

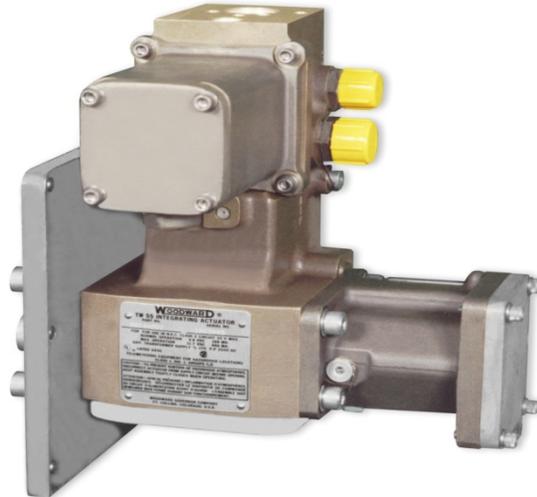
# TM-55P Actuator

## Application

The TM-55P Actuator is used on diesel, natural gas, and gasoline engines, or turbines. It is particularly well suited for use in control systems requiring a rotary mechanical output that is proportional to electrical input.

## Description

The TM-55P Actuator is an electrohydraulic, proportional actuator for controlling diesel and gas engines or steam and industrial gas turbines. It is designed for use with Woodward analog and digital controls. The TM-55P will interface (with an adapter) directly to Woodward liquid and gas fuel valves.



## Features

The standard TM-55P has an aluminum case with through-hardened stainless steel internal parts. Hydraulic fluid is sealed from the torque motor by a preformed packing ring between the armature and the servo-valve housing, which eliminates pickup of fluid contaminants. Additionally, the supply pressure inlet is a 40  $\mu\text{m}$  nominal/70  $\mu\text{m}$  absolute filter fitting. Viton A elastomer O-rings with Teflon cap seals provide dynamic sealing of the main servo and output shaft. The actuator can be mounted in any position desired.

A dual-coil torque motor is optional for redundancy. An optional position-feedback transducer for position indication is also available.

## Specifications

<b>Output Shaft</b>	0.750"- 48 serrated by 0.875" long shaft
<b>Ambient Operating Temperature</b>	-40 to +121 °C (-40 to +250 °F)
<b>Stalled Torque Rating</b>	38 N·m at 2758 kPa (28 lb-ft at 400 psi) 95 N·m at 6895 kPa (70 lb-ft at 1000 psi)
<b>Angular Travel</b>	Max 45 degrees. Increasing current causes clockwise rotation, viewing end of shaft.
<b>Nominal Factory Calibration</b>	20 $\pm$ 0.5mA at 0° 200 $\pm$ 0.5mA at 45°
<b>Maximum Transient</b>	350 mA

### Null Current Shifts

Null current shifts of up to  $\pm$ 4% of maximum rated current (200 mA) can occur due to variations in the following operational parameters: hydraulic supply and return pressures, hydraulic fluid temperature, servo valve and actuator wear.

Due to the inherent null shifts and position drift of all hydraulic servo valves and proportional actuators, engine control applications must be designed with these errors in mind.

- Proportional electrohydraulic
- 45° rotary output
- Maximum work 30 to 75 N·m (22 to 55 lb-ft)
- Corrosion resistant construction
- UL and CSA Listed Class 1, Division 1, Groups C & D
- CENELEC Zone 1 Group IIC ATEX
- CE Compliant
- Works with Woodward analog and digital controls

## Control Qualities

Time Constant	0.025 second
Maximum Velocity of Output Shaft	920° per second
Load Sensitivity	0.05° maximum per lb-ft at 1000 psig (per J at 6895 kPa) hydraulic supply pressure
Hysteresis	0.25°
Repeatability	0.25°
Threshold	Less than 0.25% of maximum rated current of 200 mA

Woodward recommends that adequate dither be used on all hydraulic actuators to minimize mA threshold and hysteresis which can result from second stage static friction or hydraulic contamination.

