WOODWARD

ENGINE CONTROLS

UG-8 MAS GOVERNOR

WOODWARD GOVERNOR COMPANY Manual 36061

CONTENTS

⚠ WARNING

Read this entire Manual before installing, operating, or servicing this equipment. Follow the warnings and cautions to prevent injury or damage to persons.

The engine, turbine, or any other type of prime mover should be equipped with an overspeed (overtemperature, or overpressure, where applicable) shutdown device(s), that operates totally independently of the prime mover control device(s) to protect against runaway or damage to the engine, turbine, or other type of prime mover with possible personal injury or loss of life should the mechanical-hydraulic governor(s), or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.

PREFACE

About This Manual
This manual contains all the information you need to install and use the UG MAS Governor.

The manual explains:
- How to install, use and service the UG MAS Governor
- How to identify UG MAS Governor problems, and possible solutions to these problems.

Technical Assistance Group
If you encounter problems with the installation or operation of the UG MAS Governor which you can not solve yourself, do not hesitate to contact our Technical Assistance Group.

☎ 31-23-5661175 for Europe
1-800-648-9119 for USA
65-270-0081 for Asia

Repair
If you have to return equipment for repair, attach a label to the parts with the following information:
- Name and location where the control is installed
- Complete part number(s) and serial number(s)
- Description of the problem.

Use solid packing material that will not damage the surface of the unit.

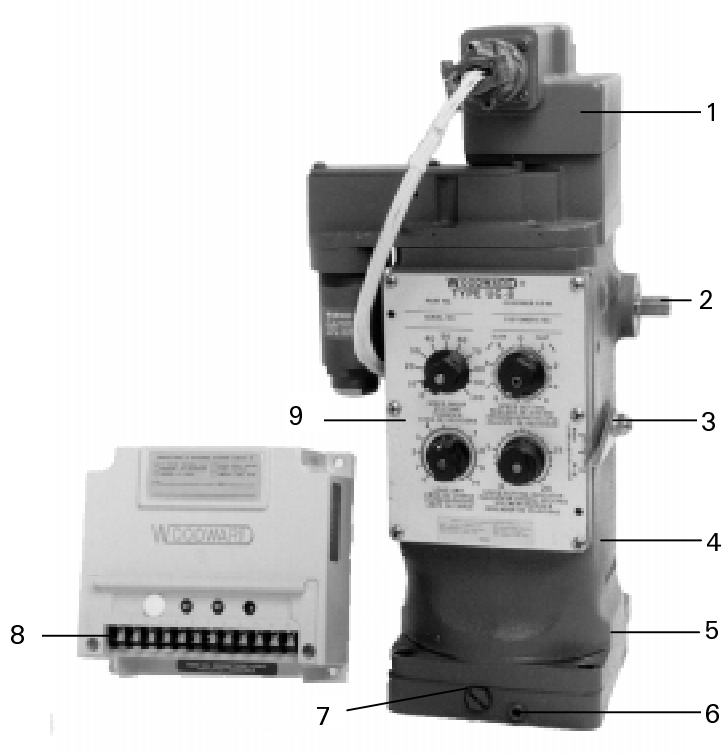
Replacement
When you have to order replacement parts for governors, include this information:

- The part number(s) on the enclosure nameplate
- The unit serial number, which is also on the nameplate
- The manual number and part reference
- For disassembly or overhaul refer to the Woodward Governor Company.

Training
If you do not feel confident in the operation of your UG MAS Governor, Woodward provides training courses by qualified Training Instructors in all aspects of controls. For more information contact the Technical Assistance Group.

1. INTRODUCTION

The UG MAS system enables you to control the speed of diesel, gas, dual fuel engines or steam turbines from a remote location by using a 4-20 mA signal. The UG MAS consists of an UG MAS governor with a stepper motor mounted on the cover and a UG MAS driver box. The UG MAS driver box has an amplifier which accepts a 4-20 mA signal to drive the stepper motor. The stepper motor rotates the speeder rod which sets the speed of the UG governor. The UG MAS governor output shaft has a rotation of 42° to provide a mechanical linkage to fuel racks or to fuel valves depending on the system. Application examples for UG MAS use are: locomotives, pumps, propulsion and compressors.



1 Stepper motor
2 Output shaft
3 Compensation pointer
4 Case
5 Base
6 Oil drain plug
7 Compensation needle valve plug
8 UG MAS driver box
9 Panel

UG MAS Governor and UG MAS Driver Box

Description	Work Output	Oil Pressure
UG-5.7	5.2 ft-lbs	110-120 psi
UG-8	9.7 ft-lbs	110-120 psi
UG-10	11.7 ft-lbs	140-150 psi

2. INSTALLATION

WARNING

In the event of a misaligned or broken drive shaft, an overspeed condition or runaway engine can develop. An overspeeding or runaway engine can result in extensive damage to the equipment, personal injury and/or loss of life.

