WOODWARD

Product Manual 37515
(Revision C)
Original Instructions

UG40 Actuator

Installation and Operation Manual

IMPORTANT

DEFINITIONS

This is the safety alert symbol. It is 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

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.

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.

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, be sure to check the *publications page* on the Woodward website:
www.woodward.com/publications
The current revision and distribution restriction of all publications are shown in manual *26311*.

The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

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.

NOTICE

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

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*.

Revisions—Text changes are indicated by a black line alongside the text.

Contents

Illustrations and Tables

Chapter 1.
General Information

Introduction

This manual describes the installation and operation of the UG40 Actuator.

Figure 1-1. The UG40 Actuator

Description

The UG40 Actuator is a proportional electro-hydraulic actuator which can be used with electronic controls which provide a 20 to 160 mA position signal. The actuator is designed for use with Woodward 2301A, 400, 43027, 500-series, and 700-series controls.

The actuator converts a given electrical signal to an output shaft position through the action of a torque motor and follower-type pilot valve. The rotary output actuator has 38 degrees of terminal (output) shaft travel. Recommended travel from the no-load to the full-load position is 2/3 of full actuator travel.

The UG40 Actuator is used on diesel, gas, and gasoline engines (also steam turbines) to replace UG40/32 type governors, providing the advantages of electronic control and load sharing systems with the convenience of the existing UG40 type drive and linkage.

The UG40 Actuator provides a maximum work capacity of 85 J (63 ft-lb). Work capacity is based on the full 38 degree travel of the terminal (output) shaft. Rated work capacity is 2/3 of maximum work capacity.

The actuator can be built with a low speed pump for speed ranges of 350 to 1000 rpm, or with a high speed pump for 600 to 1300 rpm.

The actuator may be equipped with a special gear and magnetic pickup, using the governor drive to sense engine speed. This permits an added convenience when converting from a UG40 hydraulic-mechanical governor to an electronic control system. Low cranking speeds may require override of the electronic failsafe.

IMPORTANT

The MPU will sense the speed of the governor drive, which is not necessarily the same rpm as the engine. The frequency sensed by the MPU must match the frequency range of the electronic control.

UG40 Governor Similarities

The UG40 Actuator uses the same cast-iron case as the UG40 governor. The standard UG40 output shaft, power lever, power piston, and piston link are used in the actuator. The base is designed to fit any drive designed for a UG40 governor.

Hydraulic Pump

The UG40 Actuator is equipped with a Gerotor pump. High speed and low speed pumps are available, depending on the drive speed from the engine. The pump uses oil from the self-contained UG40 Actuator sump to provide 1725 kPa (250 psi) internal operating pressure.

The direction of rotation is selected by pump housing alignment. The pump operates in one direction only. The drive uses a maximum of 525 W (0.7 hp). In some cases the actuator may require an oil cooler to operate at the high end of the drive speed range.

Actuator Response

The UG40 Actuator output is directly proportional to a 20 to 160 mA signal from an electronic control system.

This manual provides outline drawings to show the base and drive configurations. The outline drawings include information on electrical wiring, installation dimensions, drive requirements, oil requirements, and output shaft dimensions. The drawings are provided for reference only. Do not use the drawings for construction.

References

The following publications provide additional information about installation, operation, and storage of Woodward products.

Publication Number	Title
25071	*Oils for Hydraulic Controls*
25075	*Commercial Preservation Packaging for Storage of Mechanical-Hydraulic Controls*
50516	*Governor Linkage for Butterfly Control Valve*
37516	*UG40 Actuator Product Specification*

This manual does not attempt to provide information about the electronic control which determines the position of the UG40 Actuator output. This information must be obtained from the appropriate manual for the electronic control.

