WOODWARD

Application Note 51639
(Revision -, 03/2022)
Original Instructions

ProAct™ Analog (Gen1) or Digital Plus (Gen2) Upgrade to Gen3 FLEX Actuator

Exchange Procedure for WinGD / Wärtsilä 2-Stroke Engines

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. To verify that you have the latest revision, check manual *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, on the *publications page* of the Woodward website:

http://www.woodward.com

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.

Proper Use

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

Translated Publications

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

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 Out-of-date translations are marked with ⚠.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

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

Application Note 51639

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Important Definitions

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

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

⚠WARNING

Lockout/Tagout

Ensure that personnel are fully trained on LOTO procedures prior to attempting to replace or service equipment on a "live" running engine. All safety protective systems (overspeed, over temperature, overpressure, etc.) must be in proper operational condition prior to the start or operation of a running engine. Personnel should be equipped with appropriate personal protective equipment to minimize the potential for injury due to release of hot hydraulic fluids, exposure to hot surfaces and/or moving parts, or any moving parts that may be activated and are located in the area of control of the equipment.

⚠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.

⚠WARNING

Automotive Applications

On- and Off-Highway Mobile Applications: Unless Woodward's control functions as the supervisory control, customer should install a system totally independent of the prime mover control system that monitors for supervisory control of engine (and takes appropriate action if supervisory control is lost) to protect against loss of engine control with possible personal injury, loss of life, or property damage.

⚠WARNING

IOLOCK

IOLOCK: driving I/O into a known state condition. When a control fails to have all the conditions for normal operation, watchdog logic drives it into an IOLOCK condition where all output circuits and signals will default to their de-energized state as described below. *The system MUST be applied such that IOLOCK and power OFF states will result in a SAFE condition of the controlled device.*

- **Microprocessor failures will send the module into an IOLOCK state.**
- **Discrete outputs / relay drivers will be non-active and de-energized.**
- **Analog and actuator outputs will be non-active and de-energized with zero voltage or zero current.**

Network connections like CAN stay active during IOLOCK. This is up to the application to drive actuators controlled over network into a safe state.

The IOLOCK state is asserted under various conditions, including:

- **Watchdog detected failures**
- **Microprocessor failure**
- **PowerUp and PowerDown conditions**
- **System reset and hardware/software initialization**
- **PC tool initiated**

NOTE—Additional watchdog details and any exceptions to these failure states are specified in the related section of the product manual.

NOTICE

Battery Charging Device

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.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

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

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

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

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Touch your finger to a grounded surface to discharge any potential before touching the LECM or installing cabling connectors. Alternatively, ESD mitigation may be used as well: ESD smocks, ankle or wrist straps and discharging to a reference grounds surface like chassis or earth are examples of ESD mitigation.
    - ESD build up can be substantial in some environments: the unit has been designed for immunity deemed to be satisfactory for most environments. ESD levels are extremely variable and, in some situations, may exceed the level of robustness designed into the control. Follow all ESD precautions when handling the unit.
        - I/O pins within connectors have had ESD testing to a significant level of immunity to ESD, however do not touch these pins if it can be avoided.
            - Discharge yourself after picking up the cable harness before installing it as a precaution.
        - The unit is capable of not being damaged or improper operation when installed to a level of ESD immunity for most installation as described in the specifications. Mitigation is needed beyond these specifications.

IMPORTANT

External wiring connections for reverse-acting controls are identical to those for direct-acting controls.

Chapter 1.
General Information

Introduction

In the past, WinGD / Wärtsilä has been using Woodward ProAct actuators as fuel pump actuators on their 2-stroke engines. Initially ProAct Analog actuators were used, but they were not able to cope with the system inertia.

A replacement with the ProAct Digital Plus actuator was introduced in 2015 to solve this issue (refer to Application Note 51516). In the ProAct Digital Plus actuator (p/n 8404-114) the inertia setting is already pre-configured for this application.

To cope with component obsolescence and to meet RoHS compliance Woodward developed the ProAct Gen3 FLEX actuator. Again, the new actuator is pre-configured for this specific two-stroke application. No adjustments are required; after installation (as described in the manual) the actuators are immediately ready for use.

Scope of Manual

This manual will help the technician perform the work that must be carried out during an upgrade to the FLEX actuator. Most engines will already have been upgraded from ProAct Analog actuators to ProAct Digital Plus actuators. This document gives information as to how to upgrade both the Analog and the Digital Plus-equipped systems to the new ProAct Gen3 FLEX actuator.

