

ProAct™ *Analog and Digital Plus* Electric Actuators with Integral Driver



APPLICATIONS

The ProAct™ *Analog* product line is a family of electric actuators intended to be mounted on-engine to control varying functions including (but not limited to): fuel rack positioning, timing control, throttle valve, and wastegate positioning. The actuator is effectively a positioner with an integral driver, which will accept a position command signal from another device in the system such as a speed control.

In addition, the ProAct *Digital Plus* actuators include an integral digital driver capable of controlling the actuator, communicating with the outside control system, and containing on-board software and intelligence to realize monitoring and customizing functions.

DESCRIPTION

The actuators are designed to be base- or flange-mounted (Model IV is base-mounted only) in an on-engine environment and can therefore withstand high levels of vibration and temperature extremes. They all have a 0.625-36 serrated tooth terminal shaft, and an optional rotation scale and indicator are available for visible travel detection. The actuators accept analog or PWM position command signals. In addition, the *Digital Plus* driver accepts CAN position

command signals and can be configured for redundant command signals. It monitors all available internal and external signals, and annunciates any detected faults through a discrete output. An analog output provides actual position indication, and a discrete input is available to remotely shut down the actuator.

Additional features of the *Digital Plus* driver include on-line and off-line diagnostics, current limiting based on driver electronics temperature, CAN communications, and service port communications. The *Digital Plus* driver is field programmable, allowing a single design to be used in many different applications. It must be configured and calibrated to the specific engine with a personal computer (PC) and a Woodward Watch Window Service Tool that communicates serially to the driver via RS-232 using Woodward's DDE ServLink protocol. Watch Window Standard can be ordered from Woodward on a CD-ROM (part number 1796-065), or it can be downloaded from the Woodward website (www.woodward.com). Data files for subsequent applications of the same engine model can be downloaded off-engine. The ProAct *Analog* actuator/driver can be configured without a service tool.

Refer to manual 26112 for more detailed information on the ProAct *Digital Plus* actuator, and to manual 26147 for more information on the ProAct *Analog*.

- Extremely fast, bi-directional actuator, electronically positioned in both directions
- All-electric actuator requires no drive or hydraulic supply
- Integral driver compatible with broad range of control systems
- 75° (±2°) rotary output allows direct coupling to butterfly, eliminating linkage
- Multiple sizes to fit broad range of applications

Digital Plus:

- Single or redundant position command signals
- Configurable parameters to tailor to varied applications
- CAN communications
- Advanced Diagnostics

GENERAL SPECIFICATIONS

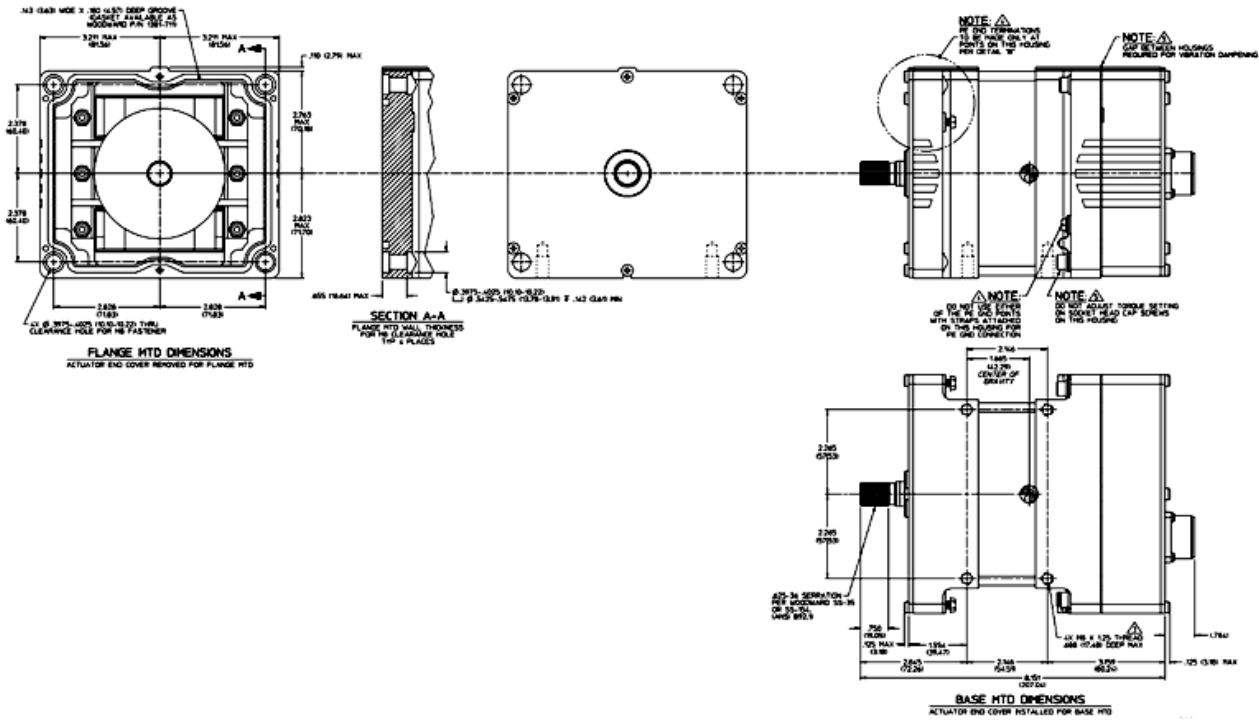
Actuator Model	Typical Part Number	Weight	Min. Work Output		Maximum Input Power		Maximum Current	
			Transient	Steady State	Transient	Continuous	Transient	Steady State
Model I	Analog–8404-005	10.5 kg 24 lbs	3.4 J	1.7 J	67 W	19 W	3.7 A	1 A
	Digital Plus–8404-002	11 kg 25 lbs	2.5 ft-lbs	1.25 ft-lbs				
Model II	Analog–8404-006	10.5 kg 24 lbs	7 J 5 ft-lbs	3.4 J 2.5 ft-lbs	251 W	65 W	14 A	4 A
	Digital Plus–8404-003	11 kg 25 lbs						
Model III	Digital Plus–8404-001	15 kg 32 lbs	14 J 10 ft-lbs	7 J 5 ft-lbs	282 W	73 W	15.6 A	4 A
Model IV	Digital Plus–8404-004	24 kg 52 lbs	27 J 20 ft-lbs	14J 10 ft-lbs	370 W	100 W	20.6 A	5.6 A

