

# ELECTROHYDRAULIC POWER CYLINDER (EHPC)



## APPLICATION

The Electrohydraulic Power Cylinder (EHPC) provides the force to operate the control valves of a steam turbine. The EHPC is intended for use on mechanical drives or generator driven turbines. The EHPC integrates the actuator, pilot valve, electronic feedback device, final driver and the power cylinder into a single package, eliminating linkage and reducing hydraulic plumbing and wiring.

The EHPC is used when longer valve strokes and higher forces are required than can be supplied by other Woodward actuators.

In retrofit applications, the EHPC can directly replace the existing valve operating system. This saves costly repairs to existing 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 wired and tested at the factory. This greatly reduces OEM shop floor fabrication and testing time. For both OEMs and end-users, the EHPC provides the final element in the Woodward control system. You are provided with a fully integrated control package from a single manufacturer.

## DESCRIPTION

The EHPC combines an actuator with a final driver which accepts a 4–20 mA input control signal. This driver controls the first stage and up to three additional stages of hydraulic amplification. It 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.

## 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 in<sup>2</sup> (1548 mm<sup>2</sup>)] x  
(supply pressure)  
Extend direction  
(Bore area) x (supply pressure)

- Positions turbine steam valve
- Double- or single-acting
- Single integrated unit
  - Final driver
  - 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
- UL Listing Class I Division 2 Groups A, B, C, & D optional
- Dual coil option available

## 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 in<sup>2</sup> (1548 mm<sup>2</sup>)

Stroke direction

Extend or retract on increasing current input

Operation

Single- or double-acting

## WEIGHT

1000 to 1200 lbs (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.**

## DRIVER ELECTRICAL SPECIFICATIONS

### DRIVER CONNECTIONS

Field connections are through 0.500-14 NPT electrical conduit to the unit mounted enclosure. Termination is to a terminal block inside driver enclosure.

### INPUT POWER

Low voltage EHPC driver—18–32 Vdc @ 2 A

### EHPC POSITION FEEDBACK SIGNAL

4–20 mA output signal for min to max cylinder position

This signal may be used to drive two 250 A (500 A total) external circuits in series (i.e. Netcon 4–20 mA input and a DVM).

### FAULT INDICATION RELAY (NON-LATCHING)

2.0 A @ 28 Vdc resistive load

0.75 A @ 28 Vdc inductive load

0.16 A @ 28 Vdc lamp

### EHPC POSITION COMMAND SIGNAL

4–20 mA input from control for cylinder position

### DUAL COIL OPTION

A dual coil EHPC, which requires the use of a Woodward Digital Remote Final Driver, is available. The integral driver does not support Dual Coil. The dual coil option is not UL listed.