Woodward strongly recommends studying this procedure thoroughly before the replacement is undertaken.

Part Numbers

The ProAct actuators used by Wärtsilä are the Model 2 on smaller engines and the Model 4 on larger engines.

Table 1-1. ProAct Part Numbers

ProAct	Model 2	Model 4	Class
Analog	8404-207	not used	Generation 1
Digital Plus	8404-114	8404-039	Generation 2
FLEX	8404-317	8404-336	Generation 3

Chapter 2.
Replacement Procedure

Required Tools

- Full set of hexagon keys (metric and imperial)
- 13 mm end wrench (fuel linkage)
- Adjustable wrench (multi-purpose)
- Flat blade screwdriver (screw terminals)

References

Installation, Programming and Troubleshooting Manual 26915, ProAct Gen3 FLEX Position Controller.

Electrical Removal of the Analog or Digital Plus Actuator

WARNING **Shut down the engine before working on the ProAct actuator.**

1. Switch off the 24 Vdc power supplies of the currently installed ProAct actuators.
2. Disconnect the 4-20 mA analog signals in the control cabinet or make sure to isolate/mask the analog signal wiring after removal from the actuator's PCB.
3. Loosen the cable glands that are installed in the cover. This will allow sliding the cover over the electrical cables.
4. Open the cover of the ProAct actuator by removing the six M4 screws, carefully slide and lower the cover over the electrical cables.
5. You will now have access to the wire terminals. Identify (positive/negative). Check that the power is switched off by means of a multi-meter and disconnect the wiring from the terminals.

Figure 2-1. Accessing Wire Terminals

6. Inspect the wiring for any damage or alteration. Replace if necessary.
7. Note any modifications found or carried out.
8. Remove the electrical cables from the cover and from the cable glands. Place the cables nearby where they won't be damaged. The cover with glands will not be re-used and can be discarded with the old actuator later.

Mechanical Removal of the Analog or Digital Plus Actuator

Most ProAct Analog applications have dampers installed on the actuator terminal lever. This is done to simulate a higher inertia system, which positively affects the control behavior of the actuator.

With the new Gen3 FLEX system inertia can be configured in the software and therefore there will be no need to re-install these dampers onto the actuator terminal lever.

The dampers in a ProAct Analog system ***must*** be discarded from the system. After this, the removal of the old actuators follows the exact same process outlined below.

1. Remove the bolt that connects the actuator terminal lever to the connecting link.
2. Fold away the connecting link.
3. Loosen the bolt that secures the actuator terminal lever onto the actuator output shaft.
4. Remove the actuator terminal lever from the actuator output shaft.

Figure 2-2. Removing Actuator Terminal Lever from Actuator Output Shaft

IMPORTANT

Be careful not to drop or lose the serrated bushing or sleeve that is located inside the actuator terminal lever!

Inspect the linkage parts for any wear and/or excessive clearances.

Replace parts if necessary.

5. Dismantle the actuator from its mounting plate by removing the four M8 x 1.25 bolts that are located at the back of the actuator. Secure the four M8 bolts as they will be re-used later with the new actuator.

Figure 2-3. Dismantling Actuator from Mounting Plate

⚠CAUTION

Be aware of the weight of the actuator. ProAct Model 2 weighs approximately 11 kg (24.3 lbs). Model 4 weighs approximately 21 kg (46.3 lbs).

IMPORTANT

Inspect the actuator support bracket for any malfunctions or irregularities.

All components and connections must be secure.

Replace parts if necessary.

Mechanical Mounting of the Gen3 FLEX Actuator

The new ProAct Gen3 FLEX actuator is equipped with the exact same mounting pattern for the four M8 x 1.25 bolts that mount the actuator to the support plate. No rework of the new actuator or the support plate is needed; it is a drop-in replacement.

Most likely the support bracket will meet the criteria noted in Figure 2-4 if the ProAct Analog or Digital Plus actuator has been installed correctly in the past.

1. Check the support bracket for cleanliness and flatness.
2. Install the Gen3 FLEX actuator using the four M8 x 1.25 bolts. Make sure that a minimum engagement of 16 mm is achieved.
3. Torque the four M8 bolts to 22.6 N·m (200 lb-in).