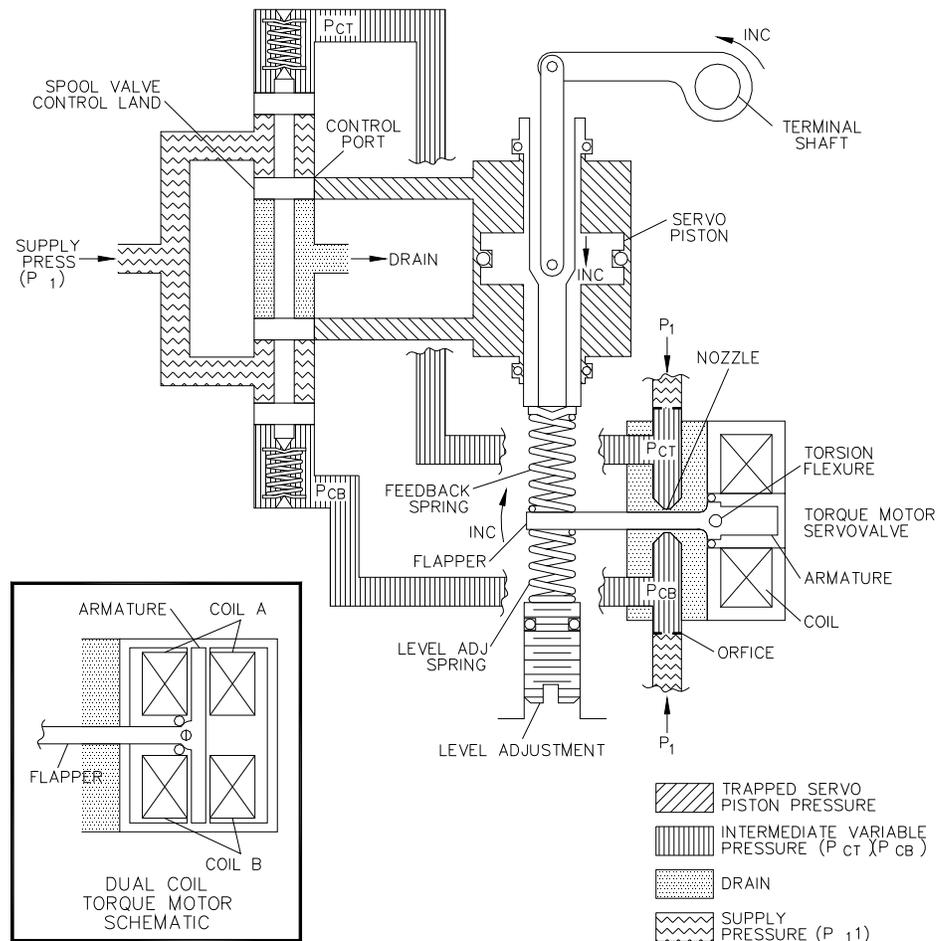
Dither is a low amplitude, relatively high frequency periodic signal that is superimposed on the servovalve input current signal. A typical dither signal generated by a Woodward control is:

- 25 Hz, 0–10 mA (tunable) amplitude
- 25% duty cycle, bipolar, square wave

Adequate dither is defined as that amount which produces no more than 0.013 mm (0.0005 inch) total oscillation in output shaft position.

## Electrical Control Requirements

Standard Input Signal	0.020 to 0.200 A coil current from 0 to 45° stroke, nominal
Coil Resistance	Single coil 26 $\Omega$ at 20 °C (68 °F) Dual coil 40 $\Omega$ at 20 °C (68 °F)
Electrical Position Transducer (options)	RVDT Linearity to $\pm 0.16^\circ$ Linear synchro transmitter linearity $\pm 0.35^\circ$ Potentiometer accurate to $\pm 1.0\%$ over 60° range