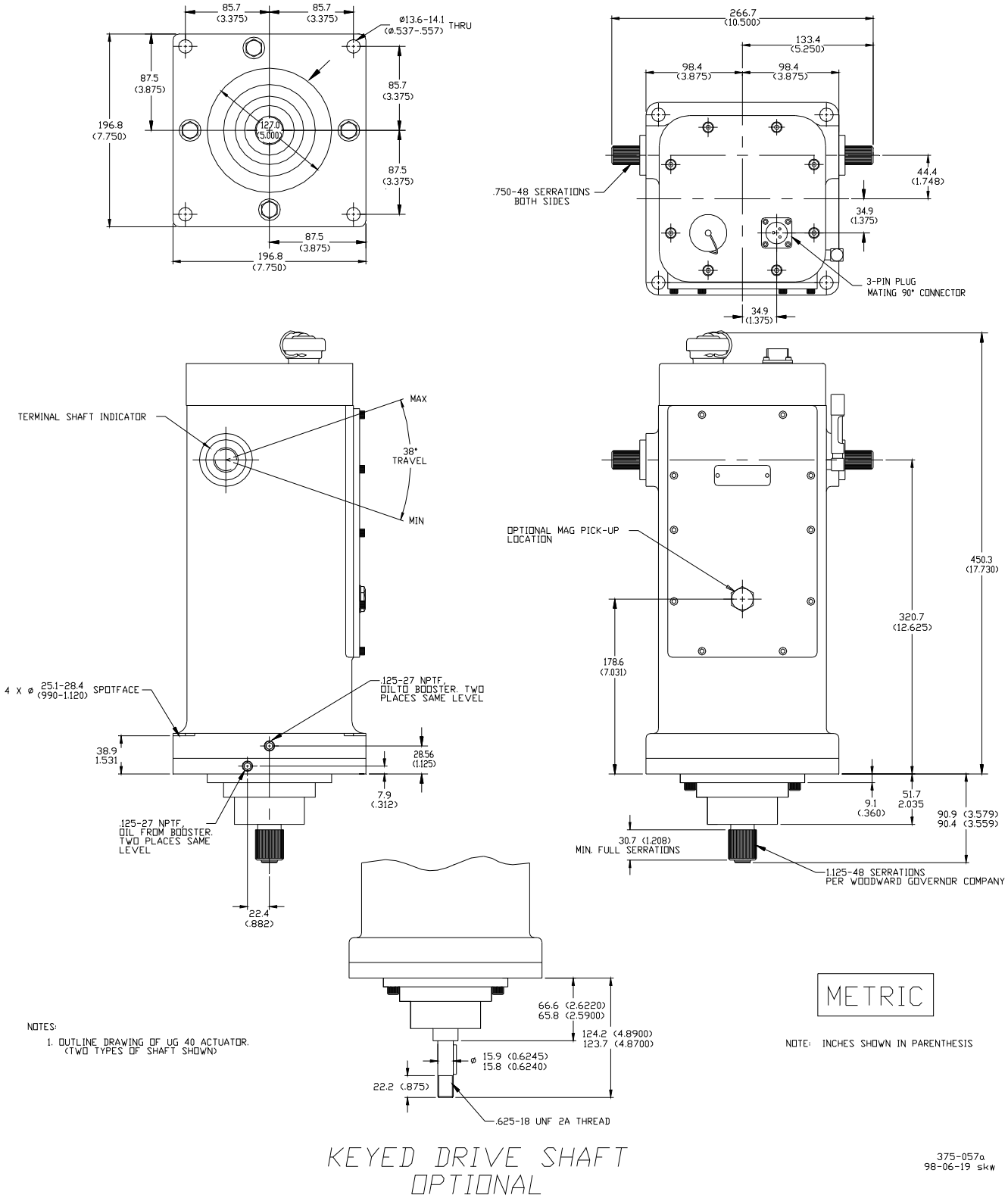


Figure 1-2. Outline Drawing of UG40 Actuator

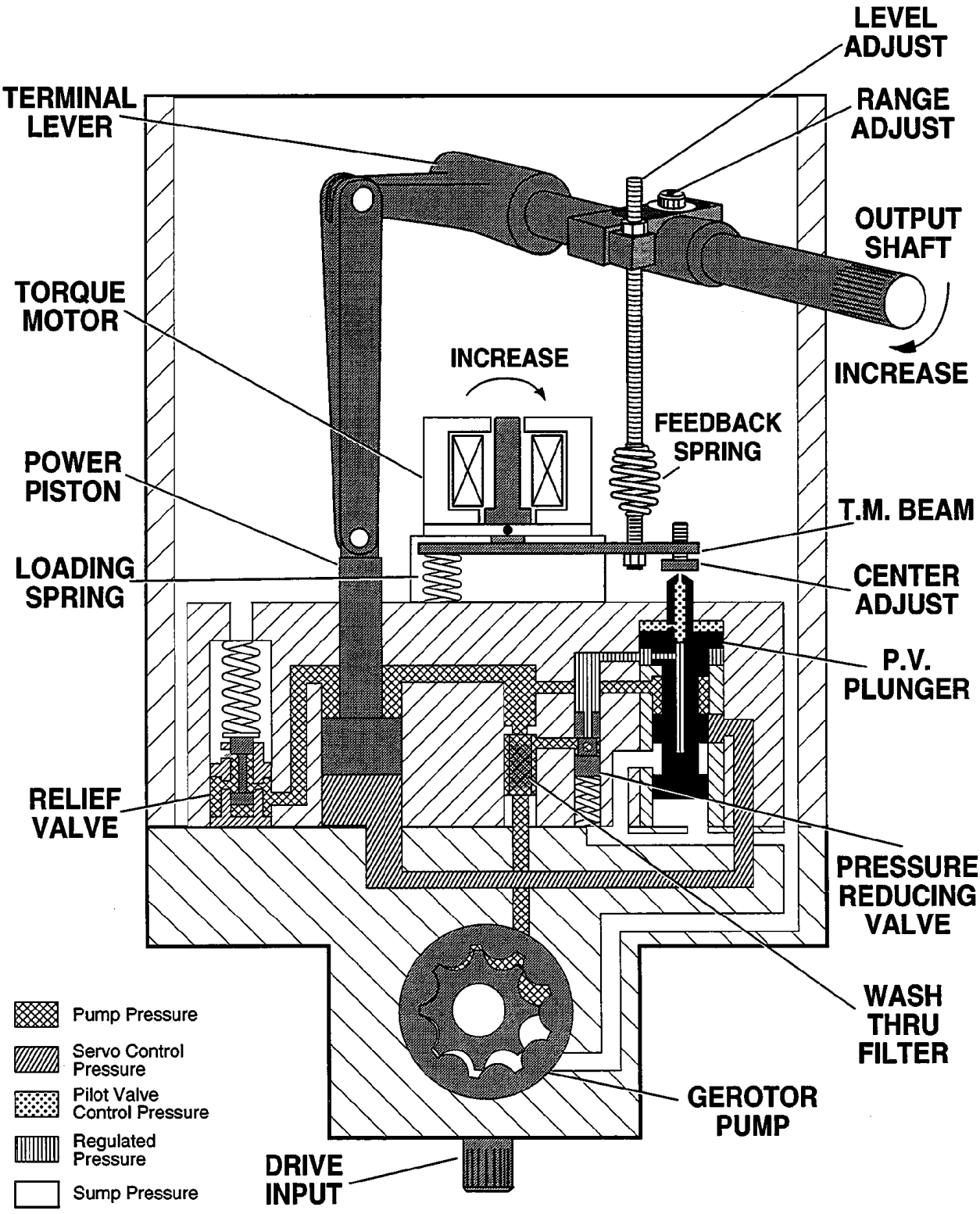


Figure 1-3. Schematic of UG40 Actuator

Chapter 2. Installation

Introduction

This chapter describes receiving, storage, and installation requirements for the UG40 Actuator.

Use care while handling and installing the UG40 Actuator. Be particularly careful to avoid striking the drive shaft, terminal shaft, or the electrical connector. Abuse can damage seals, internal parts, and factory adjustments. Do not set the actuator on its drive shaft.

Receiving

After factory testing and calibration, the UG40 Actuator is drained of oil. This leaves a light film of oil on internal parts to prevent rust. External parts are painted or coated with a spray lubricant/rust inhibitor.

No internal cleaning or flushing is necessary before installation and operation. The little oil left in the actuator is clean, multiviscosity engine oil which will not contaminate the oil selected to operate the actuator.

Fill the actuator with 7.0 liters (7.4 quarts) of oil selected to match the expected operating conditions. (The UG40 Actuator will normally run hotter than the UG40 governor. A heavier oil may be needed.) Use only new, clean oil in the actuator. Do not allow dirt or contamination to enter the actuator while filling with operating oil. Do not use oil drained from the UG40 governor.

Storage

