



Technical Support Note

Title: 900133 Operating Protocol for Lo-Ox Case Ready Meat Packaging Gas Mixes
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Created by: R. Schrader
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Testing Overview:

Testing Lo-Ox process gas is critical, due not only to the complex mixture of gases, but the need to obtain low levels of residual oxygen in the packaging process. The Bridge 900133 trigas analyzer has been designed to assist this process by using infrared measurement technology for both the CO and CO₂ measurement, and a special Oxygen sensor designed to operate at very low oxygen levels in a mix of CO and CO₂. Because of the criticality of the gas measurements, care has to be taken that adequate time is allowed for the analyzer to reach and maintain thermal stability for the infrared measurement, and for the Oxygen measurement to reach low levels – both during calibration checking and product testing.

The focus of this technical support note is to establish a testing protocol in order to achieve gas measurement stability in the Lo-Ox testing environment.

Overnight Storage and Initial Power-up:

Analyzer Charging: The analyzer should be charged for a period of 4 hours typically. It should not be charged for more than 6 hours to reach full battery recharge. A power shutoff timer is available from Bridge Analyzers for this purpose so that the timer can be set to turn off after a set period of time.

Overnight Storage: The thermal stability of the analyzer is optimized by charging it while powered off in the generally colder production packaging environment. Analyzers need to be protected from any liquid spray from facility clean-in-place activity. As an alternate practice, analyzers can be charged in an office area and then placed in the production area early in the production shift.

Bridge Analyzers, Inc.
5198 Richmond Road
Bedford Heights, Ohio 44146 USA

(510) 337-1605 office
sales@bridgeanalyzers.com



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Morning Warm-up: As early as possible at the start of the production shift, power up the analyzer to put it into an idle state with dashes on the display. Zero the analyzer by pressing the ZERO button. Once the analyzer finishes Zeroing, press the TEST button once. This puts the analyzer into a discrete test mode which is typical for most production packaging testing processes. The discrete test mode runs the pump for a set time period (typically 15 seconds) then turns off the pump with the completed measurement values.

This is important as the analyzer will equilibrate to a different internal temperature depending on if it is in the continuous run or discrete test mode. Keeping it in the discrete test mode is best as this is the daily production testing mode for most applications.

The analyzer will blink alternating between the numeric digits and dashes 5 minutes after the first Zero. This is an indication that the analyzer needs to be Zeroed. Press the ZERO button at any time when the Zero request is being made. The analyzer will Zero, perform a single discrete Test then go back to a hold state awaiting additional Test requests.

The analyzer will request an additional Zero at the 15-minute mark subsequent to the 5 minute Zero. Repeat the Zero process. Press the Zero button at any time when the Zero request is being made. The analyzer will Zero, perform a single discrete Test then go back to a hold state awaiting additional Test requests.

At this point the analyzer can be used for a calibration check test and/or production testing according to the user's internal procedures.

Start-of Day Calibration Check Test:

With the analyzer in the discrete test mode, run a Test on calibration gas using the calibration test stand and calibration gas flowing at 400 cc/min. The analyzer will sample and measure the calibration gas. It will display the final gas measurement values on the display, and stop the pump after the test time which is typically set for 15 seconds. Note the readings per the following guidelines. If the first readings are not in tolerance, press the TEST button a second time to improve the results. In most cases, the first discrete test after a Zero is discarded as the analyzer needs to be returned to Lo-Ox gas after being exposed to ambient Air.

Calibration Tolerances and Typical Lo-Ox Gas Values:

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CO: 0.400% +/- 4% Relative to the certificate CO value.

For Example: If the calibration gas is 0.400%, the gas should read 0.384% to 0.416%.

CO₂: 30% +/- 4% Relative to the certificate CO₂ value.

For Example: If the calibration gas is 30.00%, the gas should read 29.08% to 31.20%.

O₂: 0.00% +/- 0.040 Absolute Offset from the certificate O₂ value.

For Example: If the calibration gas is 0.00%, the gas should read +0.040% to -0.040%.

NOTE: The O₂ sensor requires some saturation time in low oxygen testing (less than 1%) to reach its final measurement value. In practice, the O₂ sensor should provide a reading of less than 1.00% O₂ on the first discrete test after a Zero. Readings will continue to decrease with each successive discrete test for several additional readings.