CAUTION

The UG MAS driver box contains electrostatic sensitive components which can damaged by the human body. Before you install the driver box, discharge the static electricity on your body to ground.

2.1 Location Considerations UG MAS driver box

- Place the control in a location with adequate cooling ventilation, and enough space for servicing and repair.
- Protect the control against high voltage and high current devices, or devices which produce electromagnetic interference.
- Prevent the control from direct exposure to water or condensation.
- Avoid vibration of the control.
- Operating temperature between -40°C and +85°C.
- Do not mount the control on the engine.
- Length of the wires between the governor and the control, and the battery and the control should not exceed more than 10 meters.

For dimensions of the UG MAS driver box see outline drawing Figure 2-7.

2.2 Shielded Wiring

- Use shielded wires for the signal lines according to the wiring diagram Figure 2-6, to prevent interference from other equipment.
- Prepare the shielded wires as shown on Figure 2-1.
- Connect the shield to the nearest chassis ground and leave the other end of the shield open, see Figure 2-2.
- Do not install shielded wires next to high current wires.

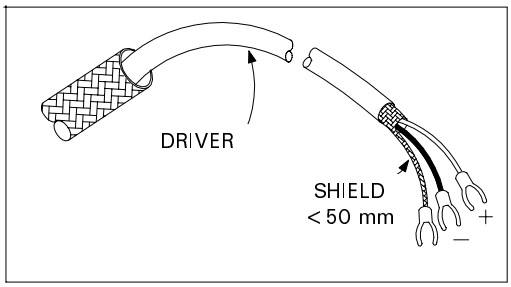


Figure 2-1 Preparing Shielded Wiring

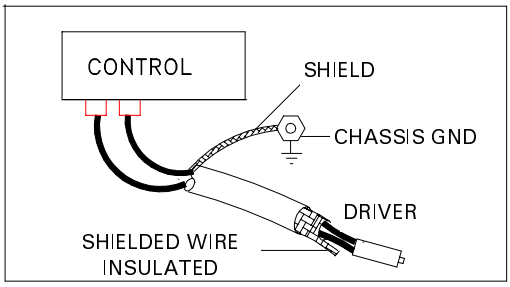


Figure 2-2 Shielded Wiring Connection

2.3 Power Supply

The UG MAS driver box requires 18-40 Vdc (24 Vdc nominal) uninterrupted power supply. You have to supply power to the UG MAS driver box terminals directly from the power source. When the power source is a battery, you have to be sure that the system includes a battery charger.

CAUTION

Do not power other devices with leads common to the control.

2.4 Install the UG MAS Governor

- Make sure the drive shaft rotates freely before you install the UG MAS governor.
- Check the condition of the coupling between the UG MAS governor and the engine drive.
- Use a proper gasket between the UG MAS governor and the engine.
- Install the UG MAS governor squarely on its mounting pad. Do not use any force to prevent that you push the drive shaft into the governor.
- Open the governor drive-shaft part on the engine (if the drive shaft is not a serrated type) and check for the right clearance at the gears. Incorrect alignment of the governor drive shaft to the coupling, or not enough clearance between any of the parts can result in excessive wear and/or seizure of the parts.
- See Figure 2-7 Outline Drawing for dimensions.

2.5 Oil Supply

Governor oil is a lubricating oil and a 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.

- Use the oil which depends on the operating temperature of the UG governor. Use the information in the Tables 2-1 and Table 2-2 to select a suitable lubricating/hydraulic oil.
- Fill the UG governor with approximately 1.4 liters of oil to the mark on the oil sight glass.

It is advisable to fill the governor with oil and let the air out from the governor as described in paragraph 3.2 before you connect the linkage.

Oil must be visible in the glass under all operating conditions.
For oil maintenance see paragraph 2.8.