The UG40 Actuator may be stored for short periods of time (less than a year) as received from the factory. For long-term storage (more than a year), storage in an environment with large temperature changes, humid or corrosive atmosphere, etc., or if the actuator is installed on the engine for storage, fill the actuator with oil and follow preservation packaging instructions in Woodward manual 25075, *Commercial Preservation Packaging for Storage of Mechanical-Hydraulic Controls*.

Drive Shaft Rotation

The actuator drive-shaft rotation is one direction only. Rotation, as viewed from the top of the actuator, must be the same as that of the engine drive when looking down on the mounting pad.

If the actuator oil pump is rotated in the wrong direction, oil pressure will not be generated in the actuator.

NOTICE

Be sure engine mounting-pad drive and actuator-drive rotation are the same. Incorrect drive rotation will cause the actuator to become inoperative, and may cause actuator damage.

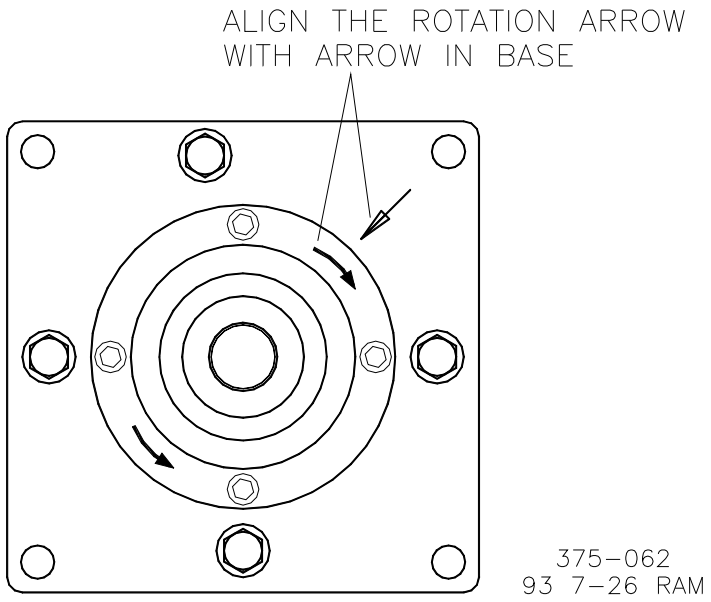


Figure 2-1. Alignment of Reference Notch and Arrow

Use the following procedure to change the direction of rotation:

1. Remove the four pump-housing screws.
2. Index the pump plate 180 degrees to align the arrow corresponding to the direction of rotation selected with the reference notch in the base.
3. Replace the four screws, and torque the screws to 18.1 N·m (160 lb-in).
4. Make sure that the actuator drive shaft rotates freely.

