

Product Manual 26168 (Revision J, 7/2016) Original Instructions



ProAct[™] ITB Integrated Actuator and Throttle Body

ProAct ITB 105/120/135 mm Throttle Body with Integrated ProAct Digital Plus and ProAct Analog Actuators

Installation and Operation Manual



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.

s Failure to follow instructions can cause personal injury and/or property damage.



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www.woodward.com/publications

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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.



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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 Out-of-date translations are marked with ▲.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—Changes in this publication since the last revision are indicated by a black line alongside the text.

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Warnings and Notices

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 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.
AWARNING 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.

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.



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.



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.

Battery Charging Device

Electrostatic Discharge Awareness

NOTICE	Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:
Electrostatic Precautions	 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. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
 - Do not touch any part of the PCB except the edges.
 - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
 - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Regulatory Compliance

General Installation and Operation Notes and Requirements:

Refer to the ProAct Digital Plus manual (26112) or ProAct Analog manual (26147) for complete actuator listing information and regulatory requirements.



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

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

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

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

ProAct™ ITB Specifications

Operating Temperature Range: Digital Plus Analog Storage Temperature Range Vibration Qualification Test Spec

Shock Qualification Test Spec Weight Nominal Diameter -40 to +85 °C (-40 to +185 °F) -40 to +74 °C (-40 to +165 °F) -55 to +125 °C (-67 to +257 °F) Woodward RV2 (0.1 G²/Hz Random, 10–2000 Hz, 12.8 Grms – 3 hours per axis) 40 G, 11 ms sawtooth pulse See table under mounting section of manual 135 mm (5.3 inches), 120 mm (4.7 inches), or 105 mm (4.1 inches) 60 psig (414 kPa/4.1 bar)

Maximum Working Pressure

Regulatory Compliance

Note—Refer to the ProAct Digital Plus manual (26112) or ProAct Analog manual (26147) for actuator compliance.

Other European Compliance:

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

Pressure Equipment Directive 2014/68/EU:	Exempt per Article 2.j of 2014/68/EU where pressure is not a significant design factor
Machinery Directive:	Compliant as partly completed machinery with Directive 2006/42/EC of the European Parliament and the Council of 17 May 2006 on machinery.

Chapter 1. General Information

Introduction

The ProAct[™] Integrated Throttle Bodies (ProAct ITBs) are electrically-actuated butterfly valves used with the ProAct Analog and ProAct Digital Plus actuators to control flow output. The 105/120/135 designations correspond to their prospective bore sizes in mm. This manual should be used in conjunction with the appropriate ProAct Actuator manual: 26112 (ProAct Digital Plus) or 26147 (ProAct Analog).

This manual is intended to assist the engine designer/retrofitter in properly applying the ProAct ITBs. This manual is not intended to be a substitute for consultation with a Woodward application engineer.

Application

The ProAct ITBs are throttle valves with integrated electric actuators designed to throttle air or air/fuel for gaseous engines. This system is designed for direct replacement of traditional throttle valves, and requires no linkage between valve and actuator. These three sizes are designed to cover a wide range of engines and should be selected using the sizing procedure described below. For reference, the mass of the throttle valve ranges from 17.3 to 21.0 kg (see table in Chapter 2).



The ProAct ITBs are designed to minimize external leakage of the charge air/fuel mixture. No overboard drain feature has been provided. Proper venting of the escaped mixture is the responsibility of the end user.

Determining the Proper Valve Size

The proper size valve can be determined using the equation below. The required Cv (flow coefficient) should be calculated for both the minimum and maximum flows expected on the application. This design allows for a nominal travel of 75 degrees of rotation.

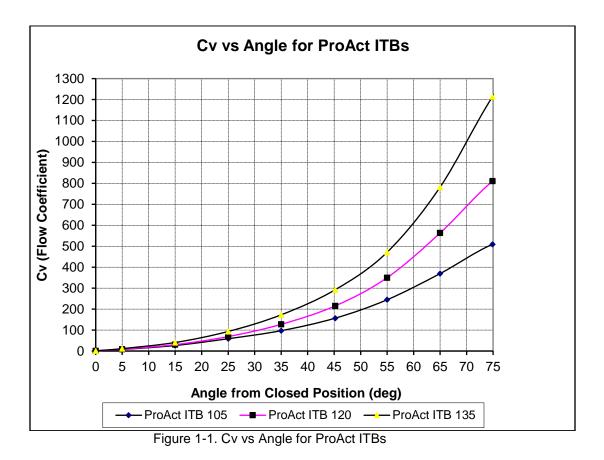
Using the graph and table below, select the closest valve that has a Cv equal to or greater than the calculated maximum flow value at approximately 80% opening (60 degrees) to ensure reasonable flow margin. Also, check that the particular valve's minimum Cv listed below is less than the minimum calculated Cv for good low idle performance. For further assistance, consult the Woodward engineering department.