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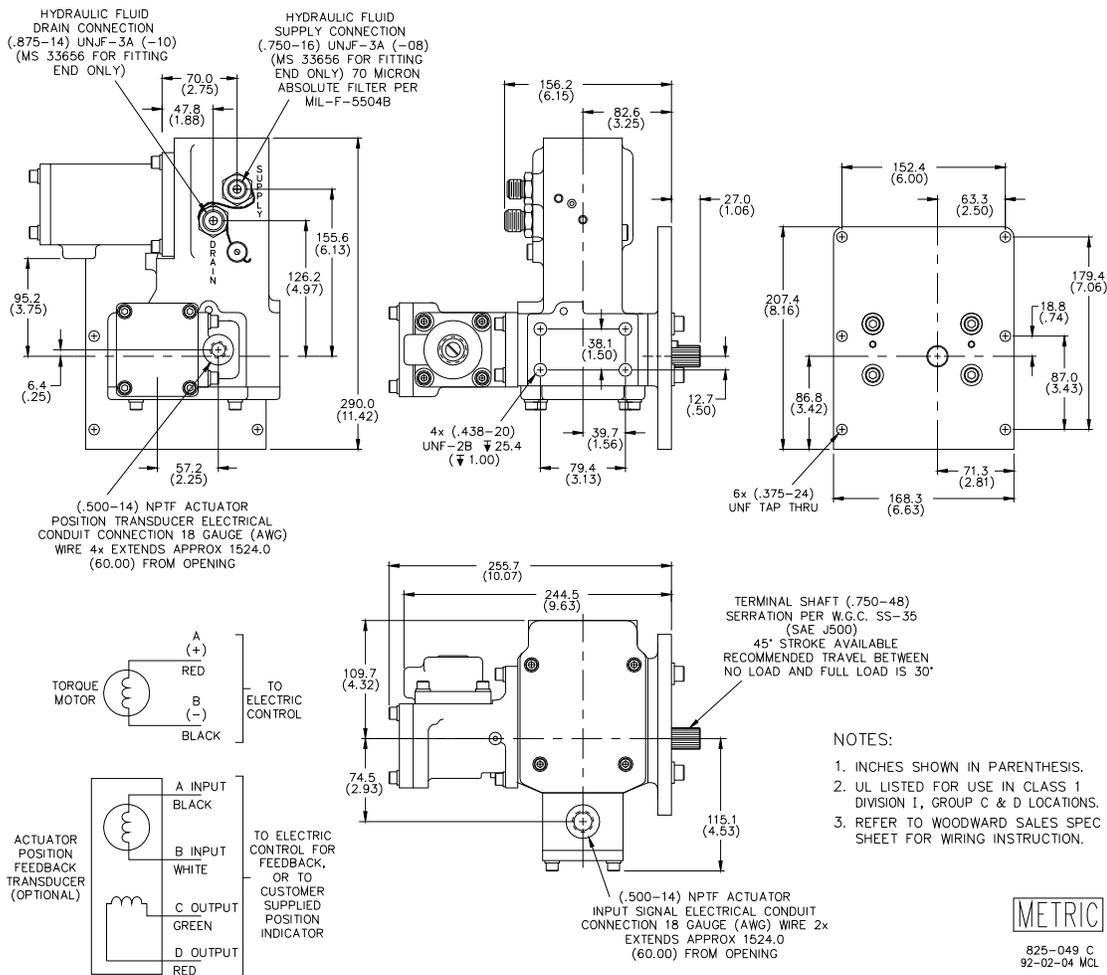
### TM-55P Schematic Drawing

*In the actuator, a torque motor servo-valve is energized by the electronic control to generate a pressure differential which is applied to ends of the second-stage spool valve. Supply pressure to the servo piston is controlled by the second-stage spool valve to move the double-acting servo piston and provide terminal shaft rotation. Internal mechanical feedback re-centers the torque motor flapper which equalizes pressure across the second-stage spool valve and stops terminal shaft rotation.*

# Hydraulic Fluid Requirements

	Supply Pressure		Steady State Flow		Maximum Transient	
	psig	kPa	gal(US)/min	L/min	gal(US)/min	L/min
Single Coil	400	2758	0.3	1.1	2.5	9.5
	1000	6895	0.5	1.9	2.7	10.2
Dual Coil	400	2758	0.5	1.9	2.7	10.2
	1000	6895	0.8	3.0	3.0	11.4

