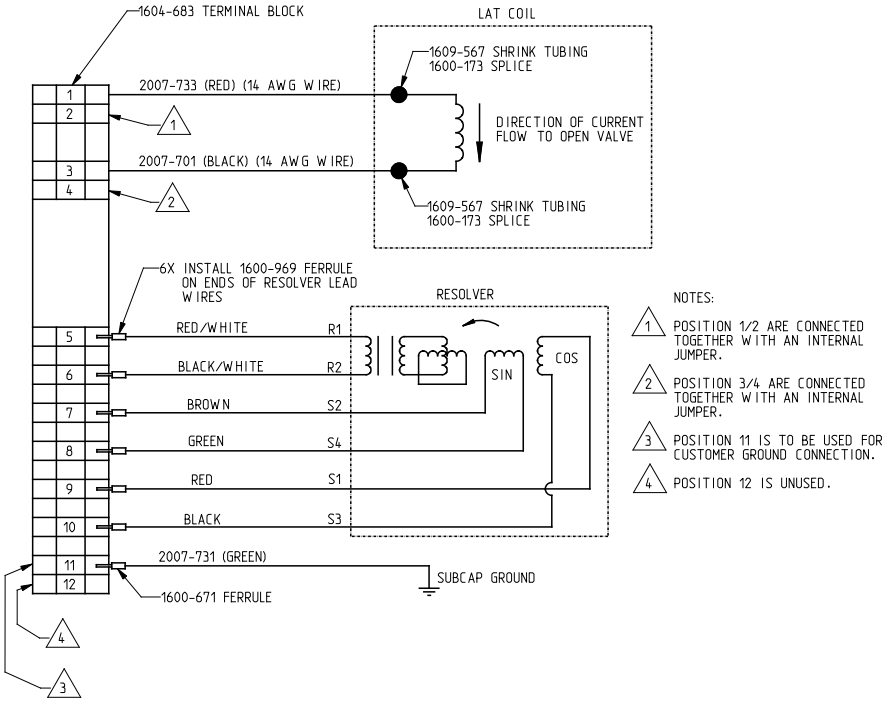


Figure 2-6. LQ25T and LQ Bypass Valve Wiring with Single 1-speed Resolver (Used with analog driver only)

