

# F-Series Modular Actuator

## Applications

The F-Series Modular Actuator is designed to be engine-mounted for various position control functions on reciprocating engines used in industrial and on-highway service. Position control application examples can include fuel rack positioning, throttle valve positioning, waste-gate valve positioning, as well as other engine position control functions.

The F-Series Modular Actuator software must be properly set up for the application. Refer to manual 26355 for detailed instruction.

## Description

The F-Series Modular Actuator is an electric bi-directional actuator with an integral driver. The actuator accepts a position demand signal from a master controller and drives the 0–70 degree output shaft to the demanded position based on an internal shaft position sensor. The actuator can accept a PWM, J1939 CAN, 4-20 mA, or 0-5 V position demand signal. The electric actuator requires no hydraulics, pneumatics, or gear train.

The CANbus protocol is SAE J1939.

The high-efficiency torque motor delivers 1.4 N·m (1.0 lb-ft) steady-state torque and 2.7 N·m (2.0 lb-ft) transient torque at 105 °C, 12 Vdc.

The directions of shaft rotation (CW or CCW) and shutdown (0% or 100%) are configurable.

The Service Tool software includes an Auto Find Mechanical Stops feature and an Auto Inertia Test feature to simplify scaling the actuator to the systems mechanical stops and setting the position control dynamics.

For status purposes, a relay driver output is provided that changes state whenever the controller experiences a configured fault or error condition.

A configurable 0–5 Vdc position feedback signal (TPS) is available for monitoring the actuator output shaft position and for potential feed-forward control.

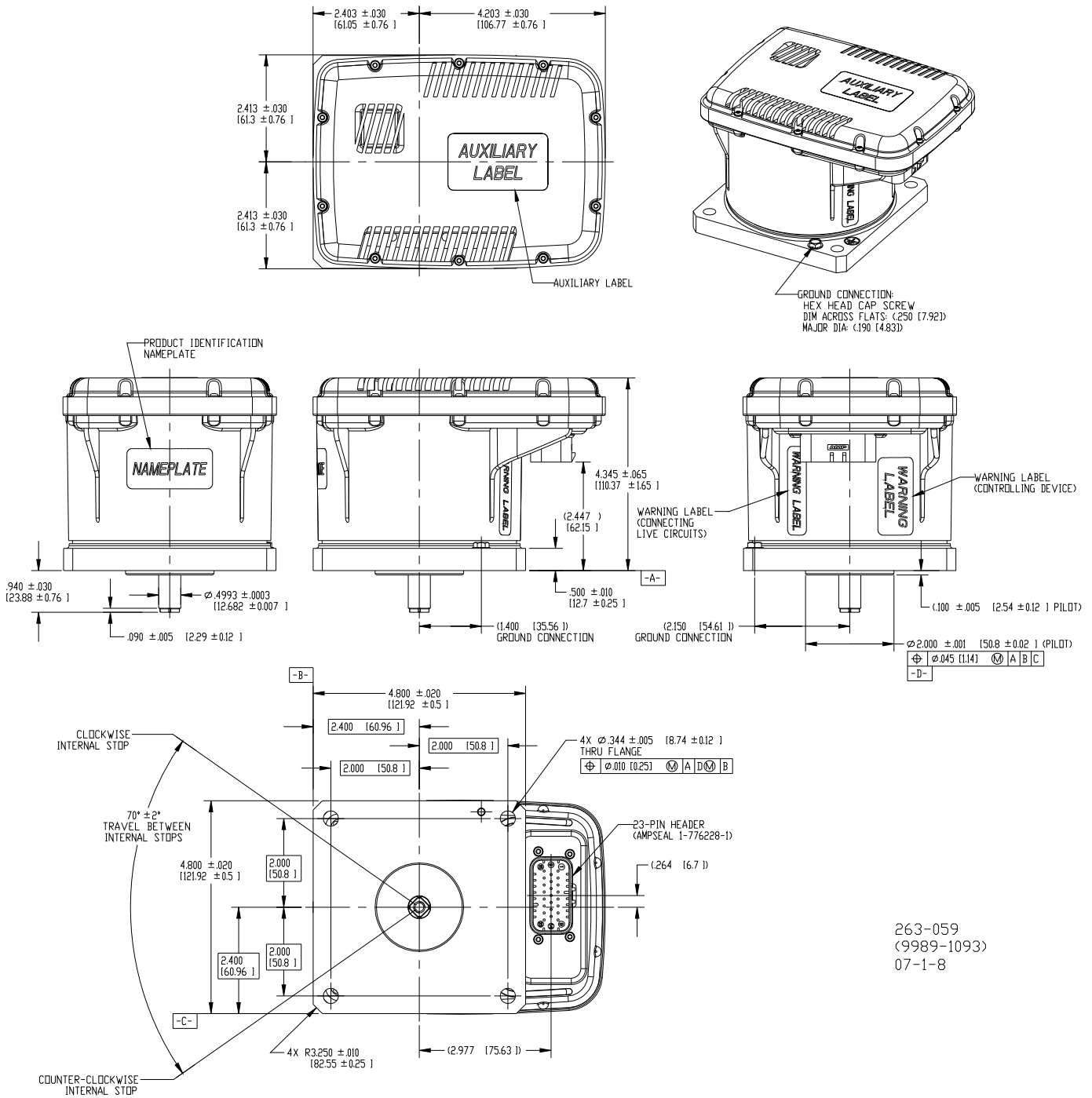
Discrete inputs are provided for a Run Enable/Key Switch and to set the CAN ID

The F-Series actuator operates on 10–32 Vdc. The ambient operating temperature range is –40 to +105 °C (–40 to +221 °F).