For functional reasons, the standard practice is to calibrate 0.000% O₂ to a level of 0.040% to 0.060% O₂ so that negative readings are not displayed during package testing as result of the O₂ sensor continuing to settle by several hundredths of a percent over a longer period of time.

Once the discrete calibration gas testing has been confirmed to be acceptable, production testing can begin. At any point during the production testing process, if the readings are being questioned, return to the certified calibration gas test set-up. Zero the analyzer then run a calibration check test in the discrete test mode.

If the discrete test mode calibration check is out of limits, the analyzer can be calibrated using the continuous test mode. This is a longer process and should only be required when the analyzer has been determined to be out of calibration.

Operating Protocol During Testing:

The analyzer usually sits idle after a Test – with the displayed values static, and the pump off. During this idle time, the analyzer Zero timer is still operating, measuring the time since it was last Zeroed. Before the analyzer is used for the next test series, the display should be observed and understood.

Numbers Constant:

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This is the typical discrete (sample/hold) idle mode, and the analyzer can be used for further package testing.

Place the needle into the next package to be tested and press the TEST button. If the numbers are not stable at the end of the Test – press the TEST button a second time.

The gas readings will usually be stable during the last 3-5 seconds of the Test. An additional Test in the same package is recommended if the readings are fluctuating at the end of the test.

Display Alternating between Numbers and Dashes:

This is the Zero prompt mode, and the analyzer should be Zeroed before the next test series. Before tests are run, do the following:

1. First place the needle into the next package to be tested:

The pump will be off, so no gas will be drawn from the package until the end of the Zero. This is preparation for the included single discrete Test after the Zero is completed. The single discrete test allows the analyzer to immediately remove the ambient air used during the Zero procedure.

2. Zero the analyzer:

The analyzer will set new correction values into the analyzer to compensate for any thermal drift since its last Zero, and recalibrate the oxygen sensor with ambient air values. At the end of the 30 second Zero, the analyzer will automatically run a single discrete Test on the package into which you have pre-inserted the sample needle. The readings from the first test will show higher oxygen (typically about 1.00% above what is in the package) due to residual air oxygen from the Zero process.

3. Repeat the Test on Package Gas to obtain Oxygen Measurement Stability:

As desired, run an additional Test on the existing or subsequent packages. After an additional 3 to 5 additional Tests or 2 minutes total, oxygen readings should be highly accurate and no longer affected by the ambient air exposure. but only needs to be done immediately after a Zero. In practice, when oxygen readings are below the tolerance limits per the customer's procedures, additional Tests are not necessary as the package gas test is already acceptable.

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Note: Package-to-package testing with low oxygen values between packages does not elevate the oxygen readings the way a Zero does, so it is not necessary to repeatedly Test packages during normal inspection.

The Zero timer increases sequentially after each Zero until it reaches a point of requesting a Zero every 60 minutes. The timing is 5 minutes, 15 minutes, 40 minutes, 60 minutes and then every 60 minutes thereafter.

Gas Calibration:

Put the analyzer in the continuous measurement mode by pressing the yellow DOWN arrow. Place the analyzer close to the calibration test stand. Zero the analyzer. Open the calibration gas cylinder valve and verify the gas pressure at 10-20 PSI on the tank regulator. Set the gas flow on the output flowmeter to 400 ml/min. Connect the analyzer sample needle to the test stand output and observe that the CO and CO₂ gas readings are typical, and that the Oxygen reading is being reduced from ambient air levels (20.90%) towards zero.

Allow the analyzer to become stable on the gas readings – this will take typically 5 to 10 minutes – as the analyzer is stabilizing its internal temperatures and removing all residual oxygen after being exposed to ambient air oxygen levels. Patience must be maintained during this critical phase to get all the oxygen out of the analyzer internal plumbing as well as the oxygen sensor itself before accuracy tolerance testing. The oxygen sensor and measurement circuitry are designed to be very sensitive to oxygen levels below 2.000%, and it typically can take over 5 minutes for this initial oxygen stabilization to occur and to reach the very low levels of oxygen required for proper calibration adjustment. When oxygen readings are low and stable, Zero the analyzer again. Doing so will further stabilize the CO and CO₂ infrared gas measurements, but it will also expose the oxygen sensor to room air and cause the oxygen readings to be elevated once more, but because of the short time of exposure (30 seconds during the Zero), they will reach the previous low levels in a much shorter time.