$$Cv = \frac{Q \bullet 0.00976}{P1} \sqrt{\frac{(T + 460) \bullet P1 \bullet Sg}{P1 - P2}}$$

where:

- Q = Mass Flow (PPH [pounds/hour]) [1 pound = 0.45 kg]
- Sg = Specific Gravity of Gas (use 1.0 for air)
- T1 = Upstream Gas Temperature (°F) [°F = 1.8 * °C + 32]
- P1 = Inlet Pressure (psia) [1 psi = 6.895 kPa = 0.06895 bar]
- P2 = Downstream Pressure (psia)

IMPORTANT P2 must be greater than 0.528 * P1 or flow be less than 0.528 * P1, then use P2= 0.528 * P1.



P2 must be greater than 0.528 * P1 or flow becomes choked. If P2 is

IMPORTANT

These flow coefficients were determined using the test setup described in ANSI/ISA-S75.02-1996 "Control Valve Capacity Test Procedure".

Plate Angle	105 mm	120 mm	135 mm
0	1.04	1.09	1.10
5	7.53	8.68	11.51
15	26.37	30.42	40.67
25	58.74	68.96	93.33
35	97.05	127.28	172.75
45	156.83	215.44	292.46
55	244.65	350.02	471.51
65	369.57	563.30	782.29
75	509.52	810.50	1214.00

Cv (Flow Coefficient)

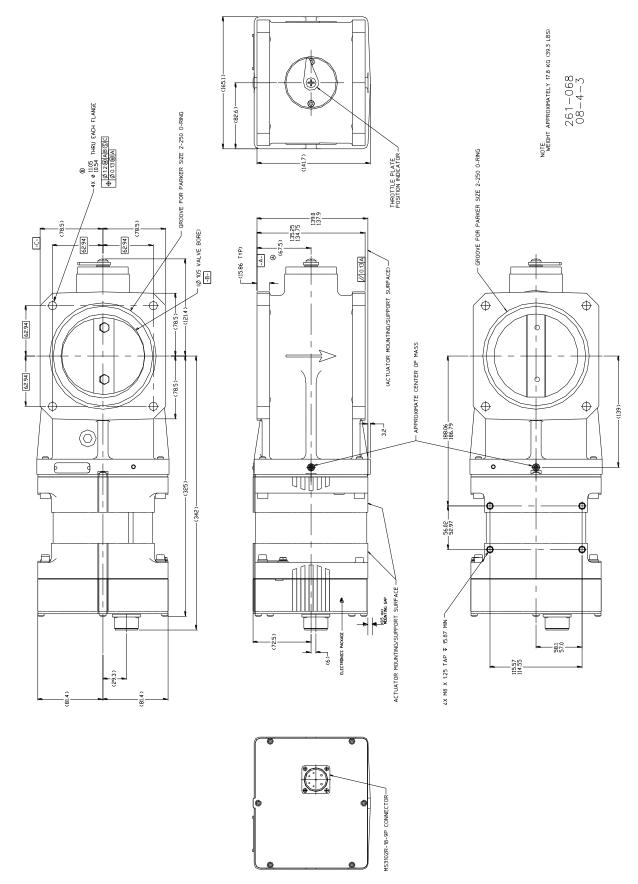
Table 1-1. Cv (Flow Coefficient)

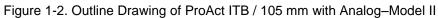
Part Number Selection

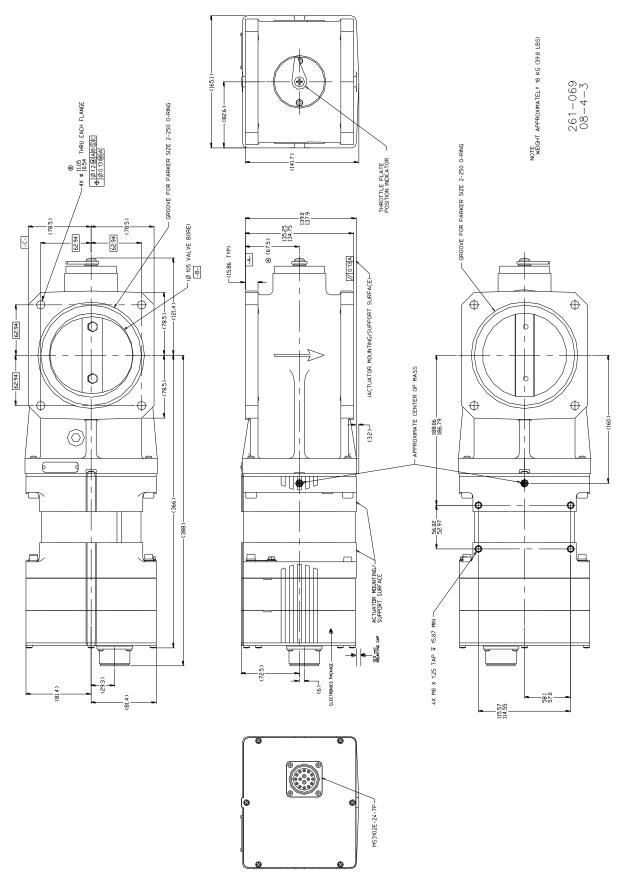
After determining the proper valve size, the part number of the assembly can be determined from the table listed below.

