

Electrohydraulic Power Cylinder (EHPC)

APPLICATION

The Electrohydraulic Power Cylinder (EHPC) is designed to use a low-pressure hydraulic oil source (typically turbine lube oil) to provide the linear actuation force to operate steam turbine control valves or valve racks. The EHPC is intended for use on mechanical-drive or generator-driven steam turbines, and incorporates a servo actuator, pilot valve, power cylinder, and feedback device into a single package, eliminating linkage, associated bracketing, and greatly reducing hydraulic plumbing.

The EHPC's modular design allows it to be custom configured to the specific application's force and stroke requirements. Standard bore diameters and strokes are also available. This actuator is applicable in 2 to 12 inch (51 to 305 mm) linear stroke and up to 2500 lb-force (11.12 kN) applications.

In retrofit applications, the EHPC can be used to directly replace the existing servo system. This saves costly repairs to existing and aging servos, eliminates difficulties obtaining spare parts for obsolete equipment, and reduces calibration time and difficulty. The total installed cost for this package is low because it has been completely assembled and tested at the factory. This greatly reduces OEM shop floor fabrication time, testing time, and site assembly time. For both OEMs and end-users, the EHPC is designed for ease of application and use, and provides the final integrated element in the control system.

DESCRIPTION

The EHPC is a linear integrating actuator typically used for steam turbine control-valve or valve-rack positioning. This actuator uses a low-pressure (80–250 psi / 552–1724 kPa) hydraulic

oil source and then uses three amplification stages to create the required output shaft force. As a custom (made to order) actuator, the EHPC is an actuator that is configured / designed and manufactured specifically for the application. The EHPC has the flexibility to be ordered with the following configuration options:

- Single or double acting cylinder action
- Stroke & cylinder bore options
- Extend or retract current to position direction
- Top or bottom mounting attachment
- Single or dual coil input actuator torque motor
- With or without return spring
- 4–20 mA or 0–10 Vdc cylinder feedback signal
- Optional 1st & 2nd stage oil supply
- 2nd stage spring bias option
- 3rd stage spring bias option

This actuator accepts a 20–200 mA (100 mA null, with an optional 15 mA null) input control signal, to position its output cylinder shaft, and outputs a 4–20 mA or 0–10 Vdc servo position indication feedback signal. An integrating actuator driver (such as a MicroNet™ actuator controller module) or an external servo position driver (such as the Woodward SPC servo position controller) is required to drive and position the EHPC.

The EHPC includes electrical position sensing on the output of the large power cylinder—a combination that, when used with a compatible electronic or digital control, results in powerful steam valve movement with pinpoint accuracy. The EHPC is driven by oil pressure supplied by either the turbine's lubricating-oil supply or from an external independent oil supply and can be operated in any attitude.

- Positions turbine steam valve
- Double- or single-acting
- Single integrated unit
 - Electronic position feedback
 - Relay/pilot valve
 - Power cylinder actuator
- Variable stroke and work force
- Operates on wide range of oil supply pressures
- One source for control system components, mechanical and electrical
- Models are available with listings for North American Hazardous Locations
- Dual coil option available

SPECIFICATIONS

OUTPUT SHAFT

Diameter

1.750 inch (44.45 mm)

Material

Hardened 17-4 PH stainless steel

Thread size

1.250 inch (31.75 mm)—12 UNF-2A

MAXIMUM STALLING FORCE

Retract direction

[Bore area—2.4 in² (1548 mm²)] x (supply pressure)

Extend direction

(Bore area) x (supply pressure)

SERVO CYLINDER

Standard bore diameters

6.0, 8.0, or 10.0 inches (152, 203, or 254 mm)

Note: Other bore diameters available as required, contact Woodward for more information.

Stroke length

2.0—12.0 inches (51—305 mm)

Note: Other stroke lengths available as required, contact Woodward for more information.