## 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)

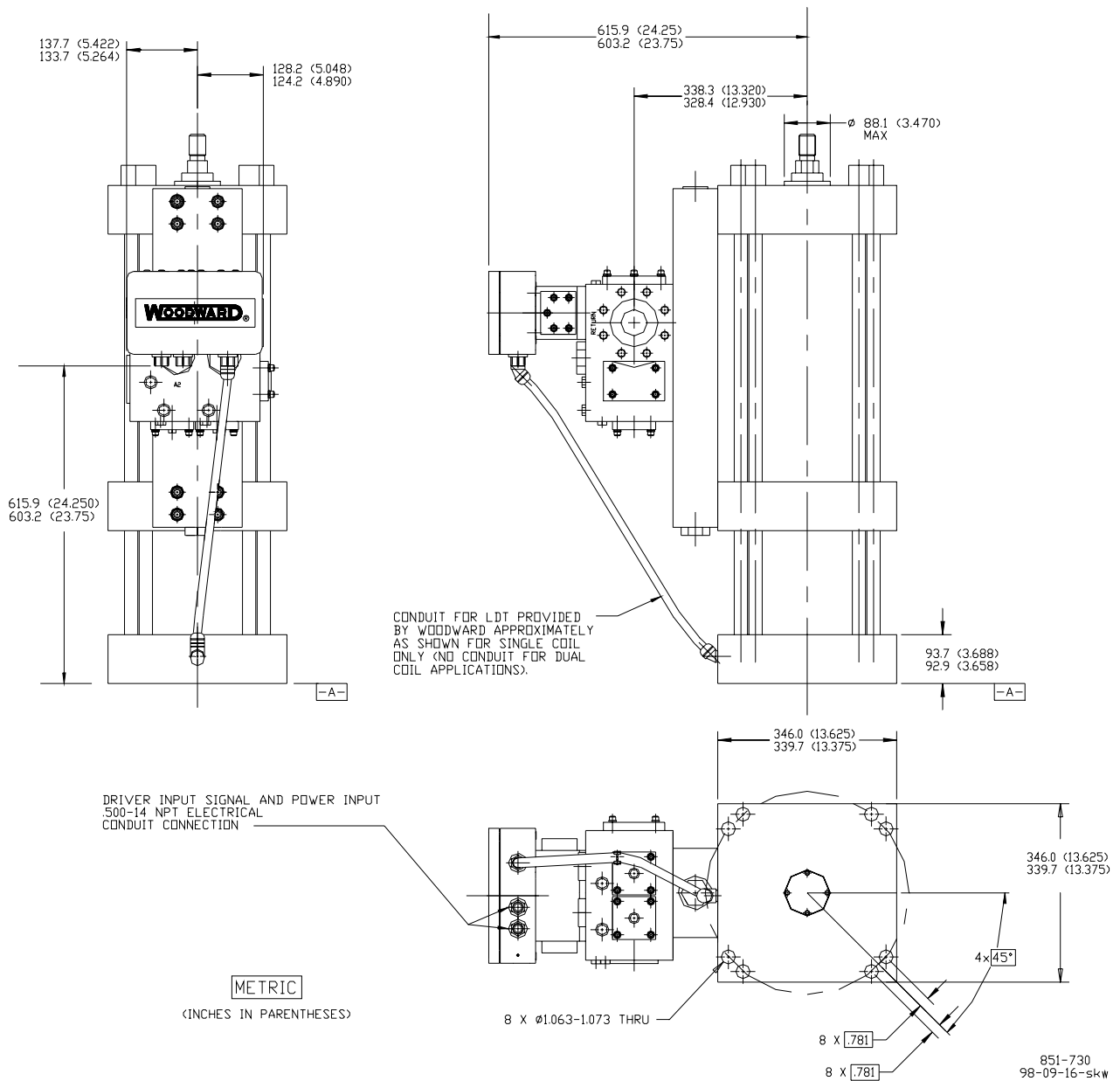
0.6 to 400 centistokes

Specific gravity

0.6 to 1.0

Source

Turbine lubricating system or external independent supply



Dimension subject to change  
Dependent upon bore and stroke

### TYPICAL EHPC OUTLINE DRAWING SINGLE OR DUAL CONFIGURATION

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  
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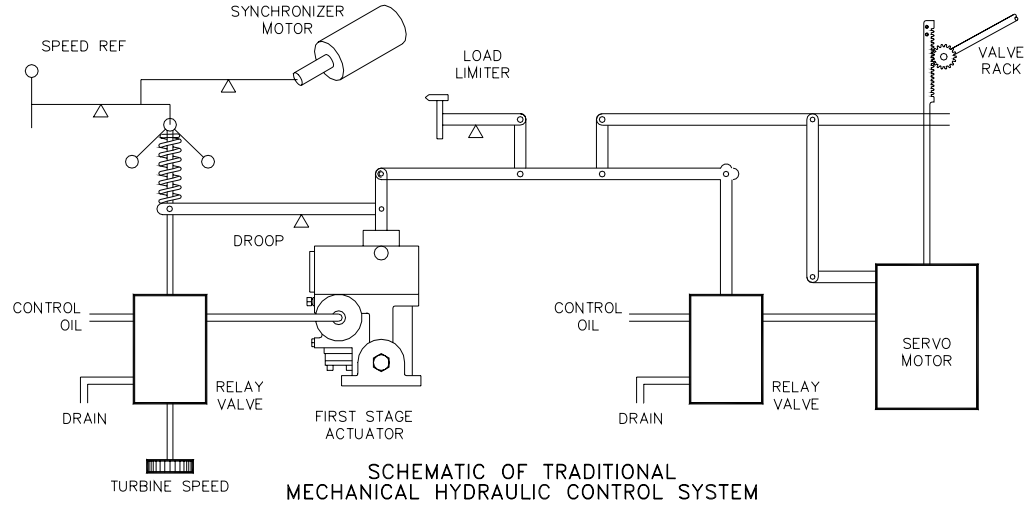
**Distributors & Service**

Woodward has an international network of distributors and service facilities. For your nearest representative call (1)(800) 835-5182 or see the Worldwide Directory on our web site.

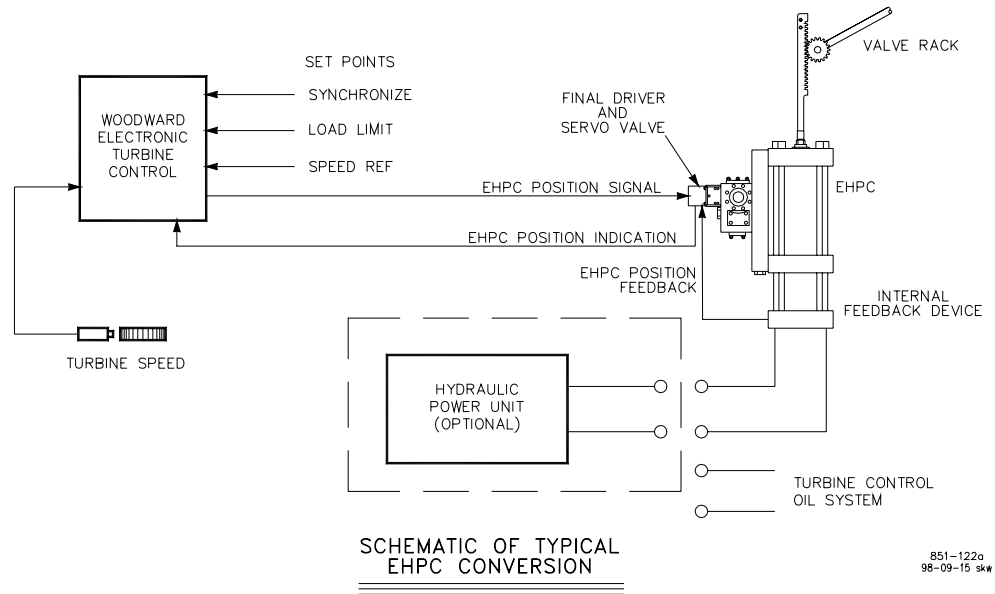
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**SCHEMATIC OF TRADITIONAL MECHANICAL HYDRAULIC CONTROL SYSTEM**



**SCHEMATIC OF TYPICAL EHPC CONVERSION**

851-122a  
 98-09-15 skw

**SCHEMATIC OF TYPICAL EHPC CONVERSION**

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