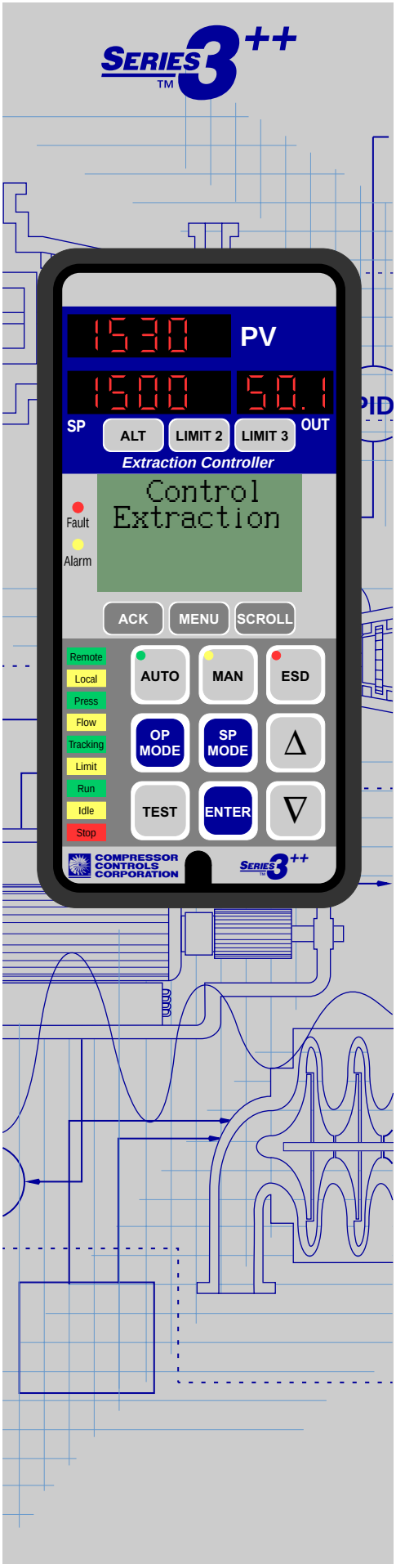

Extraction Controller

for Steam Turbines

COMPRESSOR CONTROLS CORPORATION

The Series 3++ Extraction Controller is specifically designed to regulate the LP header pressure or flow of a single extraction or induction turbine. It's the ideal companion for a Series 3++ Speed Controller (see PB3307) — together they provide integrated, efficient and reliable control for extraction steam turbines.

Through a sophisticated decoupling scheme, these two controllers coordinate the turbine's horsepower output and low-pressure flow rate, smoothly responding to changing application demands. They also cooperate to automatically sequence routine and emergency startups and shutdowns.

For extraction turbine-driven compressors, Antisurge and Performance Controllers can be added to provide fully-coordinated control and complete protection of the entire train.

As with the Speed Controller, this controller's redundant inputs, fault detection, fallback strategies, and online-backup features define a new, more economical approach to fault tolerance than has previously been available for steam turbines. And, like all Series 3++ devices, the Extraction Controller can be integrated into a distributed or supervisory control system using Modbus serial or ethernet communication.

Alternate-Variable Extraction Control

For single turbine applications, this controller can regulate the pressure or flow in the extraction header. Separate control loops are provided for both variables, each with its own tuning, inputs, and set point. The operator can bumplessly alternate between them at any time, without interrupting the process.

Depending on your needs and available measurements, the flow control loop can be configured to regulate either volumetric flow or temperature- and pressure-compensated mass flow.

The controller will accept set points for either loop from its front panel or a remote device. Remote/local switching is allowable at any time without disrupting the process.

Extraction Load-Sharing

If you have several turbines connected to a single extraction header, load-sharing can be achieved by combining Series 3++ Performance and Extraction Controllers. In most cases, this is implemented as a pressure-to-flow cascade. The Performance Controller monitors the header pressure, varying its output in response to any fluctuations. In turn, the Extraction Controllers

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Features:

- *on-the-fly switching between flow and pressure control*
- *header flow can be pressure and temperature compensated*
- *local and remote set points*
- *valve decoupling coordinates power and extraction control*
- *manual operation with loop decoupling and automatic speed override*
- *bumpless transfer among all control modes*
- *fallback strategies keep your turbine online in the event of input failures*
- *coordinated start-up and shut-down sequencing*
- *optional, automatic switching to redundant controllers in the event of critical failures*
- *compatible with pneumatic and hydraulic actuators*
- *standard hardware simplifies maintenance and parts stocking*
- *Modbus RTU or TCP interface for DCS/SCADA communication*

use that output as a flow set point, manipulating the extraction valves to keep each turbine's contribution at an optimal level while matching the total flow to your process demands.

Manual Control

When you need to directly manipulate the extraction valve, the Extraction Controller can also be operated manually. Your DCS or operator can then directly manipulate the intended position of that valve instead of the pressure or flow set point.

Although both the Speed and Extraction Controller should be run automatically, either or both can be switched to manual. If only one is, the loop decoupling scheme allows the other to precisely regulate its control variable despite any sudden manual movement of the other steam valve.

In addition, the Extraction and Speed Controllers offer a manual override feature that prevents the operator from inadvertently moving the valves into positions that might cause damage to the turbine or disruption of the plant steam balance.

Control Valve Flexibility

In addition to its two standard 20 mA / 5 Vdc outputs, the Speed Controller has a high-current output that can generate current-loop signals ranging up to 200 mA.

Benefits

Series 3^{++} Extraction Controllers offer benefits you can't get from general-purpose controllers, including:

- More precise control of your process and steam balance by coordining interacting control loops
- More reliable control because redundant inputs and fallback strategies permit continued operation even after input failures
- Simplified operation due to integral manual control capability, protective override, and automated start-up and shut-down
- Lower turbine repair costs because automated sequences provide consistent warmups and avoid critical speeds
- Lower capital costs because automated start-up and overspeed protection prolongs the life of your turbine