



Standard Test Method for Livestock, Meat, and Poultry Evaluation Devices¹

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1. Scope

1.1 This test method covers test methods used to determine the accuracy of electronic devices that evaluate composition or quality constituents of livestock, meat, and poultry.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[F2463 Terminology for Livestock, Meat, and Poultry Evaluation Systems](#)

2.2 *NIST Standard:*³

[NIST Handbook 44 Electronic Livestock, Meat, and Poultry Evaluation Systems and/or Devices](#)

3. Terminology

3.1 For definitions relating to livestock, meat, and poultry evaluation systems, see Terminology [F2463](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *error, n*—difference between the “true” value of a reference material and the indication received from an electronic evaluation device or system.

3.2.2 *meat, n*—all edible products and edible by-products harvested by the meat-packing industry.

¹ This test method is under the jurisdiction of ASTM Committee F10 on Livestock, Meat, and Poultry Evaluation Systems and is the direct responsibility of Subcommittee F10.20 on Device Performance Criteria.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

³ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.

3.2.3 *reference material, n*—physical object used as a basis for comparison or calibration.

3.2.4 *test, n*—procedure for determining a characteristic by direct measurement.

3.2.5 *tolerance, n*—value fixing the limit of allowable error or departure from true performance or value.

3.2.6 *value, measurement, n*—data point or indication representing the outcome of a measurement or observation.

4. Significance and Use

4.1 Characteristics of livestock, meat, and poultry can be used to determine value. Devices have been and are currently under development to evaluate these characteristics. The use of this test method will assist manufacturers, users, and regulating authorities to refer to uniform test methods to determine if the devices are accurate.

5. Apparatus

5.1 Reference materials may include, but are not limited to, test blocks to verify linear measurements for ultrasound and linear probes, “phantom carcasses” to verify non-linear measurements used in devices that use magnetic energy absorption, photographic plates for visual imaging devices, or other means to verify a characteristic.

5.2 Manufacturers provide reference materials to use in the initial setup and calibration of evaluating devices before use; these reference materials can be used as standards for ensuring accuracy after they are verified and documented by an independent third party. Reference material shall be uniquely identified (for example, serial number) and retained for additional testing and calibration to ensure the accuracy of the device as it is being used over time.

5.3 Verification of the reference material requires: (1) that the reference materials stated measurements are accurate (this requires that the error of the labeled measurements can not be greater than one-third of the smallest allowable error acceptable when the reference material is used to verify an evaluating device), and (2) the reference material is an appropriate proxy for the characteristic being evaluated by the device or system (the reference material is considered appropriate if it is has been designed to be used as a reference material, and it is constructed to retain its characteristics for a reasonable period of time under conditions of normal use).

6. Calibration and Standardization

6.1 *Reference Material*—The user is responsible for ensuring that all reference materials used to test its evaluating device have been verified as accurate by an independent third party. The frequency of this verification shall be every two years or less.

6.1.1 When an evaluation device or system is being calibrated at initial setup or adjusted after it has been found to be out of tolerance, the user shall ensure that the device is adjusted as close as practicable to the indications of the reference material.

7. Procedures

7.1 The production daily test for evaluating devices require a minimum of three readings from each third of the normal operating range of the device.

7.2 *Autofom Test Procedures:*

7.2.1 *Transducer Test:*

7.2.1.1 Dry the transducer array so that no water is left.

7.2.1.2 Test function is activated on the control panel.

7.2.1.3 Wait 1 min to check that none of the transducers are starting automatically.

7.2.1.4 Put some gel on the test block (reference material).

7.2.1.5 The transducer is checked with the test block.

7.2.1.6 Remove gel from transducer.

7.2.1.7 Repeat 7.2.1.4 – 7.2.1.6 on all 16 transducers. Take ten measurements with the test block for each required measurement on each transducer.

7.2.2 After each transducer test, the results will be recorded. At the end of a test series, the latest result from each transducer will be written on the last line. If a transducer is approved more than nine times, an “X” will indicate ten or more approved tests.