Part Number	Bore Size (mm)	Actuator/Connector
8235-191	105	ProAct Analog/Model II (current input) / 7 Pin MIL
8235-193	105	ProAct Analog/Model II (PWM input) / 7 Pin MIL
8235-194	105	ProAct Digital Plus–Model II 16 Pin
8235-190	120	ProAct Analog/Model II (current input) / 7 Pin MIL
8235-195	120	ProAct Analog/Model II (PWM input) / 7 Pin MIL
8235-187	120	ProAct Digital Plus–Model II 16 Pin
8235-189	135	ProAct Digital Plus–Model III 16 Pin

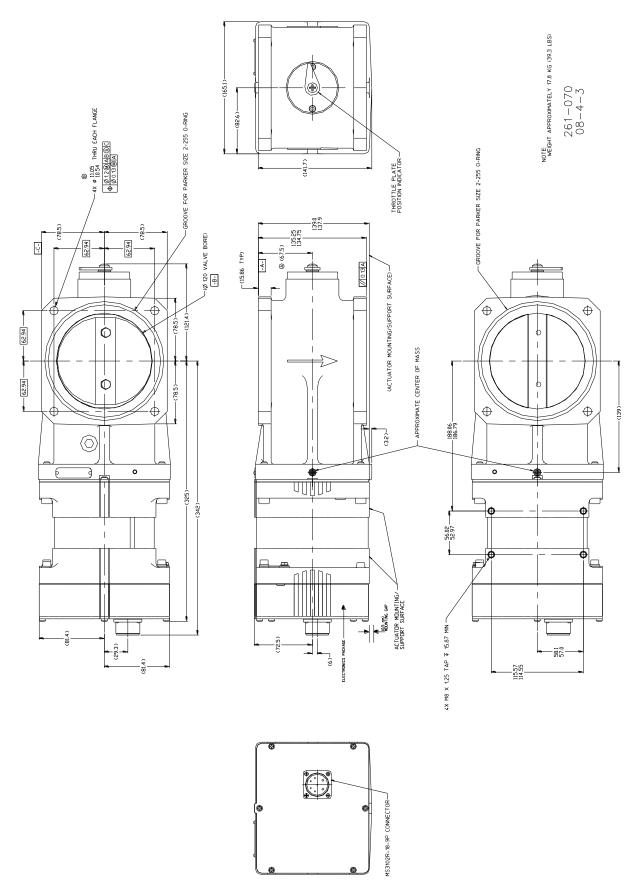
Table 1-2. Part Numbers

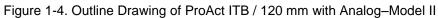


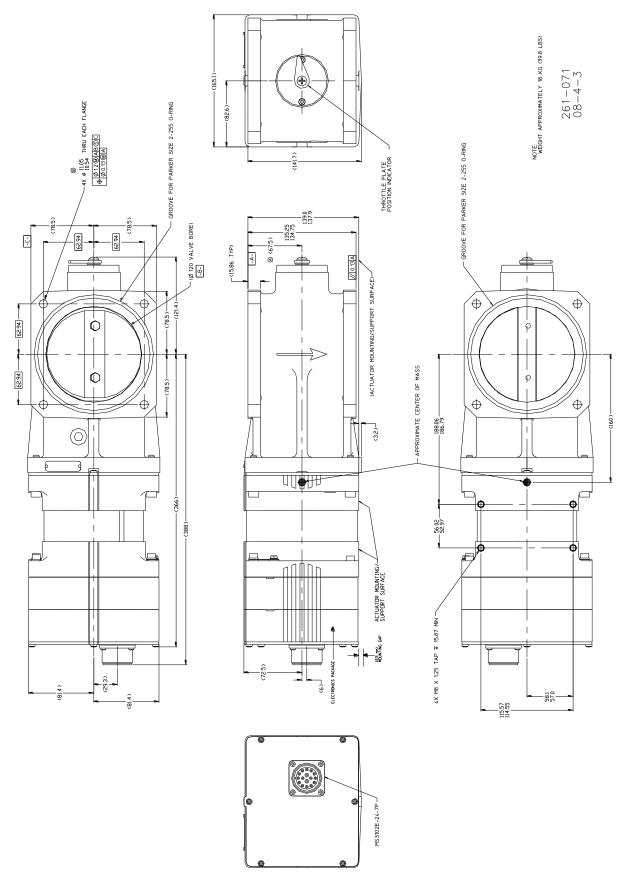




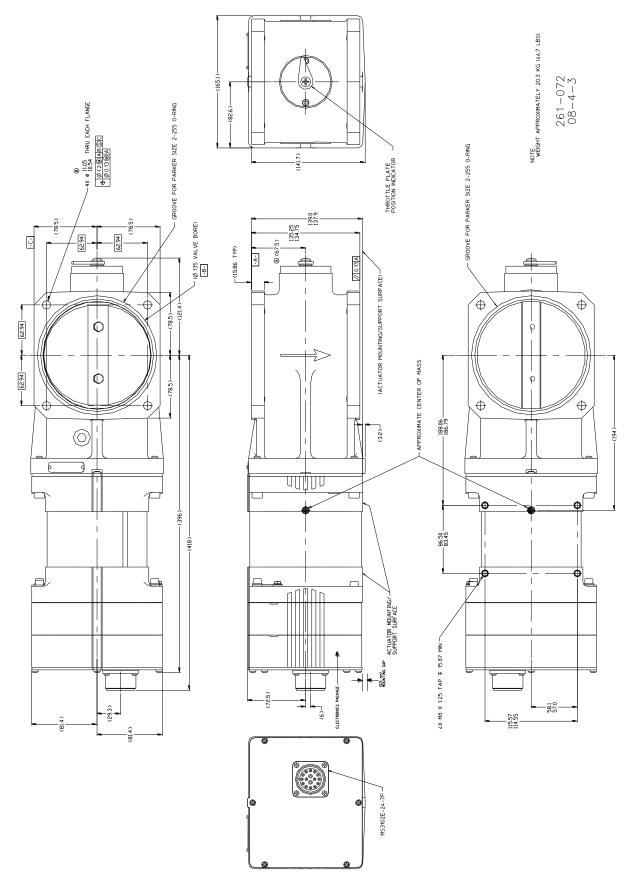














Chapter 2. Installation

Unpacking

Be careful when unpacking the device. Check the driver for signs of damage, such as bent or dented panels, scratches, and loose or broken parts. Notify the shipper and Woodward if damage is found.

Mounting

For wiring, and thermal considerations regarding the actuator, refer to the installation procedure in the ProAct Digital Plus manual (26112) or ProAct Analog manual (26147).

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

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



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.*

The ProAct ITBs are designed to be mounted on the valve flange. However, the end-user may also want to support the actuator to minimize the loads on their piping. Four M8 tapped holes are located in the base of the actuator for this purpose. For reference, the mass of the ITB along with the location of its center of gravity (CG) is listed in the following table:

