

EG-3P/EG-6P/EG-10P

Proportional Actuators

APPLICATIONS

The EG-3P/6P/10P (proportional) actuators are designed for use on diesel, gas, and gasoline engines, or turbines. They are particularly well suited for use in control systems requiring a proportional mechanical output or a proportional electrical input.

DESCRIPTION

The EG-3P/6P/10P actuators convert an electrical signal to a proportional rotary output shaft position to control the flow of fuel or energy medium to a prime mover. These actuators are suitable for controlling diesel and gas engines or steam and industrial-commercial gas turbines driving alternators, dc generators, pumps, compressors, papermaking machines, or locomotives. A Woodward hydraulic amplifier can provide larger work capacities.

The actuator provides the “muscle” for a Woodward 2301A, 723, 723PLUS, or similar integrating electric control system. The actuator will provide a mechanical output position in proportion to a dc control signal increasing from a nominal minimum to a maximum value.

STANDARD FEATURES

Critical moving parts are made from either case hardened, through hardened, or surface-nitrited steels. All o-rings and shaft seals are made of a fluoro-elastomer base. All moving parts are submerged in oil. The actuators may be mounted either vertically or horizontally.



SPECIAL FEATURES

The actuators can be used for installations where prime movers operate in tandem to drive a common load. With two actuators connected in series, only one electric control is required to supply a common signal to each prime mover's actuator. These actuators are also recommended for applications involving unattended starts.

Oil Pump Model

The actuator with an oil pump requires a drive from the prime mover or other means, such as an electric motor, to rotate the pilot-valve bushing and to power the pump gears to develop the required oil pressure. The actuator does not have its own oil sump.

Electric Motor Drive

An electric-motor drive which includes a self-contained sump is available for use with the EG-6P/10P. The motors are available in ac and dc configurations in most common voltages.

- Proportional electric mechanical transducer
- Rotary output
- 4.5, 6, or 10 lb-ft (6.1, 8.1, or 13.6 N·m) work capacity
- Oil motor or oil pump option
- EG-10P units available for Class 1, Division 1 & 2, Groups B, C, D
- EG-10P units available for European Zone 1 and 2

Oil Motor Model

An oil motor actuator requires a supply of 80 to 500 psi (552 to 3448 kPa) pressure oil from an external source to rotate the pilot valve bushing and to provide the required work. Work output and stalled torque of the oil motor model are in direct proportion to the supply pressure.

Compensation

Many EG actuators operate with oil supplied directly from the prime mover. Certain multiviscosity motor oils require a compensation system within the actuator to provide needed stability. A needle valve is included in the compensation system to allow response adjustment.

Hazardous Environments

UL Listing:

The following UL-listed actuators are available:

EG-3P

Class 1, Division 2, Groups B, C, D

EG-10P

Class 1, Division 1, Groups B, C, D
Class 1, Division 2, Groups B, C, D, T3

EG-10P with RVDT

Class 1, Division 1, Groups B, C, D
Class 1, Division 2, Groups B, D, T3

EG-10PS

Class 1, Division 1, Group D
Class 1, Division 2, Group D, T3

Note: EG-10P oil-motor models with Class 1, Groups C and D approval are limited to a maximum of 500 psi (3448 kPa) inlet pressure.

CSA Listing:

The following CSA-listed actuators are available:

EG-10P

Class 1, Division 1, Groups B, C, D

EG-10P with RVDT

Class 1, Division 2, Groups B, D, T3

EG-10PS

Class 1, Division 2, Group D, T3

ATEX Compliance (EG-10P):

Zone 1 and Zone 2, Group IIC T3

CE (EG-10P):

Compliant with ATEX Machinery and Pressure Equipment Directives

Radiation Resistance

Radiation-resistant parts are available for special applications.

Position Feedback

A position feedback transducer (RVDT) is available to monitor output shaft position.

Note: Unless otherwise specified, these actuators are tested and shipped for vertical operation. When used in a horizontal application, these actuators will have an 8 degree shift in terminal shaft calibration.

References

- Manual 82560 EG-3P Actuator
- Manual 82566 EG-6P/10P Actuator
- Manual 56102 Hydraulic Amplifier (Elec. Controlled)
- Manual 25071 Oils for Hydraulic Controls

