



**COMPRESSOR  
CONTROLS  
CORPORATION**

# Series 3 Plus Dual-Loop A/P Controller

## for Axial and Centrifugal Compressors

### Description

For some applications, the cost of a dedicated, single-loop controller for each control 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 compressor.

The Series 3 Plus Dual-Loop A/P Controller is our solution for this dilemma. If its simplified surge protection and shared operator displays meet your needs, this controller can provide an economical alternative to our full-featured Antisurge and Performance Controllers. It is particularly well suited to packaged air compressors, for which we offer [Air Miser Control Systems](#) built around this controller.

Like all Series 3 Plus Compressor Controllers, the A/P model offers loop-decoupling, limiting control, and automatic startup and shutdown. They can be combined in multi-compressor load-sharing network, and can exchange information with host computers or distributed-control systems via serial communications.

### Patented Surge Protection

Every turbocompressor has a characteristic combination of maximum head and minimum flow beyond which it will surge. To protect against this damaging phenomenon, the Dual-Loop A/P Controller employs a simplified version of our patented surge control strategy, which combines our unique method of calculating proximity to surge with both open and closed loop control responses.

A compressor's surge limit is a function of many variables. Because the antisurge loop must share the controller's inputs and computational capacity, it can not take all of those factors into account. But its proximity-to-surge calculation can adapt to changes in suction temperature and pressure, rotational speed, and guide vane angle.

Surge prevention is also complicated by the speed at which surge can develop, so the control system must respond with comparable speed. For small, slow disturbances, proportional-plus-integral control is usually enough. If the PI action fails to maintain an adequate margin of safety, the [Recycle Trip](#) response steps open the recycle valve even further. If the compressor

*Description, continued on rear panel*

### Benefits

Series 3 Plus Dual-Loop Controllers offer benefits you can't get from other multi-loop controllers, including:

- [More economical operation of your compressor](#) because our advanced surge control methods and dedicated, high-speed hardware allow your compressor to safely operate closer to its surge limit without unnecessary recycling
- [More precise control of your process](#) because our integral loop-decoupling algorithms allow the performance control loop to be tuned faster and counteract the potentially disruptive effects of antisurge control actions
- [Less compressor downtime](#) because our surge protection and process-limiting algorithms eliminate

*Benefits, continued on rear panel*



### **Description**, continued from front panel

does surge, our **Safety On** response redefines the surge limit to prevent any repetition.

In addition, the controller can further increase the recycle or blow-off rate as needed to limit either of two optional constraint parameters.

### **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.

The performance loop can also switch to limiting control of a second, single-input variable (motor current, for example) if its efforts to maintain the capacity control variable might otherwise lead to equipment damage or a process trip.

### **Summary of Features**

The many built-in, keyboard-configurable features of the Series 3 Plus Dual-Loop A/P Controller include:

- proximity-to-surge calculations that adapt to changes in most inlet conditions
- patented combination of open- and closed-loop surge control responses
- control of any single-input process variable or a load-sharing variable based on proximity-to-surge
- local or remote performance control set point
- process limitations can be controlled by either loop
- integrated loop decoupling
- bumpless transfer between each loop's automatic and manual operating modes
- automatic start-up and shut-down sequencing
- manual override guards against accidental compressor damage due to operator error
- tracking and self-test features allow smooth, automatic switching to redundant controllers
- standard hardware simplifies maintenance and spare parts stocking
- Modbus interface for communication with host computers or distributed control systems.

### **Integrated Loop Decoupling**

Operating independently and often at cross purposes, conventional antisurge and performance controllers can create pressure and flow oscillations that degrade performance and reduce antisurge protection. To prevent such problems, the A/P Controller can decouple its own control responses from those of any companion Series 3 Plus controllers.

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

### **Air Miser Control Systems**

The A/P Controller also serves as the basic building block of our **Air Miser** Control Systems for packaged air compressors. These consist of one or more A/P Controllers, usually mounted in NEMA rated enclosures. For a load-sharing application, the system would also include a master *Series 3 Plus Performance Controller* [PB302].

The A/P Controller incorporates several features specifically for Air Miser applications. These include special proximity-to-surge calculations, modified start-up and shut-down sequences, and the ability to display additional calculated variables such as total and net mass flow.

### **Benefits**, continued from front panel

- unnecessary process trips due to surge or overload conditions
- **Lower maintenance and capital costs** because our surge protection and limiting-variable control algorithms prolong the life of your compressor
- **Optimal efficiency in multi-compressor applications** because our patented load-sharing algorithms eliminate unnecessary recycling
- **Simplified operation** because our **Recycle Trip**, **Safety On**, and start-up and shut-down routines require less operator involvement

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