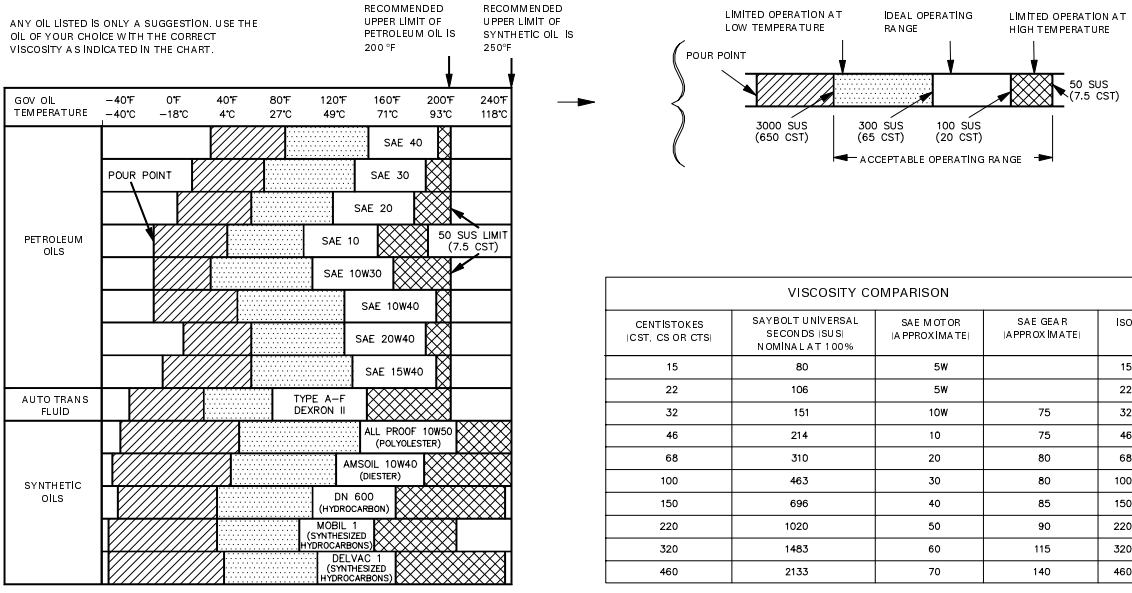


Table 2-1 Oil Chart

VISCOSITY COMPARISON				
CENTISTOKES (CST, CS OR CTS)	SAYBOLT UNIVERSAL SECONDS (SUS) NOMINAL AT 100%	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

Table 2-2 Viscosity Comparisons

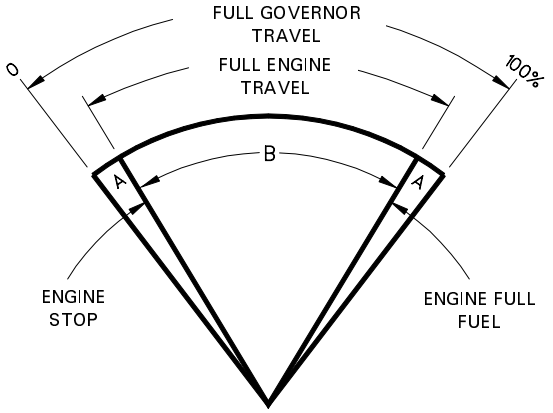
2.6 Output Linkage and Stops

WARNING

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

Adjust the fuel linkage to provide fuel control from "ENGINE STOP" to "ENGINE FULL FUEL" within the limits of 42° governor output shaft travel, see Figure 2-3. A minimum output shaft travel is required from "ENGINE STOP" to "ENGINE FUEL FULL" which is equal to 2/3 of 42°. On diesel engines use the diesel engine rack travel minimum and maximum stops, see Figure 2-4 On gas engines the butterfly valve requires a small amount of travel for a minimum fuel setting and a higher amount of travel for maximum fuel setting, see Figure 2-5.

Follow the engine manufacturer's instructions on linkage selection, installation and adjustment of the linkage.



A - OVER TRAVEL TO INSURE ENGINE STOPS ARE REACHED.

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

IN SPECIAL APPLICATIONS MIN AND MAX ENGINE STOPS MAY BE OUTSIDE THE GOVERNOR STOPS.

Figure 2-3 Recommended Output Shaft Travel Adjustment

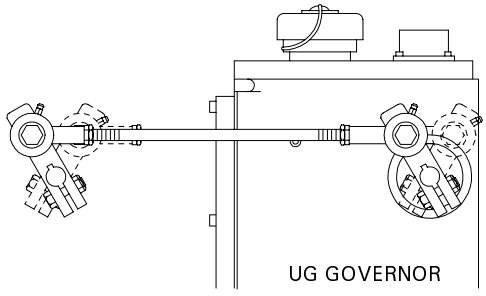


Figure 2-4 Linear Linkage

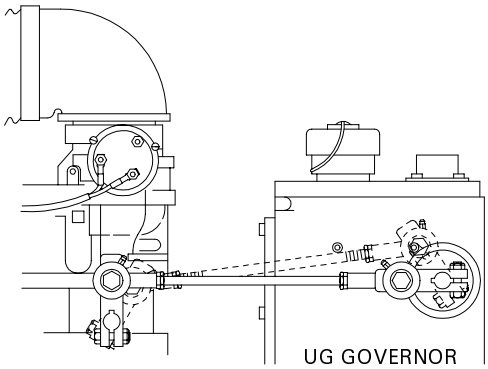


Figure 2-5 Nonlinear Linkage

2.7 Install the UG MAS Driver Box

Connect the UG MAS driver box to the UG MAS governor connector see Figure 2-6 Wiring Diagram.