Once the gas readings are stable, note the readings, and if they are out of tolerance, enter the CAL mode and trim them to match the Calibration Gas Tank Certificate values.

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NOTE: The O₂ sensor requires some saturation time in low oxygen testing (less than 1%) to reach its final measurement value. In practice, the O₂ sensor should provide a reading of less than 1.00% O₂ on the first discrete test after a Zero. Readings will continue to decrease with each successive discrete test for several additional readings. For functional reasons, the standard practice is to calibrate 0.000% O₂ to a level of 0.040% to 0.060% O₂ so that negative readings are not displayed during package testing as result of the O₂ sensor continuing to settle by several hundredths of a percent over a longer period of time.

Calibrate CO₂ First:

Enter the CAL mode (CAL and ZERO) buttons together, and push the CAL button until CAL is displayed on CO and O₂, and numbers on the CO₂ display. Adjust the values up or down using the yellow arrow keys until they match the calibration gas certificate value within the tolerance above.

Calibrate CO:

When CO₂ is completed, press the CAL button until numbers are displayed on the CO display and adjust CO values up or down using the yellow arrow keys until they match the calibration gas certificate value within the tolerance above.

Calibrate Low O₂:

When done with CO, press the CAL button until 'Lo' is displayed for low oxygen calibration, and adjust the oxygen values to +0.040% to 0.060%.

When all gas readings are calibrated, cycle through the gas readings one more time to makes sure they are within tolerance and adjust them again if necessary.

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When you are satisfied with the gas readings, push the CAL and ZERO buttons together again to set the calibrated gas values in the analyzer.

Change to the Sample/Hold test mode - Run a Test on Calibration Gas:

Leave the analyzer attached to the calibration gas, and run a TEST on it. The analyzer should continue to sample and measure the calibration gas, and then freeze the final values on the display, and stop the pump after 15 seconds.

Wait 5 Minutes with the Pump Off:

Let the analyzer thermally stabilize with the pump off for 5 minutes – still connected to the calibration gas. The pump will be off, so the analyzer will not be sampling calibration gas, but this idle time will allow the analyzer to thermally stabilize to the Sample/Hold test condition with the pump off.

Zero the Analyzer in Sample/Hold Mode:

Zeroing the analyzer after 5 minutes with the pump off will start the pump, draw in ambient air, and reset the reference values into the analyzer to compensate for the operating mode change from calibration to normal testing. At the end of the 30 second Zero, the analyzer will automatically run a Test on the calibration gas. The readings from the first test will be very close to the calibrated values, except for Oxygen, which will be high by almost 1% due to its exposure to room air oxygen levels (20.90%) during the Zero.

Repeat the Tests on Calibration Gas to obtain Oxygen Measurement Stability:

Run another Test on calibration gas, observing the ending oxygen value – which will be substantially lower than the previous (automatic) Test.

Test again as desired (3-5 times) until the final oxygen readings are within tolerance and stable.

Note: This may take 3-5 Tests to achieve, but only needs to be done after a Zero when in the Sample/Hold mode.

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If the readings stay within tolerance, remove the analyzer from Calibration gas, and turn off the calibration gas flow and tank valve. The analyzer can now be used to test actual product packages – and will stay in calibration until the next Zero prompt – usually 60 minutes.

Trimming Gas Readings from Sample/Hold Mode:

If the gas readings are not within tolerance at the end of the Sample/Hold TESTs above, they can be further trimmed by reverting to the continuous measurement mode and trimming calibration as follows:

Note the gas reading error magnitude. For example: if the CO is still 0.15 too high after repeated Tests.

Set the unit into Continuous Measurement Mode. (DOWN Arrow)

Go into CAL mode (CAL+ZERO)

Select and adjust the gases that are out of tolerance.

Save the calibration (CAL+ZERO)

Select Sample//Hold Mode (TEST)

Repeat TEST if necessary to confirm readings are correct.

Repeat the sequence above until the Test readings are within tolerance.

When the readings stay within tolerance, remove the analyzer from calibration gas, and turn off the calibration gas flow and tank valve. The analyzer can now be used to test actual product packages – and will stay in calibration until the next ZERO prompt – usually 60 minutes.

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