Type	Mineral or synthetic based oils, diesel fuel, kerosene, gasoline, or light distillate fuels
Regulated Supply Pressure	2758–6895 kPa (400–1000 psig)
Return Pressure	0–690 kPa (0–100 psig)
Fluid Temperature	16 to 79 °C (60 to 175 °F), US MIL-L-23699
Recommended Viscosity	0.6 to 400 centistokes
Specific Gravity	0.6 to 1.0
Required Hydraulic Fluid Cleanliness	10 µm (nominal), ISO DIS 4406, Code 20/18/15
Standard Hydraulic Connections	Inlet—0.750-inch/16 tpi UNJF-3A (-08) (MS 33656 for fitting end only) 40 µm nominal/ 70 µm absolute filter per US MIL-F-5504B Drain—0.875-inch/14 tpi UNJF-3A (-10) (MS 33656 for fitting end only)
Mass/Weight	6.6 kg (14.5 lb)



**Single Coil TM-55P Actuator Outline Drawing**  
(Do not use for construction)

## Certifications

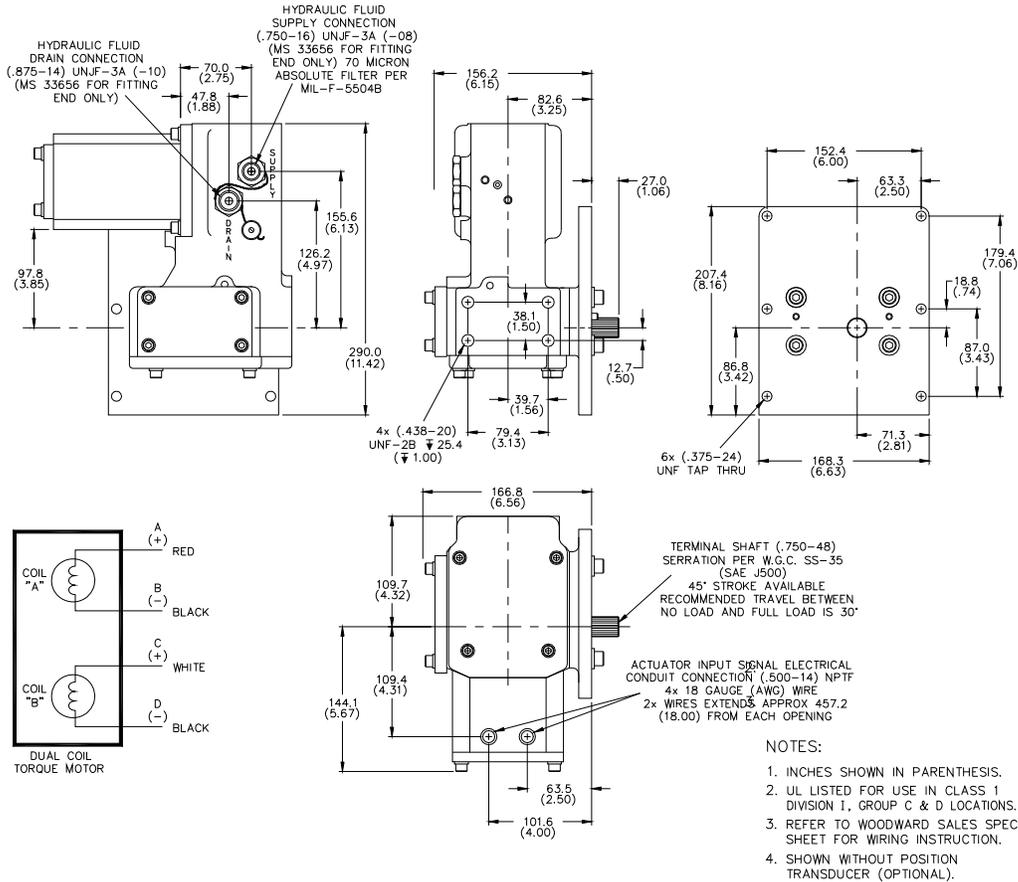
CE Compliant with ATEX, Machinery, and Pressure Equipment Directives  
 North America UL/CSA Class I, Division 1, Groups C & D  
 European LCIE Zone 1, Group IIC

## Adjustments

Level Adjustment Provides bias on position versus input signal

## References

Manual 82400, *TM-55P Actuator*



METRIC 825-049 E  
 92-02-04 MCL

**Dual Coil TM-55P Actuator Outline Drawing**  
 (Do not use for construction)



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