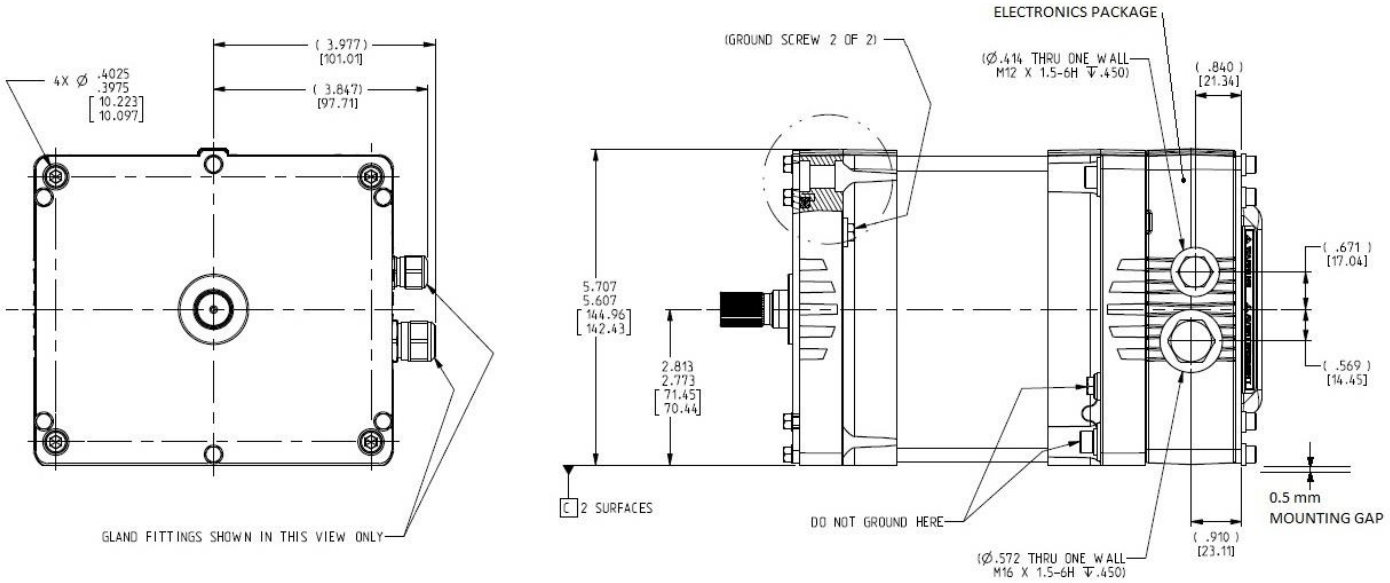

Figure 2-4. ProAct Gen3 FLEX Actuator Mounting Views with Mounting Gap

NOTICE

A minimum gap of 0.5 mm must be maintained between the support bracket and electronics enclosure as shown in the above figure. This is necessary because the enclosure is supported on vibration isolators to filter out high-frequency vibrations from reaching the electronics. If the enclosure contacts the brackets, the isolation is defeated and may reduce the electronics operating life.

If spacers are used to achieve the necessary gap, Woodward recommends maximizing the surface contact area of the spacers to maximize heat transfer between the ProAct and mounting bracket.

Electrical Installation of the Gen3 FLEX Actuator

Remove the electronics housing cover by removing the six #10-32 screws using a 5/32-inch Allen wrench. Safeguard the screws and cover as they will be used later-on. To ensure that no contamination enters the electronic housing while the cover is removed, do not leave the cover detached any longer than necessary.

The wiring to either the Analog or Digital Plus actuator consists of two cables: one for the 24 Vdc power supply and one for the 4-20 mA control signal.

- It is recommended that ferrules be utilized with stranded wire at connections to terminal blocks. 8mm pin length insulated ferrules are recommended for signal connections.
- Panduit® ferrule part number FSD77-8-D or equivalent would be appropriate for use with an 18AWG wire termination. 9mm pin length non-insulated ferrules are recommended for power connections.
- Panduit ferrule part number F81-9-M or equivalent would be appropriate for use with 12AWG power wire termination. Ferrule diameter should be sized accordingly for the wire chosen for signal and power connections to the ProAct Gen3 FLEX.
- For best results, Woodward recommends using a crimp tool that creates a square crimp at the ferrule. WAGO tool part number 206-204 creates a square crimp for the size range of wire recommended for use with the ProAct Gen3 FLEX actuator.

