



**GCE Calibration Verification / Linearity Test Kit**

**INTENDED USE**

**VALIDATE** GCE Calibration Verification / Linearity Test Kit solutions are intended for *in vitro* diagnostic use in the quantitative determination of linearity, calibration verification and verification of reportable range in automated, semi-automated and manual instrument systems for the following analytes: alanine aminotransferase (ALT), alkaline phosphatase (ALP), amylase (AMY), aspartate aminotransferase (AST), creatine kinase (CK), gamma-glutamyl transferase (GGT), lactate dehydrogenase (LD) and lipase (LIP).

Each test kit consists of one bottle each of Levels 1 through 5 plus a base matrix. Each bottle contains 3.0 milliliters. There exists a linear relationship among Levels 1 through 5.

**SUMMARY**

Each **VALIDATE** GCE Calibration Verification / Linearity Test Kit contains purified chemicals in a solution of bovine albumin stabilized with ethylene glycol. Multiple levels are provided to establish the relationship between theoretical and actual performance of each of the included analytes. The **VALIDATE** GCE Calibration Verification / Linearity Test Kit will assist in the documentation of linearity, calibration verification and verification of linear range required by many inspection agencies. The solutions will also provide assistance when troubleshooting instrument systems, reagent problems and calibration anomalies.

**REAGENTS**

**Reactive Ingredients:**

Purified enzymes: ALP from human placenta, ALT and AST from porcine heart, AMY and LIP from porcine pancreas, CK from rabbit muscle, GGT from bovine kidney and LD from chicken heart. The purified materials are in a solution of bovine albumin stabilized with ethylene glycol.

**Nonreactive Ingredients:**

Preservatives and stabilizers.

**Precautions and Warnings:**

*For In Vitro Diagnostic Use*  
 Disposal of all waste material should be in accordance with local guidelines.

**WARNING: Potentially Biohazardous**

Human source material is considered potentially biohazardous. Material of human origin used in the manufacture of this test kit was tested at the donor level using FDA approved methods and found to be non-reactive for HBsAg and to antibodies to HCV and HIV-1/2. Because no test method can offer complete assurance that infectious agents are absent, these specimens should be handled and treated as potentially infectious.

**STORAGE AND STABILITY**

**VALIDATE** GCE Calibration Verification / Linearity Test Kits are stored at -10° to -20°C. **Do NOT store in a frost-free freezer.** Test kits are stable until the expiration date printed on the bottle and storage container when handled according to instructions.

**PREPARATION**

Prior to use, remove the **VALIDATE** GCE Calibration Verification / Linearity Test Kit from storage and allow to come to room temperature (18° to 25°C). Invert gently several times before dispensing.

To maximize stability, it is recommended that exposure to room temperature be minimized. Tightly cap opened bottles and return to -10° to -20°C immediately after dispensing.

Discard any solutions that appear to have gross bacterial contamination.

The **VALIDATE** GCE Calibration Verification / Linearity Test Kit should be treated in the same manner as patient samples. If dilutions or pre-treatment are required as part of the testing procedure, follow the manufacturer's instructions.

**ASSAY**

Analyze each level in replicates. If following the CLSI EP6 guidelines for linearity, use a random analytical sequence to assay each level.

**CALCULATION OF RESULTS**

**VALIDATE** Calibration Verification / Linearity material is prepared in a manner such that an equal distance (delta) exists between each consecutive level. This dilution scheme is consistent with the CLSI EP6 recommendation for preparing linearity sets.

Two examples for calculating the theoretical values of Levels 1 through 5 are provided below.

**Example 1:**

Choose two consecutive levels and calculate the delta between the recovered values. The following example demonstrates the use of the delta between Levels 2 and 3 to calculate the theoretical value for Levels 1, 4 and 5:

**Mean Recovered Values**

|         |     |
|---------|-----|
| Level 1 | 51  |
| Level 2 | 164 |
| Level 3 | 275 |
| Level 4 | 388 |
| Level 5 | 501 |

Using Level 2 and Level 3 recovered values to calculate the Delta, the above data produces the following:

Level 3 – Level 2 = Delta, or (275 - 164 = 111)

Level 1 Theoretical = Level 2 Recovered - Delta, or (164 - 111 = 53)  
 Level 4 Theoretical = Level 3 Recovered + Delta, or (275 + 111 = 386)

Level 5 Theoretical = Level 4 Theoretical + Delta, or (386 + 111 = 497)

Using the delta between Level 2 and Level 3, the theoretical value for each level would be:

| Level | Theoretical (x-axis) | Recovered (y-axis) |
|-------|----------------------|--------------------|
| 1     | 53                   | 51                 |
| 2     | 164                  | 164                |
| 3     | 275                  | 275                |
| 4     | 386                  | 388                |
| 5     | 497                  | 501                |

NOTE: The user can select the calculated delta between any two consecutive levels to calculate the theoretical values. Typically, the user should choose an area of recovery known to be linear for the method being studied.

