FLUKE.

Calibration

Using COMPASS® for Pressure software to automate pressure calibrations

Application Note

COMPASS® for Pressure calibration management software is a universal platform designed to handle a wide range of pressure calibration applications. It has the flexibility to manage virtually any test setup, from a piston gauge calibrating individual devices in the cal lab all the way to using transfer standards to characterize racks of sensors in a production environment. COMPASS provides an off-the-shelf software tool to maximize the automation of your calibration and testing processes.

Why automate pressure calibrations?

1. Consistency

There are several important advantages to applying automation to the pressure calibration process. By creating software configurations for your process that can be saved and shared, the process can be readily duplicated by multiple operators in multiple locations, and over time. This improves the quality of your results, reduces operator error and standardizes methods. Additionally, electronic records of results are captured and preserved for later recall.

2. Efficiency

Automation of the pressure calibration process allows for operation without a technician present, even over night. This does not make technicians obsolete but frees them up to perform more valuable tasks like data analysis, quality improvement and running multiple tests or stations at once.

Automation of pressure calibrations can increase throughput of workload. COMPASS software provides capability to simultaneously calibrate multiple units under test (UUTs). Doing so can save hours over calibrating them one at a time.

These efficiencies improve equipment utilization and therefore ROI on equipment purchases.

3. Avoid custom programming

The use of COMPASS software provides the benefits of the professionally developed, highly specialized calibration software that has been installed in hundreds of facilities throughout the world, thus delivering results quickly and saving valuable internal engineering resources.

What kinds of tests can be automated?

The pressure calibration process can be automated to various levels. Complete automation consists of setting and controlling the pressure setpoints, capturing the output of the unit under test (UUT) or device under test (DUT), capturing the output of the reference pressure device and following a pre-determined test script, all without operator intervention once it is commenced. This level of automation requires that each component of the system has an electronic interface that COMPASS can utilize. These components include:

- UUT output
- Reference pressure device output
- Pressure control device
- Control and output of ancillary devices such as digital multimeters, multiplexers, environmental chambers, etc.

In some cases, such as when a mechanical gauge is the UUT, complete automation might not be possible. This application requires the operator to read the device and to input its reading manually into COMPASS. When any of the components involved does not have electronic output, partial automation should still be considered. The benefit of following a structured procedure still exists, even when the operator must interact with the software in order to provide a portion of the "automation."

Configuring COMPASS for Pressure for automated pressure calibration

In general the tasks that must be completed are:

1. Setup Reference – To use a piston gauge reference, such as the Fluke Calibration PG7000 series, select **[Setup], [Piston Gauge], [Piston Gauge Platform]** to create a piston gauge platform setup. COMPASS is programmed with the necessary digital commands to interface with the piston gauge. Simply check "Autodetect setup".
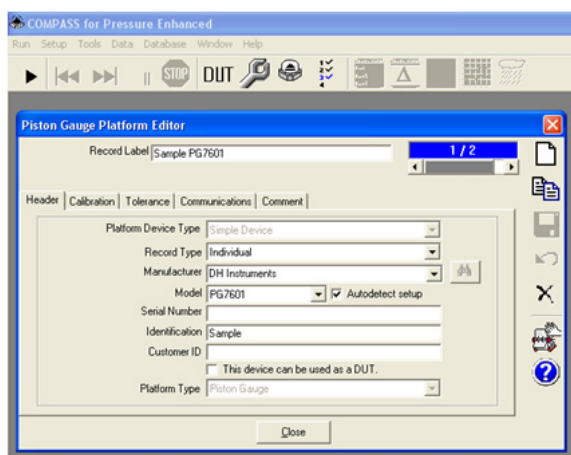
Piston Gauge Platform Editor.

The other options under **[Piston Gauge]** allow piston–cylinders, mass sets and mass bells to be associated with the platform. Each metrological element requires its own setup to specify its unique characteristics. Therefore each piston–cylinder, mass set and mass bell must first be created using the Piston–Cylinder Editor, Mass Set Editor and Mass Bell Editor respectively.

Automated Piston Gauge Reference.

The piston gauge system pictured, PG7302 with AMH Automated Mass Handler, enables completely automated operation. Even if your piston gauge or deadweight tester (DWT) is not fully automated COMPASS for Pressure can improve your results. COMPASS calculates the reference pressure at each point using your DWT's effective area, the applied mass, your local gravity, etc. This insures consistent results, reduces operator error and adds near real–time calculation of reference pressure during the test.

Automated Pressure Controller/Calibrator References.

To use a pressure controller/calibrator, such as PPC4 or 7250LP, select **[Setup], [Support Device]** and create/modify the reference's configuration. COMPASS is provided with several sample setups for Fluke Calibration pressure calibration products as well as examples for third party manufacturers. COMPASS is preprogrammed to utilize the former DH Instruments' products without additional configuration—simply check "Autodetect setup".

