



NATIONAL TYPE EVALUATION PROGRAM

# Certificate of Conformance

for Weighing and Measuring Devices

**For:**

Grain Analyzer  
Moisture (grain)  
Dielectric  
Model: MTC 999 ES

**Submitted By:**

Missouri Moisture Analyzers LLC  
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## Standard Features and Options

**Standard Features:**

- Liquid Crystal Touch Screen Display
- LCD Display of Moisture Content
- RS-232 Interface Port
- Variable Print Format
- Integrated Thermal Printer
- USB Interface Ports
- Audit Trail

**Conditions of Certification:**

This Certificate covers the use of the MTC 999 ES only with the grains and calibrations listed on Page 6. Moisture calibration data will be reviewed annually.

MTC 999 ES meters must be installed in a system which provides means for printing audit trail information.

Certificates of Conformance are issued after successful completion of Phase I NTEP testing. To maintain a current NTEP Certificate of Conformance for grain moisture meters, the manufacturer must participate in the NTEP on-going calibration program that represents Phase II. Under Phase II, the manufacturer is provided calibration data for use in making calibration updates. NTEP Certificates of Conformance are run annually to reflect these calibration updates. Calibrations for commodities or constituents other than moisture, not listed on page 6 of this Certificate may be used on this device at the discretion of the regulatory body having authority over the device.

This device was evaluated under the National Type Evaluation Program and was found to comply with the applicable technical requirements of "NIST Handbook 44: Specifications, Tolerances and Other Technical Requirements for Weighing and Measuring Devices." Evaluation results and device characteristics necessary for inspection and use in commerce are on the following pages.

Gene Robertson  
Chairman, NCWM, Inc.  
Effective: July 1, 2024

Mahesh Albuquerque  
Chairman, NTEP Committee  
Issued: April 30, 2024

Expiration: June 30, 2025

1135 M Street, Suite 110 / Lincoln, Nebraska 68508

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## Missouri Moisture Analyzers LLC

Grain Analyzer / 999 ES

**Application:** For use in determining the moisture content of whole grain samples in commercial grain applications.

**Identification:** The identification sticker listing the manufacturer's name, serial number, model name, and NTEP Certificate of Conformance number is located on the rear of the meter.

**Sealing:** The MTC 999 ES uses an audit trail as a means of providing security for metrologically significant parameters. The form of audit trail used by the device is an event logger, which keeps a record of all changes to a calibration or metrological adjustment. Access to metrological menu items is protected by a security password entered through the keypad and are automatically logged into the audit trail. Each audit trail entry includes the event description, the event detail, and the time and date of the change. (See "Field Inspection Notes" for details on accessing audit trail information.)

### **Operating Ranges:**

Ambient Temperature Range (Environment): 10°C to 40°C (50.0 °F to 104 °F).

Temperature Difference (Room to Grain Temperature): 10°C (50 °F) for all grains.

Grain Temperature Range: 0°C to 50 °C (32°F to 122°F)

Grain Moisture Range: Refer to Table 1

**Conditions of Operations:** The MTC 999 ES is a fully automatic grain moisture meter. The appropriate sample size is determined by the instrument. An exact quantity of sample must be poured into the hopper before a measurement occurs. That quantity is typically 250g but varies depending on the grains and the calibrations selected by the user.

A warm-up time of 5 minutes is specified. The instrument is not equipped with a leveling device.

**Field Inspection Notes:** The calibration names listed on Page 6 will be used in all instruments of the approved models without variation.

### **To Select the Desired Products that will appear on the Main Measurement Screen:**

1. Turn the instrument on and wait for the initial screen to appear.
2. Select the "Graph" button to reach the standard charts screen.
3. Scroll through the chart codes using the arrow button and select the USA group.
  - a. A window will appear indicating the parameters for the selected group. Select YES.
4. Select each grain group and then select each product that you would like to see on the main measurement screen.
  - a. Selected products will be indicated by a check mark.
  - b. Deselected products will be indicated by an X mark.
5. Once all desired products have been selected, select the Save button in the top right corner (floppy disk image).
6. Select the "Check" button or wait 5 seconds to continue with the saved selections.
7. The instrument will perform internal self-testing and then proceed to the main measurement screen.