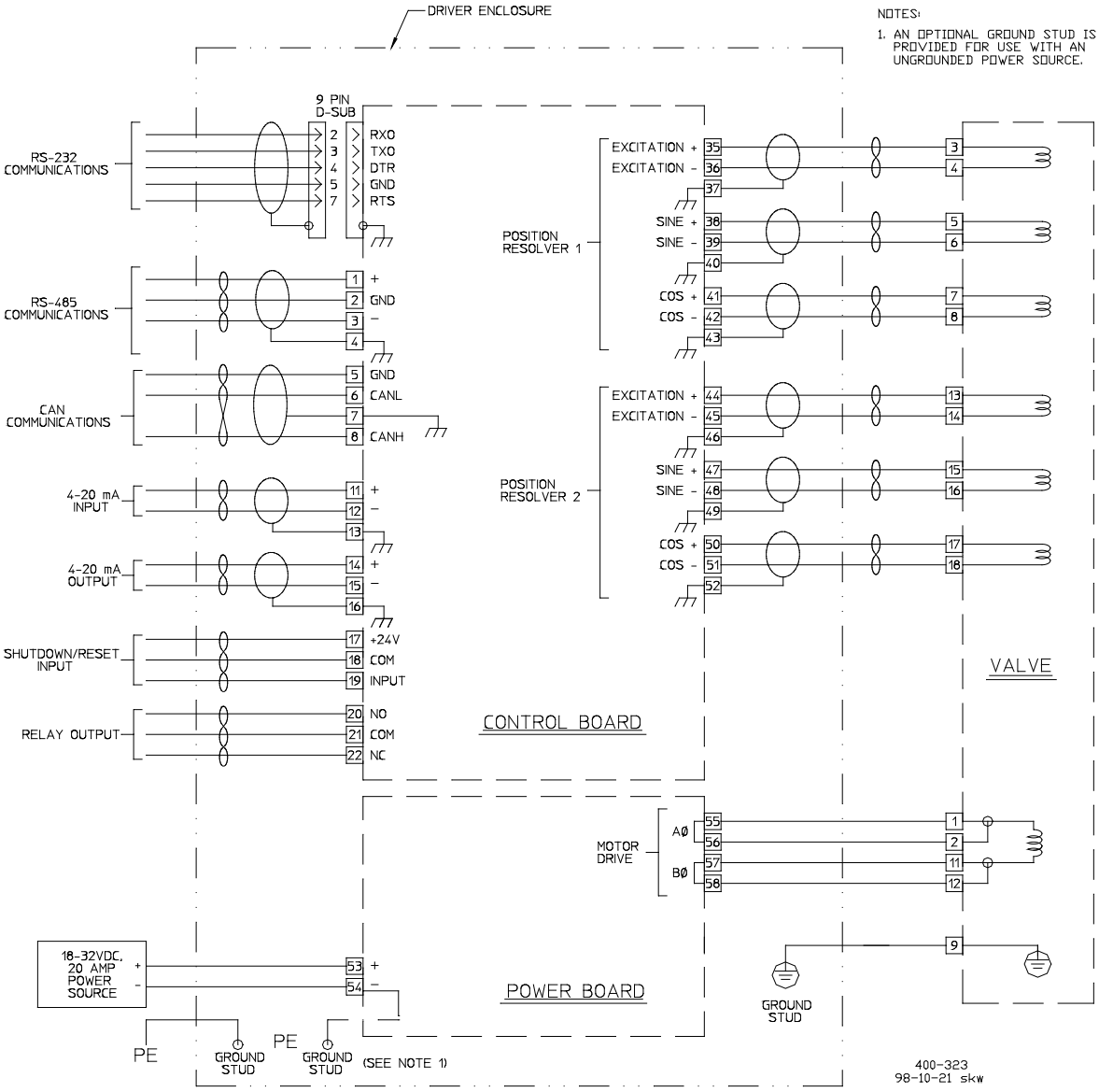


Figure 2-7. LQ25T and LQ Bypass Plant Wiring Diagram with Dual 3-speed Resolver to Digital Driver

