

## 2015 NIST EPO No. 22

### Examination Procedure Outline for

### Retail Motor-Fuel Dispensers Blended Products

It is recommended that this outline be followed as minimum criteria for examining conventional blended product, power-operated retail dispensers – “gasoline pumps,” analog or digital, and consoles. For non-blending single, dual, and multi-product dispensers, see EPO No. 21. Nonretroactive requirements are followed by the applicable date in parentheses.

#### SAFETY NOTES

*When excerpting this Examination Procedure Outline for duplication, the NIST EPO Safety Annex (Safety Considerations and Glossary of Safety Key Phrases) should be duplicated and included with this outline.*

*Safety policies and regulations vary among jurisdictions. It is essential that inspectors and servicepersons be aware of all safety regulations and policies in effect at the inspection site and practice their employer’s safety policies. The safety reminders included in this EPO contain general guidelines useful in alerting inspectors and servicepersons of the importance in taking adequate precautions to avoid personal injury. These guidelines can only be effective in improving safety when coupled with training in hazard recognition and control.*

Prior to beginning any inspection, the inspector should read and be familiar with the NIST EPO Safety Annex - “Safety Considerations and Glossary of Safety Key Phrases.” The terms and key phrases in each safety reminder of this outline are found in the glossary of the EPO Safety Annex. The inspector is reminded of the importance of evaluating potential safety hazards prior to an inspection and taking adequate precautions to avoid personal injury or damage to the device. As a minimum, the following safety precautions should be noted and followed during the inspection:

**Clothing**

**Electrical Hazards**

**Emergency Procedures**

**Eye Protection**

**Fire Extinguisher**

**First Aid Kit**

**Grounding**

**Ignition Sources**

**Lifting**

**Location**

**Safety Data Sheets (SDS)**

**Nature of Product**

**Personal Protection Equipment**

e.g., safety shoes, safety aprons, gloves, barrier cream, etc. if deemed necessary

**Static Discharge**

**Safety Cones/Warning Signs**

**Switch Loading**

**Traffic**

**Transportation of Equipment**

**See Also: Wet/Slick Conditions, Chemicals, Petroleum Products, and Hazardous Materials, Obstructions**

**SAFETY REMINDER!!!**

- Check the inspection site carefully for safety hazards and take appropriate precautions.
- Learn the nature of hazardous products used at, or near, the inspection site.
- Obtain and read copies of SDS's.
- Know the emergency procedures, location, and operation of fire extinguishers and emergency shut-offs.
- Post safety cones/warning signs and be aware of vehicular and pedestrian traffic patterns.
- Use caution when moving in wet, slippery areas.
- Open both sides of the dispenser to allow fumes to dissipate before proceeding with the inspection of the dispenser.
- If leaks, spills, or exposed wiring cause hazardous testing conditions, it is recommended that the testing be discontinued until the unsafe conditions are corrected.
- Use personal protection equipment appropriate for the inspection site.
- Be sure that a first aid kit is available and that the kit is appropriate for the type of inspection activity.

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**Inspection:**

**1. Selection.**

Selection and Suitability .....	G-S.3., G-UR.1.1., G-UR.1.2., G-UR.1.3., UR.3.3.
Installation.....	G-S.2., G-UR.2.1., G-UR.2.2., UR.2.1., UR.2.2., UR.2.4.
Position of Equipment .....	G-UR.3.3.
Accessibility.....	G-UR.2.3.
Assistance .....	G-UR.4.4.
Use and Maintenance.....	G-UR.3.1., G-UR.4.1., G-UR.4.2., UR.3.5.
Computing Capability.....	UR.3.3.

**2. Indicating and recording elements.**

Design .....	S.1.1.
Units.....	S.1.2.1., S.1.2.3.(a), S.1.2.3.(c)