1. The Gen3 FLEX actuator comes equipped with two cable glands. Route the power cable thru the larger gland, and make sure to put the dome nut, sealing sleeve, and sealing collar on the cable prior to feeding through cable gland body. See Figure 2-5 below.
2. Some cable glands will be used with only a sealing collar and without the sealing sleeve. In this case, ensure that the dome nut and sealing collar are on the cable prior to feeding through the cable gland body. After installing the wires, apply thread locker (Recommended Loctite 243 or equivalent) to the dome nut threads and screw the dome nut onto the cable gland body.
3. Make sure that the cable's overall jacket extends slightly into the electronics housing so that the rubber seal completely and tightly grips the cable jacket and reduces the chance of chaffing through wire insulation during operation, Reference Figure 2-5.
4. Do the same for the signal cable thru the smaller gland.

Figure 2-5. Cable Gland Components

The recommended torque for the cable gland top dome nut is (2.8 ± 0.3) Nm / (25 ± 2.5) lb-in against the sealing collar and sleeve as shown below in Figure 2-6 picture 4.

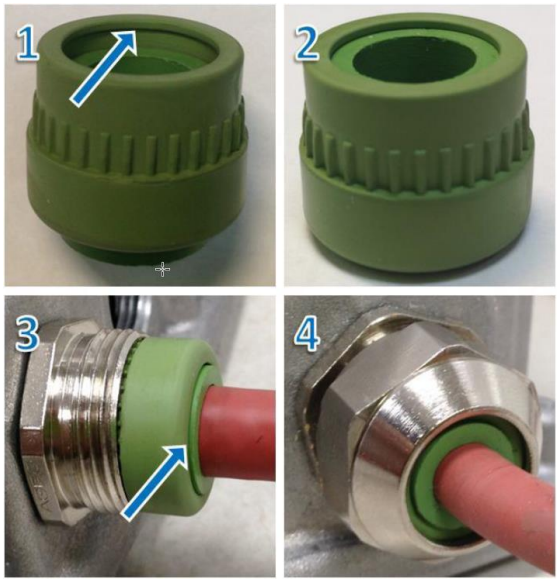

Figure 2-6. Cable Gland Sealing

Note: In picture 1 of Figure 2-6, there is a ridge visible on the inside bottom of the sealing collar for the sealing sleeve to stop on. Do not push the sealing sleeve past this ridge. If the sleeve is installed past the ridge, the cable gland will not seal properly. Picture 3 shows a correct installation with the sealing sleeve slightly proud of the sealing collar.

5. Insert the ferrules and wires through the cable gland, providing enough wire inside the electronics housing to run loose wires to connection points at the terminal blocks. Use a small, flathead screwdriver inserted in the top of the wiring terminals for TB-4 (I/O Terminal) and inserted from the front for TB-1 (Power Terminal) to assist in the insertion of the ferrule into its associated terminal location. Figure 2-7 (I/O) and Figure 2-8 (Power) show the steps for properly installing a wire in the terminal using a small, flathead screwdriver.