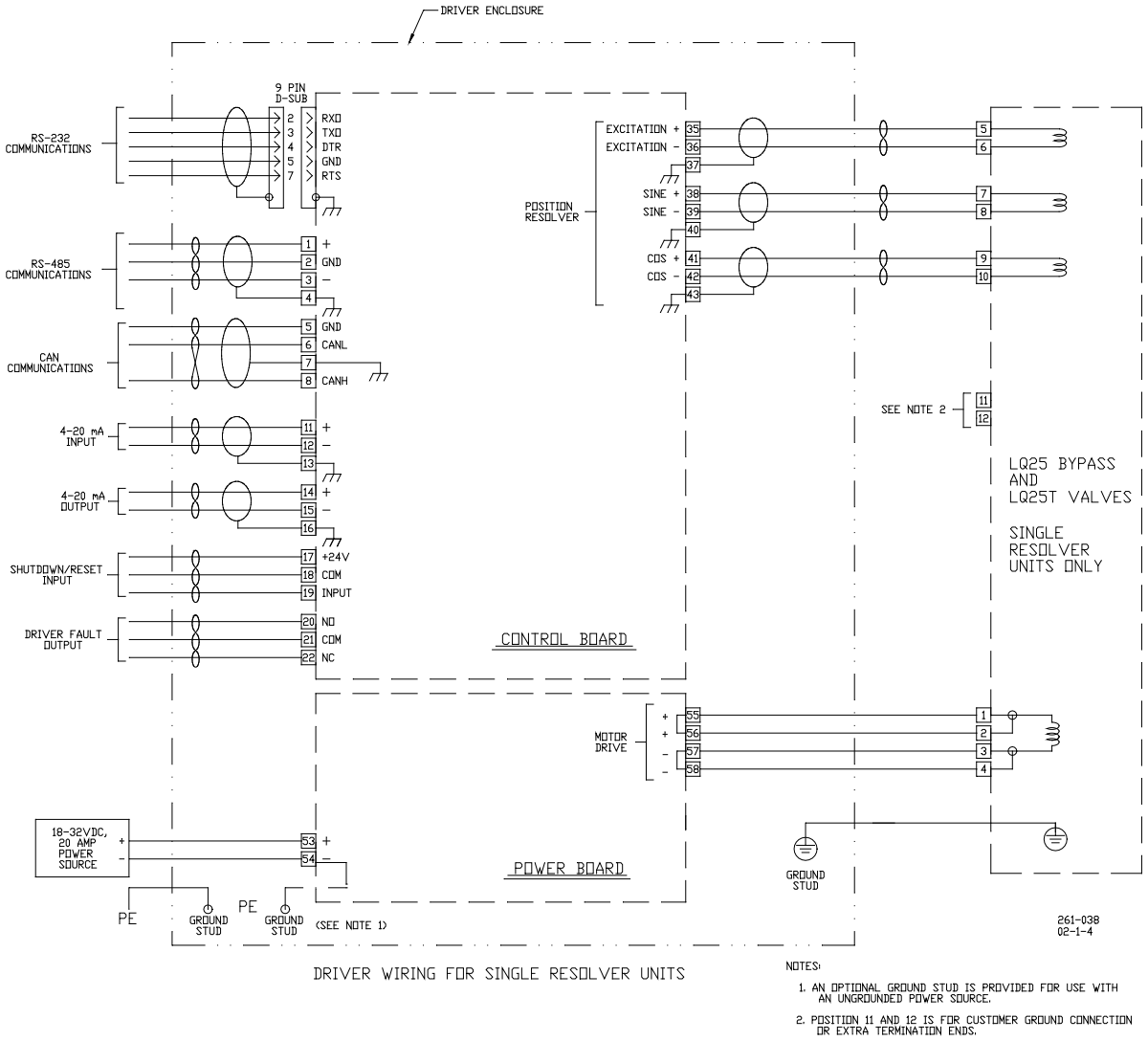


Figure 2-8. LQ25T and LQ Bypass Plant Wiring Diagram with Single 3-speed Resolver to Digital Driver

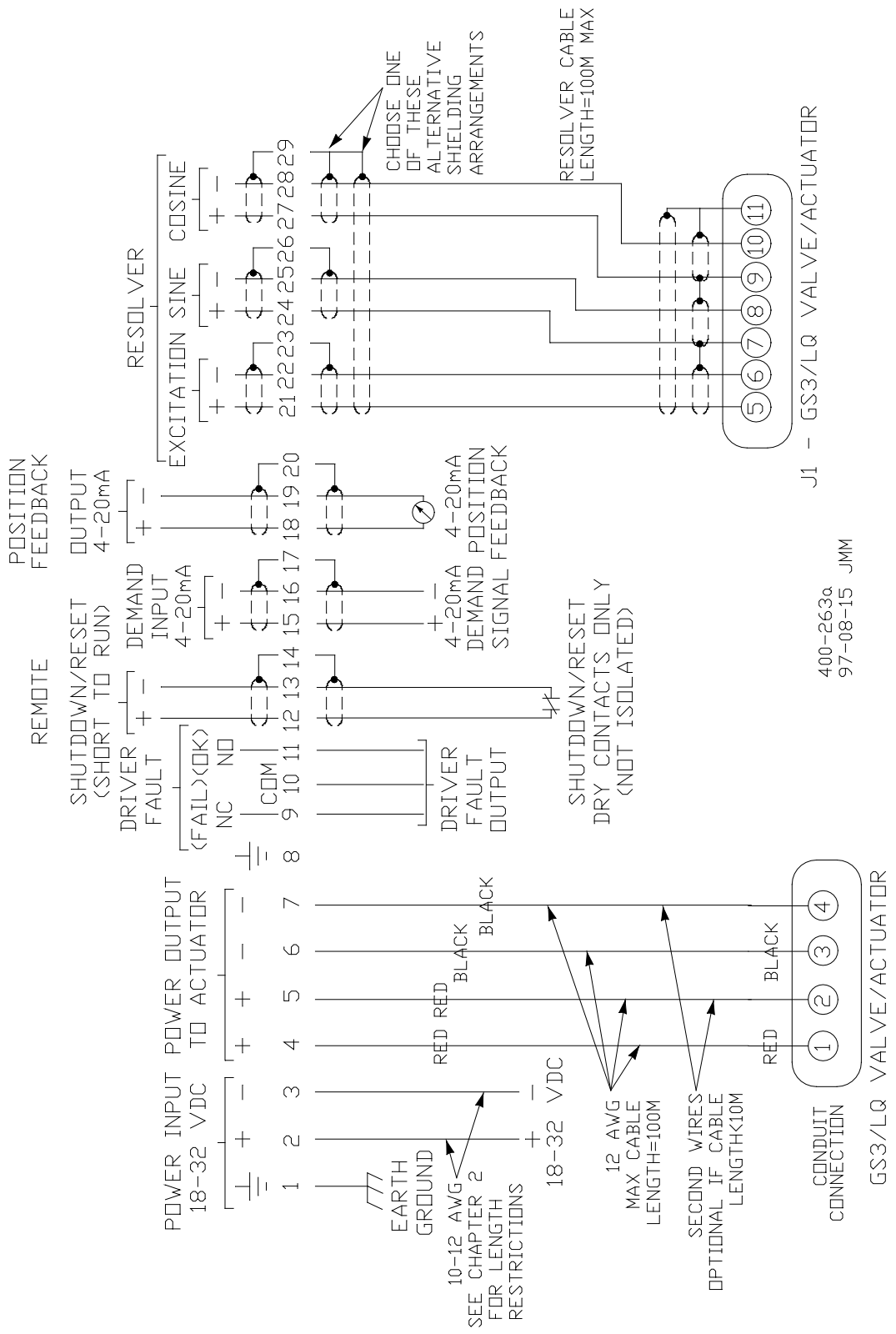


Figure 2-9. LQ25T and LQ Bypass Plant Wiring Diagram with Single 1-speed Resolver to Analog Driver

Terminal Blocks

Terminal blocks are used on all LQ valves. These terminal blocks are top load, cage clamp style, and are actuated by inserting a DIN 5264 screwdriver into the opening behind the wire slot. Once the cage clamp has been opened, the wire can be inserted and the screwdriver removed. Please see the illustration and instructions below:

- The screwdriver is inserted into the operating slot up to the stop.
- The screwdriver blade holds the clamping spring open automatically so that the conductor can be introduced into the clamping unit.
- The screwdriver is withdrawn. The conductor is automatically clamped.

