

# VARISTROKE™ LINEAR ELECTRO-HYDRAULIC VALVE ACTUATOR

WOODWARD | INDUSTRIAL TURBOMACHINERY SYSTEMS

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RELIABLE SOLUTIONS  
FOR INDUSTRIAL STEAM  
AND HYDRO TURBINES



# VARISTROKE™ VALVE ACTUATOR

## THE VARISTROKE ACTUATOR - WHEN TURBINE UP-TIME AND AVAILABILITY IS ESSENTIAL

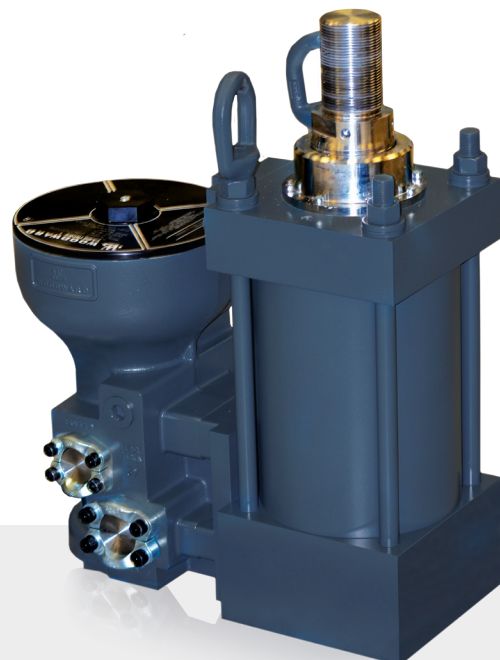
VariStroke is Woodward's line of linear electro-hydraulic valve actuators for operation of steam or hydro turbine control valves. These linear actuators utilize a low-pressure, hydraulic oil source (typically turbine lube oil) to provide its output shaft force. Its superb accuracy and resolution make it ideal for steam valve control and related turbine speed and load control, where turbine up-time and availability is essential.

Woodward's VariStroke line is factory and/or field configurable via a simple user-friendly computer-based PCI service tool, allowing users to easily configure, calibrate, and adjust all internal functions and response settings. The VariStroke integrated driver includes a 4-20 mA output channel to indicate output shaft (control valve) position, as well as unit alarm and shutdown relay outputs for use as unit health and status indications. The 4-20 mA demand inputs and dual-redundant shaft position sensors allow it to continue to operate even with demand input or feedback sensor failures, ensuring extended run-times between forced outages and on-line system repair.

The total installed cost for this fully integrated actuator is low because it has been completely assembled and tested at the factory, greatly reducing OEM and end-user fabrication, testing, and site assembly time. In retrofit applications, the VariStroke actuator can be used to directly replace the existing servo system. This saves costly repairs to existing and aging servos, eliminates the difficulty of obtaining spare parts for obsolete equipment, and reduces calibration time and difficulty.

### FEATURE OVERVIEW

- Precise and stable control for responsive performance
- Variable/configurable shaft lengths for various application requirements
- Patented dirt tolerant and self-cleaning technology for increased reliability
- High-torque valve and motor design (50 lbs chip shear)
- Fast slew rates/times (up to 10"/sec)
- Side-load tolerant for reducing potential oil leaks
- Integrated driver (4-20 mA) and 11-point linearization table
- Self-tuning adaptive control algorithm



# DESIGNED FOR RELIABILITY, SPEED, AND COMPATIBILITY

## DIRT-TOLERANT DESIGN FOR CONTAMINATED OIL

Designed to solve steam turbine users' #1 reliability problem, dirty oil. VariStroke actuators feature a patented self-cleaning valve design with more than 50 lbs of chip shear to operate in some of the most contaminated turbine lube oil environments in the industry. The VariStroke actuator was tested in conditions with over 3x the normal contamination found in audited turbine lube oil supplies around the world. VariStroke performed perfectly with zero position errors recorded, outlasting the system's hydraulic regulators and pumps.