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**Inspection (cont.):**

Readability .....	G-S.5., G-S.6.(1/1/77), G-S.7., S.1.4., S.1.5.
Values of Intervals .....	G-S.5.3., G-S.5.3.1.
Indication of delivery .....	S.1.6.1. (portions NR 1/1/06)
Money-value divisions	
Analog .....	S.1.6.5.1.
Digital .....	S.1.6.5.2.
Auxiliary indications.....	S.1.6.5.3. (1/1/85)
Unit Price and product identity .....	S.1.6.4.1.(a), S.1.6.4.2., UR.3.2., UR.3.3.
Multiple unit price dispensers.....	S.1.6.4.1.(b)(1) (1/1/91), S.1.6.4.1.(b)(2), S.1.6.5.(a) (1/1/91), S.1.6.5.4.(a) (1/1/91), S.1.6.5.4.(b), UR.3.3.
Quantity and total price display – except aviation refueling .....	S.1.6.5.5. (1/1/94)
Quantity and total price display – aviation refueling .....	S.1.6.5.6. (1/1/08)
Advancement and return to zero.....	S.1.3., S.1.6.3., UR.3.1.
Recorded representations.	
General .....	G-S.5.6.
Point of sale systems. ....	S.1.6.7. (1/1/86)
Post-delivery discounts. ....	S.1.6.8., UR.3.3.
Provision for sealing. ....	G-S.8. (1/1/90), G-UR.4.5., S.2.2., Table S.2.2. (1/1/95)
Sealing multiple measuring elements with a common provision for sealing.....	G-S.8.1. (1/1/10)

**3. Marking.**

General.....	G-S.1.
Location, Not-Built-For Purpose, Software-Based Devices .....	G-S.1.1.(1/1/04)
Devices or Main Elements Remanufactured as of January 1, 2002.....	G-S.1.2.
Visibility of required markings after installation.....	G-UR.2.1.1.
Location of Marking Information, Retail Motor-Fuel Dispensers.....	S.4.4.2. (1/1/03)
Money-Operated Devices, Responsibility.....	G-UR.3.4.

**Inspection (cont.):**

Limitation on Use. ....	S.4.1.
Discharge Rates. ....	S.4.4.1. (1/1/85)
<b>4. Measuring elements.</b>	
Air eliminator vent, if self-contained dispenser.....	S.2.1.
Security seal on adjusting mechanism. ....	G-UR.4.5.
<b>5. Discharge hose-retail.....</b>	S.3.1., S.3.2., S.3.3., S.3.5., S.3.6., S.3.7.
Length – General. ....	U.R.1.1.1.
Length and Protection – Marinas and Airports.....	U.R.1.1.2.
<b>6. Totalizers.....</b>	S.5. (1/1/95)

**Pretest Determinations:**

<b>1. Tolerances.</b>	
Applicable requirements. ....	G-T., T.1.
Basic values. ....	T.2., Table T.2.
Repeatability.....	T.3.
<b>2. Product storage identification.....</b>	UR.2.5.
<b>3. Test Liquid.....</b>	N.1.1.
Verify that the liquid available for testing is appropriate.	
<b>4. Test Draft Size. ....</b>	N.3.4.

**Pretest Determinations (cont.):**

**SAFETY REMINDER!!!**

- **Wear appropriate personal protection equipment such as petroleum-resistant, nonskid safety shoes (to prevent possible injury from spills or slipping on slick surfaces), protective clothing, and eye protection to prevent injury from splashed product.**
- **Do not leave an activated dispenser unattended!**
- **Ground the test measure or prover properly and only use a metal funnel when returning product to storage.**

**Test Notes:**

1. If the test measure or prover is dry, it must be prepared for use by first “wetting” it. To wet the test measure or prover, fill it to capacity and empty it following proper drain procedures
2. Level the test measure or prover. When the test measure or prover is full of liquid, re-check its level to ensure that the weight of the product has not affected the level condition.
3. Take care to minimize changes in volume of the test liquid due to temperature changes and evaporation losses. .... N.2.
4. Hand held test measures require a 30 s ( $\pm$  5 s) pour followed by a 10 s drain, with the measure held at a 10 to 15 degree angle from vertical..... N.4.4.1.  
  
Bottom drain provers require a 30 s drain after the main flow ceases. .... N.4.4.2.  
  
See NIST HB 105-3, Specifications and Tolerances for Graduated Neck Type Volumetric Field Standards,” 2010, Section 7.
5. To determine proper operation of totalizers, read and record the totalizer indications before and after all test drafts. .... S.5. (1/1/95)
6. After each test draft:
  - a. Print a ticket if the device is so equipped and verify required information is provided on the receipt..... G-S.5.6., G-S.5.6.1., UR.3.4.