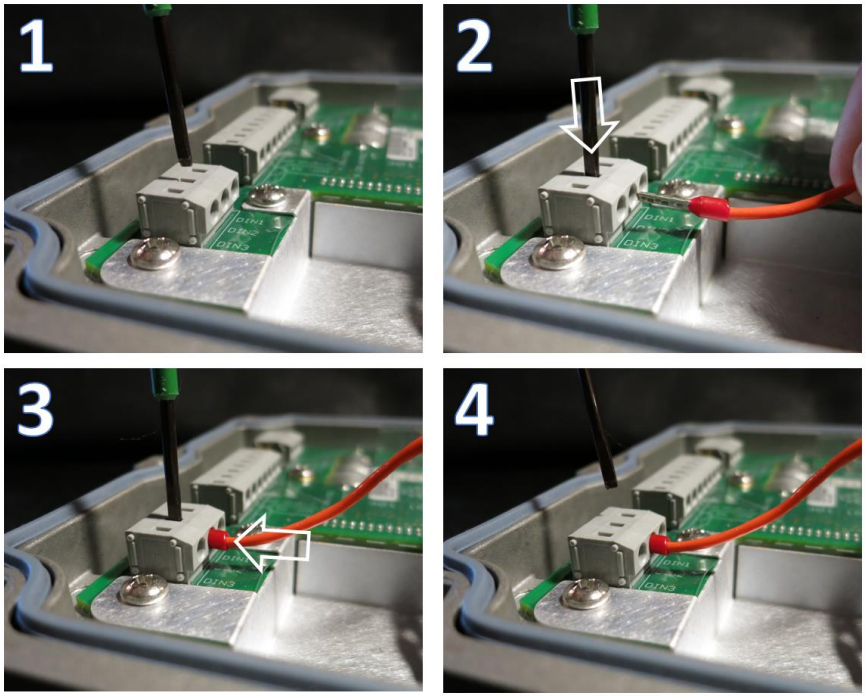

Figure 2-7. I/O Terminal Block Ferrule Installation

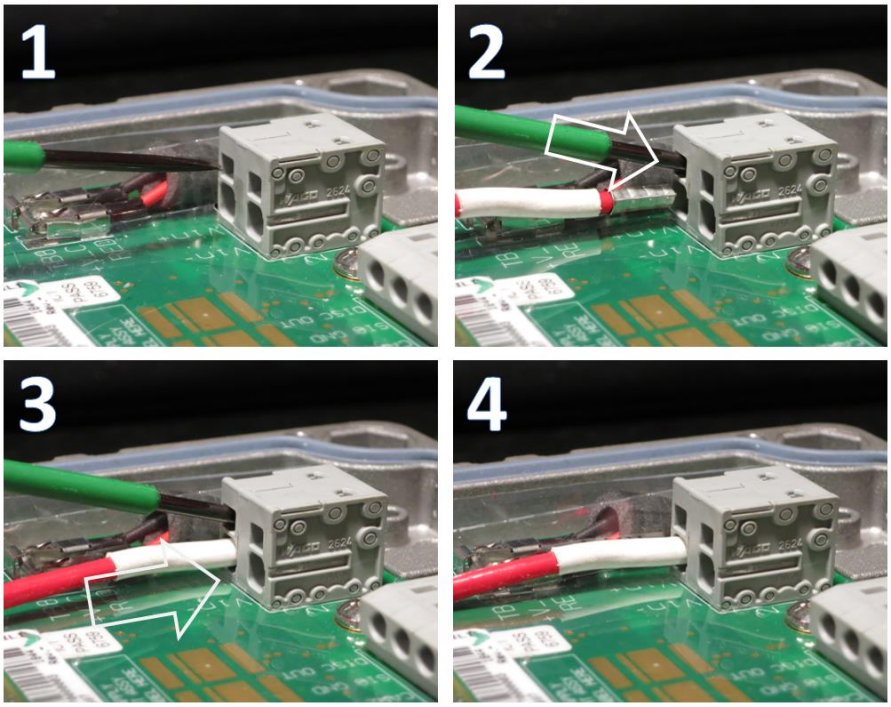

Figure 2-8. Power Terminal Block Ferrule Installation

6. With the exception of chassis shield ground, it is recommended that the wire routing is limited to the center of the electronics housing cavity, in the area between the rows of terminal blocks. Staying in this area will help avoid pinching any wires between terminal blocks and the cover or between cover and housing. There should be some slack in the wires between the entry point and the terminal block. With wires routed slack in the center of the electronics housing, there should be natural overlap of groups of wires. Using cable ties at these locations (where practical) will help support wires, reduce wire fatigue, and reduce fretting wear due to shock and vibration in application. An example of wire routing in the electronics cavity of the ProAct Gen3 FLEX is shown in Figure 2-9. Any cable ties selected for use in the ProAct Gen3 FLEX should be capable of temperatures typical of the application.