END USER I/O DESCRIPTION

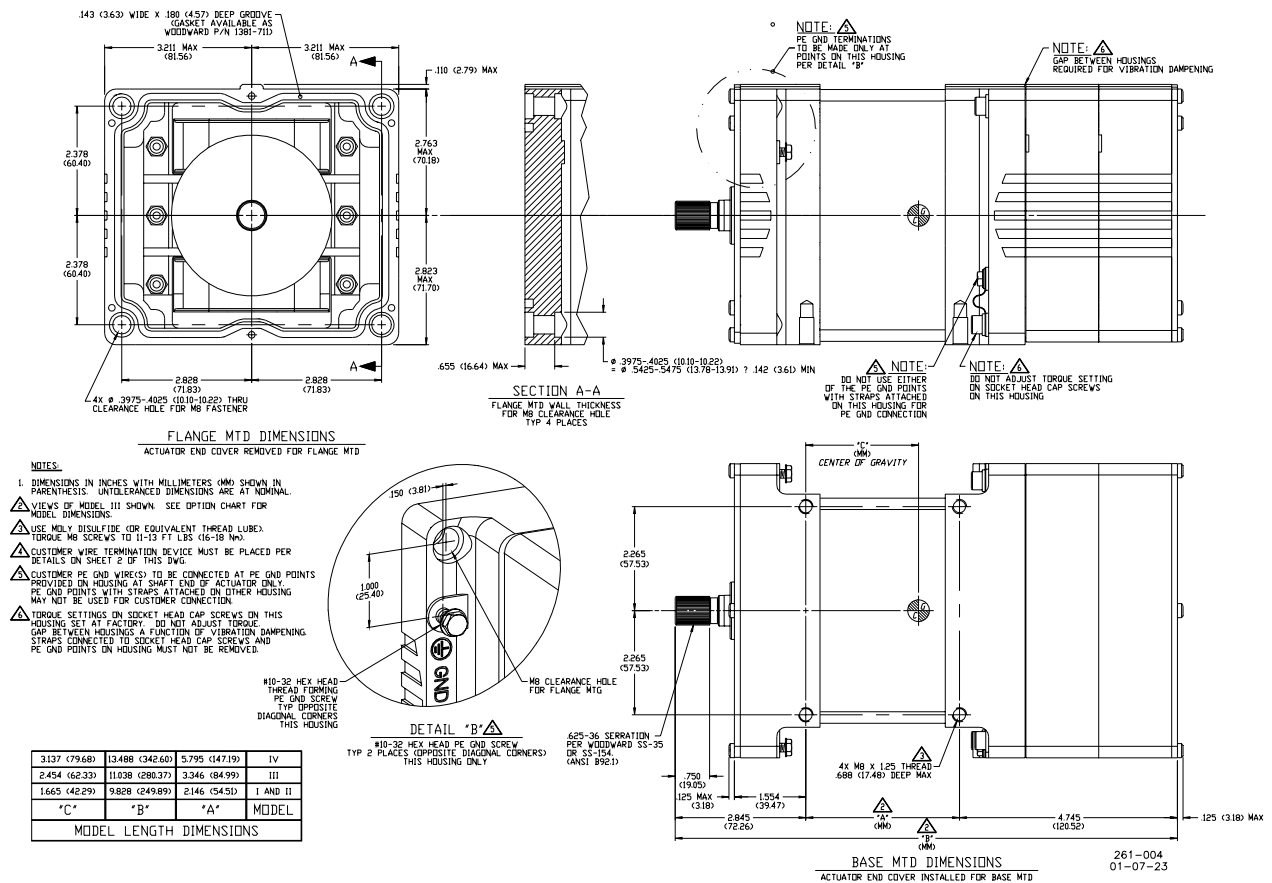
	Analog	Digital Plus
Power Input	18–32 Vdc	18–32 Vdc with out-of-range diagnostics
Command Input	PWM: 7–32 V, 150–3100 Hz Analog: 20–180 mA, 4–20 mA, and 0.5–4.5 Vdc	PWM: 7–32 V, 100 to 3000 Hz Analog: 20–180 mA or 4–20 mA CAN
Position Feedback Output	0.5 Vdc and 4.5 Vdc corresponds to full CCW and CW, respectively	4 mA and 20 mA corresponds to 0% and 100% actuator position
Discrete Inputs	Not Applicable	Low Power standby mode Four CAN address combinations
Discrete Output	Not Applicable	Normally “ON” turns “OFF” to indicate a detected fault
RS-232 Serial Communications	Not Applicable	9-pin sub-D male connector for connection to PC Service Tool
CAN 2.0B Serial Communications (optional)	Not Applicable	Complies with SAE J1939 but uses proprietary group extensions. Supports position command signal and monitoring of all shutdown and alarm conditions as well as some system variables.