Valve Bore Size	Actuator Model (ProAct II or III)	Mass of Valve and Actuator	Location of CG from Valve Bore Centerline
105 mm	Analog–Model II	17.4 kg (38.4 lb)	139 mm (5.5")
105 mm	Digital Plus–Model II	18.8 kg (41.4 lb)	160 mm (6.3")
120 mm	Analog–Model II	16.6 kg (36.6 lb)	139 mm (5.5")
120 mm	Digital Plus-Model II	17.9 kg (39.5 lb)	160 mm (6.3")
135 mm	Digital Plus-Model III	21.0 kg (46.3 lb)	194 mm (7.6")

Locate the appropriate O-rings (specified on the outline drawing) in the grooves on both sides of the valve body. Install the four M10 or 3/8" bolts on both flanges and tighten evenly to a torque recommended by the engine manufacturer. The relationship between the valve body and the actuator has been pre-set by Woodward, therefore no adjustments are required by the end user. No valve maintenance by the end user is required.



External fire protection is not provided in the scope of this product. It is the responsibility of the user to satisfy any applicable requirements for their system.

|--|

Due to typical noise levels, hearing protection should be worn when working on or around the ProAct ITB.

The surface of this product can become hot enough or cold enough to be a hazard. Use protective gear for product handling in these circumstances. Temperature ratings are included in the specification section of this manual.