This configuration defines the reference's output interface type and communication details.
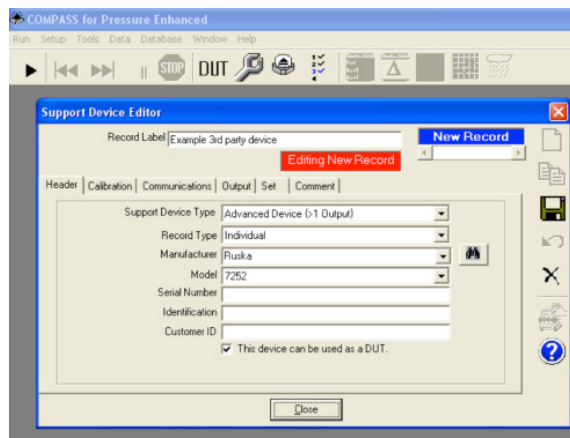
Automated Pressure Controller/Calibrator References.

2. Setup Support Device(s) – Select **[Setup]**, **[Support Device]** to update the Device Definition of specific devices, other than UUTs and piston gauges, which will be made available for use by **COMPASS**. These can include reference pressure measuring and controlling devices, data acquisition components, temperature control and other devices. Realize that a single DMM Device Definition can provide voltage, current, frequency and resistance measurement in one setup. When a support device is selected for use, there is no need to access the Device Definition unless a change in the device is necessary.

Example Digital Multi-Meter (DMM) Support Device.

3. Setup DUT – Select **[Setup], [DUT]** to create a UUT Definition. Start with a simple device under test (DUT). A DUT that outputs an electrical signal such as V, mV or mA will most likely have to be read using a digital multi-meter. The DMM must be set up in the Device Definition before it will be available for use in the DUT configuration.

The DUT configuration defines the relationship between the UUT's pressure range and its raw output. It defines its output type and collection method. In addition, if you provide its tolerance, COMPASS will calculate and display in/out of tolerance condition in real time.

Example Digital Output UUT Devices.

COMPASS for Pressure supports several digital UUT interfaces, such as RS-232, IEEE-488 and HART. In addition, the output of analog devices can be run through a DMM and input directly into COMPASS via one of these interfaces.

COMPASS is very useful when calibrating UUTs that have a visual interface, such as bourdon-tube pressure gauges.

Example Visual Interface UUT Devices.

In this case the UUT interface type is set to manual and COMPASS will prompt the user to enter the displayed value during the test. All other advantages of COMPASS are still gained.

4. Setup Test Script – Select **[Setup], [Test]** to create a Test Definition that describes the test points and other aspects of the testing procedure. The Test Definition also specifies the reference pressure measurement and control devices to use in the test.
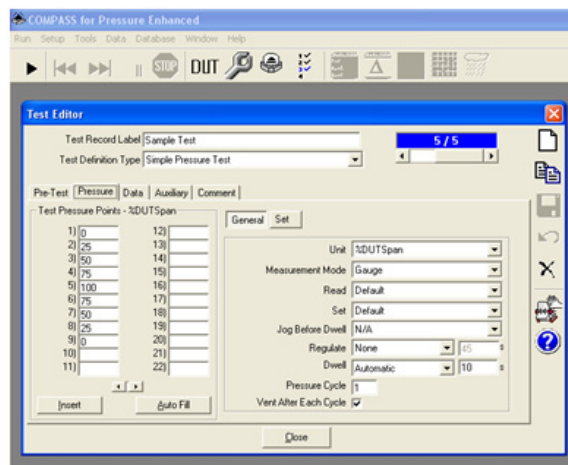
Test Editor.

Each device such as the UUT, support device, reference, etc. will have its own communications thread. COMPASS will poll each device with the highest possible frequency. So devices that respond more quickly will have more samples in the final average. Devices that respond slowly will have fewer. Therefore it

is important to consider the response speed of each of your devices when you configure the test's averaging time to make sure a suitable number of samples is acquired for each device.

Tech note

If you create a test script that simply goes from a minimum pressure to a maximum pressure with some number of points in between, COMPASS Report Editor will calculate the linearity of the device. If you add points to the test script that go back to the starting pressure in the opposite order, COMPASS Report Editor can also calculate hysteresis. If you run the latter script twice, COMPASS Report Editor will calculate repeatability as well.

5. Run Test – Select **[Run], [Run Test Definition]** to begin the Test Initialization process required to run a test.

COMPASS will initialize the interface to any and all associated digital interfaces.
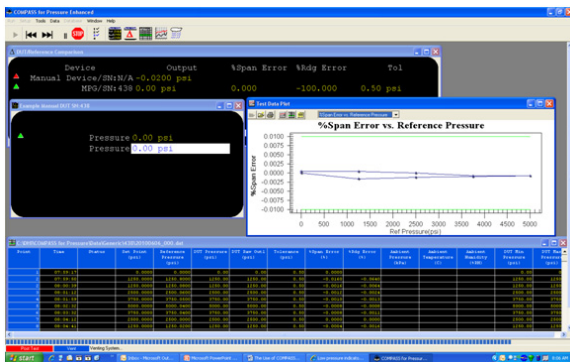
COMPASS Runtime Display.

