

# AUTOPOL CALIBRATION CERTIFICATE

Date of Calibration: 03/09/11 Instrument Serial No.: 80311 Instrument Type: APV

## CALIBRATION TEST 1

NIST Traceable Quartz Control Plate Calibration Standard Serial No.: 8832

- \* Certified Rotation at 633 nm and 20° C: 9.883
- \* Certified Rotation at 589 nm and 20° C: 11.488
- \* Certified Rotation at 546 nm and 20° C: 13.503
- \* Certified Rotation at 436 nm and 20° C: 21.965
- \* Certified Rotation at 405 nm and 20° C: 25.750
- \* Certified Rotation at 365 nm and 20° C: 32.651
- \* Certified Rotation at 325 nm and 20° C: N/A 03/09/11
- \* ISS Certified Rotation at 589 nm and 20° C: N/A 03/09/11
- \* ISS Certified Rotation at 880 nm and 20° C: N/A 03/09/11

\* A copy of the NIST traceable calibration certificate is available for purchase

Instrument Readings at 633nm after calibration

- 1) 9.884 °Arc
- 2) 9.884 °Arc
- 3) 9.884 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at 589nm after calibration

- 1) 11.487 °Arc
- 2) 11.488 °Arc
- 3) 11.488 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at 546nm after calibration

- 1) 13.504 °Arc
- 2) 13.504 °Arc
- 3) 13.504 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at 436nm after calibration

- 1) 21.967 °Arc
- 2) 21.967 °Arc
- 3) 21.967 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at 405nm after calibration

- 1) 25.750 °Arc
- 2) 25.750 °Arc
- 3) 25.750 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at 365nm after calibration

- 1) 32.649 °Arc
- 2) 32.649 °Arc
- 3) 32.649 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at 325nm after calibration

- 1) N/A 03/09/11 °Arc
- 2) N/A 03/09/11 °Arc
- 3) N/A 03/09/11 °Arc

☐Uncorrected ☐Corrected to 20°

Instrument Readings at 589nm after calibration

- 1) N/A 03/09/11 °Z
- 2) N/A 03/09/11 °Z
- 3) N/A 03/09/11 °Z

☐Uncorrected ☐Corrected to 20°

Instrument Readings at 880nm after calibration

- 1) N/A 03/09/11 °Z
- 2) N/A 03/09/11 °Z
- 3) N/A 03/09/11 °Z

☐Uncorrected ☐Corrected to 20°

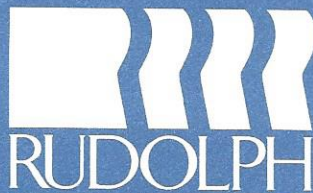
The following formula is used to calculate temperature correction for quartz control plates when measured on a Rudolph Research Analytical Autopol. Temperature correction calculation is done automatically on newer models.

$$\alpha = \frac{T}{QCP} = \frac{20}{QCP} / [1 - 0.000043(T - 20)],$$

$$= \frac{20}{QCP} / \delta$$

Based on the readings above, Instrument Type: APV Serial No. 80311 Belonging to: GLAXOSMITHKLINE  
Meets Rudolph Research Analytical reproducibility and accuracy specifications as found in Rudolph Research Analytical Technical Bulletin 928.

Date 03/09/11 Rudolph Research Analytical Service Engineer Raul Rincon



## CALIBRATION TEST 2

NIST Traceable Quartz Control Plate Calibration Standard Serial No.: 8524-8248

- \* Certified Rotation at 633 nm and 20° C: 0.858
- \* Certified Rotation at 589 nm and 20° C: 0.997
- \* Certified Rotation at 546 nm and 20° C: 1.172
- \* Certified Rotation at 436 nm and 20° C: 1.906
- \* Certified Rotation at 405 nm and 20° C: 2.234
- \* Certified Rotation at 365 nm and 20° C: 2.833
- \* Certified Rotation at 325 nm and 20° C: N/A 03/09/11
- \* ISS Certified Rotation at 589 nm and 20° C: N/A 03/09/11
- \* ISS Certified Rotation at 880 nm and 20° C: N/A 03/09/11