7.2.3 A complete test of the transducers requires that the test block be correctly placed on each transducer. It is important that the test block rest on the whole surface on the transducer head with light pressure. When starting the test, all transducers must be “0”. If this is not the case, the transducer might be broken (wait approximately 1 min after activation of the test function). If a transducer is defective, then the display will show no results.

7.2.4 Verify that all measurement errors are within NIST Handbook 44 or this test method, as applicable.

7.3 *Fat-o-Meat'er Test Procedures:*

7.3.1 Push the morning control button.

7.3.2 Take ten measurements with the test block (reference material) for each required measurement (see 6.1 and 7.1).

7.3.3 Record test results.

7.3.4 The measurement results can be cancelled by pushing the pistol button or accepted by pushing the morning control button on the terminal. When the morning control button is activated, no transmission is sent to the scale terminal.

7.3.5 Verify that all measurement errors are within NIST Handbook 44 or this test method, as applicable.

7.4 *UltraFom Test Procedures:*

7.4.1 Press the key twice and select “Test” from the main menu.

7.4.2 Press * and select “Test”.

7.4.3 Put water on the test block (reference material).

7.4.4 Hold the test block to the sensor.

7.4.5 Record the displayed results.

7.4.6 Repeat 7.4.3 – 7.4.5 a total of ten times for each required measurement.

7.4.7 Data is automatically recorded.

7.5 *CVT Test Procedures:*

7.5.1 Apply fine spray of water on test block, reference material, and transducer standoff cover.

7.5.2 Place transducer on test block.

7.5.3 Be sure that the surface of the test block is set at zero. Reset baseline if necessary.

7.5.4 Press trigger to make a measurement.

7.5.5 Repeat the steps in 7.5.1 – 7.5.4 a total of 10 times.

7.5.6 Measurements are automatically displayed and recorded.

7.5.7 Verify that all measurement errors are within NIST Handbook 44 or this test method, as applicable.

7.6 *Vision System Testing Procedures for E+V, VGB 2000:*

7.6.1 *Instrument Verification:*

7.6.1.1 Inspect camera conduit cable for cracks and ensure that cable connectors, camera housing attachments, trigger assemblies are securely fastened.

7.6.1.2 Inspect camera glass window and optical components to make sure it is clean and free of any smudges.

7.6.1.3 Inspect certified reference materials to make sure each is clean and free of smudges.

7.6.1.4 Before proceeding, ensure that the instrument has been warmed up according to manufacturer’s instructions.

7.6.2 *Computer Software Verification:*

7.6.2.1 Check the graphics resolution setting to determine if it meets manufacturer’s minimum specifications (that is, 1024 × 768 pixels and a color depth of 32 bits).

7.6.2.2 Check to see if shading or flat field correction is turned on. Record setting (if applicable).

7.6.2.3 Check to see if the Image Save mode turned on (if applicable).

7.6.2.4 Verify and record the variables being automatically recorded.

7.6.3 *System Check Verification:*

7.6.3.1 Correctly position the first reference material on the base/nose of the camera and under the instructions of the COMPUTER SOFTWARE VERIFICATION, push switch to record the variables being measured.

7.6.3.2 System acquires the picture of the reference material, evaluates it and compares the determined data with the desired values. If data is within the tolerance limits, a message appears that system is OK. Proceed to the step in 7.6.3.3. Otherwise proceed to the step in 7.6.3.5.

7.6.3.3 Repeat the steps in 7.6.3.2 to 7.6.3.3, a total a three times for each variable being measured.

7.6.3.4 Repeat the steps in 7.6.3.1 to 7.6.3.4 for each of the reference materials. Per 7.1, there should be a minimum of three reference items, one each third of the normal operating range of the device.

7.6.3.5 If data is outside the tolerance limits, a message appears indicating that the system failed and is rejected. Consult SOP for procedures for System Check Verification Failure.