Attitude

The UG40 Actuator can be installed in a vertical or near vertical position without affecting its calibration. Do not install more than 45 degrees from vertical. See the outline drawing for installation instructions and dimensions.

Drive Connection

Make sure the actuator drive shaft turns freely before installing the actuator. The drive gear or coupling must slip freely into the governor drive of the engine. Do not apply external force. The drive must be free of binding, side load, or excess end-play. Improper alignment or fit between the parts can result in excessive wear or actuator-drive seizure.

Mount the actuator squarely on the mounting pad. Torque the mounting bolts evenly. There can be no movement or rocking of the actuator on the engine-mounting pad.

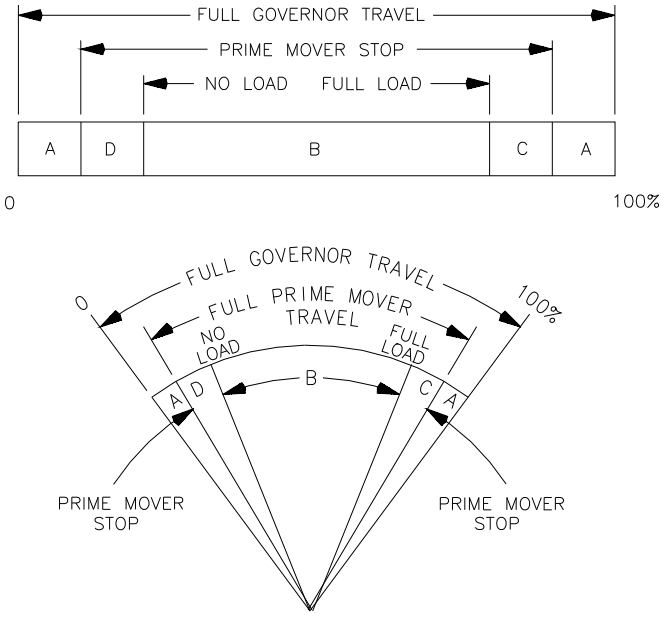
Control Linkage

The terminal shaft rotates 38 degrees. Use 2/3 of the total rotation between no load and full load. The additional “overtravel” should be split and used at both ends to provide maximum fuel when required and to assure shutdown at minimum-fuel actuator position (see Figure 2-2).

WARNING

To prevent possible serious injury or loss of life, or damage to the engine, from an overspeeding engine, be sure to allow sufficient overtravel at each end of the terminal shaft, so the actuator can shut down the engine, and also give maximum fuel when required. Misadjusted linkage could prevent the actuator from shutting down the engine.

Many control problems are related to linkage between the actuator and the engine. Use only first-quality rod ends for the linkage, rod ends that will last under the nearly constant motion associated with precise speed control. The linkage must be stiff, not subject to engine caused vibration. The linkage must be as light as possible and still maintain the attributes of stiffness. Linkage which is too heavy can damage the actuator as well as make it difficult to achieve steady control.



A – OVERTRAVEL TO INSURE PRIME MOVER STOPS ARE REACHED.

B – NO LOAD TO FULL LOAD TRAVEL – NORMALLY 2/3 OF FULL GOVERNOR TRAVEL IS RECOMMENDED.

C – TRAVEL REQUIRED TO ACCELERATE THE PRIME MOVER.

D – TRAVEL REQUIRED TO DECELERATE OR SHUT DOWN PRIME MOVER.

MI-153a
98-04-14 skw

MAXIMUM WORK CAPACITY OVER FULL GOVERNOR TRAVEL OF 42° IS * . SEE ABOVE FOR RECOMMENDED GOVERNOR OUTPUT TRAVEL. IN SPECIAL APPLICATIONS MIN AND MAX PRIME MOVER STOPS MAY BE OUTSIDE THE GOVERNOR STOPS.

Figure 2-2. Terminal Shaft Travel

Installed linkages must operate smoothly, be free of binding, and free of lost motion due to worn parts. If there is a collapsible member in the linkage, be sure it does not yield each time the actuator moves the linkage rapidly.

Use a linear linkage for most diesel applications. Most gasoline and gas fueled engines will require a non-linear linkage. See Figures 2-3 and 2-4 for information on the arrangements of linear and nonlinear connections. Linear linkage moves the fuel setting shaft in direct proportion to the movement of the actuator output. Nonlinear fuel arrangement lets the actuator open the fuel setting more at maximum settings than it does at minimum settings. Woodward manual 50516, *Governor Linkage for Butterfly Throttle Valves*, provides more information about non-linear linkage.