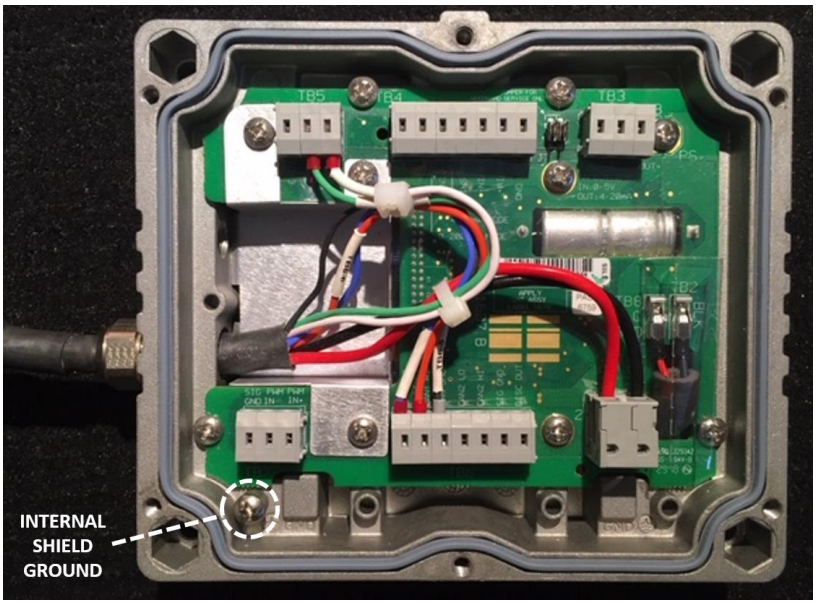

Figure 2-9. Example of Internal Wiring of ProAct Gen3 FLEX

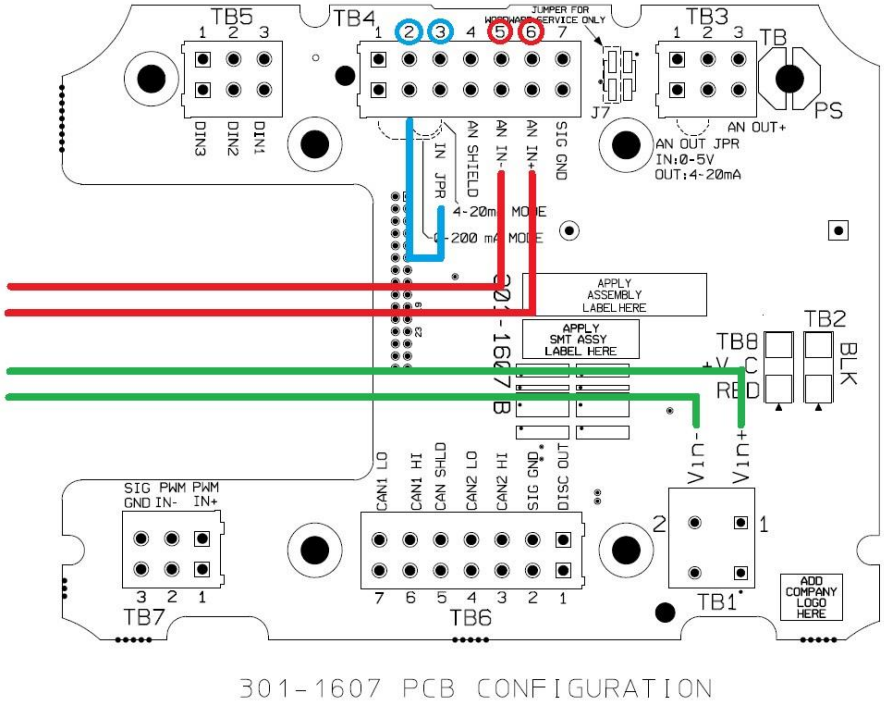

Figure 2-10. Wiring Diagram

7. Install an internal jumper at TB4, between pins 2 and 3 (this selects the 4–20 mA mode; see light blue line in Figure 2-10). Use a wire 20 to 16 gauge or order a jumper from Woodward (item number 10-012-396) for this specific purpose.

IMPORTANT **Jumpers should not be moved or changed unless power has been switched off.**

8. The 4-20 mA analog signal wires (red lines) are to be connected to TB4 terminals 5 (-) and 6 (+).
9. The power supply wires (green) are to be connected to the TB1 terminals 1 (+) and 2 (-).
10. With the cover off, check the groove around the perimeter of the casting to verify the presence of the seal. Securely replace the wiring cover plate after completing the wiring connections to ensure the integrity of electromagnetic noise interference and ingress protection capabilities of the actuator.
11. When replacing the cover, install the six #10-32 screws around the perimeter of the cover. Torque the #10-32 screws to (2.8 to 3.4) Nm / (25 to 30) lb-in.

Linkage Adjustment between Actuator and Fuel Pump

1. After the actuator has been installed mechanically onto the support bracket and the electrical connections have been made, install the serrated clamping sleeve onto the actuator output shaft (slot facing to the right).
2. Rotate the actuator output shaft fully CCW by hand.
3. Pull the toothed rack completely towards the actuator (minimum position).