### **To View Calibration Version and Constants:**

1. From the main measurement screen, select MENU.
2. Select the "Gears" button to reach the CONFIGURATION screen.
3. Select the "Graph" button.
4. Select one of the following options:
  - a. "PRINT CHARTS FLASH DRIVE" to copy the calibration charts to an external drive inserted in the USB port.
  - b. "PRINT CHARTS PRINTER" to directly print all the selected calibration charts by the attached printer.
  - c. "PRINT CHARTS USB" to send the calibration charts to a computer\* that is connected to the instrument via a USB cable.
5. Select EXIT to return to the previous screen.



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**Field Inspection Notes (Continued):**

**To View and Export Audit Trail Entries:**

1. From the main measurement screen, select MENU.
2. Select the first button (gears image) to reach the CONFIGURATION screen.
3. Select LOG.
4. Select VIEW LOGGER.
5. Select one of the following options:
  - a. "SAVE IN FLASH DRIVE" to save the log (.txt format) to an external drive inserted in the USB port.
    - i. The screen will indicate "File Saved!" when the transfer is complete.
  - b. "SEND TO PC BY USB" to send the log to a computer\* that is connected to the instrument via a USB cable.
    - i. A window will appear asking "USE BAUD RATE = 9600 Bauds in PC Serial Port and Press OK."
    - ii. Select OK.
    - iii. The screen will indicate "Sent: Logger File to USB!" when the transfer is complete.
6. Select EXIT to return to the previous screen.

\*Note: Connecting a personal computer to the instrument requires the download of an RS232 PC module driver. The manufacturer offers this download from their website [www.mtcmoisture.com](http://www.mtcmoisture.com).

**Test Conditions:** This Certificate supersedes Certificate of Conformance Number 16-029A7 and is issued to update the moisture calibrations for hard red spring wheat, long grain rough rice, medium grain rough rice, and oats based upon testing performed in the on-going moisture calibration program and the criteria specified in NCWM Publication 14, Section IV and Section V for Grain Moisture Meters. Previous test conditions are listed below for reference.

**Certificate of Conformance Number 16-029A7:** This Certificate supersedes Certificate of Conformance Number 16-029A6 and is issued to update the moisture calibrations for two-row barley, six-row barley, hard red spring wheat, medium grain rough rice, and oats based upon testing performed in the on-going moisture calibration program and the criteria specified in NCWM Publication 14, Section IV and Section V for Grain Moisture Meters. Previous test conditions are listed below for reference.

**Certificate of Conformance Number 16-029A6:** This Certificate supersedes Certificate of Conformance Number 16-029A5 and was issued without additional testing to reactivate Certificate of Conformance 16-029A5 without lapse. Previous test conditions are listed below for reference.

**Certificate of Conformance Number 16-029A5:** This Certificate supersedes Certificate of Conformance Number 16-029A4 and is issued to remove the moisture calibrations for soft white wheat, six-row barley, and oats which are no longer approved based upon testing performed in the on-going moisture calibration program and the criteria specified in NCWM Publication 14, Section IV and Section V for Grain Moisture Meters. Previous test conditions are listed below for reference.

**Certificate of Conformance Number 16-029A4:** This Certificate supersedes Certificate of Conformance Number 16-029A3 and is issued to update the moisture calibrations for hard red winter wheat and soft white wheat based upon testing performed in the on-going moisture calibration program and the criteria specified in NCWM Publication 14, Section IV and Section V for Grain Moisture Meters.

**Certificate of Conformance Number 16-029A3:** This Certificate supersedes Certificate of Conformance Number 16-029A2 and is issued based upon testing performed in the on-going moisture calibration program and the criteria specified in NCWM Publication 14, Section IV and Section V for Grain Moisture Meters.