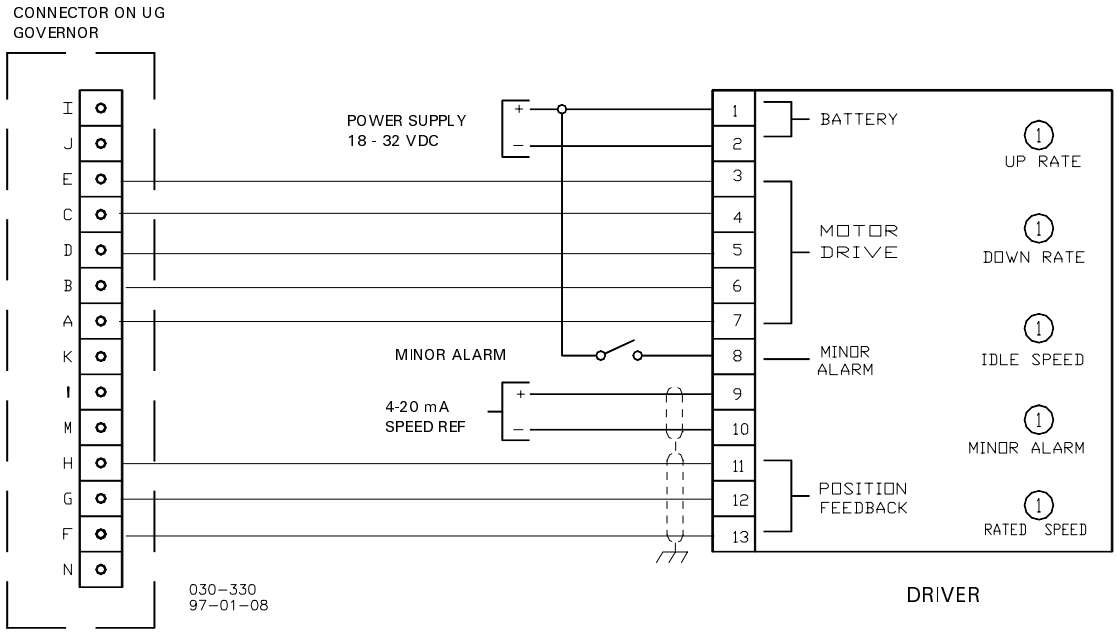


Figure 2-6 UG MAS Wiring Diagram

2.8 Oil Maintenance

Change the oil and flush the UG MAS governor two times a year if possible.

- Remove the drain plug and drain out the old oil. Fill the governor with fuel oil and then flush the governor with the engine running at low speed.
- Open the needle valve two or three turns to let the governor hunt for two minutes, then stop the engine and drain the governor. Flush the governor once again. Refill the governor with oil.
- Restart the engine and reset the compensation pointer and the needle valve.