Rod cross-sectional area = 2.4 in² (1548 mm²)

Stroke direction

Extend or retract on increasing current input

Operation

Single- or double-acting

WEIGHT

1000 to 1200 lb (454 to 544 kg)

OPERATING TEMPERATURE RANGE

–20 to +200 °F (–29 to +93 °C)

MOUNTING

Attachment

Mounted by either cylinder end cap

BOLT HOLE PATTERN

Eight 1-1/16 inch (27.0 mm) bolts on 15.375 inch (390.52 mm) circle per National Fluid Power (NFP) Configuration MF-6 and MF-5.

BOLT HOLE SIZE

1.063—1.073 inch (27.00—27.25 mm)

CONFIGURATION

Does not affect operation

Note: While this unit can be operated in any attitude, it is very heavy, and adequate support must be provided, especially if it is operated horizontally.

If not properly supported, cylinder deformation will cause side loading resulting in excessive cylinder wear and/or cylinder failure.

ELECTRICAL SPECIFICATIONS

INPUT POWER

24 Vdc ±10% @ 2 A

INPUT SIGNAL

20–200 mA integrating input signal (100 mA null)

EHPC POSITION FEEDBACK SIGNAL

4–20 mA, 20–4 mA, 0–10 Vdc, or 10–0 Vdc output signal for min to max cylinder position

HYDRAULIC SPECIFICATIONS

SUPPLY PRESSURE

80 to 250 psi (552 to 1724 kPa)

250 psi (1724 kPa) is the absolute maximum and is not to be exceeded.

PRESSURE SENSITIVITY

Supply and return—less than 2%

MINIMUM SUPPLY FLOW (STEADY STATE)

3.0 US gal./min at 250 psi (11.4 L/min at 1724 kPa)

2.0 US gal./min at 80 psi (7.6 L/min at 552 kPa)

MAXIMUM SUPPLY FLOW (TRANSIENT)

Use accumulators—up to 175 US gal./min (662 L/min)

FLOW TOLERANCE

± 10%

REQUIRED FILTRATION

10 µm nominal, 25 µm absolute

CONNECTION SIZE

2.0 pipe size, Class 600 raised face flanges per ANSI B16.5

HYDRAULIC FLUID

Types

Mineral or synthetic based oils

Note: Contact Woodward for specific oil recommendations.

Viscosity (recommended)