7.7 *Pork ultrasound scanning testing procedures for devices and systems similar to the BioQscan:*

7.7.1 *Instrument Verification:*

7.7.1.1 Inspect the transducer fixture housing, cover for the mini LCD and LED, and conduit cables for cracks and ensure that the cover and cable connectors are securely fastened.

7.7.1.2 Inspect the transducer fixture for proper alignment and to ensure that the ultrasound transducer rests securely within the fixture housing.

7.7.1.3 Check the main computer and cabinet that houses the equipment to ensure the monitor is easily viewed and all cables within the cabinet are securely fastened.

7.7.1.4 After the system is fully powered on, check that the main computer monitor shows the login screen.

7.7.2 *Ultrasound Verification:*

7.7.2.1 Inspect that the test block (reference material) is clean and there is no visible sign of damage.

7.7.2.2 Prepare the test block by placing the block on a stable flat surface or secure horizontal shelf where the transducer fixture can be easily aligned in the test block. Fill the test block cavity with room temperature water (70 to 90°F), having the water completely cover the top 2 pins and no air bubbles are present.

7.7.2.3 Position the transducer fixture securely in the test block with the ultrasound transducer sitting on the top 2 pins and resting firmly against the test block vertical positioning side.

7.7.2.4 Check that the ultrasound transducer's face is parallel to the horizontal shelf.

7.7.2.5 Login to the Ultrasound manufacturer's system under Maintenance.

7.7.2.6 Select "ASTM Ultrasound Test."

7.7.2.7 Enter the test block serial number using the keyboard as prompted.

7.7.2.8 Select "Test & Save" button. The verification test performs automatically. The system acquires ultrasound images and automatically determines depths of 9 reflecting targets for comparison with known reference depths of the targets. Measurement error is recorded in a table for each target depth and scored as PASS when the measurement error falls within +1.0 mm (+0.039 in.), according to Test Method F2343 – 09, Section 8.1 of the NIST Handbook 44, edition 2013.

7.7.2.9 Check the table on the screen. The test is successfully accomplished when PASS is recorded for the measurement error of all targets. For a successful test, proceed to 7.7.2.12.

7.7.2.10 If the measurement error for one or more target depth is a FAIL, proceed to 7.7.2.11 to repeat the test, and do not select "Exit Test."

7.7.2.11 For a failed test, remove the transducer fixture from the test block and ensure that adequate water has been filled in the test block cavity. Reposition the transducer fixture on the test block and proceed to 7.7.2.8 to repeat the test. If this verification test fails three consecutive times, the system cannot be put into operation.

7.7.2.12 At the completion of a successful test, select "Exit Test" and proceed to 7.7.3.

7.7.3 *Software Processing Verification:*

7.7.3.1 Select "ASTM Processing Test." The verification test performs automatically. The system processes through 12 reference sets of carcass images that define the packer population of porcine carcasses from a backfat and muscle depth standpoint. These reference sets of carcass images are stored in the ultra sound system with restricted access. The system automatically determines measurement errors in comparison with previously known measurements for backfat and muscle depth of the reference carcass images. Each measurement error is recorded in a table and scored as PASS if the error falls within the manufacturer's tolerance limit, which is +0.1 mm (+0.0039 in.) for both carcass backfat and muscle depth.

7.7.3.2 Check the table on the screen. The test is successfully completed when PASS is recorded for all measurement errors. Upon a successful test, proceed to 7.7.3.4.

7.7.3.3 Upon a failed processing test, the system cannot be put into operation.

7.7.3.4 Select "Exit Test."

8. Precision and Bias

8.1 The tolerance for evaluating devices which make linear measurements of characteristics will be ± 1 mm (± 0.039 in.) for each characteristic measured.

8.2 The tolerance for evaluating devices which make area measurements of characteristics will be ± 1.6 cm² (± 0.25 in.²) for area.

9. Keywords

9.1 evaluation devices; livestock; meat; poultry; reference material

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