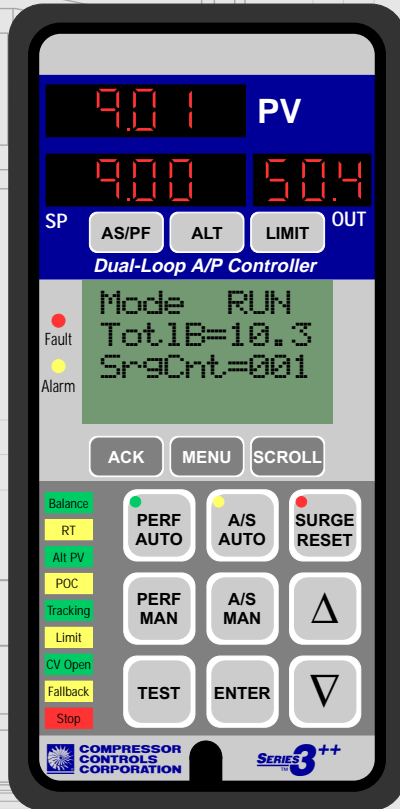


SERIES 3⁺⁺
TM



Dual-Loop A/P Controller

for Centrifugal and
Axial Compressors



For some applications, the cost of a dedicated controller for each loop may be hard to justify. On the other hand, general-purpose controllers lack the speed and specialized algorithms needed to protect and precisely regulate a turbocompressor.

The Series 3⁺⁺ Dual-Loop A/P Controller is our solution for this dilemma. If its simplified surge protection and shared operator displays meet your needs, it is an economical alternative to our full-featured Antisurge and Performance Controllers.

Like all Series 3⁺⁺ Compressor Controllers, the A/P model offers loop-decoupling, limiting control, and automatic startup and shut-down. They can be combined in multi-compressor load-sharing networks, and can exchange information with supervisory and distributed-control systems via Modbus communications.

This controller also offers several features specifically intended for packaged air compressor applications. These include special proximity-to-surge calculations, modified start-up and shut-down sequences, and the ability to display calculated variables such as the total and net mass flow.

Pioneering Surge Protection

Every centrifugal or axial compressor has a characteristic ratio of maximum head to minimum flow beyond which it will surge. To protect against surge damage, the Dual-Loop A/P Controller uses simplified versions of the proximity to surge calculations and control responses employed by the Series 3⁺⁺ Antisurge Controller (see [PB3301](#)).

A compressor's surge limit is a function of many variables. This controller's antisurge loop can not take all of them into account (because it must share the controller's limited resources), but can still adapt to changes in suction temperature and pressure, rotational speed, and guide vane angle.

Surge protection is also complicated by the speed at which surge can develop, so the controller responds with comparable speed. For small, slow disturbances, proportional-plus-integral control is usually enough. If that fails to maintain an adequate flow rate, the Recycle Trip[®] response steps the valve even further open. If the compressor does surge, our Safety On[®] response response redefines the surge limit to prevent any repetition.

In addition, the recycle rate can be further increased if one limiting variable control threshold is reached.



Features:

- *proximity-to-surge calculations suitable for many applications*
- *combined open and closed-loop antisurge control responses provide maximum protection and optimal process efficiency*
- *local or remote set point control of any single-input capacity measurement, or load-sharing control for one compressor*
- *either loop can limit one other process measurement*
- *integrated loop decoupling prevents interacting loops from destabilizing your process*
- *bumpless transfer between each loop's automatic and manual operating modes*
- *coordinated start-up and shut-down sequencing*
- *manual override guards against accidental compressor damage due to operator error*
- *optional, automatic switching to redundant controllers in the event of critical failures*
- *standard hardware simplifies maintenance and parts stocking*
- *Modbus RTU or TCP interface for DCS/SCADA communication*

Performance Control

The capacity control loop can regulate any single-input process variable (such as the suction pressure), including any of those used by the proximity-to-surge calculation. Or, it can participate in a load-sharing network that throttles each compressor as needed to keep them all equidistant from their surge limits.

This loop can also switch to limiting control of one single-input variable (motor current, for example).

Integrated Loop Decoupling

If operated independently, antisurge and performance controllers can create pressure and flow oscillations that degrade control precision and reduce antisurge protection. To prevent that, the A/P Controller can decouple its own control responses from those of companion Series 3⁺⁺ (or Series 3 Plus) Controllers.

As a result, its loops can be tuned faster to achieve more precise control without sacrificing process stability. This loop decoupling action also enables the performance loops to help move the compressor away from surge, and to maintain precise capacity control during movement of the antisurge valve.

Benefits

Series 3⁺⁺ Dual-Loop A/P Controllers offer benefits you can't get from general-purpose controllers, including:

- **More economical operation of your compressor** because our surge control methods allow the compressor to safely operate closer to its surge limit without unnecessary recycling
- **More precise control of your process** because the built-in loop decoupling algorithms allow companion Performance and Antisurge Controllers to be tuned faster and to counteract the potentially disruptive effects of antisurge control actions
- **Less downtime** because our control algorithms eliminate unnecessary process trips due to surge or overload conditions
- **Lower compressor repair costs** because elimination of damaging surges reduces the frequency of major repairs
- **More reliable operation** because fall-back strategies permit continued surge protection even after transmitter failures
- **Simplified operation** because our Recycle Trip and Safety On control responses minimize operator involvement
- **Lower engineering costs** because the Series 3⁺⁺ Dual-Loop Controller is designed specifically for compressor applications, thus eliminating custom software design and debugging costs and reducing startup expenses
- **Lower capital costs** because our surge and overload protection features prolong the life of your compressor.