0.6 to 400 centistokes

Specific gravity

0.6 to 1.0

Source

Turbine lubricating system or external independent supply

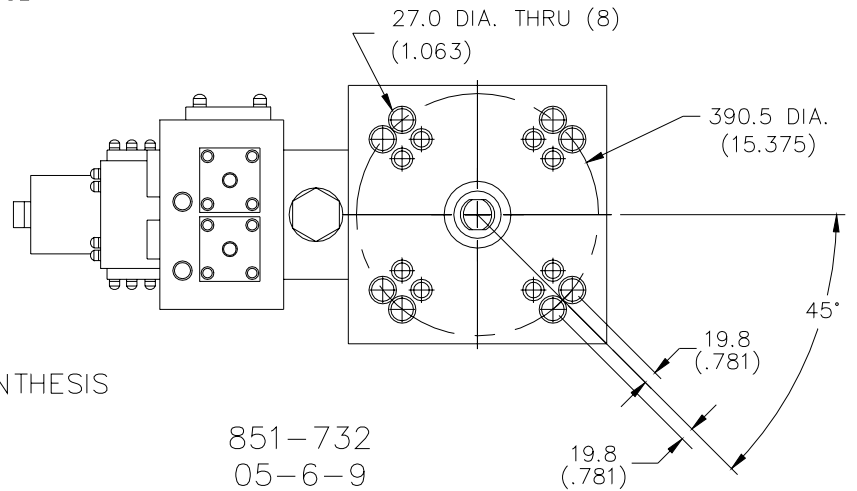
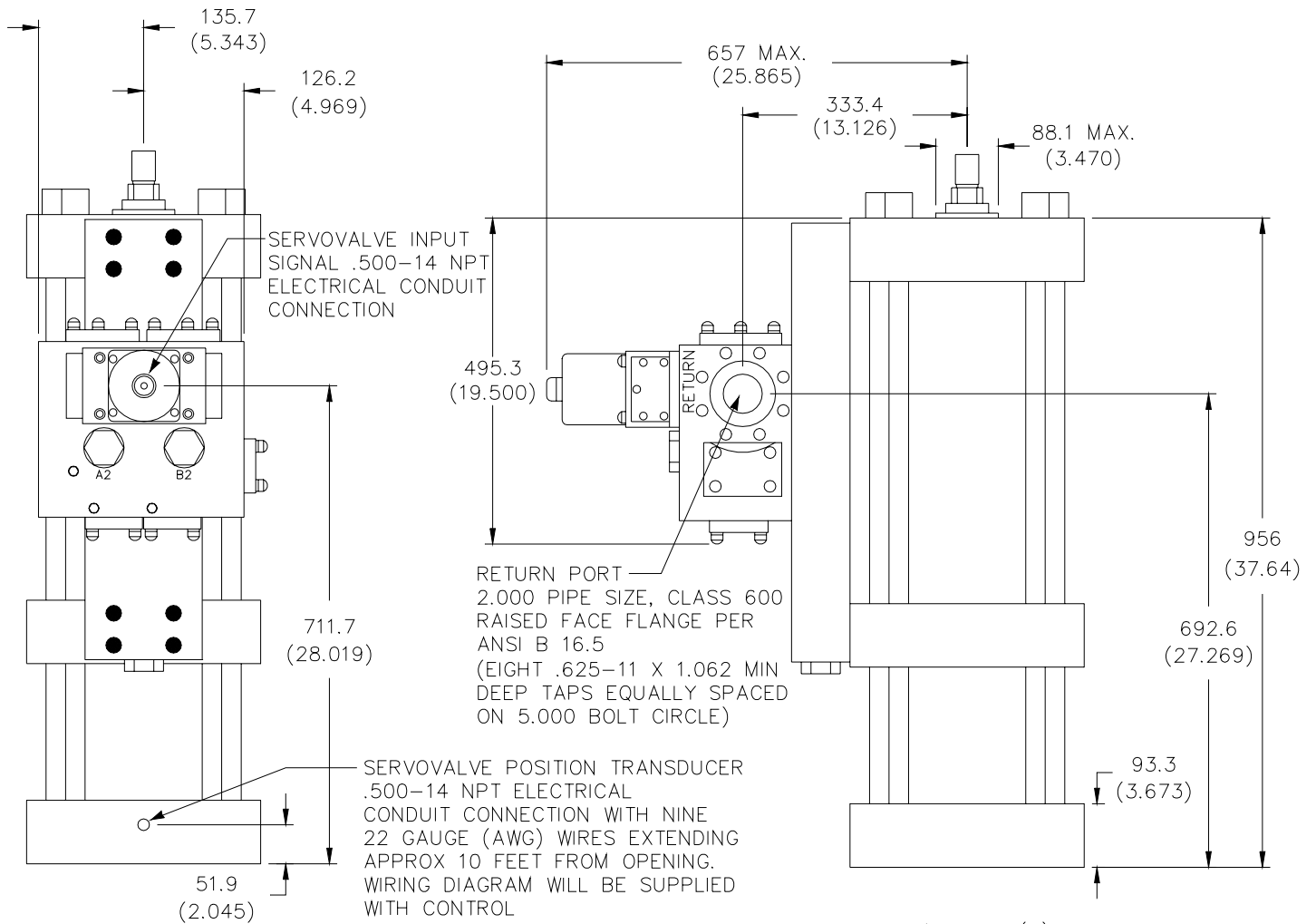
REGULATORY COMPLIANCE

North American Compliance

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

UL:

UL Listed for Class I, Division 2, Groups A, B, C, and D, T4 at 40 °C ambient. For use in Canada and the United States.