**Certificate of Conformance Number 16-029A2:** This Certificate supersedes Certificate of Conformance Number 16-029A1 and is issued to update the moisture calibrations for hard white wheat, medium grain rough rice, oats, six-row barley, two-row barley, and soybeans based upon testing performed in the on-going moisture calibration program and the criteria specified in NCWM Publication 14, Section IV and Section V.

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Grain Analyzer / 999 ES

**Certificate of Conformance Number 16-029A1:** This Certificate supersedes Certificate of Conformance Number 16-029 and is issued to update the moisture calibration for durum wheat, soft red winter wheat, soft white wheat, sunflower seed, grain sorghum, and soybeans based upon testing performed in the on-going moisture calibration program and the criteria specified in NCWM Publication 14, Section IV and Section V.

**Certificate of Conformance Number 16-029:** The following tests were performed on each of two instruments submitted for evaluation. The emphasis of the evaluations was on the device design, operation, and compliance with temperature requirements. For purposes of the evaluation, room temperature was defined as  $22^{\circ}\text{C} \pm 2^{\circ}\text{C}$ .

Basic instrument tests were conducted using a stable moisture hard red winter wheat (HRW) sample between 12 and 14 percent moisture to check the effect of power supply fluctuations, storage temperature, leveling, warm-up time, and humidity. Instrument stability and instrument temperature sensitivity tests were conducted using HRW samples selected from all three 2 percent moisture intervals in the 10 to 16 percent moisture range. Testing for calibration performance was performed using corn, soybeans, and hard red winter wheat samples over a 6 percent moisture range.

Temperature Difference (Room to Grain Temperature): Sample temperature sensitivity, the effect of differences between room and grain temperature, was tested for the following grains: corn, soybeans, and HRW wheat.

Moisture calibration constants listed on this Certificate are evaluated using procedures and tolerances specified for the Phase I Type Evaluation testing. The categories are described as follows:

**Phase I Type Evaluation:** Phase I Type Evaluation testing for Corn, HRW wheat, and soybean calibration performance is over the 6% moisture range listed in the first column of Table 1 and evaluated during the Accuracy testing. Calibration performance is evaluated and approved in 2% moisture intervals. The calibration is approved for a specified moisture interval if the average bias, i.e., the difference between predicted moisture values and reference air oven values for samples within the 2% moisture intervals, does not exceed one-half the handbook 44 acceptance tolerance.

The initial evaluation for the remaining NTEP grain moisture calibrations listed on the Certificate performance are evaluated over the 6% moisture range listed in the first column of Table 1 during the Bias Check testing. A set of 10 to 12 samples is used to verify that the calibration bias is within  $\pm 0.40$  of the GIPSA reference air oven.

**Phase II On-going Moisture Evaluation:** After a meter has been in the on-going national calibration program, the calibration performance is evaluated annually over the 2% moisture intervals for the moisture range listed in the second column of Table 1.

The calibration meets the evaluation criteria and remains listed on the Certificate if the average bias, i.e., the difference between predicted moisture values and reference air oven values for samples within the 2% moisture intervals, does not exceed one-half the Handbook 44 acceptance tolerance over the moisture range listed in Table 1 and does not exceed one-half the Handbook 44 acceptance tolerance plus a 95% confidence interval over the remaining 2% moisture intervals in the moisture range listed in Table 1.

**Table 1: NTEP Moisture Evaluation Ranges**

<b>Grain</b>	<b>Phase I Type Evaluation 6% Moisture Range</b>	<b>Phase II On-Going Evaluation Moisture Range</b>
Corn	12 – 18%	10 – 26%
Grain Sorghum	10 – 16%	10 – 18%
Durum Wheat	10 – 16%	8 – 16%
Hard Red Spring Wheat	10 – 16%	8 – 18%
Hard Red Winter Wheat	10 – 16%	8 – 18%
Hard White Wheat	8 – 14%	8 – 14%
Soft Red Winter Wheat	10 – 16%	10 – 18%
Soft White Wheat	10 – 16%	8 – 16%
“All Class” Wheat	10 – 16%	8 – 18%