ENVIRONMENTAL SPECIFICATIONS

Specification Item	Acceptable Range or Qualification Condition	Comments
Operating Temperature Limits	Analog: –40 to +74 °C. Digital Plus: –40 to +85 °C. Under all conditions the Temperature Monitoring Zone must remain below 90 °C.	See Mechanical Installation section of manual for discussion of this specification item.
Storage Temperature	–40 to +125 °C, unpowered.	
Vibration Qualification Test	Sine: 3.2 mm peak-to-peak for 2-39.4 Hz, 10 G for 39.4-300 Hz. Random: 0.01 G ² /Hz at 10 Hz, 0.10 at 100 Hz, 0.10 at 1000 Hz, 0.05 at 2000 Hz (12.79 Grms) 3 hours per axis.	
Shock Qualification Test	MS1—40G 11ms sawtooth.	
Ingress Protection	IP56 per EN 60529:1992.	
Humidity Qualification Test	60 °C, 95% RH for five days at one cycle per day.	
Chemical Resistance	The actuator uses materials proven capable of withstanding normal engine environment chemicals per SAE J1455, such as diesel fuel, engine oil, and antifreeze.	



ProAct Analog



ProAct™ Digital Plus Outline Drawing

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Woodward
 Industrial Controls
 PO Box 1519
 Fort Collins CO, USA
 80522-1519
 1000 East Drake Road
 Fort Collins CO 80525
 Ph: +1 (970) 482-5811
 Fax: +1 (970) 498-3058

Distributors & Service
 Woodward has an international network of distributors and service facilities. For your nearest representative, call the Fort Collins plant or see the Worldwide Directory on our website.

Corporate Headquarters
 Rockford IL, USA
 Ph: +1 (815) 877-7441

www.woodward.com

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PERFORMANCE SPECIFICATIONS

Parameter	Specification
Max Slew Rate	> 1000 degrees/second > 18.5 rad/s (10% to 90% travel)
Position Feedback Accuracy	<i>Analog</i> — ±5% of full scale from -40 to +90 °C <i>Digital Plus</i> — < ±1.5% of full stroke at 25 °C after calibration and ±1.5% linearity < 400 ppm/°C, maximum after calibration
Position Feedback Linearity	<i>Digital Plus</i> — < ±1.5% of full stroke at 25 °C after calibration
Position Feedback Repeatability	<i>Digital Plus</i> — < ±1.5% of full stroke at 25 °C after calibration

CERTIFICATIONS, AGENCY LISTINGS, AND REGULATORY COMPLIANCE

European Compliance for CE Mark:

- EMC Directive: Declared to 89/336/EEC COUNCIL DIRECTIVE of 03 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Other European Compliance:

- Machinery Directive: Compliance as a component with 98/37/EC COUNCIL DIRECTIVE of 23 July 1998 on the approximation of the laws of the Member States relating to machinery.

Agency Listings:

- CSA and UL/cUL for ordinary locations (Digital Plus only)
- CSA Class I, Div 2 component listing (standard with Analog; optional upgrade with Digital Plus)
- Marine Type Approved by Lloyds Register of Shipping for ENV1, ENV2, ENV3, and ENV4 (Digital Plus only)

CUSTOMER ELECTRICAL CONNECTIONS

ProAct Analog

The standard actuator is equipped with a 7-pin MS-style connector.

ProAct Digital Plus

The standard actuator is designed with a blank cover for use with a gland fitting or a custom connector to be supplied by the customer. All inputs and outputs to the ProAct actuator are accessed beneath the end cover, which is fastened with 6 M4x10 mm screws. Input power is connected to size M4 screws, and the wires must be terminated with insulated spade or ring lugs. The I/O terminal blocks are screwless cage-clamp-style blocks that accept wires from 0.20–3.3 mm² (24–12 AWG) wire.

Actuators with an MS-style connector mounted as an option on the end cover are also available. For OEMs, other factory-installed connectors may also be considered.

For more information contact: