

Replacing PACE 5000 with the 6270A Modular Pressure Controller/Calibrator

Application Note

The 6270A Modular Pressure Controller/Calibrator is an effective drop-in replacement for the GE Druck PACE 5000 Modular Pressure Controller/Indicator in most applications. This application note summarizes some of the benefits of upgrading to the 6270A, as well as detailing the steps for configuring and installing the 6270A as a replacement to the PACE 5000.

Benefits of upgrading

There are many benefits to upgrading to the 6270A Modular Pressure Controller/Calibrator, including:

- Workload coverage
- Control performance
- Maintainability/serviceability
- Expandability

Let's explore these benefits in more detail.

Workload coverage

The PACE 5000 supports one pressure range at a time (for the dual channel version of PACE, see the application note "Replacing a PACE 6000 with the 6270A Modular Pressure Controller/Calibrator"). The single module setup limits the range of pressure that a single PACE 5000 unit can cover. Theoretically, different range modules could be used to allow for wider range coverage, but replacing a module requires disconnecting all pressure and vacuum lines running to and from the instrument. The 6270A allows for up to five modules to be installed at one time and allows you to re-range the unit by quickly and easily replacing modules through the front panel.

Measurement performance

The PACE 5000 utilizes silicon-based pressure sensors for its on-board calibration reference



standards. Its measurement specification is typically cited to be as good as 0.005 % reading +0.005 % full scale. This specification includes the combined effects of non-linearity, hysteresis, and repeatability. It does not include long term stability, which is an additional 0.01 % reading per year. The specifications provided below for the Fluke Calibration 6270A include one-year measurement stability.

Fluke Calibration 6270A offers two pressure measurement module class options to balance cost and performance. The specifications provided for the 6270A are inclusive of all influences, including one-year stability.

- I. The silicon-based cost-effective PM200 module offers 0.02 % full scale total one-year measurement uncertainty specification.
- II. PM600 module offers 0.01 % reading total one-year measurement uncertainty specification from 30 % to 100 % of the module full scale. Most of the PM600 modules offer gauge, absolute and vacuum measurement standard.

Control performance

The 6270A provides control precision of $\pm 0.001\%$ of the active range. This specification allows for proper pressure stability at both high and low pressures. For example, if the 6270A is configured with a 300 psi range and a 3000 psi range, then the control precision will be ± 0.003 psi at lower pressures (300 psi and below) and ± 0.03 psi for higher pressures. The PACE 5000 has a similar specification of $\pm 0.001\%$ full scale.

Maintainability/serviceability

The 6270A is designed with a focus on maintenance and service. The modular design allows for reduced downtime during recalibration. Control functionality is also encapsulated in a module, making troubleshooting and repair of any control performance issues. The focus on serviceability is seen throughout the design. For example, the removable connection manifold allows for easy repair if the port connection threads are damaged due to misuse.

Expandability

Your calibration needs change with time. The 6270A can change with your needs. You can change the pressure range or measurement performance of the instrument by adding pressure measurement modules. This can be done without sending any part of the instrument back to the factory for reconfiguration. Simply install the new pressure measurement modules and start controlling pressure. You can install the new module in less than a minute, without having to change any of your pressure lines connected to the instrument. The system can then automatically switch between modules as necessary.

Configuring a 6270A

Selecting a pressure module

The PACE 5000 is available with a choice of three different accuracy classes (CM0, CM1, and CM2). The 6270A pressure modules are available in two accuracy classes, with the PM200 modules providing 0.02% FS uncertainty for one year (for most ranges) and the PM600 providing 0.01% reading uncertainty for one year.

Figure 1 shows a comparison of the specifications across the given pressure range. The uncertainty of the PACE 5000 has been estimated as the summation of the precision specification and the long term stability specification.

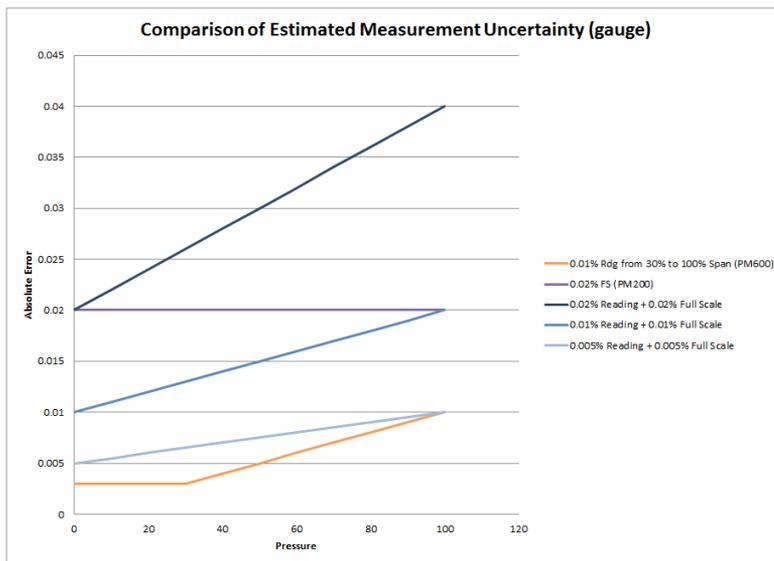


Figure 1. Comparison of percent full scale, percent reading, and percent reading plus percent full scale specifications.