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Wheat Excluding Durum	10 – 16%	8 – 18%
Long Grain Rough Rice	10 – 16%	10 – 20%
Medium Grain Rough Rice	10 – 16%	10 – 20%
“All Class” Rough Rice	10 – 16%	10 – 20%
Oats	8 – 14%	8 – 14%
Soybeans	10 – 16%	8 – 18%
Sunflower Seed	6 – 12%	6 – 16%
Six-Row Barley	10 – 16%	8 – 16%
Two-Row Barley	10 – 16%	8 – 16%
“All Class” Barley	10 – 16%	8 – 16%

**Evaluated By:** C. Brenner; R. Dempster; J. Jordan; S. Coulibaly; and R. Rudder (GIPSA Type Evaluation and Calibration Group) 16-029; J. Jordan 16-029A1, 16-029A2, 16-029A3, 16-029A4, 16-029A5, 16-029A7, 16-029A8

**Type Evaluation Criteria Used:** NIST, Handbook 44: Specifications, Tolerances and Other Technical Requirements for Weighing and Measuring Devices, 2014. NCWM, Publication 14: Grain Analyzers, 2014.

**Conclusion:** The results of the evaluation and information provided by the manufacturer indicate the device complies with applicable requirements.

**Information Reviewed By:** J. Truex (NCWM) 16-029, 16-029A1, 16-029A2; D. Flocken (NCWM) 16-029A3, 16-029A4, 16-029A5, 16-029A6, 16-029A7, 16-029A8