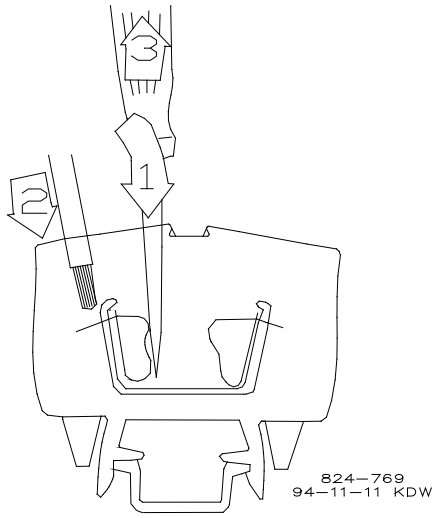


Figure 2-10. WAGO 264 Series Terminal Block

Damage to sealing surfaces may result in moisture ingress, fire, or explosion. Clean the surface with rubbing alcohol if necessary. Inspect the conduit and joint surfaces to ensure that they are not damaged or contaminated.

For Zone 1 valves: The LQ25T and LQ Bypass valves are certified to a Zone 1, Category 2 method of protection. Wiring methods must comply with the Zone 1, Category 2 method of protection when installed in a Zone 1 classified atmosphere.

⚠WARNING

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

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 (Figures 2-4 through 2-9).

Chapter 3.
Specifications

IMPORTANT **For complete information on drivers, see manual 26159 or 26329 for the digital drivers and manual 40175 for the analog driver.**

Table 3-1. LQ25T Valve Specifications

Environmental Specifications	
Ambient Temperature	Units are available with the following temperature ranges: –28 to +103 °C (–18 to +217 °F) –40 to +103 °C (–40 to +217 °F)
Storage Temperature	–40 to +103 °C (–40 to +217 °F)
Vibration	US MIL-STD-810C, Procedure 1, Table 514.2-ii, Figure 514.2-2, Curve J (5g)
Shock	US MIL-STD-810C, Method 516.2, Procedure 1, 20 g, 11 ms, sawtooth wave form
Valve Weight	22 kg (49 lb)
Airborne Noise	Ear protection must be worn while valve is operating
Ingress Protection (IEC 60529, IEC 60079-0)	IP66
Electrical Characteristics	
Dielectric Withstand	1500 Vac from motor phases to Protective Earth (PE) ground; 500 Vac from all I/O to PE ground
Limited Angle Torquer (LAT)	Coil -
Coil Resistance	.525 - .900 Ohms
Coil Inductance	20 mH at 60 Hz
Insulation Resistance	>50 MΩ after dielectric test
Driver Input Voltage	24 Vdc nom. or 125Vdc nom. (see driver manual)
Limited Angle Torquer (LAT) Input Current	3 A steady state, 8 A max. Expected transient current may be up to 20 A with a maximum of 20% duty cycle
Feedback Device (analog driver)	
Type	Frameless resolver (single-speed)
Excitation	4 Vac at 5000 Hz
Return	2 Vac at 5000 Hz
Feedback Device (digital driver)—	
Type	Frameless resolver (three speed)
Excitation	7 Vac at 4000 Hz
Return	3.5 Vac at 4000 Hz
Steady State Performance Characteristics	
Range of Maximum Metered Flows	1814 to 9979 kg/h (4000 to 22 000 lb/h)
Range of Minimum Metered Flow	27 to 454 kg/h (60 to 1000 lb/h)
Fuel Supply Pressure Range—	
Normal Operation	1034 to 9653 kPa (10.3 to 96.5 bar/150 to 1400 psig)
Max Inlet (Proof Pressure)	19 MPa (193 bar/2800 psig)
Min Burst Pressure	48 MPa (483 bar/7000 psig)
Max Internal fuel Leakage	27 kg/h (60 lb/h)

Table 3-1. LQ25T Valve Specifications (cont'd.)