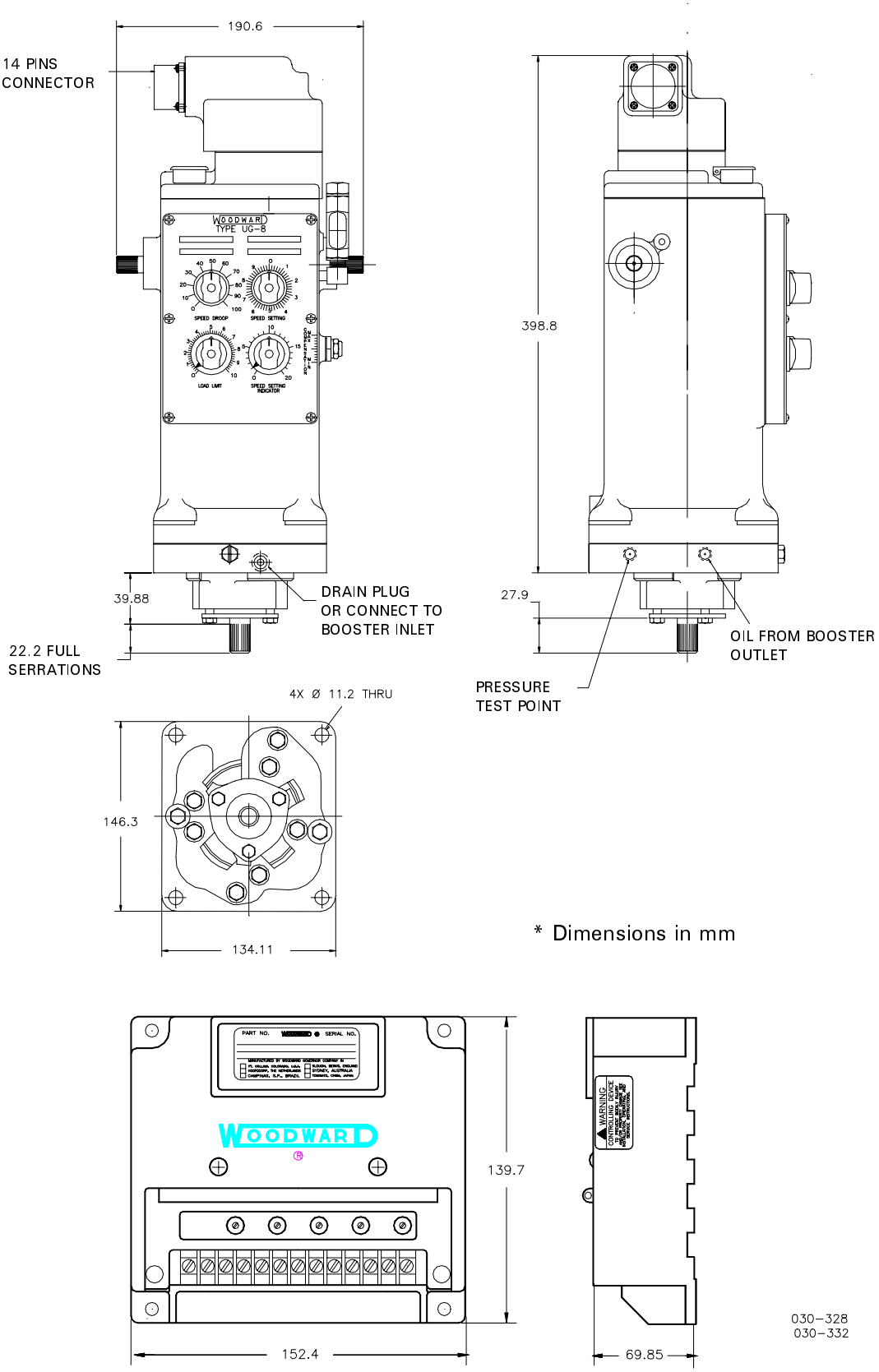


Figure 2-7 Outline Drawing UG MAS Governor and UG MAS Driver Box

* For serrations of the output shaft and the drive shaft see technical specification.

3. OPERATION

3.1 Installation Prestart Check

Complete these checks before you start the engine. Adjust the UG governor and the driver box:

- Check the linkage between the UG governor and the engine for correct binding.
- Check the oil level of the UG governor.
- Remove the compensation needle valve plug. Close the needle valve clockwise and open it counter clockwise 1/2 to 3/4 turn, to let oil in under the pistons. Use a Philips screwdriver.
- Move the fuel rack.
- Position the speed droop knob if required, see paragraph 3.3.
- Check for correct wiring and grounds, refer to Figure 2-6 Wiring Diagram.
- Check the UG MAS driver box for signs of damage, broken terminals and loose terminals.

3.2 Engine Start-Up

WARNING

To protect against possible personal injury, loss of life, and/or property damage when starting the engine, be prepared to make an emergency shutdown to protect against runaway or overspeed should the mechanical-hydraulic governor, or electric control, the actuator, fuel control, the driving mechanism, the linkage, or the controlled device fails.

When you perform the engine start-up, one person should be at the engine, to shutdown the engine in case of failures.

When you start the engine for the first time the UG governor may be stable at constant speed. Still the UG governor needs adjustment due to high overspeeds and underspeeds after load changes and a slow return to the normal speed.

Start the engine and run the UG governor until it is at operating temperature.
Adjust the UG governor for stable operation **without load**, with the compensation pointer and the compensation needle valve, see Figure on page 1.

- Loosen the nut on the compensation pointer and set the compensation pointer to the maximum position, to bleed trapped air from the UG governor oil passages. Be aware of sudden movement of the compensation pointer. Tighten the nut
- Open the needle valve two turns ccw with a Philips screwdriver to avoid damage to the needle valve. Let the engine hunt 30 seconds to bleed trapped air from the UG governor oil passages
- Loosen the nut on the compensation pointer and set the compensation pointer to the minimum position. Tighten the nut.
- Slowly close the needle valve until the hunting stops.
  If the hunting does not stop, then open the needle valve and turn the compensation pointer up by one mark, and slowly close the needle valve again.
- Repeat this operation until the hunting stops.
- When the UG governor adjustment is correct, tighten the compensation pointer nut.

The compensation adjustment is useful to find your particular setting at which the engine returns quickly to speed (needle valve adjustment) after a speed disturbance with only a slight over or undershoot (compensation pointer adjustment).

Check if the UG governor gives a good response at full load:

- Momentarily disturb the UG governor stability with the load limit knob.
- Turn the load limit knob slightly to 0 and bring it back quickly to its maximum position.
- Check if the UG governor returns to the speed with only a small overshoot or undershoot.
- If not adjust the needle valve setting to find a compromise between no load and full load.
- Install the compensation needle valve plug.

Keep the needle valve minimal 1/16 open. Closing the needle valve more makes the UG governor slow and decreases the UG governor stability which can cause hunting. The average needle valve settings are between 1/4 to 3/4 open.