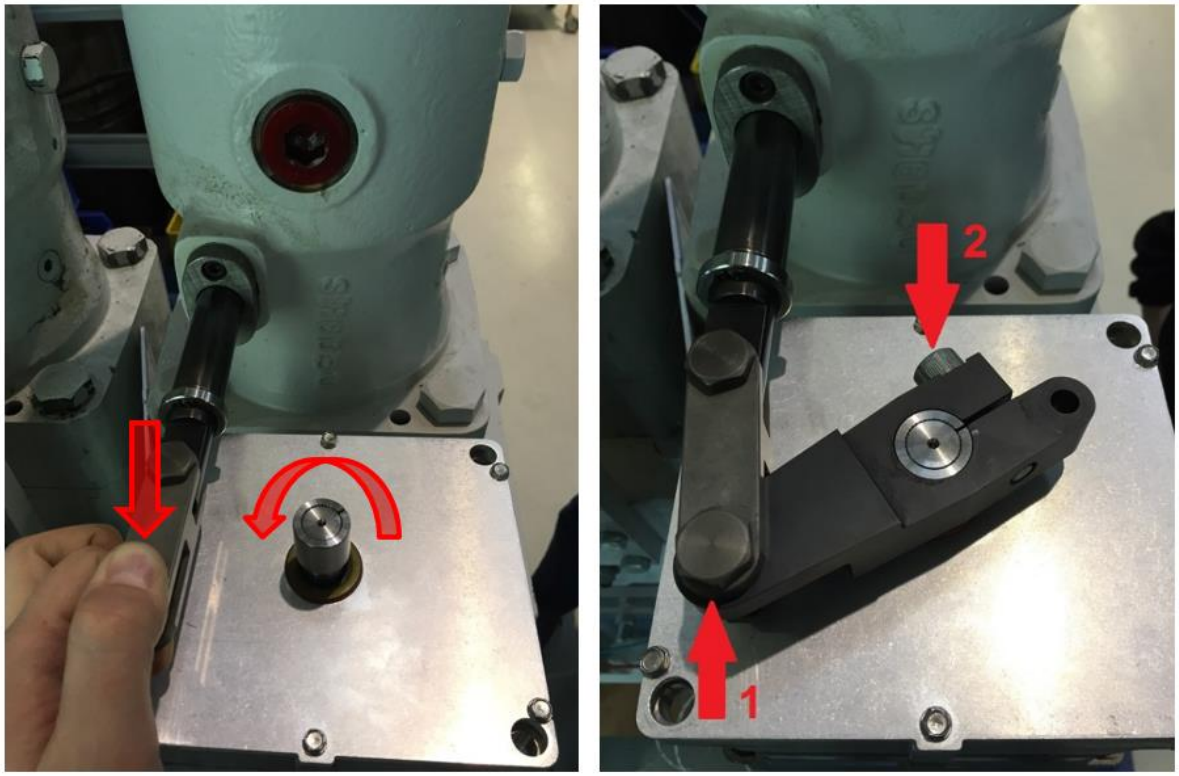

Figure 2-11. Linkage Adjustment

4. Install the lever that connects the actuator output shaft to the connecting element.
5. Adjust the height of the lever on the actuator output shaft such that there will be no binding between the lever and the connecting element.
6. Tighten the set screw and self-locking nut, (arrow 1).
7. Tighten the clamping screw, (arrow 2).

IMPORTANT

The photos above show the procedure for engines with one actuator per fuel pump. For engines where one actuator is controlling several fuel pumps, refer to the respective Wärtsilä Maintenance Manual.

⚠WARNING

Make sure that the engine is shut down.

Make sure that the wiring is installed correctly.

8. Switch on the 24 Vdc power supplies to the actuator. This will result in a slight opening of the actuator output shaft.

   The actuator is now controlling at minimum position, equal to 4 mA, 0% output.
9. At the back of the fuel pump, hold a 1.0 mm feeler gauge between the mechanical end stop of the toothed rack and the fuel pump housing (see Figure 2-12).

   Pull the toothed rack towards the actuator to minimum position such that the 1 mm feeler gauge fits snug between the mechanical end stop and the fuel pump housing.

   This will require some manual force to overcome the actuator force.
10. Holding the toothed rack in this position, now carefully loosen the clamping screw such that the actuator output shaft slides visually to its correct position. Now fully tighten the clamping screw and remove the 1 mm feeler gauge.