Fuel Pressure Differentials	
Nominal Regulated Metering Valve ΔP	345 kPa (3.45 bar/50 psid)
ΔPressure Droop	±6.9 kPa (±0.069 bar/±1.0 psid) w/ droop compensations in control
Total Differential Pressure	P1 to PN 827 to 9653 kPa (8.3 to 96.5 bar/120 to 1400 psid) For dynamic response, P1 to PN must be at least 1380 kPa (13.8 bar/200 psid).
Chip Shearing Force Capability	133 N (30 lb force) minimum at the metering port edge
Flow Metering Accuracy	Greater of ±5.0% of point or ±0.5% of maximum flow using 4–20 mA input Greater of ±2.5% of point, or 0.1% of maximum flow, or 6.8 kg/h (15 lb/h), using RS-485 and droop compensation in control (including all effects—valve position, ΔP, temperature)
Valve Positioning Stability	Oscillations < ±0.05% of full stroke
Metered Flow Dynamic Response	> 25 rad/s bandwidth (for ±2% of stroke)
Max Slew Time	0.100 s (measured from 10 to 90% or 90 to 10%)
Liquid Fuel Types and Test Fluids	
Operating Fuel Types	The valve is compatible with most types of diesel, kerosene, gasoline, heavy and light distillates including naphtha, gas turbine fuel and fuel oil, and other liquid fuels such as biodiesel that are compatible with fluorocarbon (FKM) type elastomers and conform to international standards for utility, marine, and aviation gas turbine service. Ultra-low sulfur diesels are also acceptable with proper lubricity additives. Other fuels such as ethanol or methanol may be acceptable with internal seal compound substitutions. Contact Woodward for these and other special fuel applications.
Fluid Inlet Temperature Range	Units are available with the following fuel temperature ranges: –28 to +103 °C (–18 to +217 °F) –40 to +103 °C (–40 to +217 °F)
Fuel Specific Gravity Range	0.650 to 0.900
Fuel Viscosity Range	0.50 to 12.0 Centistokes
Inlet Fuel Filtration Levels	Filter liquid fuel to limit particulate size to 20 µm or smaller. Water and sediment must be limited to 0.1% by volume. Limit total particulate concentration to 2.64 mg per liter of fuel.
Operating Life	
Mean Time Between Overhauls	>50 000 operating hours
Cyclic Life	>150 000 full stroke cycles
Total Design Life with Overhauls	>150 000 operating hours
Storage Life	>10 years, non-operating

Table 3-2. LQ Bypass Valve Specifications

Environmental Specifications	
Ambient Temperature	–28 to +103 °C (–18 to +217 °F)
Storage Temperature	–40 to +103 °C (–40 to +217 °F)
Vibration	US MIL-STD-810C, Procedure 1, Table 514.2-ii, 20 Hz to 1000 Hz Figure 514.2-2, Curve J (5g)
Shock	US MIL-STD-810C, Method 516.2, Procedure 1, 20 g, 11 ms, sawtooth wave form
Valve Weight	17.7 kg (39 lb)
Airborne Noise	Must wear ear protection while valve is operating
Ingress Protection (IEC 60529, IEC 60079-0)	IP66
Electrical Characteristics	
Dielectric Withstand	1500 Vac from motor phases to Protective Earth (PE) ground; 500 Vac from all I/O to PE ground
Limited Angle Torquer (LAT) Coil—	
Coil Resistance	.525-.900 Ohms
Coil Inductance	20 mH at 60 Hz
Insulation Resistance	>50 MΩ after dielectric test
Driver Input Voltage	24 Vdc nom. or 125 Vdc nom (see driver manual)
LAT Input Curren:	3 A steady state, 8 A max. Expected transient current may be up to 20 A with a maximum of 20% duty cycle
Feedback Device (analog driver)—	
Type	Frameless resolver (single-speed)
Excitation	4 Vac at 5000 Hz
Return	2 Vac at 5000 Hz
Feedback Device (digital driver)—	
Type	Frameless resolver (three speed)
Excitation	7 Vac at 4000 Hz
Return	3.5 Vac at 4000 Hz
Steady State Performance Characteristics	
Range of Bypass Fuel Flow	< 45 to 13 608 kg/h (< 100 to 30 000 lb/h)
Range of Inlet Fuel Pressures	1034 to 9653 kPa (10.3 to 96.5 bar/150 to 1400 psig) (normal operation)
Range of Bypass Fuel Pressure	690 to 2070 kPa (6.9 to 20.7 bar/100 to 300 psig)
Maximum Differential Fuel Pressure	8964 kPa (89.6 bar/1300 psig) (normal operation)
Valve Design Point Condition	13 608 kg/h (30 000 lb/h) at Pinlet=1724 kPa (17.2 bar/250 psig), Preturn= 690 kPa (6.9 bar/100 psig)
Continuous Operational Condition	4536 kg/h (10 000 lb)/h) at Pinlet=9653 kPa (96.5 bar/1400 psig), Preturn= 690 kPa (6.9 bar/100 psig)
Port Area vs Stroke Characteristic	Approximately square law (triangular porting)
Proof Pressure Test Leve:	19 MPa (193 bar/2800 psig)
Burst Pressure Test Leve:	48 MPa (483 bar/7000 psig)
Maximum Internal Leakage	<45 kg/h (100 lb/h) at Pinlet=9653 kPa (96.5 bar/1400 psig), Preturn= 690 kPa (6.9 bar/100 psig)
Maximum Leakage to Vent Port	< 5 cm³/h at any condition Based on the use of diesel fuel with a specific gravity of 0.810