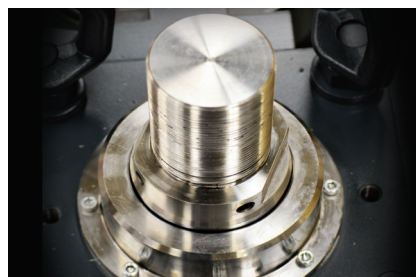
- Operates on turbine lube oil with no special filters needed
- Made with corrosion-resistant 440C stainless steel parts
- Patented silt buster and dither dynamics management
- Robust self-cleaning rotary control valve
- Large internal ports for contamination resistance
- High-powered valve control motor with 50 lbs of chip shear
- Tested and rated for dirty oil per industrial standard ISO 20/18/16

## SPEED RESPONSE

The first line of defense for any turbine rotor experiencing a full or partial load loss is a quality governor controller and quick response valve actuator. Woodward's industry leading digital turbine control systems, combined with VariStroke's fast response scan rates of 2.5 milliseconds, and 10x faster slew rates, effectively prevent rotor overspeed events. In addition, during normal operating times, the faster actuator response provides more stable turbine speed control for optimal operating output.

## ELIMINATES COMMON OIL LEAKS

Woodward's quality of design sets a new benchmark in actuator reliability and performance. With its robust shaft and bearing design, the VariStroke actuator surpasses traditional actuators in reliability by eliminating leaks common with base mounted steam valve racks and the associated arc-induced continuous side load on the output shaft. After being tested to over 1 million shaft cycles, with over 1,000 lbs of side force continuously applied to the output shaft, the VariStroke was leak free.



Not only is VariStroke fast, it is built to protect the integrity and longevity of your steam chest throttle valve or valve rack. VariStroke is equipped with soft seating closure technology, eliminating hard closure impact and prolonging the life of valve poppets and seals. Now you can have confidence that your system is protected both in speed of response and longevity of operations.

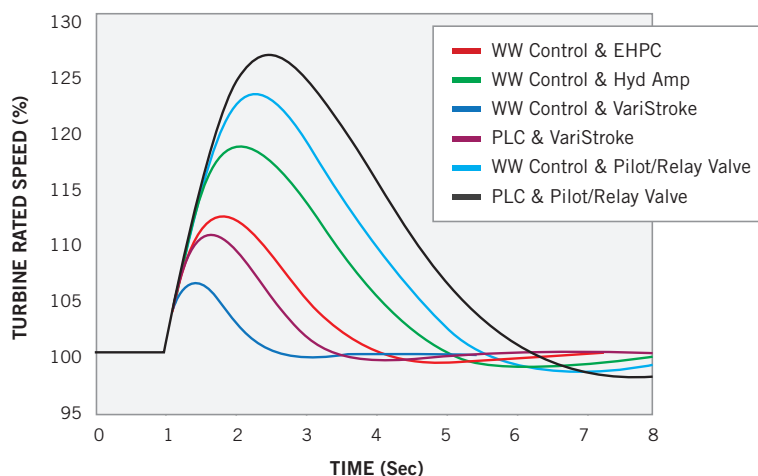


Diagram: Full Load Rejection Summary

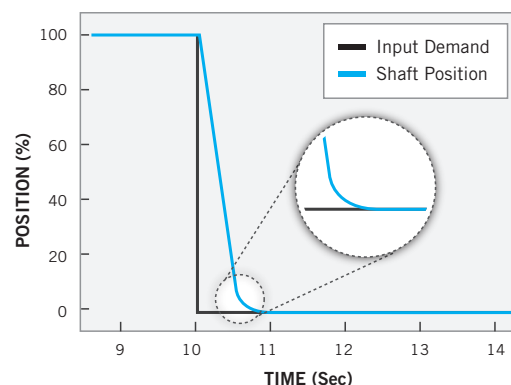
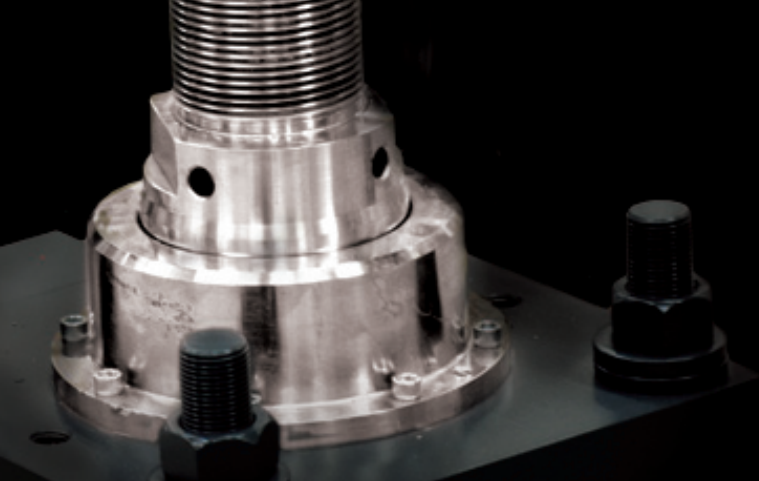
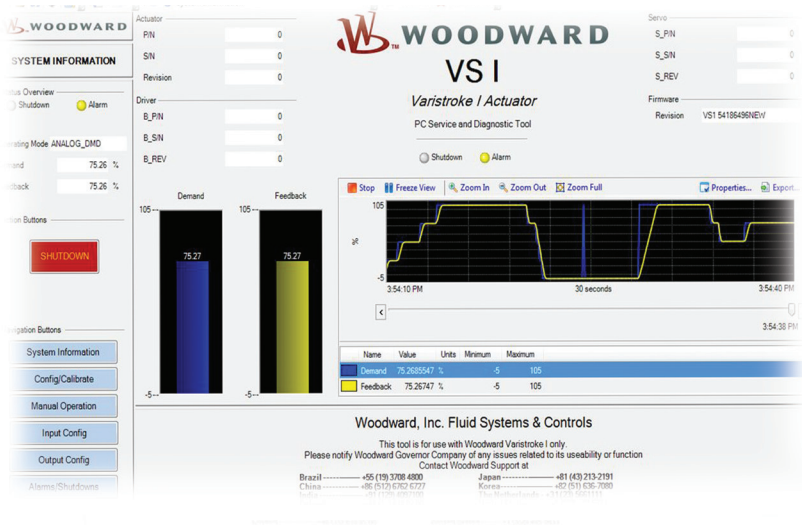