Adjustment of the UG MAS driver box

- Set the speed setting on the UG governor and check that the engine speed is under control of the UG governor.
- Set the remote milliamp signal to 4 mA.
- Apply 24 Vdc to the UG MAS driver box and check that the engine runs at the adjusted low speed level. If not then adjust the "IDLE SPEED" and "RATED SPEED" potentiometers, till you have the desired low speed.
- Set the remote milliamp signal to 20 mA and check that the engine runs at the adjusted high speed level. If not then adjust the "IDLE SPEED" and "RATED SPEED" potentiometers, till you have the desired high speed.

3.3 Control Functions of the UG MAS Governor

SPEED SETTING

Rotating the "SPEED SETTING" knob allows you to change the engine speed for a single engine operation, when the UG MAS driver box is disconnected. For engines which operate parallel it is used to change the engine load.

SPEED SETTING INDICATOR

The "SPEED SETTING INDICATOR" knob has no function of its own but has an indicator scale which shows the "SPEED SETTING" knob position.

SPEED DROOP

Droop is expressed as a percentage of the original speed setting from no load to full load. 3 or 5% droop is the normal recommended percentage of droop. Droop makes loadsharing between engines possible. The "SPEED DROOP" knob is factory set at zero droop. Use the Governor Specification Report if you have to adjust an amount of droop in your UG governor.

If instead of a decrease in speed setting an increase takes place, then the UG governor shows negative droop which will cause instability. Return the UG governor to Woodward for repair.

Droop is calculated with the following formula:

$$\%\,\text{Droop} = \frac{\text{No Load Speed - Full Load Rated Speed}}{\text{Full Load Rated Speed}} \times 100$$

$$\%\,\text{Droop} = \frac{1236 - 1200}{1236} \times 100 = \pm\, 3\%$$

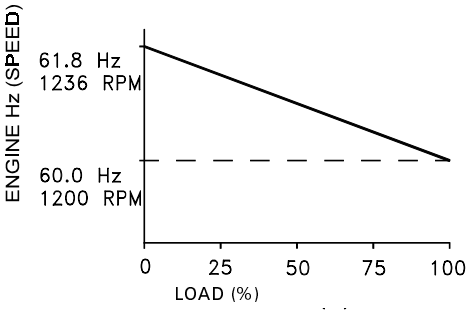


Figure 3-1 Example of Droop

The marks on the speed droop scale are reference numbers and do not represent droop percentages. Thus the 100 mark does not represent 100% droop. It represents the max. droop percentage available on that particular governor model.

LOAD LIMIT
The "LOAD LIMIT" knob limits the load that can be placed on the engine by restricting the travel of the governor output shaft (in the increased fuel direction). You can reduce manually the fuel limit during starting. For normal operation the "LOAD LIMIT" knob should be set at 10.

CAUTION
Do not manually force the engine linkage to increase fuel without first turning the "LOAD LIMIT" knob to the maximum position (10). Force can cause damage to the UG governor internal parts.

3.4 Control Functions of the UG MAS Driver Box

UP RATE
Rotating the "UP RATE" potentiometer allows you to set the time in which the engine goes from idle speed to rated speed.

DOWN RATE
Rotating the "DOWN RATE" potentiometer allows you to set the time in which the engine goes from rated speed to idle speed.

IDLE SPEED
Adjusting the "IDLE SPEED" potentiometer gives you the speed setting for a given milliamp input signal.

MINOR ALARM
Adjusting the "MINOR ALARM" potentiometer allows you to limit the maximum speed of the governor in case of low lube oil pressure or high cooling water temperature.

RATED SPEED
Adjusting the "RATED SPEED" potentiometer determines your speed change over the 4-20 mA input signal range.

4. TROUBLE SHOOTING

This table gives an overview of the observed faults which are noted during maintenance on the UG MAS Governor. When you have an observed fault, go to the paragraph as mentioned in table 4-1.

Table 4-1 Observed Faults

Fault Description	Go to Paragraph
Fuel rack does not open quickly when cranking the engine.	4-1
Engine hunts or surges.	4-2
Jiggle at the UG governor output shaft.	4-3
Load does not divide properly on paralleled engines.	4-4
Engine responds too slow to a speed change or a load change.	4-5
Engine does not reach rated full load.	4-6
Engine speed increases with an increase in load.	4-7
Speed variations of the engine (not necessarily caused by UG).	4-8
UG MAS driver box failure.	4-9
Engine does not run above idle speed and stepper motor makes sound.	4-10
Engine runs at idle speed and stepper motor makes no sound.	4-11
Engine runs ok, untill a speed lower than the rated speed.	4-12

4.1 Fuel rack does not open quickly when cranking the engine

Possible cause	Solution
• Low oil pressure in the UG governor.	→ Return the UG governor to Woodward for repair.
• Cranking speed too low.	→ Use a booster servo motor if necessary.