Table 3-2. LQ Bypass Valve Specifications (cont'd.)

Nominal Diameter	33.3 mm (1.312 inches)
Flow Capacity	Minimum flow < 45 kg/h (< 100 lb/h) at 8964 kPa (89.6 bar/1300 psid) Maximum flow > 13644 kg/h (>30,000 lb/h) at 1034 kPa (10.34 bar/150 psid)
Flow Versus Input	$\frac{W_{fb}}{\sqrt{P_{inlet} - P_{discharge}}} @ K_1 + K_2(x) + K_3(x)^2$
Signal Characteristics	(As obtained from a triangular metering slot)
Pressure Loss	At max position, the total pressure loss from inlet to outlet port connections is less than 1034 kPa (10.34 bar/150 psid) at 13 608 kg/h (30 000 lb/h) bypass flow
Liquid Fuel Types And Test Fluids	
Operating Fuel Types	The valve is compatible with most types of diesel, kerosene, gasoline, heavy and light distillates including naphtha, gas turbine fuels and fuel oils, and other liquid fuels such as biodiesel that are compatible with fluorocarbon (FKM) type elastomers and conform to international standards for utility, marine, and aviation gas turbine service. Ultra-low sulfur diesels are also acceptable with proper lubricity additives. Other fuels such as ethanol or methanol may be acceptable with internal seal compound substitutions. Contact Woodward for these and other special fuel applications.
Test Fluid	Calibration Fluid per US MIL-C-7024C Type II at –28 to +103 °C (–18 to +217 °F)
Fluid Inlet Temperature Range	–28 to +103 °C (–18 to +217 °F)
Fuel Specific Gravity Range	0.650 to 0.900
Fuel Viscosity Range	0.50 to 12.0 Centistokes
Inlet Fuel Filtration Levels	Must filter liquid fuel to limit particulate size to 20 µm or smaller. Water and sediment must be limited to 0.1% by volume. Total particulate concentration must be limited to 2.64 mg per liter of fuel.
Service Life and Reliability	
Mean Time Between Overhaul (MTBO)	> 50 000 operating hours (target)
Total Operating Life with Overhauls	> 200 000 operating hours (target)
Mean Time Between Failures	> 50 000 operating hours (target; all defects)
Storage Life	> 10 years, non-operating

Chapter 4. Maintenance

LQ25T Valve Maintenance

The valve assembly is designed to avoid the accumulation of air and fuel vapor in service (based on the use of diesel fuel with a specific gravity of 0.810), and does not require any action by the user to purge air or vapor from the assembly following installation or use on the engine system.

The valve is also designed such that during normal operation or storage, fuel or condensed water vapor does not accumulate within any part of the assembly in such a way as to cause damage or deterioration.

When removed from the engine system, it is possible to drain all fuel, condensed water vapor, or other contaminants from the assembly without further disassembly.

There are no field-replaceable parts on the LQ25T.

LQ Bypass Valve Maintenance

On the LQ Bypass Valve, the outlet fitting with its integrated cavitation shield and the 1.2 meter (4 ft) straight length of 51 mm (2 inch) diameter steel or stainless steel pipe (or tube) should be inspected for signs of cavitation damage at a maximum interval of 5000 hours of pump operation. Replace components showing significant signs of erosion immediately and check the system to ensure adequate backpressure is being maintained to the outlet of the valve.

Do not replace the fitting connected to the outlet of the LQ Bypass with any other fitting. This fitting is considered part of the LQ Bypass Valve. Replacement of this fitting with a standard fitting will expose the fitting to cavitation erosion resulting in a hazardous condition with the potential to cause personal injury and/or damage to the fuel system and valve.

The valve assembly is designed so as to avoid the accumulation of air and fuel vapor in service (based on the use of diesel fuel with a specific gravity of 0.810), and does not require any action by the user to purge air or vapor from the assembly following installation or use on the engine system.

The valve is also designed such that during normal operation or storage, fuel or condensed water does not accumulate within any part of the assembly in such a way as to cause damage or deterioration.