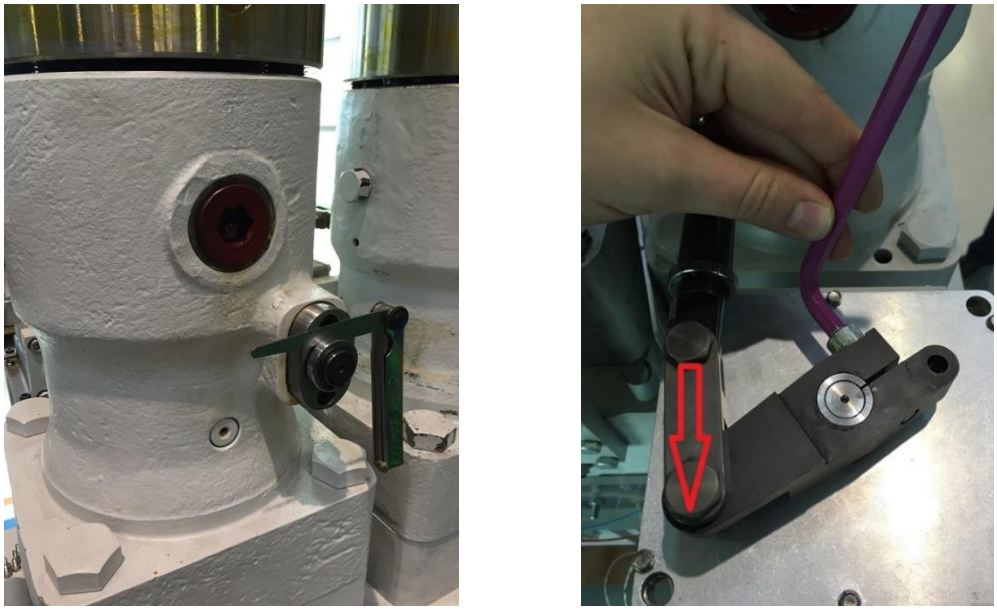

Figure 2-12. Adjusting Minimum Stop Position on the Actuator

NOTICE

Take care not to loosen the clamping screw too far, as this could result in an oscillating output shaft of the actuator!

11. Start the engine and verify that the actuator moves to the maximum position, equal to 20 mA, 100%.

WARNING

Before starting the engine, be prepared to control the engine manually, or if necessary to make an emergency shutdown should the actuator not control the engine.

12. Visually check if there is a gap of approx. 1~2 mm between the mechanical end stop and the fuel pump housing (at the front).
13. Enable the ‘Shutdown’ condition of the engine and verify that the actuator moves to the minimum position, equal to 4 mA, 0%.
14. Visually check if there is a gap of approx. 1 mm between the mechanical end stop and the fuel pump housing (at the back).
15. If no clearance is present between the mechanical end stops at either end, repeat the steps above.

Chapter 3
Product Support and Service Options

Product Support Options

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

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

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

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

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

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

Product Service Options

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

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

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

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 5-01-1205 North American Terms and Conditions of Sale (Industrial Business Segment) 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 5-01-1205 North American Terms and Conditions of Sale (Industrial Business Segment). This option is applicable to mechanical products only.

Returning Equipment for Repair

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

When shipping the item(s), attach a tag with the following information:
- Return authorization number
- Name and location where the control is installed
- Name and phone number of contact person
- Complete Woodward part number(s) and serial number(s)
- Description of the problem
- Instructions describing the desired type of repair

Packing a Control

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

NOTICE

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

Replacement Parts

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

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

Engineering Services

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

- Technical Support
- Product Training
- Field Service

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

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

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

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

Contacting Woodward's Support Organization

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

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

Products Used in Electrical Power Systems

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

Products Used in Engine Systems

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

Products Used in Industrial Turbomachinery Systems

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

Technical Assistance

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

General

Your Name _____

Site Location _____

Phone Number _____

Fax Number

Prime Mover Information

Manufacturer _____

Turbine Model Number _____

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

Power Output Rating _____

Application (power generation, marine, etc.)

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Control/Governor #2

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Control/Governor #3

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Symptoms

Description _____

_____

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

Revision History

New Manual—

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 51639.

B 5 1 6 3 9 : -

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Phone +1 (970) 482-5811

Email and Website—www.woodward.com

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

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