



PROVEN STEAM TURBINE CONTROL SOLUTIONS: ANY SIZE, ANY APPLICATION

Simple | Reliable | Safe | Precise | Proven

TURBOMACHINERY CONTROL EXPERTS

Turbines | Compressors | Safety | Actuation

 **WOODWARD**

CONTROL SOLUTIONS



* TG Governor

SMALL MECHANICAL Drive Turbine Application

- Simple governor
- Overspeed test function



* Peak 150

SMALL MECHANICAL Drive Turbine Application

- Large speed band
- Plant DCS interface



* 505 / 505E

MEDIUM MECHANICAL/GENERATOR

Drive Turbine Application

- Auto-start sequence
- Header pressure control
- First-out indication
- Optional single extraction



* 5009FT

CRITICAL MEDIUM MECHANICAL/GENERATOR

Drive Turbine Application

- Triple modular redundant (99.999% availability)
- Auto-start sequence
- Header pressure control
- First-out indication
- Optional single extraction control



* MicroNet

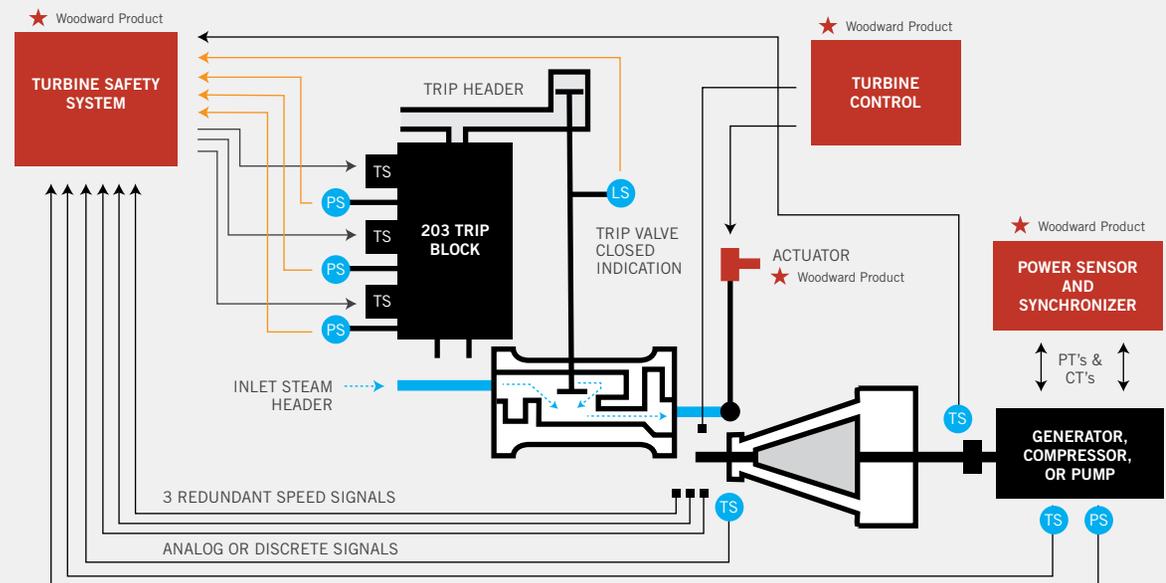
MEDIUM-LARGE MECHANICAL/GENERATOR

Drive Turbine Application

- Custom site specific control logic
- Custom redundancy -- architecture and I/O
- Custom number of input & outputs
- Custom user interfaces

INTEGRATED SYSTEM APPROACH

Woodward designs its line of steam turbine control products to be easily integrated together, simplifying system design and assuring unit-to-unit compatibility. This integrated approach reduces installation costs and allows customers to scale their system components to meet the requirements of small, medium, or large steam turbine applications.



CONTINUOUS INNOVATION

Woodward released its popular 505 Steam Turbine Controller in 1985 and has worked closely with turbine OEMs and end-users to improve it through the years. This standard off-the-shelf controller was purpose-built for small- to medium-size steam turbines driving generators, pumps, or compressors.

The latest 505 controller models contain many new features that improve reliability and performance, including:

- Generator load rejection anticipation logic
- Three critical speed avoidance bands
- Auto-start routines based on turbine temperature
- Compressor "Performance Control" de-coupling logic
- Plant boiler loss protection control
- Dual-Redundant capability (2 Master/Slave based 505's)



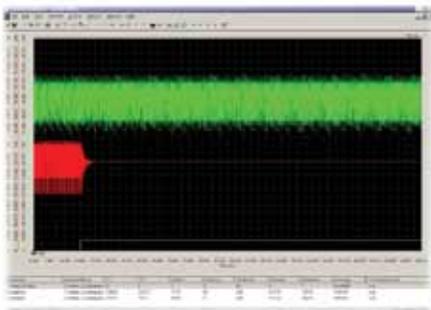
FIELD PROVEN

With over 40,000 steam turbine controllers installed worldwide, Woodward's control systems have been proven to stand up to harsh steam turbine environments, as well as meet the rigorous control requirements of steam turbine OEMs and users.

Robust product designs are leveraged to ensure long-term operation, no matter what the environment or application

PRECISE

Purpose-built for steam turbines, Woodward's powerful controllers have the performance and accuracy required for today's steam turbine applications. Steam turbine OEMs utilize Woodward's turbine controllers to ensure their packages meet steady-state stability and fast transient responses required by petrochemical plant processes and utility grid regulatory commissions.



Low rotor inertias of smaller steam turbines pose controlling problems for general purpose PLCs (programmable logic controllers), but not for Woodward controllers. Their deterministic architecture and model-based algorithms were designed in collaboration with steam turbine manufactures to ensure the required performance and stability at all levels of operation.

SIMPLE INTERFACING

As petrochemical and power plants continue to grow in size and complexity, steam turbine operators have found that they cannot be an experts on every system, including the steam turbine controller. For this reason, Woodward has put extra focus on ensuring that our user interfaces are simple to understand and use.

Our goal is to make the controller's user interface start, stop, and troubleshoot their turbine without opening a product manual.

OEM QUALIFIED

OEM control system qualification is a stringent process in which details of the control system design, architecture and performance are carefully scrutinized and tested to ensure that OEM turbine performance requirements are met. Qualification includes verification of I/O signal processing accuracy, software algorithms, and control system execution that meet OEM requirements.

Control System Qualifications

Ready State Stability	✓	Hazardous Location Rating	✓
Load Step Performance	✓	Competitive Cost	✓
Product Robustness	✓	Global Support	✓

GLOBAL SUPPORT

Woodward's global support network and our turbomachinery OEM partners provide an extensive range of technical and after-sales support services. This global presence allows us to respond quickly to the needs of our customers anywhere in the world. In today's complex control world, customers have come to recognize our people's expertise beyond the control system and depend on our global teams as critical plant support assets.

TECHNICAL SUPPORT

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CONTENT

For general information on Woodward products or to download manuals and other documentation, visit:

www.woodward.com/turbine

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