4.2 Engine hunts or surges

Possible cause	Solution
• Compensation adjustments of the UG governor are incorrect.	→ Adjust the compensation needle valve and compensation pointer.
• Dirty oil or sludge in UG governor.	→ Drain and clean the UG governor and refill with new or filtered oil.
• Low oil level which permits air to enter and causes foaming.	→ Add oil to the governor and check oil level against the mark on the sight glass. → If the oil level decreases and you don't see external leaks on the UG governor, then check the drive shaft for oil leaks. → If foaming continues, drain oil and refill with a different type of oil.
• Oil varnish which causes sticking parts.	→ Repair the UG governor.
• Lost motion in engine linkage or fuel pumps.	→ Repair linkage and/or pumps.
• Binding in engine to UG governor linkage or fuel pumps.	→ Repair and realign linkage and/or pumps.
• UG governor output shaft travel is too short to provide full fuel.	→ Adjust travel until the UG governor has the right travel.
• Spring on yield linkage to fuel racks too weak.	→ Install heavier spring.
• Low oil pressure Normal operating pressure for UG 5.7 and 8 between 110-120 psi and for UG 10 between 140-150 psi.	→ Return the UG governor to Woodward for repair.

4.2 Engine hunts or surges (continuation)

Possible cause	Solution
• Pump check valves are not seating or accumulator springs too weak.	→ Return the UG governor to Woodward for repair.
• Power piston is sticking.	→ Check for sideplay or binding of the UG governor output shaft.
• Fuel linkage incorrectly set.	→ Adjust the linkage from UG governor to engine to get linear relationship.
• Faulty linkage.	→ Check yield links, shutdown arrangements, etc., to be sure that the engine torque changes for very small increments of governor output shaft travel.
• Incorrect non-linear relationship between governor travel and horsepower output of the engine. Engine hunts with a light load and stabilizes with a heavy load.	→ Adjust the linkage from the UG governor to the gas valve to get linear relationship between the UG governor travel and the engine output.
• Gas or steam pressure too high.	→ Adjust the gas or steam pressure.
• Load limit indicator binding on nameplate or load limit shaft bent.	→ Correct or replace the damaged indicator. Replace the load limit shaft if bent.
• Droop calibration out of adjustment. Negative droop when speed droop knob at 0.	→ Return for readjustment to Woodward.
• UG governor wear.	→ Return UG governor to Woodward for repair.

4.3 Jiggle at the UG governor output shaft

Possible cause	Solution
• Rough engine drive or rough UG governor drive.	→ Inspect drive mechanism: Check alignment of gears. Inspect for rough gear teeth, eccentric gears or excessive backlash in gear train. Check gear keys and nuts or set screws holding drive gears to shafts. Check for bent drive shaft. Check serrated or spline coupling for wear and alignment. → Check the backlash and the gear shimmed so that there is no binding, if you use a keyed drive.
• Improper UG governor alignment.	→ Loosen the UG governor mounting screws and move the UG governor slightly on its mounting pad to align the drive shaft with its coupling.
• Failure of flexible drive in flyweight head. • Dirty or worn ballhead bearing. • Rough or worn gear teeth. • Bent speeder spring. • Damaged drive shaft seal retainer.	→ Return the UG governor to Woodward for repair, if one of these causes appear.
• Air in the UG governor which causes a jiggle during startup or transient.	→ Check that the UG governor has a 110-120 psi oil pressure at normal operating speed.

4.4 Load does not divide properly on paralleled engines

Possible cause	Solution
• Speed droop adjustment incorrect.	→ Adjust the droop to divide the load properly.
• Speed settings of the UG governor are not the same.	→ Adjust the speed setting to run the engines at the same speed.

4.5 Engine responds to slow to a speed change or a load change

Possible cause	Solution
• Needle valve adjustment incorrect.	→ Adjust the compensation needle valve. Open the compensation needle valve without causing instability when running the governor without load. Compensation pointer may be too far toward maximum.
• UG governor is not sensitive enough to measure speed changes (deadband).	→ Friction or wear on flyweight toes. Sludge in the UG governor. Return the UG governor to Woodward.
• Low oil pressure in the UG governor.	→ Return the UG governor to Woodward to inspect pump and check valves.
• Engine overloaded.	→ Reduce the load.
• Restricted fuel supply.	→ Clean the fuel supply filters.
• Load limit knob set to restrict fuel.	→ Increase the load limit setting.

4.6 Engine does not reach rated full load

Possible cause	Solution
• Fuel rack does not open far enough, or the UG governor its at the end of its stroke and the load limit indicator is set at 10.	→ Adjust the engine to the UG governor fuel linkage. Adjust the load limiting device or fuel pump stops. → Check compression of load limit friction spring. Low compression permits load limit cam to work toward reduced load position.
• Restricted fuel supply	→ Clean the fuel supply filters. Gas pressure too low. or gas with different calorific value.
• Load limit knob set to restrict fuel.	→ Increase the load limit setting.

4.7 Engine speed increases with an increase in load

Possible cause	Solution
• Droop calibration out of adjustment. Negative droop when speed droop knob at 0.	→ Return for readjustment to Woodward.

