

Calibration & Linearity Check of Automatic Polarimeters Why or Why Not, When or When Not

Rudolph Instruments has developed a comprehensive IQ/ OQ/ PQ package for the DigiPol, Automatic Polarimeters, to be performed at the time of installation. Our customers report that it is the most comprehensive for any Polarimeter, and is fact a leading product for the industry. A comprehensive document includes, among other things, Calibration check, Linearity check required specifically by BP and much more. We recommend that the both of these be checked at the time of installation, followed by a calibration check only at regular intervals.

- The foregoing is restricted to Automatic Polarimeters

Calibration: Every analyst wants to work on an instrument that is recently calibrated. That answers the question **why**? There is no need to answer the question, **why not**, since there is never a situation where one would not want it. **When** to calibrate & how frequently to recalibrate? Calibration of the Polarimeter depends upon the precise characteristics of all the optics used, as also the health of all the mechanical components necessitating frequent checks

Optimum Recommendation:

- Once every three to six months or at other regular intervals depending on usage, and as per your company SOPs
- When the Light Source is replaced - happens about once an year usually in most labs
- Following routine maintenance of replacement parts
- Following factory service overhaul

What standards to use for calibration

Quartz Rotation Standards are the preferred choice for calibration of high accuracy Polarimeters like the DigiPol because:

- They are accurate to $\pm 0.004^\circ$, about an order of magnitude better in accuracy than sugar solutions
- They are stable and repeatable
- They do not have any errors dependent on sample preparation or operator training
- They are always ready to use
- They can be used as often as needed without any consumable expense, even every day.

NIST sugar is expensive requiring valuable analyst's time to prepare the solution would have an accumulation of volumetric, weighing and other errors, and is not accurate enough to calibrate modern automatic Polarimeters like the DigiPol

Linearity: Why? The short answer is that BP requires it, and should you test any samples as per BP, the instrument needs to be in compliance. Also calibration with 'a' quartz plate or 'a' sugar solution is a single point check and cannot assure that the instrument would provide accurate readings elsewhere in the angle range.

In some respects Linearity check is a carryover from the times of older manual instruments. Modern automatic Polarimeters are precision manufactured instruments using electronic angle measurement and highly reliable stepper motors or encoders. The measurement algorithm used on the DigiPol and most modern automatic Polarimeters ensures uniform accuracy across the range 'Linearity' is assured, and a single point calibration is adequate in modern automatic Polarimeters like the DigiPol.

We recommend that the linearity be checked:

- Once at the time of initial installation
- Again at the time of a reinstallation at a different location if it involves transportation across significant distances, not just moving it across the lab. Or to a different lab. On the same premises.
- When any of the polarizer rotor drive components (stepper motor, worm and wheel) are replaced or repaired - happens only in case of some kind of catastrophic damage to the Polarimeter, and when it does happen it would invariably be a 'factory replacement'
- If the instrument is subjected to any significant mechanical shock or impact