Design the linkage so the power output of the engine is proportional to the position of the actuator output shaft.

Follow the engine manufacturer's instructions on linkage selection, installation, and adjustment. In almost all cases, the linkage designed for a UG40 governor will work with the UG40 Actuator. In the case of a direct exchange, make sure that the linkage is in good condition and the installation of the lever on the actuator is in the same position as it was on the governor.

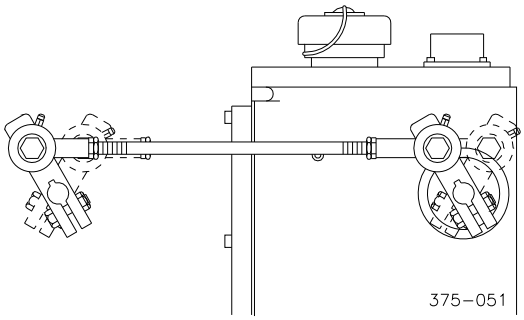


Figure 2-3. Linear Linkage

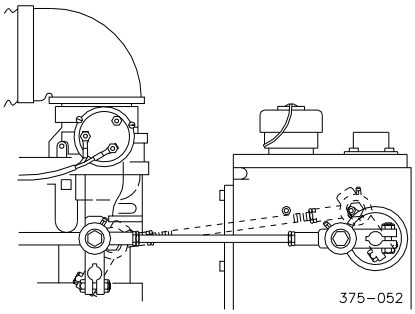


Figure 2-4. Nonlinear Linkage

Oil Supply

Use the information given in Figures 2-5 and 2-6 as a guide in the selection of a suitable oil. Oil grade selection is based on the operating temperature range of the actuator. Also use this information to aid in recognizing and correcting common problems associated with oil used in the actuator. Many operation and maintenance problems associated with UG40 Actuators are directly related to the selection and condition of the oil in the actuator. Use care in the selection and make sure that the oil in the actuator is not contaminated.

The oil in the UG40 Actuator is both a lubricating and hydraulic oil. It must have a viscosity index that allows it to perform over the operating temperature range and it must have the proper blending of additives that cause it to remain stable and predictable over this range.

The UG40 Actuator is designed to give stable operation with most oils, if the fluid viscosity at the operating temperature is within a 50 to 3000 SUS (Saybolt Universal Seconds) range (see Figure 2-6). Poor actuator response or instability is an indication that the oil is too thick or too thin.

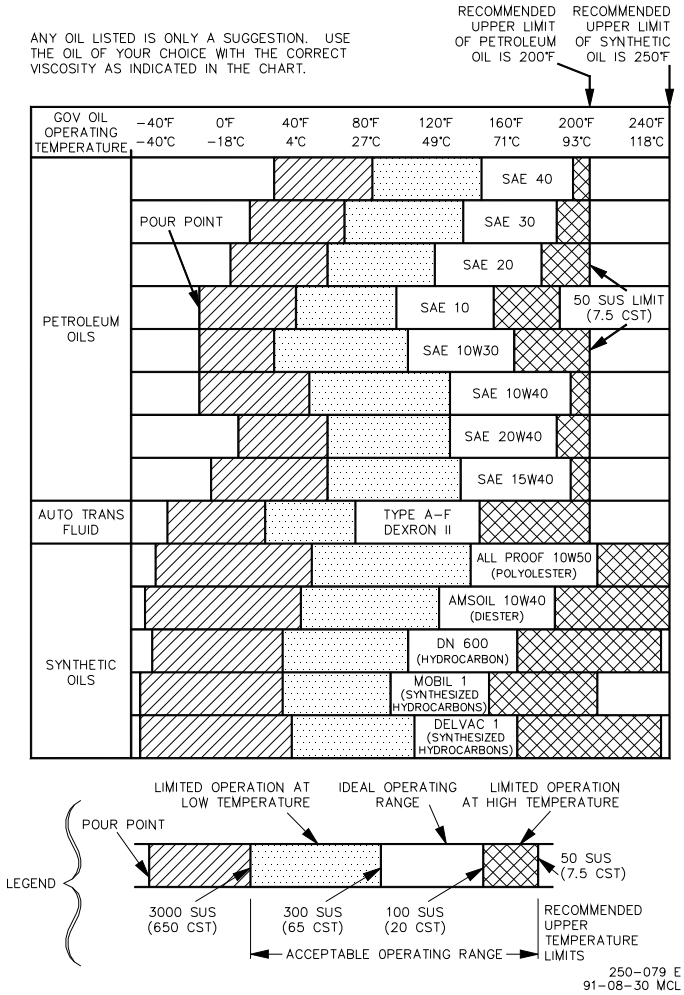


Figure 2-5. Oil Chart

VISCOSITY COMPARISONS				
CENTISTOKES (CST, CS, OR CTS)	SAYBOLT UNIVERSAL SECONDS (SUS) NOMINAL AT 100° F	SAE MOTOR (APPROXIMATE)	SAE GEAR (APPROXIMATE)	ISO
15	80	5W		15
22	106	5W		22
32	151	10W	75	32
46	214	10	75	46
68	310	20	80	68
100	463	30	80	100
150	696	40	85	150
220	1020	50	90	220
320	1483	60	115	320
460	2133	70	140	460