SPECIFICATIONS

All Models

Output Shaft	0.375"-36 serrations (standard/EG-3P) both sides of the case; 0.500"-36 serrations (standard/EG-6P/10P) either side of the case. Special output shafts are available.
Angular Travel	42° nominal travel available with 28° travel from no load to full load at rated speed recommended.
Calibration	2° to 3° off minimum shaft position at 20 mA. 36° ±3° additional travel at 160 mA.
Hysteresis.....	Within 3% of maximum stroke.
Linearity	Within 0.5%
Temperature Drift	Nominally ±1° of output per 100 °F/56 °C.
Transducer Coil Resistance	30 to 35 Ω at 20 °C/68 °F.
Nominal Coil Input Current Range	20 to 160 mA for single or two actuators operating from one electric control.
Electrical Connector	4-pin MS-33682-14S-2P. UL design does not have connector.
Hydraulic Oil Supply Fluid	Hydrocarbon oil. Consult Woodward for recommended synthetic oils. If multiviscosity oils are used, the compensated model is suggested.
Hydraulic Oil Viscosity.....	100 to 200 SUS at operating temperature recommended. 50 SUS minimum, 3000 SUS maximum (7.5 CST to 850 CST).
Oil Temperatures of Continuous Operation.....	140 to 200 °F/60 to 93 °C depending on oil viscosity.
Ambient Temperature Range	-20 to +200 °F/-29 to +93 °C. The primary temperature concern is for the hydraulic fluid properties in the actuator.
Case and Base Construction	Cast or ductile iron.
Cover, Subcap, and Drain Adapter	Cast aluminum.
Mounting Configuration	Vertical (or horizontal with proper adjustments; non-interchangeable).
Mounting Studs	Two 5/16" diameter (EG-3P); four 5/16" diameter (EG-6P/10P).

Oil Pump Models (EG-3P/10P)

Work Output.....	EG-3P—Maximum 4.5 lb-ft (6.1 N·m). Travel is 2/3 full travel for a work output of 3.0 lb-ft (4.1 N·m). Stalled torque rating is 6.2 lb-ft (8.4 N·m). EG-10P—Maximum 9.3 lb-ft (12.6 N·m). Travel is 2/3 full travel for a work output of 6.2 lb-ft (8.4 N·m). Stalled torque rating is 12.8 lb-ft (17.4 N·m).
Time Constant.....	0.08 second (EG-3P); 0.17 second (EG-10P).
Hydraulic Source.....	Engine lubricating system or a separate sump.
Supply Pressure.....	EG-3P—1 ft (300 mm) of lift to a maximum of 100 psi (690 kPa). EG-10P—1 ft (300 mm) of lift to a maximum of 50 psi (345 kPa).
Flow.....	Peak demand of 2 US gal/min (7.6 L/min) during transients; steady-state flow of 0.5 US gal/min (1.9 L/min) with 250 SUS oil supply.
Filter	20 to 25 µm (nominal).
Pump Capacity.....	92.7 cubic inches (1519 cm ³)/minute/1000 rpm.
Pump Power Required.....	EG-3P—0.5 hp (373 W) at 1800 rpm recommended for motor drive. EG-10P—0.18 hp (134 W) at 1000 rpm required for EG-10P. 0.5 hp (373 W) at 1000 rpm recommended for motor drive.
Supply Inlet	0.250"-18 NPTF (2). Use one or supply through mounting surface.
Drain.....	11/32" dia. base, must have free discharge. For horizontal mounting, use 0.250-18 NPTF in cover.
Weight.....	EG-3P—9.25 lb (4.2 kg). EG10P—16.0 lb (7.3 kg).
Drive Rotation	Plugged for either clockwise or counterclockwise.
Recommended Drive Speed.....	1500 to 4000 rpm.
Drive Coupling	EG-3P—.562-6 spline extends 0.375" (9.5 mm) from mounting hub (standard). EG-10P—.562-6 spline extends 0.562" (14.3 mm) from mounting surface (standard).

Oil Motor (EG-3P/10P)

Work Output:	Recommended Output Shaft					
	Actuator Operating Oil Pressure		Maximum Work Output		Travel is 2/3 Full Travel for a Work Output of:	
EG-3P	400 psi	2758 kPa	4.5lb-ft	6.1 N·m	3.0 lb-ft	4.1 N·m
	300	2068	3.3	4.5	2.2	3.0
	200	1379	2.2	3.0	1.4	1.9
	100	690	1.1	1.5	0.7	0.9
EG-10P	400	2758	9.3	12.6	6.2	8.4
	300	2068	7.0	9.5	4.7	6.4
	200	1379	4.6	6.2	3.1	4.2
	100	690	2.3	3.1	1.5	2.0
Time Constant.....	EG-3P— $0.5P^{-1/2} + 0.0028P^{1/2}$ sec EG-10P— $1.06P^{-1/2} + 0.0059P^{1/2}$ sec. where P=supply pressure in psig (1 psig=6.895 kPa).					
Supply Pressures.....	80 to 500 psi (552 to 3448 kPa). Pressures outside this range are not recommended.					
Supply Flow	Peak demand of 4 US gal/min (15 L/min) during transients. Steady-state flow 1.4 US gal/min (5.3 L/min) maximum, depending on orifice size and operating pressure.					
Filter	10 to 15 µm (nominal).					
Pressure Inlet.....	0.250"-18 NPTF to pilot valve.					
Orifice (to oil motor supply):						
	Supply Pressure		Orifice Diameter			
	(psi)	(kPa)	(inch)		(mm)	
	80 to <100	552 to <690	0.076		1.9	
	100 to 175	690 to 1207	0.062		1.6	
	>175 to 300	>1207 to 2068	0.055		1.4	
	>300 to 500	>2068 to 3448	0.047		1.2	
Drain.....	0.75"-14 NPTF on drain adapter. Must have free discharge. For horizontal mounting, use 0.250"-18 NPTF in cover.					
Weight.....	EG-3P—11 lb (5 kg). EG10P—17 lb (8 kg).					



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