**Example 2:**

Theoretical values can be determined using the recovered values for Levels 1 and 5. Using this method, the following formulas apply:

Level 2 Theoretical = 0.75 \* (Level 1) + 0.25 \* (Level 5)  
 Level 3 Theoretical = 0.5 \* (Level 1) + 0.5 \* (Level 5)  
 Level 4 Theoretical = 0.25 \* (Level 1) + 0.75 \* (Level 5)

Using the recovered values for Level 1 (51) and Level 5 (501), the following applies:

Level 2 Theoretical = 0.75 \* (51) + 0.25 \* (501) = 163.5  
 Level 3 Theoretical = 0.5 \* (51) + 0.5 \* (501) = 276  
 Level 4 Theoretical = 0.25 \* (51) + 0.75 \* (501) = 388.5

| Level | Theoretical (x-axis) | Recovered (y-axis) |
|-------|----------------------|--------------------|
| 1     | 51                   | 51                 |
| 2     | 163.5                | 164                |
| 3     | 276                  | 275                |
| 4     | 388.5                | 388                |
| 5     | 501                  | 501                |

After theoretical values are calculated, for each analyte plot the expected (Theoretical) value on the x-axis versus the Recovered value on the y-axis using standard linear graph paper. If the system is linear, the plot should approximate a straight line. The point at which the line is no longer straight can be used to determine the limit of linearity or the reportable range.

Data reduction is available from Maine Standards Company (see worksheet for instructions). Commercially available linear regression software may also be used. The software should provide data point display and x-y graphical presentation. Linear regression should be interpreted using standard statistical analysis and the results should be compared with the instrument manufacturer's claims for linearity or with individual laboratory performance requirements. The degree of acceptable nonlinearity is an individual judgment based on methodology, clinical significance and medical decision levels of the test analyte.

**LIMITATIONS**

**VALIDATE** GCE Calibration Verification / Linearity Test Kit solutions are not intended for use as routine quality control materials or as calibration materials.

These solutions are not intended for use on systems employing reflectance spectroscopy.

**EXPECTED VALUES**

**VALIDATE** GCE Calibration Verification / Linearity Test Kits are manufactured such that a linear relationship exists among Levels 1 through 5. The expected value of the Base Matrix is zero, however, in some instances a non-zero result may be obtained. The Base Matrix can be used to make dilutions of Level 1 to obtain a result lower than Level 1, if needed.

**TYPICAL VALUES**

Actual results obtained may vary depending on instrumentation, methodology and assay temperature. Results may also be dependent on the accuracy of the instrument/reagent system calibration. The degree of acceptable nonlinearity is an individual judgment based on methodology, clinical significance and medical decision levels of the test analyte.

| Typical Values by Level 1500 |       |    |     |     |       |       |
|------------------------------|-------|----|-----|-----|-------|-------|
| Analyte                      | Units | 1  | 2   | 3   | 4     | 5     |
| ALP                          | U/L   | 0  | 250 | 500 | 750   | 1,000 |
| ALT                          | U/L   | 0  | 250 | 500 | 750   | 1,000 |
| AMY                          | U/L   | 0  | 163 | 325 | 488   | 650   |
| AST                          | U/L   | 0  | 250 | 500 | 750   | 1,000 |
| CK                           | U/L   | 0  | 200 | 400 | 600   | 800   |
| GGT                          | U/L   | 0  | 200 | 400 | 600   | 800   |
| LD                           | U/L   | 0  | 150 | 300 | 450   | 600   |
| LIP                          | U/L   | 50 | 413 | 775 | 1,138 | 1,500 |

**ORDERING INFORMATION**

**ORDER NO.: 1500**

**VALIDATE GCE**

Calibration Verification / Linearity Test Kit 6 x 3 mL

For technical assistance or to place an order, please call:  
 800-377-9684 or  
 207-892-1300  
 Fax 207-892-2266  
[www.maineStandards.com](http://www.maineStandards.com)

Please allow 5 to 7 days for delivery.

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