4.8 Speed variations of the engine (not necessarily caused by the UG governor)

Possible cause	Solution
• Load changes beyond the capacity of the engine.	→ Check the load that the speed changes are not result of the load changes.
• Lost motion in linkage between the UG governor and fuel rack or valve.	→ Repair the linkage. There must be no binding or lost motion.
• Dirty or less oil in the UG governor.	→ Check that the oil is clean and the oil level is correct at operating temperature.
• Incorrect alignment of the drive to the UG governor.	→ Check that the drive to the UG governor is correctly aligned and free of roughness, side loading and excessive backlash.

4.9 UG MAS driver box failure

Possible cause	Solution
• Power supply below 18 Vdc.	→ Stop the engine and measure the voltage at terminals 1 and 2. If the voltage is below 18 Vdc then investigate the power supply. → If the power supply is ok, then disconnect terminals 11 and 13 and measure the voltage of the position feedback. If the voltage is not 5 Vdc, then replace the driver. → If there is no fault found in the first two steps, then check the milliamp signal at terminal 9 and 10. The milliamp signal should be 4-20 mA. → If no fault has been found, measure the resistance over these pins:A-E, B-E, C-E and D-E of the governor. The resistance should be between 1.3 and 1.7 Ω. If no fault is found then the stepper motor or the stepper motor wires are broken. Return the UG MAS to Woodward.
• Break in connection to the potentiometer, failure of the potentiometer, or loss of supply to the potentiometer.	→ Follow the same procedure as mentioned above.
• Open circuit of the stepper motor or break in connection to the motor.	→ Follow the same procedure as mentioned above.

4.10 Engine does not run above idle speed and stepper motor makes sound

Possible cause	Solution
• Loss of milliamp input signal.	→ Check the voltage at terminals 9 and 10 (0.6 Vdc for 4mA.
• Broken potentiometer or potentiometer wire.	→ Return UG MAS driver box to Woodward.
• Iincorrect adjustment of DLE SPEED and RATED SPEED potentiometers.	→ Readjust the IDLE SPEED and RATED SPEED potentiometers.

4.11 Engine only runs at idle speed and stepper motor makes no sound

Possible cause	Solution
• No voltage supplied to the driver.	→ Check the voltage on terminals 1 and 2.

4.12 Engine runs ok, until a speed lower than the rated speed

Possible cause	Solution
• Voltage supply to terminal 8 (MINOR ALARM).	→ Remove voltage supply at terminal 8.

5. TECHNICAL SPECIFICATION

UG MAS Specifications	
Weight	22.7 kg (50 lbs), dry weight
Work Output	UG-5.7, 7.1 J (5.2 ft-lbs) work over 42° rotation UG-8, 13.2 J (9.7 ft-lbs) UG-10, 15.9 J (11.7 ft-lbs)
Output Shaft	Standard .500 inch - 36 serrations on output shaft on both sides Optional .500 inch - 36 serrations single side left Optional .500 inch - 36 serrations single side right Optional .500 inch -36 grooved
Drive shaft	Standard .625 inch - 36 serrations on drive shaft Optional .625 inch keyed Optional metric serrated ∅16 mm - 31 serrations Optional .600 inch - 12 spline Optional .750 inch - 6 spline
Drive Power Requirement	250 W at normal speed and temperature. Drive operates in clockwise (CW) and counterclockwise (CCW) direction
Construction	Case, base and cover are cast iron.
Max. Operating Temperature	60°C to 93°C
Ambient temperature	-29°C to 99°C
Speed	Maximum speed 375-1500 rpm. Recommended speed 1000-1500 rpm
Hydraulic Oil	Self contained sump, 1.4 liter capacity. SAE 10 to 50 is recommended with a viscosity of 100 to 300 SSU
Hydraulic Pressure	110-120 psi for UG-5.7 and UG-8 and 140-150 psi for UG-10

UG MAS driver box	
Weight	0.79 kg (1.8 lbs) dry weight
Power Supply Rating	18-32 Vdc (24 Vdc nominal)
Current Signal	4-20 mA into 250 Ω
Max. Operating Temperature	-30°C to 70°C
Accuracy/Linearity	Within 2% of speed range

If you want to have more detailed information concerning the description or principle of operation of the UG MAS Governor, refer to Manual 03047.

We appreciate your comments about the content of our publications.
Please send comments to:

Woodward Governor Nederland B.V./Engine Controls
P.O. Box 34, 2130 AA Hoofddorp
Hoofdweg 601, 2131 BA Hoofddorp
The Netherlands
Phone: 31--23-5661111
Fax: 31-23-5636529

WOODWARD LOCATIONS:

Hoofddorp, The Netherlands	Phone 31-23-5661111	Fax 31-23-5636529
Asia/Pacific Regional Office, Singapore	Phone 65-270-0081	Fax 65-271-6250
Fort Collins, USA	Phone 1-970-482-511	Fax 1-970-498-3058