- Extremely fast, bi-directional actuator, electronically positioned in both directions
- Requires no hydraulics, pneumatics, or gear train
- Integral driver compatible with a broad range of control systems
- 70° ( $\pm 2^\circ$ ) rotary output allows direct coupling to butterfly valves, eliminating linkage
- Auto Find Mechanical Stops feature
- Auto Inertia Test feature
- CAN communication
- Versatile 12 or 24 Vdc operation
- Configurable parameters to tailor to a variety of applications
- Advanced diagnostics
- Models available:
- With certification for North American Hazardous Locations
- Compliant with the applicable CE Directives – EMC, Machinery

# Installation



**F-Series Modular Actuator Outline**  
(Do not use for construction)

263-059  
(9989-1093)  
07-1-8

## Specifications

Power Supply	12/24 V systems (10–32 Vdc), reverse polarity protection
Power Consumption	24 W steady-state, 98 W instantaneous during transient
Travel	70 ±2 degrees
Torque Steady State	1.4 N·m (1.0 lb-ft) at 105 °C, 12 Vdc
Transient	2.7 N·m (2.0 lb-ft) at 105 °C, 12 Vdc
Mass/Weight	Modular Actuator = 3.9 kg (8.7 lb)
Command Input	PWM (4–32 V, 300-2000 Hz, low-side and push-pull), J1939 CAN or Analog (4–20 mA or 0–5 Vdc)
Position Feedback Output	0.5 to 4.5 Vdc, configurable in software
Load Inertia	Ranges from 0 (bare shaft) to 0.0025 kg-m <sup>2</sup>
Programming Port	Programmable with Service Tool software (9927-1419) and 23-pin harness (8923-1255)
<b>Performance</b>	
Positioning Accuracy	±4% full stroke for all input types after effects from –40 to +85 °C board temperature ±7% full stroke all input types above 85 °C board temperature
10%–90% step Slew Time	55 ms (at 12 Vdc, room temperature, no external load)
Overshoot	< 2%
Bandwidth	>= 10 Hz at –3 db, ±0.5% of full scale >= 14 Hz at –3 db, ±2% of full scale
Steady State Limit Cycle	< 0.25 degree p-p (at 12 Vdc, room temperature, no external load)
<b>Environmental</b>	
Amb. Oper. Temperature	–40 to +105 °C (–40 to +221 °F)
Storage Temperature	–40 to +125 °C (–40 to +257 °F)
EMC	EN61000-6-2 (2005): Immunity for Industrial Environments EN61000-6-4 (2001): Emissions for Industrial Environments
ISO 10605 (2001)	ESD Immunity for Packaging and Handling, ± 4 kV contact discharge
ISO 11452-4 (2005)	Conducted RF Immunity (BCI method), 1 MHz – 200 MHz, 100 mA induced current
ISO 11452-2 (2004)	Radiated RF Immunity, 200 MHz – 1 GHz @ 100 V/m, 1 GHz – 2 GHz @ 30 V/m
CISPR 25 (2002)	Radiated RF Emissions, 30 MHz – 1 GHz, 2004/104/EC and ECE Regulation 10 limits
ISO 7637-2 (2004)	Conducted Transient Immunity, Pulse 1c, 2a, 3a, 3b, 4, and 5a
Humidity	US MIL-STD 810D, 507.2, Procedure III (60°C, 95% RH), Lloyd's Register of Shipping Humidity Test 1 and Det Norske Veritas Damp Heat per Woodward Procedure 4-04-6230
Salt Fog	SAE J1455, 4.3
Dust Exposure	SAE J1455, 4.7
Chemical Resistance	SAE J1455, 4.4.3 (except water immersion testing)
Shock	40G, 11 ms duration saw-tooth pulse Per Woodward Procedure 3-04-6231, MS1
Vibration	Random: 0.3 G <sup>2</sup> /Hz, 10–2000 Hz (22.1 Grms) 3 h/axis per Woodward Procedure 3-04-6231, RV3
Drop Test	SAE J1455, Section 4.10.3.1
Thermal Shock	SAE J1455, 4.1.3.2. Modified, –40 to +105 °C and 20 cycles
Ingress Protection	IP56 per IEC 60529, (dust ingress, water ingress)
Immersion and Splash, Steam	Cleaning and Pressure Washing SAE J1455, 4.4.3 (submerged, frozen, thawed) SAE J1455, 4.5 (steam cleaning and pressure wash)
<b>Technical Manual</b>	26355

## Regulatory Compliance

### European Compliance for CE Marking:

These listings apply to stationary industrial markets only and are limited only to those units bearing the CE Marking.)

**EMC Directive:** Declared to 2004/108/EC COUNCIL DIRECTIVE of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and all applicable amendments.

### Other European and International Compliance:

Compliance with the following European Directives or standards does not qualify this product for application of the CE Marking.

**Machinery Directive:** Compliant 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.

### North American Compliance:

These listings are limited only to those units bearing the CSA identification.

**CSA:** CSA Certified for Class I, Division 2, Groups A, B, C, & D, T3 at 105 °C Ambient for use in Canada and the United States.  
Type 3R Enclosure Rainproof

This product is certified as a component for use in other equipment. The final combination is subject to acceptance by the authority having jurisdiction or local inspection.

F-Series Connector	AMP P/N	Woodward P/N
Mating Connector, 23-Pin	770680-1	1751-805
Gold Sockets for all Connectors	770854-3	1608-1044



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#### Distributors & Service

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