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**Test Notes (cont.)**

- b. Verify that any options for obtaining a recorded representation are appropriate. The customer may be given the option of not receiving the recorded representation. If the system is equipped with the capability, the customer may also be given the option of receiving the recorded representation electronically in lieu of or in addition to a hard copy. .... G-S-5.6.
  - c. For transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash, verify that required information is printed on the receipt. .... S.1.6.7. (1/1/86)
  - d. Verify that required information is on the receipt and that a receipt is provided in applications where post-delivery discounts are offered..... S.1.6.8., UR.3.3.
  - e. Check price computations on all indicators (including consoles) and on recorded representations..... S.1.6.5.(a) (1/1/91)
    - Digital equipment..... G-S-5.5.
    - Analog equipment..... S.1.6.5.(b), Table 1., N.4.3.2.
  - f. Check for agreement of quantity values between indicated and recorded representations..... G-S-5.2.2., S.1.6.6.(a)(1), S.1.6.6.(a)(2) (1/1/88), S.1.6.6.(b)
7. Verify, after a delivery is completed, that the quantity and total price are displayed for at least 5 minutes or until the next transaction is initiated by a customer. .... S.1.6.5.5. (1/1/94), S.1.6.5.6. (1/1/08) (aviation)

**SAFETY REMINDER!!!**

- Use proper lifting techniques when lifting a test measure!!!
- Be aware of and attempt to eliminate potential ignition sources in or near the inspection site.
- Be aware of vehicular and pedestrian traffic when moving between dispenser and storage tanks.
- Avoid switch loading! Test devices dispensing low-vapor pressure products (e.g., diesel fuel and kerosene) before testing devices dispensing high-vapor pressure products (e.g., gasoline and ethanol blends up to E85) with the same test measure or prover. Additional precautions may be necessary with other high-vapor pressure products.

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**Test:**

**1. Lowest Grade – Normal and Special Tests.**

**Normal Test, Lowest Grade - Full Flow, Basic Tolerance.**

Test with the **lowest grade** product, activating the dispenser such that the lowest grade product is dispensed. .... N.2., N.3.4., N.4.1., T.2., Table T.2.

For this and subsequent Normal Tests, verify that the maximum discharge rate of the installation does not exceed the marked maximum. .... S.4.4.1. (1/1/85), UR.2.2.

For this and subsequent tests, verify that other conditions of use do not exceed marked or manufacturer-specified limitations. .... G-UR.3., S.4.1.

At the beginning of the first delivery, check for suppressed values. .... S.1.6.1. (1/1/06)

For this and subsequent tests, re-check the level of the test measure or prover once it is full of liquid and before reading the indication to ensure that the weight of the product has not affected the level condition.

If the result of this test is at or near the tolerance limit, repeat the test.

If necessary, conduct a repeatability test as outlined in Step 5 below. .... N.4.1.2.

**Special Test, Lowest Grade - Slow Flow, Basic Tolerance. .... N.4.2., N.4.2.2., T.2., Table T.2.**

*Petroleum Product Sampling<sup>1</sup> for Lowest Grade Octane Verification*

**2. Highest Grade – Normal and Special Tests.**

**Normal Test, Highest Grade – Full Flow, Basic Tolerance.**

<sup>1</sup> When taking gasoline samples from single hose multi-product dispensers, the samples should be collected either immediately following an observed sale of the particular grade or product to be sampled, or after sufficient product has been purged from the hose to ensure the sample is representative of the grade or product being sampled. Guidelines for taking samples for octane verification are found in NIST Handbook 130, Interpretations and Guidelines, Section 2.6.16. Minimum Fuel Flush for Octane Verification and are stated as follows: **“A minimum of 1.2 L (0.3 gal) of motor fuel shall be flushed from a dispenser before taking a sample for octane verification. The flush shall be returned to the storage tank containing the lowest octane.”**

**Test (cont.):**

Test with the highest grade product, activating the dispenser such that the highest grade product is dispensed..... N.4.1., T.2., Table T.2.

If the result of this test is at or near the tolerance limit, repeat this test. If necessary, conduct a repeatability test as outlined in Step 5 below. .... N.4.1.2., T.3.