When removed from the engine system, it is possible to drain all fuel, condensed water vapor, or other contaminants from the assembly without further disassembly.

The only field-replaceable part on the LQ Bypass Valve is the outlet fitting with integral cavitation shield.

Chapter 5.
Troubleshooting

⚠WARNING

The valve(s) may not fail shut in every situation. If the driver is unable to shut the valve in a fault situation, the valve will stay open. For safe turbine operation in fault situations, the valve must be used in conjunction with an additional high-speed shutoff valve. Also, the driver fault relay should be tied into the engine protection system.

⚠WARNING

Before attempting any troubleshooting action, verify that the prime mover is shut down and that fuel pressure is not present to valves that may open due to actuator motion.

⚠WARNING

Explosion Hazard

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

Valve Problems

This troubleshooting section does not give the certain cause of any problem. Nor does it cover all possible problems or all possible causes of any problem. This section will not enable a technician to locate a faulty component in the valve.

If trouble occurs, use Figure 5-1, the Troubleshooting Flowchart, as a guide to locate and repair the problem. Follow the flow chart down from the title block to the next block. Rectangular boxes contain suggestions on where to look for a problem. Diamond-shaped boxes ask you questions based on the information you have gathered. The answer to that question will guide you to the next step in the troubleshooting procedure. By following the flowchart, you should be able to identify and correct most problems that may occur with the valve. If after following these troubleshooting procedures you are unable to find the cause of a problem and repair it, contact Woodward for assistance.

If the results of these procedures indicate that the valve may be faulty, replace the suspected unit with a valve known to be good to verify that the cause of the problem is in the valve.

To verify electrical connections within the valve, disconnect the electrical cables at the driver and measure resistances between driver connector terminals. Note that the following resistances are approximate and do not include tolerances. This test is to check for open or short circuits, and to test the wiring from the driver to the valve.

Analog Drivers

For analog drivers, use resistances called out on Figure 5-1.

Terminals 50–51: approximately 74.8 to 101.2 Ω

Digital Drivers

Motor Windings:
Terminals 55/56—57/58: approximately 0.525 to 0.9 Ω
Resolver Connectors—These resistances apply to either resolver connector
Terminals 35–36: approximately 36.6 to 49.4 Ω
Terminals 38–39: approximately 74.8 to 101.2 Ω
Terminals 41–42: approximately 74.8 to 101.2 Ω
Terminals 9–10: N/A
Terminals 11–12: N/A
Terminals 44–45: approximately 36.6 to 49.4 Ω
Terminals 47–48: approximately 74.8 to 101.2 Ω