NOTICE	

A minimum gap of 0.5 mm must be maintained between the support bracket and electronics enclosure (see Figures 1-2 through 1-6). 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 bracket, 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.

Chapter 3. Troubleshooting

Introduction

Improper engine operation is often the result of factors other than governor operation. The following paragraphs are provided to give tips about engine problems, which can resemble governor problems. Make sure the engine is operating correctly before making any changes in the governor.

Attempting to correct engine or load problems with untimely governor adjustment can add to the problems involved with solving improper operation.

Most governor problems are corrected by carefully repeating the calibration procedure given in the governor manual. There are no adjustments available within the valve.

If possible, isolate the governor from the engine to determine if the problem is with the governor and not with the engine or the load on the engine.

Governor system faults are usually caused by problems in the installation. Carefully review all the wiring connections, the power supply, and the actuator before making any adjustments to the control box. The throttle valve should be considered as a possible control problem if it was not removed during installation.

Fuel supply, pressure regulators, carburetors, and ignition conditions can present problems, which resemble governor problems.

Governor Problems

If the engine will not start, the following problems may exist:

- Verify that any "open for shutdown" contacts are closed.
- Make sure the start fuel limit is not preventing adequate airflow.
- Verify that the 12 or 24 volt power supply is present at the appropriate governor terminals.

Stability Problems

Stability problems not caused by the engine or gas pressure at the carburetor require carefully following the setup procedure provided in the governor manual. Follow every step when readjusting the control.

If the engine oscillates when cold and stabilizes when warm, make sure that the desired (usually idle) dynamics have been selected. Turn the selected dynamics gain pot slightly counterclockwise. Turn the stability pot slightly clockwise if required to maintain stability.

Chapter 4. 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 <u>www.woodward.com/directory</u>.

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.

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.

NOTICE

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 <u>www.woodward.com/directory</u>.

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 <u>www.woodward.com/directory</u>.

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	Products Used In Engine Systems	Products Used In Industrial Turbomachinery
Desility Disease Newslaw	Desility Diseas Newslaw	Systems
FacilityPhone Number	<u>Facility</u> Phone Number	FacilityPhone Number
Brazil+55 (19) 3708 4800	Brazil+55 (19) 3708 4800	Brazil+55 (19) 3708 4800
China+86 (512) 6762 6727	China+86 (512) 6762 6727	China +86 (512) 6762 6727
Germany:	Germany+49 (711) 78954-510	India +91 (129) 4097100
Kempen+49 (0) 21 52 14 51	India +91 (129) 4097100	Japan +81 (43) 213-2191
Stuttgart+49 (711) 78954-510	Japan +81 (43) 213-2191	Korea +82 (51) 636-7080
India +91 (129) 4097100	Korea +82 (51) 636-7080	The Netherlands - +31 (23) 5661111
Japan +81 (43) 213-2191	The Netherlands - +31 (23) 5661111	Poland +48 12 295 13 00
Korea +82 (51) 636-7080	United States +1 (970) 482-5811	United States +1 (970) 482-5811
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 <u>www.woodward.com/directory</u>.

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.

Revision History

Changes in Revision J—

New Declaration of Incorporation

Changes in Revision H—

• Revision advanced to coordinate with new installation sheet, and to update manual to latest formats and safety warnings.

Changes in Revision G-

• Updated compliance information

Declarations

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

File name: Manufacturer's Name:	00184-04-EU-MD-02-02 WOODWARD INC.
Manufacturer's Address:	3800 Wilson Avenue Loveland, CO 80538 USA
Model Names:	85/95/105/120/135/137/160/180 mm Integrated Throttle Bodies using the ProAct Actuators
This product complies, where applicable, with the following Essential Requirements of Annex 1:	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7

The relevant technical documentation is compiled in accordance with part B of Annex VII. Woodward shall transmit relevant information if required by a reasoned request by the national authorities. The method of transmittal shall be agreed upon by the applicable parties.

The person authorized to compile the technical documentation:

 Name:
 Dominik Kania, Managing Director

 Address:
 Woodward Poland Sp. z o.o., ul. Skarbowa 32, 32-005 Niepolomice, Poland

This product must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of this Directive, where appropriate.

The undersigned hereby declares, on behalf of Woodward Governor Company of Loveland and Fort Collins, Colorado that the above referenced product is in conformity with Directive 2006/42/EC as partly completed machinery:

	MANUFACTURER
	Cl. Pel
Signature	
-	Christopher Perkins
Full Name	
	Engineering Manager
Position	
	Woodward Inc., Fort Collins, CO, USA
Place	
	20-JUL-2016
Date	

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

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication **26168J**.



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.