**Example of Device:**



**Missouri Moisture Analyzers LLC: Model 999 ES**



**Missouri Moisture Analyzers LLC**

Grain Analyzer / 999 ES

**Moisture Meter Calibration – 2024****The Effective Date for All Moisture Calibrations is July 1, 2024**

Grain	Designation	Calibration File Version	Calibration Constants
Corn	CORN LOW MOIST (8% TO 21%)	NTEP_REV0_2024	250, 53, F, 32, 104, 16, 79, 1, 9.42, 0.123, 0.00129, -0.0000046, -0.049161, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 32
	CORN MED MOIST (21% TO 29%)	NTEP_REV0_2024	250, 33, F, 32, 104, 59, 89, 1, 46.1, -1.1531, 0.018326, -0.000076907, -0.070287, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 32
	CORN HI MOIST>29% (29% TO 46%)	NTEP_REV0_2024	150, 53, F, 32, 104, 27, 79, 1, 26.35, -0.073546, 0.010825, -0.000081684, -0.024024, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 32
Durum Wheat	WHEAT DURUM	NTEP_REV0_2024	250, 53, F, 32, 104, 9, 102, 1, 7.94097, 0.21611, -0.00033686, 0.0000035266, -0.05048, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 6, 41
Grain Sorghum or Milo	GRAIN SORGHUM (MILO)	NTEP_REV0_2024	250, 53, F, 32, 104, 27, 93, 1, 9.659566, 0.056077, 0.0036941, -0.000026556, -0.045558, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 8, 40
	GRAIN SORGHUM HM (HIGH MOISTURE)	NTEP_REV0_2024	150, 53, F, 32, 104, 17, 34, 1, 9.62686, 1.32817, -0.034139, 0.0003217, -0.03834, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 8, 40
	GRAIN SORGHUM LW (LOW TEST WGT)	NTEP_REV0_2024	175, 63, F, 32, 104, 1, 40, 1, 12.7188, 0.19366, 0, 0, -0.03647, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 8, 40
Hard Red Spring Wheat	WHEAT HARD RD SP (RED SPRING)	NTEP_REV0_2024	250, 53, F, 32, 104, 10, 112, 1, 8.35888, 0.203383742, 6.01744E-05, 0, -0.050763, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 6, 41
Hard Red Winter Wheat	WHEAT HARD RD WI (RED WINTER)	NTEP_REV0_2024	250, 53, F, 30, 99, 10, 75, 1, 7.87527, 0.2549521992, -0.0018310752, 0.0000169849, -0.05045, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 6, 41
Hard White Wheat	WHEAT HARD WHITE	NTEP_REV0_2024	250, 53, F, 32, 104, 11, 55, 1, 6.4546, 0.33669, -0.0029021, 0.000022241, -0.0525, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 6, 41
Long Grain Rough Rice	RICE ROUGH LN GR (LONG GRAIN)	NTEP_REV0_2024	200, 53, F, 32, 104, -2, 106, 1, 12.21007, 0.241327836, 0.000319774, -1.47239E-05, -0.03444, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 4
	RICE ROUGH LG HM (L GRAIN HI MOIST)	NTEP_REV0_2024	150, 33, F, 32, 104, 9, 99, 1, 26.6943, 0.30497, 0, 0, -0.084025, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 6
Medium Grain Rough Rice	RICE ROUGH MD GR (MEDIUM GRAIN)	NTEP_REV0_2024	200, 53, F, 32, 104, 1, 89, 1, 11.85625, 0.326854051, -0.002292555, 1.24961E-05, -0.037475, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 4
	RICE ROUGH MD GR (HIGH MOISTURE)	NTEP_REV0_2024	200, 33, F, 40, 99, 51, 100, 1, 19.6558, 0.193469, 0, 0, -0.0575676, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 6
	RICE ROUGH MD GR (LOW MOISTURE)	NTEP_REV0_2024	200, 63, F, 40, 99, 1, 20, 1, 9.3275, 0.275, 0, 0, -0.0375, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 6
	RICE ROUGH CAL (CALROSE HI MOIST)	NTEP_REV0_2024	200, 33, F, 40, 99, 51, 100, 1, 19.6558, 0.193469, 0, 0, -0.0575676, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 7
Oats	OATS	NTEP_REV0_2024	200, 63, F, 32, 104, -3, 36, 1, 10.79531, 0.31738015, -0.010329472, 3.048663E-04, -0.03491, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 8, 8
	OATS LOW DENSITY	NTEP_REV0_2024	175, 63, F, 32, 104, 1, 40, 1, 11.3533, 0.224, 0, 0, -0.03165, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 8, 8
Six-Rowed Barley	BARLEY SIX-ROWED	NTEP_REV0_2024	225, 53, F, 32, 104, 0, 55, 1, 11.48414, 0.218198666, 0.001457488, -4.21E-05, -0.0445, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 8, 14
Soft Red Winter Wheat	WHEAT SOFT RD WI (RED WINTER)	NTEP_REV0_2024	250, 53, F, 32, 104, 16, 100, 1, 9.439, 0.12292, 0.0013111, -0.0000070587, -0.047663, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 6, 41
Soft White Wheat	WHEAT SOFT WHITE (SOFT WHITE)	NTEP_REV0_2024	250, 53, F, 32, 104, 14, 99, 1, 8.43957, 0.26953, -0.0024027, 0.000019162, -0.05201, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 6, 41
Soybeans	SOYBEANS	NTEP_REV0_2024	250, 53, F, 32, 104, 0, 103, 1, 11.207237, 0.19621, -0.0019227, 0.000012802, -0.055581, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 38
	SOYBEANS HI MO. (ABOVE 20% MOIST)	NTEP_REV0_2024	150, 53, F, 32, 104, 1, 100, 5, 45, 100, 22.8711, 0.064, 0.0036, 0, -0.080533, 10.7085, 0.495926, 0, 0, -0.080533, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 38
Sunflower Seed	SUNFLOWER SEED	NTEP_REV0_2024	150, 73, F, 32, 104, -6, 100, 1, 9.43647, 0.18468, -0.0010732, 0.0000041109, -0.029759, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 5, 27
	SUNFLOWER SEED HM (HIGH MOISTURE)	NTEP_REV0_2024	100, 53, F, 32, 104, 30, 90, 1, 19.0961, 0.175299, 0, 0, -0.081388, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 5, 27
Two-Rowed Barley	BARLEY TWO-ROWED	NTEP_REV1_2023	225, 53, F, 32, 104, -3, 47, 1, 11.51682, 0.252378185, -0.002186223, 3.27E-05, -0.04509, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 8, 14

All moisture models meet the Phase I Type Evaluation.