6. Generate Report

Once the test is complete, the COMPASS Report Editor can be used to create, view and edit reports and report templates. The Report Editor is essentially a customized word processor and as such, navigation and use is intuitive to users familiar with other word processors. During the report generation process, user defined templates are merged with COMPASS Data Files to create final reports. These newly generated reports may be saved as Microsoft Word documents or PDF documents if Adobe Acrobat is installed.

The COMPASS Report Editor is accessed by selecting the **[Data], [Report Editor]** menu option in COMPASS, pressing the **[Generate Report]** button in the Test Complete form at the end of a test, or run directly by selecting the COMPASS Report Editor icon in the COMPASS program group. In all cases the Report Editor

runs as a separate application and may be closed at any time without affecting the operation of the main COMPASS application.
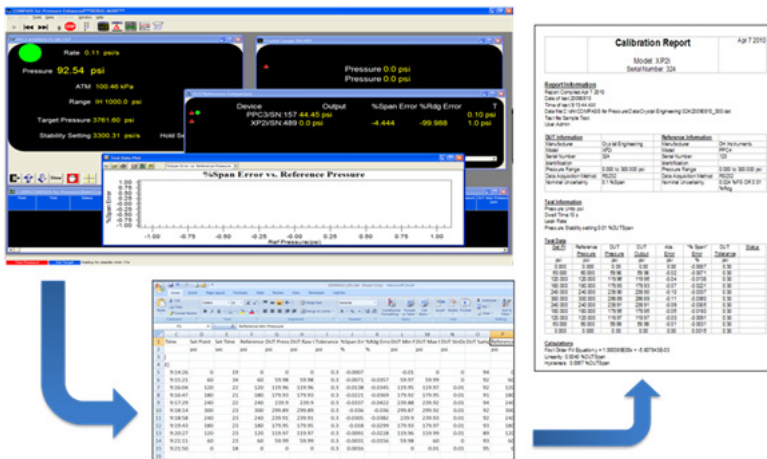

Example COMPASS Report.

COMPASS reports are based upon predefined and customizable templates. The field codes in yellow shown below are replaced with COMPASS data during report generation.

Customizeable COMPASS Report Template.

COMPASS data can be exported into an Excel worksheet, allowing further analysis of the data.

COMPASS Reports Embedded with an Excel Data Range.

Other COMPASS software features:

- Provides Visual Basic (VB) macro programming for unique UUT interfaces and automatic UUT adjustment based on test data
- Provides VB macro programming for special–ized support devices such as ovens, chambers, switchers, etc.
- Supports multiple calibration references during a test
- Supports third party (non–Fluke) calibration references
- Automatically exports data to MET/TRACK® asset management database
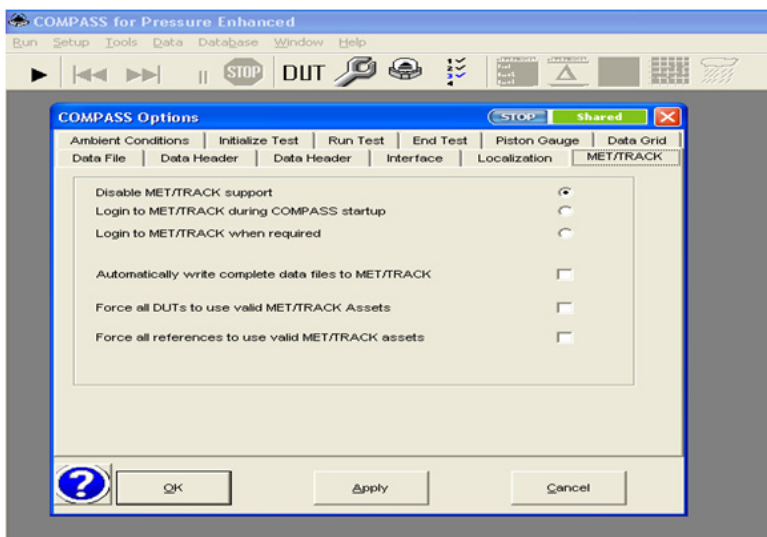
Easy Export of Test Data to MET/TRACK Database.

Total solutions in calibration

Fluke Calibration provides the broadest range of calibrators and standards, software, service, support and training in electrical, temperature, pressure, RF and flow calibration.

Visit **www.flukecal.com** for more information about Fluke Calibration solutions.

Pressure and flow calibration

- High performance pressure and gas flow standards
- Accredited pressure and gas flow calibration services
- Calibration software
- Services and training

Temperature calibration

- Contact and non–contact temperature calibrators and standards
- Temperature calibration software
- Services and training

Electrical calibration

- DC/LF electrical calibrators and standards
- Power calibrators and standards
- RF calibrators
- Timer/counters and frequency standards
- Calibration software
- Services and training

Fluke Calibration. *Precision, performance, confidence.*™

Electrical	RF	Temperature	Pressure	Flow	Software