Druck
a Baker Hughes business

The need for speed

Optimising Druck's PACE5000 E & 6000 E Pressure Controllers

Introduction

Druck, a Baker Hughes business, has been developing and delivering pressure measurement solutions to customers for more than 50 Years. Our expertise spans across many of the harshest applications, including in Aerospace, Oil & Gas, Industrial, Metrological Laboratories and many others.

One of Druck's main areas of technical expertise is Pressure Controllers, with customers using Druck's solution across many different industrial applications and by metrological laboratories as calibration standards around the world.

Druck's PACE Pressure Controllers are widely regarded as the fastest, most stable and accurate controllers on the market, across a wide variety of applications.

In the past, we have written about the accuracy and stability of the PACE portfolio, producing a whitepaper (available to download here) that discusses aspects to consider when accuracy and stability are key to your application.

In this paper, we are focusing on how to optimise your PACE controller set up to achieve the best result when speed is the most critical factor.

In reality, applications often require a blend of all three aspects of speed, accuracy and stability. We see competing suppliers heavily promoting one aspect of performance, but customers are often not aware that their pressure controller sacrifices one of the other two key areas to achieve this.

The versatility and flexibility of Druck's PACE Pressure Controllers portfolio allows for fine tuning to find the best possible set up to meet your application needs.

In this paper, we are going to focus on three main areas to consider when optimising your PACE Pressure Controller setup to maximise speed:

- Controller settings
- Pneumatic connections
- Maintenance

Controller settings

One of the easiest, quickest and cost-effective ways to improve the PACE control performance is to optimise the settings within the controller to match the application. All control settings can be found within the "control setup" menu.

Slew rate

For the majority of applications, the optimum setting is to configure PACE for "Max rate". This will ensure the PACE controls as fast as possible.

However, for configurations that contain complex loads/volumes it may be necessary to find a slew rate that hits the sweet spot for that application by configuring the slew rate as "linear" with a defined value in mbar/second (example) that can be tuned to match the application.

This setting is also useful should maximum speed not be a requirement, but where a slower and precisely controlled ramp might be more desirable

Overshoot

In order to guarantee the fastest control speed, it is necessary to enable the overshoot setting. This does not guarantee that the controller will overshoot, but allows it to if necessary.

If the user requires the controller not to overshoot then the "no overshoot" setting can be enabled.

In-limits

PACE Pressure Controllers are considered the most stable on the market, guaranteeing a control stability of 10ppmFS (0.001%FS) minimum. Typically, figures of 5ppm or even 1ppm are possible.

When compared to the closest competitor product, achieving 30ppm, you can see the gap in performance. However, if the user wishes to sacrifice control stability for enhanced speed-to-setpoint then the "in-limit" settings can be adjusted to higher values e.g. 50ppm. This will reduce the time it takes for PACE to report back via remote communication (or on-screen) that it has settled at the desired setpoint. In this case PACE can reach most setpoints in as little as 1-2 seconds. This setting can be found within the supervisor setup menu.

PACE also provides feedback that you are within these specified control stability limits for a user defined period of time. This feedback can be provided on-screen or via the remote communication interface.

Active/passive/gauge mode

Although not related to control speed, this setting allows the user to potentially improve their uncertainty budget in a leak-free or low leak system.

In active mode, the PACE controller is always responding to pressure fluctuations and so the 10ppm pressure stability figure must be included within the uncertainty budget. The reason for not including this term as standard is because the PACE often achieves 1-2ppm control stability and is therefore negligible in these situations.

If the user has a setup whereby the system has a very small leak, then PACE can be switched to passive mode whereby the controller turns off when reaching setpoint. This allows for the uncertainty budget to be improved. It's extremely important to consider this uncertainty budget if using a competitor product with reduced control stability.

Often, claims of very fast control speed are offset by control stability specifications of >=250ppmFS. Consider this against a sensor uncertainty in the region of 50-100ppmFS and the excellent sensor performance is completely negated by the poor control stability.

In addition to this, it is worth mentioning gauge mode, this allows the user to control PACE without the use of a vacuum pump by venting the controlled pressure when close to atmospheric conditions, should a 0barg setpoint be required.