**Special Test, Highest Grade - Slow Flow, Basic Tolerance.** ..... N.4.2., N.4.2.2., T.2., Table T.2.

*Petroleum Product Sampling<sup>1</sup> for Highest Grade Octane Verification.*

**3. Special Test, Middle Grade - Slow Flow, Basic Tolerances.**

Test the middle grade blended product. Activate the dispenser such that an intermediate blended product is dispensed. .... N.4.2., N.4.2.2., T.2., Table T.2.

If the result of this test is at or near the tolerance limit, repeat the test. If necessary, conduct a repeatability test as outlined in Step 5 below ..... N.4.1.2., T.3.

**4. Special Test, Other Blends – Slow Flow, Basic Tolerances.**

Conduct a slow flow test at the first blended grade above the lowest grade and at the first blended grade below the highest grade. .... N.4.2., N.4.2.2., T.2., Table T.2.

If the result of this test is at or near the tolerance limit, repeat the test. If necessary, conduct a repeatability test as outlined in Step 5 below. .... N.4.1.2., T.3.

*Petroleum Product Sampling<sup>1</sup> for Blended Octane Verification*

**Return any blended product to the storage tank containing the lowest octane fuel.**



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**Test (cont.):**

**5. Repeatability Test.**

If necessary, conduct a repeatability test. A repeatability test must include at least three consecutive test drafts. Test drafts must be conducted under approximately the same conditions (e.g., flow rate and temperature) and be of approximately the same draft size. .... N.2., N.3.4., N.4.1.2., T.3.

**6. Money-Value Computations and Recorded Representations.**

Check money-value computations on all other blends. Select each of the remaining blends and dispense 1 liter/gallon to check that the computed price is mathematically correct. .... G-S.5.5., S.1.6.5.

Print a ticket if device is so equipped and check price computations as outlined in "Test Notes." ..... G-S.5.2.2., S.1.6.6.(a), S.1.6.6.(b) (1/1/88)

**7. RFI/EMI Test (electronic equipment only).**

This testing is typically done only if a problem is suspected or during the inspection of a **new installation**.  
**Radio Frequency Interference (RFI)**  
**Electromagnetic Interference (EMI)**..... G-N.2., G-UR.1.2., G-UR.3.2., G-UR.4.2.

**8. Anti-Drain Test - Check the effectiveness of the anti-drain means.** S.3.7.

**9. Zero-Setback Interlock.**

Check the effectiveness of the zero-setback interlock. .... S.2.5.(a), S.2.5.(b)

On equipment with remote pumping systems, activate one dispenser and check all others operated by the same pump to make certain they will not operate without activating the individual starting levers. .... S.2.5.(c)

**10. Power Loss Test.**

**Test (cont.)**

Ensure that information needed to complete transactions in progress at the time of a power loss can be determined for at least 15 minutes at the dispenser or customer-accessible console and that user information is retained in device memory..... S.1.6.2.1. (1/1/83), S.1.6.2.2. (1/1/83)

Before conducting a power loss test, first check with your supervisor to determine your jurisdiction’s policy on the conditions under which this test is to be conducted.

**Post-Test Tasks:**

**1. Security Means.**

Check for the presence of security seals on the device. Document missing seals on the official report and apply new ones as needed. .... G-UR.4.5., S.2.2.

Adequate provision shall be made for applying a physical security seal or providing for other approved means of security. .... G-S.8, S.2.2., Table S.2.2. (1/1/95)

Audit Trail Information. If the system is equipped with an audit trail, note the event counter settings on the report form for future reference. If equipped with an event logger, print a copy of the event log and attach it to the report form for future reference. .... S.2.2. (1/1/95), Table S.2.2. (1/1/95)

**2.** Record the total number of gallons of product dispensed during testing on the official report.

**3.** After all equipment at a location has been tested, review results to determine compliance with equipment maintenance and use of adjustments. .... G-UR.4.1., G-UR.4.3.

**4.** Record the compliance action and disposition of the device on the report and explain the results to the device owner.

### Post-Test Tasks (cont.)

#### **SAFETY REMINDERS!!!**

- **Avoid switch loading! Test devices dispensing low-vapor pressure products (e.g., diesel fuel and kerosene) before testing devices dispensing high-vapor pressure products (e.g., gasoline and ethanol blends up to E85) with the same test measure or prover. Additional precautions may be necessary with other high-vapor pressure products.**
- **Take precautions to isolate equipment when transporting it to avoid exposure to hazardous fumes.**

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