* The exact range is not available, but the required range is within the percent reading region of the given PM600 range.

PACE 5000, SI units	PACE 5000, psi		PM200	PM600
2.5 kPa	0.35 psi	gauge	PM200-BG2.5K	-
7 kPa	1 psi	gauge	-	PM600-BG15K*
20 kPa	3 psi	gauge	-	-
35 kPa	5 psi	gauge	PM200-BG35K	PM600-G100K*
70 kPa	10 psi	gauge	-	PM600-G100K*
100 kPa	15 psi	gauge	PM200-BG100K	PM600-G100K
200 kPa	30 psi	gauge	PM200-BG200K	PM600-A350K*
350 kPa	50 psi	gauge	-	PM600-A700K*
700 kPa	100 psi	gauge	PM200-G700K	PM600-A700K
1 MPa	150 psi	gauge	PM200-G1M	PM600-A1.4M
2 MPa	300 psi	gauge	PM200-G2M	PM600-A2M
3.5 MPa	500 psi	gauge	PM200-G3.5M	PM600-A3.5M
7 MPa	1000 psi	gauge	PM200-G7M	PM600-A7M
10 MPa	1500 psi	gauge	PM200-G10M	PM600-A10M
13.5 MPa	2000 psi	gauge	PM200-G14M	PM600-A14M
17.2 MPa	2500 psi	gauge	-	PM600-A20M
21 MPa	3000 psi	gauge	PM200-G20M	PM600-A20M

Figure 2. Recommended ranges when replacing a PACE 5000 with a 6270A

The 6270A pressure modules are available in a number of ranges, as shown in Figure 2. The PM200 and PM600 provide different levels of performance, allowing it to cover many different applications.

Measuring barometric reference pressure

A barometric reference sensor is an available option on the PACE 5000. Choosing this option allows the instrument to be used in absolute mode. If gauge mode PM200 modules are used with the 6270A, then a barometric reference option is recommended for operation in absolute mode. There are two modules available that can be used for measuring the barometric reference pressure:

Model	1-year specification
PM200-A100K	0.1 % FS
BRM600-BA100K	0.01 % reading

When a barometric reference sensor is used to allow for absolute mode pressure measurements, the barometer's performance has a greater impact on the overall measurement at lower pressures compared to higher pressures. For many applications, the PM200-A100K is acceptable for pressure ranges of 500 psi or greater. The BRM600-BA100K is preferred for lower pressure ranges.

The majority of PM600 modules are inherently absolute mode. They are capable of measuring in both gauge and absolute mode without the use of an additional barometer. Adding the barometer can improve the measurement performance in absolute mode. In most situations where the PACE 5000 measurement performance was acceptable, the additional improvements provided by the barometer are not necessary.

Selecting the test port manifold

There are three versions of the 6270A main chassis. The difference between the versions is the connection types on the back of the instrument. The connection types can be changed by removing and replacing the rear connection manifold. To remove the manifold, simply remove the four screws and slide the manifold out the back of the instrument. The pressure connections on the PACE 5000 are 1/8 BSP. Adaptors are available where necessary.

Model	Supply, exhaust, test, and reference connections	Vent connection
6270A-NPT	1/4 NPT	1/8 NPT
6270A-BSP	1/4 BSP (parallel)	1/8 BSP (parallel)
6270A-7/16	7/16-20 SAE	5/16-24 SAE

Installation and setup

Rackmount installation

An optional rackmount kit is available for the 6270A. This kit allows for installing the 6270A in a standard 19-inch rack, just like the optional rackmount kit that was available for the PACE 5000. The PACE 5000 is 2U high, where the 6270A is 3U. When replacing a PACE 5000 installed in a rack system, an additional 45 mm (1.75 inches) of vertical space is necessary.

Physical connections

Making pressure connections when replacing a PACE 5000 is straightforward. Simply connect the device under test to the 6270A test port instead of the PACE 5000 outlet. Connect the supply pressure (previously connected to the PACE 5000 supply+ port) to the supply port on the 6270A. If there was a vacuum pump connected to the PACE 5000 supply port, connect it to the 6270A exhaust port. For ranges above 100 psi, the supply pressure requirements for the PACE 5000 and the 6270A are the same (10% above the full scale range). For ranges below 100 psi, increase the 6270A supply pressure to equal the full scale plus 15 psi (100 kPa).

Emulating remote communication

The 6270A can be placed in PACE 5000 remote emulation mode. To set remote emulation mode from the front panel, press SETUP. In the main setup menu, select INSTRUMENT SETUP and then REMOTE PORT. Pressing EMULATION MODE allows you to select PACE 5000. For a complete listing of all supported commands, see the 6270A Programmers Reference Guide. When using RS-232, the 6270A requires a null modem cable, where the PACE 5000 uses a straight cable. Null modem adaptors and cables are readily available.

Conclusion

The Fluke Calibration 6270A offers many benefits. The ability to use five modules simultaneously allows for wide pressure range coverage, and that coverage can be easily expanded as your needs change. A true modular design provides improved uptime. With the 6270A you get the service and support of Fluke Calibration, the industry leaders in pressure calibration.

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