Diagram: Soft Seating Closure





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## DESIGNED TO FIT YOUR SYSTEM

VariStroke's versatile design provides the flexibility to integrate the best solution to fit your turbine application. The actuator design enables users to adjust output shaft stroke range to fit their specific needs. Turbine manufacturers and owners now can easily set maximum stroke position from 50 – 100% of factory listed maximum stroke range, saving time and the cost of modifying expensive valve racks and related linkages.

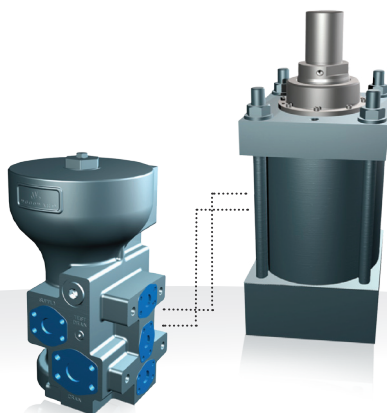
## NO DRIVERS REQUIRED

The VariStroke includes an embedded driver module within the servo assembly for closed loop control. The driver module includes a self-tuning/adaptive control – eliminating PID control tuning and allowing users to “plug-and-operate.” Installations are made easier by entering the correct hydraulic supply oil pressure and then allowing VariStroke's intelligent control algorithm to adapt its output response for the fastest slew rate and most stable operation possible.

VariStroke's embedded driver module also allows for easy calibration to the valve rack through its automatic and manual calibration routines. The innovative software service tool enables the VariStroke's auto-calibration routine to learn the valve rack's mechanical minimum and maximum positions by slowly moving the actuator's output shaft from end to end to learn precisely where the mechanical stop positions are in your set up. Users also have the option to use a manual calibration routine if they want to manage the set up to predetermined positions.



→ INTEGRATED ACTUATOR



→ REMOTE SERVO



→ SERVO ONLY

# GLOBAL SUPPORT

## TECHNICAL SUPPORT

### Colorado:

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## CONTACT

For general information on Woodward products or to download manuals and other documentation, visit:  
[www.woodward.com/turbine](http://www.woodward.com/turbine)

## DISTRIBUTOR INFORMATION

## VARISTROKE ORDERING OPTIONS

Cylinder Bore Sizes	Description
	100mm (4in)
	150mm (6in)
	200mm (8in)
	250mm (10in)
	300mm (12in)
Configuration	Description
	Integrated
	Remote
	Servo Valve Only
Cylinder - Max. Stroke Lengths	Description
	100mm (4in)
	150mm (6in)
	200mm (8in)
	250mm (10in)
	300mm (12in)
	350mm (14in)

Action	Description
	Double Acting
	Single Acting
	No Hydraulic Cylinder
Rod End	Description
	Male Thread
	Female Thread
	No Hydraulic Cylinder
Fail-Safe Direction	Description
	Extend
	Retract
	No Hydraulic Cylinder
Compliance	Description
	ATEX Zone 1
	ATEX Zone 2

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