250−087

Figure 2-6. Viscosity Comparisons

Actuator oil must be compatible with seal material, that is, nitrile, polyacrylic, and fluorocarbon. Many automotive and gas engine oils, industrial lubricating oils, and other oils of mineral or synthetic origin meet these requirements.

Fill the actuator with about 7.0 liters (7.4 quarts) of oil, to the mark on the oil sight glass. After the engine is started and the actuator is at operating temperature, add oil if necessary. **Oil must be visible in the glass under all operating conditions.**

Excessive component wear or seizure in the actuator indicates the possibility of:

1. Insufficient lubrication caused by:
   an oil that flows slowly when it is cold, especially during start-up;
   no oil in the actuator.
2. Contaminated oil caused by:
   dirty oil containers;
   an actuator exposed to heating and cooling cycles, which created condensation of water in the oil.
3. Oil not suitable for the operating conditions caused by:
   changes in ambient temperature;
   an improper oil level which creates foamy, aerated oil.

Operating an actuator continuously beyond the high limit temperature of the oil will result in oil oxidation. This is identified by varnish or sludge deposits on the actuator parts. To reduce oil oxidation, lower the actuator operating temperature with a heat exchanger or other means, or change to an oil more oxidation-resistant at the operating temperature.

⚠WARNING

To prevent possible serious injury or loss of life, or damage to the engine, resulting from engine overspeed or a runaway engine, be sure to use only oil that falls within the 50 to 300 SUS range. Using oils outside this range could cause the actuator to be unable to prevent a runaway engine.

Oil Maintenance

Replace the actuator oil if it is contaminated, and change it if it is suspected of contributing to instability. Drain the oil while it is still hot. Flush the actuator with a clean solvent having some lubricating quality (fuel oil or kerosene) before refilling with new oil. If drain time is insufficient for the solvent to completely drain or evaporate, flush the actuator with the same oil it is being refilled with to avoid dilution and possible contamination of the new oil.

Oil that has been carefully selected to match the operating conditions and is compatible with actuator components should give long service between oil changes. Check oil conditions regularly and change oil if any deterioration or contamination is suspected.

Regularly scheduled oil changes will extend the life of the actuator and improve actuator operation. Properly selected oil should permit annual oil changes, but more frequent changes are recommended.

Electrical Connection

The electrical connector on the UG40 Actuator is a 3-pin (MS-3102E-14S-7P) plug connector.

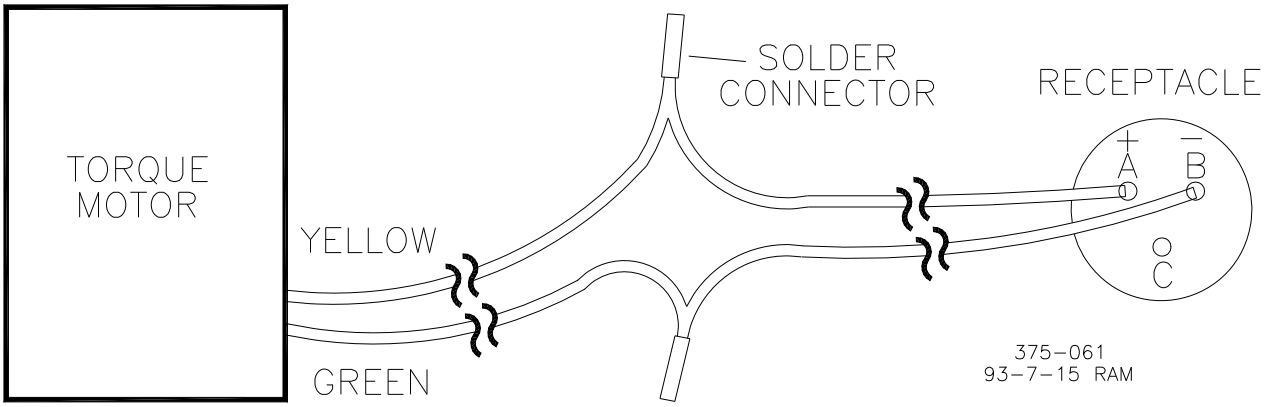


Figure 2-7. Wiring for a UG40 Actuator

Heat Exchanger Selection

A heat exchanger is available for the UG40 Actuator. It consists of a plate mounted on the front of the actuator. Passages are cut in the plate that allow cooling fluid to pass through the plate and remove energy from the actuator. The guidelines for when to use the heat exchanger are not straightforward, and some knowledge of the installation is required.