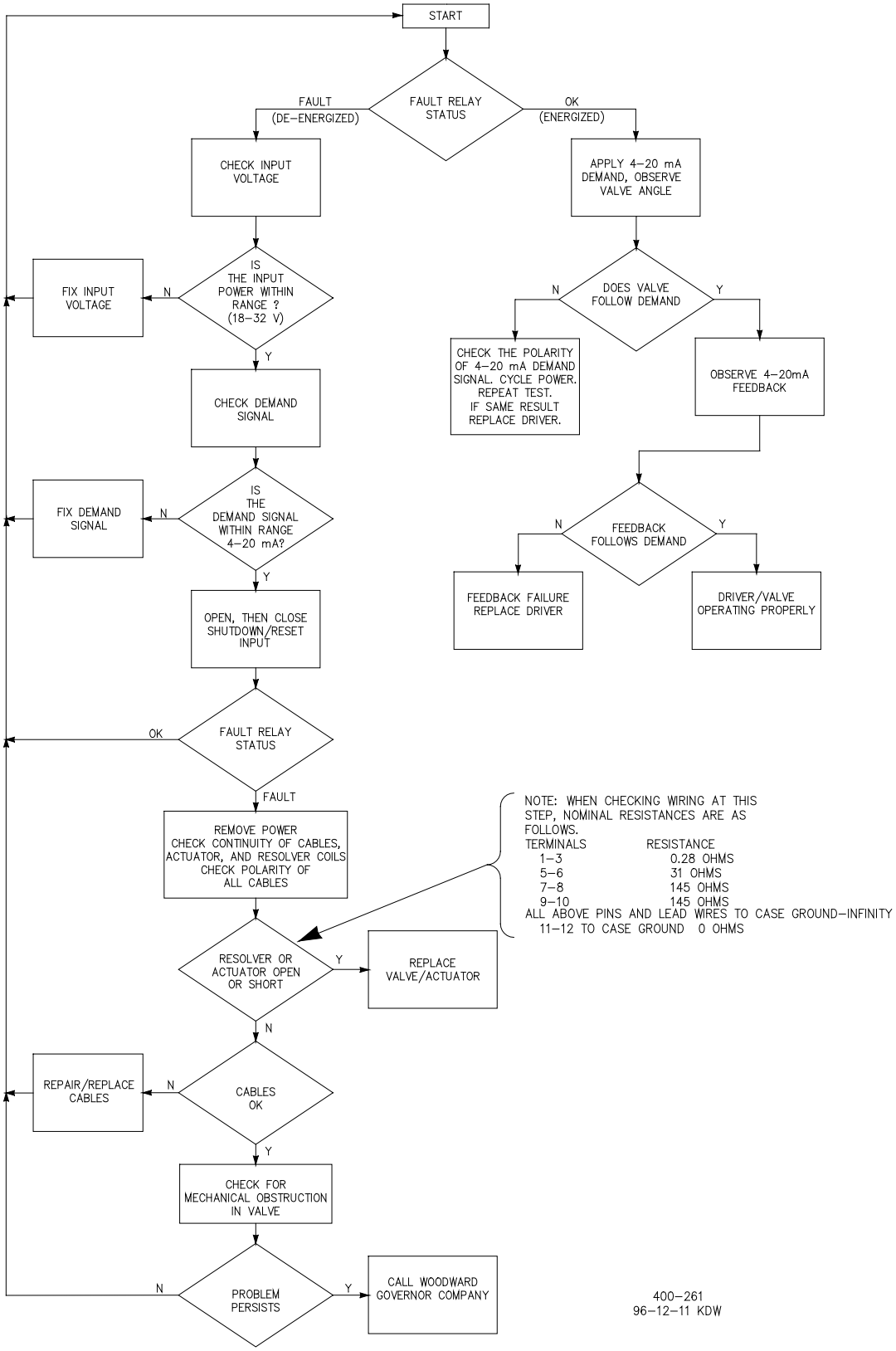


Figure 5-1. Troubleshooting Flowchart

Chapter 6.
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 N—
- Replaced EU DoC

Changes in Revision M—
- Revised Regulatory Compliance section
- Replaced Declarations

Changes in Revision L—
- Revised PED and ATEX – PEAD Directives in the Regulatory Compliance Section
- Added RoHS Directive in the Regulatory Compliance Section
- Updated Ingress Protection Titles in Tables 3-1 and 3-2
- Replaced Declarations

Changes in Revision K—
- Updated Regulatory and Compliance Section
- Updated specifications tables in Chapter 3
- New drawings in Chapter 2.

Changes in Revision J—
- Updated Regulatory and Compliance Section
- Updated Declarations

Changes in Revision H—
- Updated Figure 2-2

Changes in Revision G—
- Updated fuel particulate concentration to 2.64 mg/L

Declarations

EU DECLARATION OF CONFORMITY

EU DoC No.:	00122-04-CE-02-05
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Contact Address:	1041 Woodward Way Fort Collins, CO 80524 USA
Model Name(s)/Number(s):	LQ25T and LQ Bypass with conduit entry, no ID module
The object of the declaration described above is in conformity with the following relevant Union harmonization legislation:	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 2014/68/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 LQ25T & LQ Bypass: PED Category II
Markings in addition to CE marking:	Ⓔx II 2 G, Ex db IIB 160C (T3) Gb Ⓔx II 3 G, Ex nA IIC T3 Gc
Applicable Standards:	
ATEX:	EN IEC 60079-0 :2018 – Explosive atmospheres – Part 0 : Equipment – General requirements EN 60079-1 :2014 – 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'
PED:	ASME B31.3 Process Piping, 2004
Third Party Certification:	ITS 16ATEX8458X (Category 2 only) Intertek Italia S.p.A. (2575) Via Miglioli, 2/A – 20063 Cernusco sul Naviglio, Milano – Italy
Conformity Assessment:	ATEX Annex IV - Production Quality Assessment, 01 220 113542 TUV Rheinland Industrie Service GmbH (0035) Am Grauen Stein, D51105 Cologne 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

Engineering Manager
Position

Woodward, Fort Collins, CO, USA
Place

14 April 2025
Date

5-09-1183 Rev 43

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

File name:	00122-04-CE-02-04
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Address:	1041 Woodward Way Fort Collins, CO 80524 USA
Model Names:	LQ25T Valves LQ Bypass Valves
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 Governor Company of Loveland and Fort Collins, Colorado that the above referenced product is in conformity with Directive 2006/42/EC as partly completed machinery:

MANUFACTURER

Annette Lynch
Signature

Annette Lynch
Full Name

Engineering Manager
Position

Woodward Inc., Fort Collins, CO, USA
Place

8/11/2022
Date

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

Released

We appreciate your comments about the content of our publications.

Send comments to: industrial.support@woodward.com

Please reference publication 26162.

B 2 6 1 6 2 : N

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.