METRIC

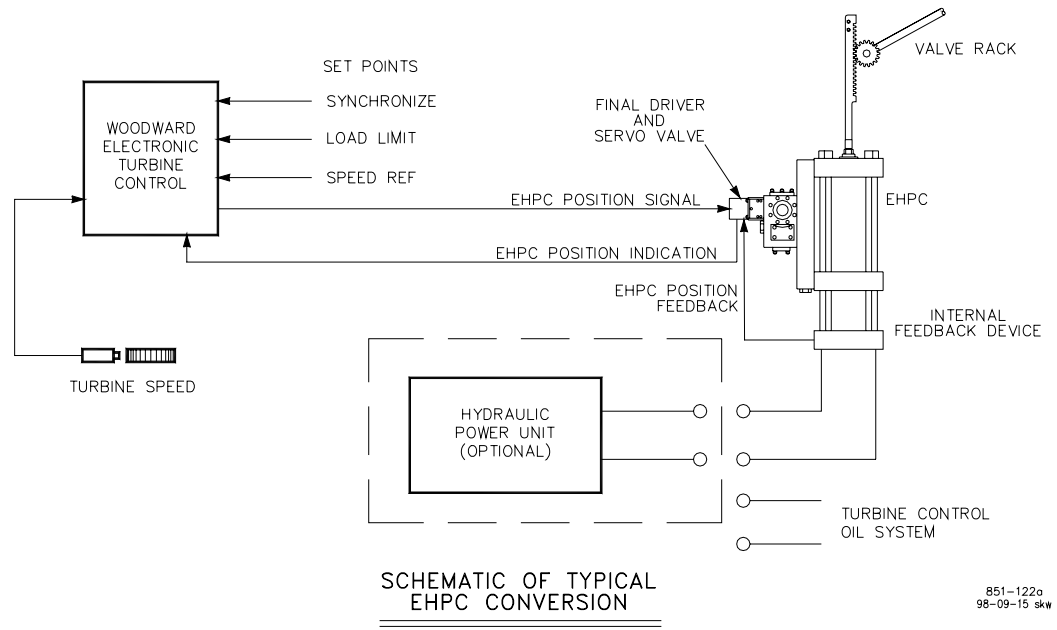
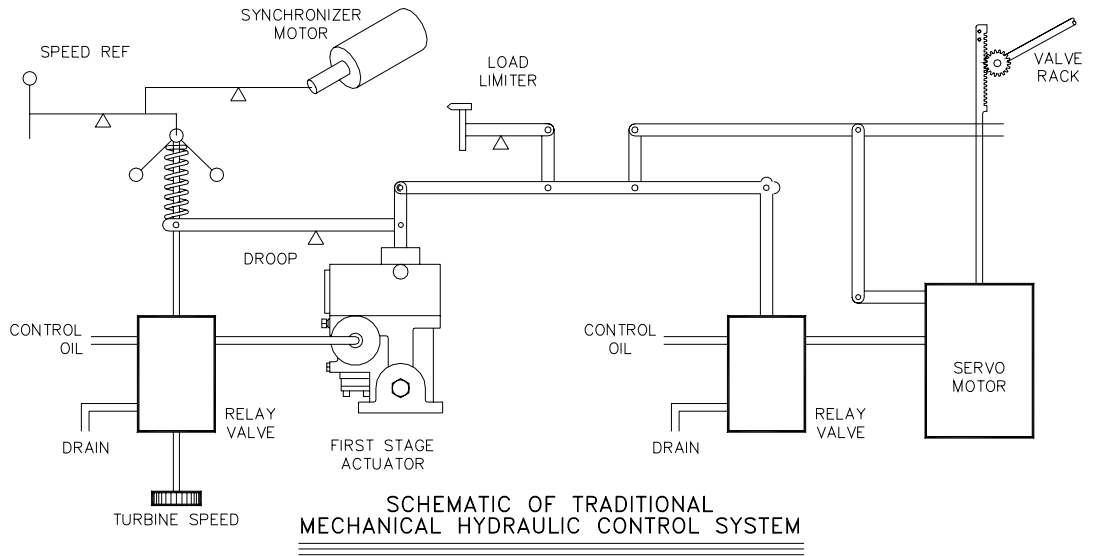
INCHES SHOWN IN PARENTHESIS

Typical EHPC Outline Drawing (Single or Dual Configuration)
(Do not use for construction)

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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.

www.woodward.com



Schematic of Typical EHPC Conversion

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