The pump on the UG40 Actuator generates energy which must be dissipated from the actuator. Most of the energy is dissipated through the bottom mounting surface of the actuator. Therefore, the more direct mounting (no gasket) and the better heat-dissipating mounting surface will allow the actuator to run at the lowest temperatures. If the low speed pump was applied, changing pump type to high speed type will minimize generating energy.

Using synthetic oil will eliminate the possibility of varnishing due to high oil temperature.

For more extreme applications, the actuator may require the heat exchanger and the lowest possible coolant temperature to the heat exchanger.

Chapter 3.
Actuator Operation

Introduction

This chapter provides initial operation instructions for the UG40 Actuator.

Initial Operation

Before initial operation of the engine equipped with a UG40 Actuator, read all of Chapter 2, Installation Procedures. Make sure that all installation steps have been correctly accomplished and all linkages are secured and properly attached.

Carefully review the direction of rotation for the actuator oil pump.

Follow this procedure when putting a new or repaired UG40 Actuator into service.

1. Check that the actuator is full of the proper type and grade of clean oil.

2. Properly adjust the linkage.

⚠WARNING

To prevent possible serious injury or loss of life, or damage to the engine, from an overspeeding engine, be sure to allow sufficient overtravel at each end of the terminal shaft, so the actuator can shut down the engine, and also give maximum fuel when required. Misadjusted linkage could prevent the actuator from shutting down the engine.

3. Select a LOW SPEED setting on the Woodward electronic control to give low engine speed at initial start up.

⚠WARNING

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.

4. Follow the engine manufacturer's instructions, and start the engine.

5. Adjust the selected speed setting on the Woodward electronic control as necessary to bring the engine to rated speed.

6. Obtain system stability as outlined in the electronic control instruction manual. (If less than the recommended actuator output stroke is used, it may cause for less than optimum engine stability or response.)

All operating adjustments of the UG40 Actuator are made during factory calibration. Additional adjustment should not be needed.

Chapter 4.
Principles of Operation

Introduction

This section describes the operation of the UG40 Actuator. The schematic drawing in Figure 1-3 illustrates the working relationship of the various parts.

Connecting oil passages between components is simplified for ease in visualizing the system.

The UG40 Actuator contains its own sump.

The UG40 Actuator consists of the following basic components:

1. **Oil Pump**
   Gerotor pump. Pump is driven by the actuator drive shaft.

2. **Relief Valve**
   Set to maintain internal operating pressure at 1725 kPa (250 psi).

3. **Oil Filter**
   Filters oil to the pilot valve to prevent contamination of the orifice and nozzle. Bypass oil flows through the filter, providing a filter-cleaning function.

4. **Torque Motor, Torque Motor Beam, Feedback Spring, and Loading Spring**
   Used to establish a mechanical position of the pilot valve flapper in response to the dc current being sent to the actuator.

5. **Pilot Valve Plunger**
   A follower-type valve, which duplicates the movement of the torque-motor beam, but at a much higher force level, controls flow of oil to and from the servo. The pressure regulator is used to minimize calibration shifts due to speed-induced pump pressure changes.

6. **Power Piston, Terminal Lever, and Terminal Shaft**
   The terminal lever converts the linear motion of the differential-type servo piston to rotary motion of the terminal shaft, which in turn moves the fuel linkage. The terminal-shaft position is fed back to the torque-motor beam to provide the proportional control.

Increase in Load or Speed Setting

An increase in load, or speed setting, causes an increase in control current from the electronic control to the torque motor. This, in turn, causes an increase in the torque-motor force, tending to lower the centering adjustment end of the torque motor beam. The flow of oil through the nozzle is decreased, which increases pressure on the top side of the differential power land. Pressure above the differential power land then moves the pilot-valve plunger down, or allows the plunger to follow the torque-motor beam as if they were one piece. Pressure oil is now directed to the underside of the servo piston, causing it to move upward, which rotates the terminal lever and terminal shaft in the increase-fuel direction.

As the terminal shaft rotates, the range adjustment and feedback linkage increases the feedback spring force, and cause the torque-motor beam to move away from the nozzle. As flow through the nozzle is less restricted, pressure decreases on the top side of the differential power land to start moving the pilot-valve plunger up. The terminal shaft and pilot-valve plunger movement continues until the increase in feedback-spring force equals the increase in force seen in the torque motor. When the pilot-valve control land is centered, all movement stops at the new position required to run the engine at the increased load or speed setting.

Decrease in Load or Speed Setting

A decrease in load or speed setting causes a decrease in control current from the electronic control to the torque motor. This, in turn, causes a decrease in torque motor force, and raises the centering adjustment of the torque motor beam. The pilot valve follows the beam and uncovers the control port. Oil trapped under the servo piston escapes to drain, causing the servo piston to move downward and the terminal shaft to rotate in the decrease-fuel direction.