\* A copy of the NIST traceable calibration certificate is available for purchase

Instrument Readings at  
633nm after calibration

- 1) 0.859 °Arc
- 2) 0.859 °Arc
- 3) 0.859 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at  
589nm after calibration

- 1) 0.997 °Arc
- 2) 0.997 °Arc
- 3) 0.997 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at  
546nm after calibration

- 1) 1.174 °Arc
- 2) 1.174 °Arc
- 3) 1.174 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at  
436nm after calibration

- 1) 1.907 °Arc
- 2) 1.907 °Arc
- 3) 1.907 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at  
405nm after calibration

- 1) 2.236 °Arc
- 2) 2.236 °Arc
- 3) 2.236 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at  
365nm after calibration

- 1) 2.833 °Arc
- 2) 2.833 °Arc
- 3) 2.833 °Arc

☐Uncorrected ☒Corrected to 20°

Instrument Readings at  
325nm after calibration

- 1) N/A 03/09/11 °Arc
- 2) N/A 03/09/11 °Arc
- 3) N/A 03/09/11 °Arc

☐Uncorrected ☐Corrected to 20°

Instrument Readings at  
589nm after calibration

- 1) N/A 03/09/11 °Z
- 2) N/A 03/09/11 °Z
- 3) N/A 03/09/11 °Z

☐Uncorrected ☐Corrected to 20°

Instrument Readings at  
880nm after calibration

- 1) N/A 03/09/11 °Z
- 2) N/A 03/09/11 °Z
- 3) N/A 03/09/11 °Z

☐Uncorrected ☐Corrected to 20°

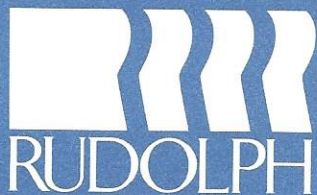
The following formula is used to calculate temperature correction for quartz control plates when measured on a Rudolph Research Analytical Autopol. Temperature correction calculation is done automatically on newer models.

$$\alpha_{\text{QCP}} = \alpha_{\text{QCP}} \frac{T - 20}{[1 - 0.000043(T - 20)]}$$
$$= \alpha_{\text{QCP}} / \delta$$

Based on the readings above, Instrument Type: APV Serial No. 80311 Belonging to: GLAXOSMITHKLINE  
Meets Rudolph Research Analytical reproducibility and accuracy specifications as found in Rudolph Research Analytical Technical Bulletin 928.

Date 03/09/11 Rudolph Research Analytical Service Engineer Raul Quiroz





## AUTOPOL TEMPERATURE VALIDATION CERTIFICATE

☐ This page is not applicable – No Temperature Display

Date of Validation: 03/09/11

Instrument Serial No: 80311

NIST-Traceable Thermometer Serial No(s): Left 1107

Right or Single 1053

### Autopol Polarimeters with Temperature Display

Column	A		B		C		D	E	
Temperature Control Setting on Autopol (if applicable)	NIST Thermometer Reading						Autopol Temperature Reading	Difference Between Column C and D	
	Measured Temperature Reading		Correction to Thermometer Reading as Shown on NIST Certificate		Actual Thermometer Reading After Correction				
Left	R or Single	Left	R or Single	Left	R or Single		Left	R or Single	
20° C	20.0 °C	19.9 °C	0.0 °C	+0.1 °C	20.0 °C	20.0 °C	20 °C	0.0 °C	0.0 °C
25° C	25.1 °C	25.0 °C	0.0 °C	0.0 °C	25.1 °C	25.0 °C	25 °C	0.1 °C	0.0 °C
30° C	30.1 °C	30.0 °C	-0.1 °C	0.0 °C	30.0 °C	30.0 °C	30 °C	0.0 °C	0.0 °C
OTHER					N/A	03/09/11			

The results shown under the heading "Autopol Temperature Reading" in column D should be within 0.2 °C of the results shown under the heading "Actual Thermometer Reading after Correction" in column C. Stated further, all results in column E should be equal to or less than 0.2 °C.

Verified by:

Raul Rivera Jr.

Print Name

Raul Rivera Jr.

Signature

03/09/11

Date