

Calibration of pressure measurement system - lab report example

[Engineering](#)



Calibration of Pressure Measurement System

The instrument can also be used as a reference pressure gauges. It involves simplifying the adjustment, checking, and direct calibration of other pressure measurement devices on the site.

The presence of a push-button for the user-defined zero points setting eases offset adjustment. It also ensures that the tedious mechanical adjustment is eliminated. Single-point adjustment allows for the linear characteristic curve to be shifted in a positive or negative direction over the entire measuring range.

The large selection of pressure units of up to 6 different units is possible. It is far more than any complicated dual-scale, or multi-scale gauge can offer.

The digital pressure gauge has a selection point for the required display unit to be posted on the screen. The desired value can be read directly eliminating the need for conversions (Kobata, Kojima and Kajikawa, 2012).

The digital manometer shown above has an accuracy of 0.5% when operating well.

Operation

The pressure is applied to the pressure sensors within the equipment. These sensors can either be resistive, capacitive or piezoelectric crystals. Pressure on the crystals causes a generation of electric current due to the piezoelectric effect. Since the generated voltages are slight, an amplifier is used to amplify the output to a readable value. The output is in analog form due to the analog sinusoidal voltage output from the transducers. The analog to digital converter is thus used to convert the analog output to produce its digital counterpart for ease of reading. The final output is displayed on a

digital display screen (Morris, 2001).

There are two operating keys on the Reference Type E. The left key turns the instrument on while at the same time used to execute its functions.

Contrarily, the right key helps in switching between the MAX and MIN-value.

The device displays the pressure range after turn-on for two seconds before changing into measuring mode. The functions of the device include:

RESET: Max/Min value is set to the actual pressure.

OFF: Used to turn off the instrument

ZERO: Used to set a new zero reference

CONT: It deactivates the automatic turn-off function. The instrument is set to turn automatically off 15min after the last key function.

An indication on the display shows if the ZERO- and/or CONT-function is activated. By pressing the left key until ZERO and/or CONT disappears, the zero is reset to factory settings with the possibility of reactivating the automatic turn-off function. If the actual pressure goes beyond the measuring range, OFL (overflow) appears on the display (Quinn, 1970).

Methodology

Pressures of known values were applied to a Bourdon Pressure Gauge using standard masses on a deadweight tester. Recording of the results was done in terms of the indicated pressure from the pressure gauge in the table below. The loading values included a steady increase in the applied pressure. Unloading values were derived when the pressure was progressively reduced.

Test Results

Loading

Unloading

Applied Pressure(psi)

Indicated Pressure(psi)

Applied Pressure(psi)

$$\% \text{ Error of FSD} = (105-100)/100$$

$$= 5\%$$

$$0.145 \text{ psi} = 1 \text{ kPa}$$

The pressure measurement system consisting of Bourdon Pressure Gauge has a higher percentage error, meaning that its accuracy is lower than that of the type E-Ex pressure gauge. Type E-Ex pressure gauge has an accuracy of 0.5% while Bourdon Pressure Gauge has an accuracy of 5%. Lower pressures applied to the system produces much error since the components of the measurement systems like the springs are not entirely stretched. High pressures ensure maximum extension and compressions of the elements of the measurement systems.

Conclusion

The comparison between the indicated values of pressure measuring device with the stated values of a pressure standard with a known accuracy is referred to as Pressure Calibration. Calibration is done on-site to avoid lengthy downtimes like the cases where the tested device cannot be isolated from the system.

Routine calibrations can be performed on-site very quickly and economically with the right combination of pressure generator and reference. The

indicated pressure values are ensured to be correct and reliable and that all specified requirements are fulfilled.