As the terminal shaft rotates, the range adjustment and feedback linkage decrease the feedback-spring force. The terminal shaft rotates until the decrease in spring force equals the decrease in force in the torque motor, and the pilot-valve plunger is centered. This stops the servo piston and the actuator shaft in the new position needed to run the engine at the decreased load or speed setting.

Loss of Control Voltage

Upon loss of control voltage, the actuator terminal shaft goes to minimum fuel, thus offering a safety feature.

With loss of control voltage, there is no current sent to the torque motor and no magnetic force generated. The torque motor and attached beam and the force of the loading spring causes the center adjustment to raise. The pilot valve follows, keeping the control port uncovered. Trapped oil escapes to drain, and the servo piston moves down until it reaches minimum fuel position.

Chapter 5.
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:

1. Consult the troubleshooting guide in the manual.
2. Contact the **OE Manufacturer or Packager** of your system.
3. Contact the **Woodward Business Partner** serving your area.
4. Contact Woodward technical assistance via email (**EngineHelpDesk@Woodward.com**) with detailed information on the product, application, and symptoms. Your email will be forwarded to an appropriate expert on the product and application to respond by telephone or return email.
5. If the issue cannot be resolved, you can select a further course of action to pursue based on the available services listed in this chapter.

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

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

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

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

Product Service Options

Depending on the type of product, the following options for servicing Woodward products may be available through your local Full-Service Distributor or the OEM or Packager of the equipment system.

- 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 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.

Flat Rate Repair: Flat Rate Repair is available for many of the standard mechanical products and some of the electronic 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.

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. 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 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's Full-Service Distributors offer various Engineering Services for our products. For these services, you can contact the Distributor by telephone or by email.

- 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.

Product Training is available as standard classes at many Distributor locations. Customized classes are also available, which can be tailored to your needs and held at one of our Distributor 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 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 **www.woodward.com/directory**.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory published at **www.woodward.com/directory**.

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

Products Used In Electrical Power Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany:	
Kempen	+49 (0) 21 52 14 51
Stuttgart	+49 (711) 78954-510
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

Products Used In Engine Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany	+49 (711) 78954-510
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
United States	+1 (970) 482-5811

Products Used In Industrial Turbomachinery Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
India	+91 (129) 4097100
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

For the most current product support and contact information, please visit our website directory at **www.woodward.com/directory**.

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 _____

Engine Model Number _____

Number of Cylinders _____

Type of Fuel (gas, gaseous, diesel, dual-fuel, 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.

UG40 Actuator Specifications

Control Qualities	
Hysteresis	Within 3% of maximum travel when measured over full 38 degree travel. Within 0.5% of maximum travel when measured over 4% of full travel at 1 Hz.
Temperature Drift	Nominally ±1 degree per 38 °C (100 °F)
Time Constant	160 to 190 ms for 50 mA step with 1725 kPa (250 psi) actuator oil pressure
Linearity	Within 2.5% of full 38 degree output travel
Work Output	129 N·m (95 lb-ft) stalled torque; 85 J (63 ft-lb) of work over 38 degrees. The UG40 Actuator operates with 1725 kPa (250 psi) internal hydraulic pressure.
Pump	Gerotor. Relief valve set at 1725 kPa (250 psi).
Output Shaft	(2) 0.750-48 inch serrated. In same location relative to drive as UG40 governor.
Drive Shaft	1.125-48 serration is standard. 0.625 keyed drive shaft with 0.625-18 threads available.
Weight	29 kg (64 lb) dry weight
Vibration Resistance	Vibration tested to US MIL-STD 810C, Curve H (10 G to 2000 Hz; in Y-axis, parallel to drive shaft, 8 G maximum)
Drive/Hydraulic Specifications	
Drive Speed and Rotation	Actuator available with either high or low speed pump. High speed pump: 600 to 1300 rpm. Low speed pump: 350 to 1000 rpm. Drive operates in one direction only.
Drive Power Requirement	Drive will use a maximum of 525 W (0.7 hp)
Hydraulic Supply	Self contained sump, 7.0 liter (7.4 quart) capacity. See Woodward manual 25071, Oils for Hydraulic Controls, for specific recommendations.
Ambient Temperature Range	–29 to +93 °C (–20 to +200 °F)
Operating Temperature	–29 to +93 °C (–20 to +200 °F) within the limits of the oil being used in the governor
Electrical Specifications	
Electrical Connector	3 pin, MIL-STD 3102E-14S-7P, located in cover
Coil Resistance	23–26 Ω at 20 °C
Calibration	1–2 degrees at 20 mA, 32 ±2 degrees additional travel from 20 mA to 160 mA. Reaches maximum fuel at less than 200 mA.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 37515C.

B37515:C

PO Box 1519, Fort Collins CO 80522-1519, USA
1000 East Drake Road, Fort Collins CO 80525, USA
Phone +1 (970) 482-5811 • Fax +1 (970) 498-3058

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.

2012/8/Colorado