

2015 EPO No. 23

NIST Examination Procedure Outline (EPO) for

Vehicle-Tank Meters (VTMs) Power-Operated

It is recommended that this outline be followed as minimum criteria for examining all power-operated vehicle-tank meters – analog or digital. Nonretroactive requirements are followed by the applicable date in parentheses. Do not use this outline for testing vehicle-tank metering systems used to measure milk, LPG, cryogenics, or carbon dioxide. This EPO does not apply to gravity-discharge vehicle tank meters or vehicle-mounted mass flow meters. Nonretroactive requirements are followed by the applicable date in parentheses.

SAFETY NOTES

When excerpting this Examination Procedure Outline for duplication, the 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 or servicepersons be aware of all safety regulations and policies in place at the inspection site and to practice their employer's safety policies. The safety reminders included in this EPO contain general guidelines useful in alerting inspectors and servicepersons to the importance of 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 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 should read and be familiar with the introductory section on safety found at the beginning of this publication. As a minimum, the following safety precautions should be noted and followed during the inspection. Definitions of each reminder are found in the "Glossary of Safety Key Phrases" at the back of this publication.

Clothing	Nature of Product
Electrical Hazards	Personal Protection Equipment e.g.,
Emergency Procedures	Safety Shoes, Safety Aprons, Gloves, Eye Protection
Fire Extinguisher	Hard Hat, etc. if deemed necessary
First Aid Kit	Safety Cones/Warning Signs
Grounding	Safety Data Sheets (SDS)
Ignition Sources	Static Discharge
Lifting	Switch Loading
Location	

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Traffic

Transportation of Equipment

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

SAFETY REMINDER

- Check the inspection site carefully for safety hazards and take appropriate precautions.
- Check to be certain that the ground surface of the inspection site is sufficiently strong and rigid to support the prover when it is filled with product - don't forget to chock the wheels of the prover.
- Learn the nature of hazardous products used at or near the inspection site – obtain and read copies of MSDS's.
- Know emergency procedures and location and operation of fire extinguisher and emergency shut-offs.
- Post safety cones/warning signs and be aware of vehicular and pedestrian traffic patterns.
- Use caution in moving in wet, slippery areas and climbing on prover, storage tanks, and vehicles.
- Use personal protection equipment and clothing appropriate for the inspection site.
- If leaks, spills, or exposed wiring cause hazardous testing conditions it is recommended that the testing be discontinued until the unsafe conditions are corrected.
- Be sure that a first aid kit is available and that it is appropriate for the type of inspection activity.

**H-44 General Code
and VTM Code
References**

Inspection:

1. General considerations

Selection	G-S.3., G-UR.1.1., G-UR.1.2., G-UR.1.3.
Installation.	G-S.2., G-UR.2.1., G-UR.2.2., UR.1.1.
Position of equipment	G-UR.3.3.
Accessibility.	G-UR.2.3.
Assistance.....	G-UR.4.4., G-UR.4.6
Use and maintenance	G-UR.3.1., G-UR.4.1., G-UR.4.2., UR.2.3., UR1.4.
Use of Automatic Temperature Compensator (ATC).....	UR.2.5.
Invoices based on device readings with ATC.	UR.2.5.3.
Period of use (ATC).	UR.2.5.2.

2. Indicating and recording elements.

Design.....	S.1.1.1., S.2.4.
Units.....	S.1.1.2.(a), S.1.1.3.(b) and (c)
Readability.....	G-S.5., G-S.6. (1/1/77), G-S.7., S.1.2., S.1.3.
Values of Intervals.....	G-S.5.3.
Recorded representations.	
General	G-S.5.6., S.1.4.2.
Required for vehicle-tank metering systems	UR.2.2., UR.2.3.
Exceptions for aviation fuel.....	UR.2.2.1.

Inspection (cont.)

Computing-type Devices.	
Display of unit price.	S.1.4.1, UR.1.2.
Money-value computations	S.1.4.3.
Gross and net indications with ATC.	
Advancements and return to zero.	S.2.5.3.
Provisions for sealing.	S.1.1.4., S.1.1.5., UR.2.1. G-S.8. (1/1/09), G-S.8.1. (1/1/10) G-UR.4.5.
Provisions for sealing ATC.	S.2.2., Table S.2.2. S.2.5.4.
3. Marking.	
General.	G-S.1. G-S.1.1.(1/1/04)
Location, Not-Built-For Purpose, Software-Based Devices	G-S.1.2.
Devices or Main Elements Remanufactured as of January 1, 2002.	G-UR.2.1.1.
Visibility of required markings after installation.	G-UR.3.4.
Money-Operated Devices, Responsibility.	S.5.1.
Limitation on Use	S.5.2.
Discharge Rates	S.5.6.
Temperature Compensation for Refined Petroleum, if equipped with ATC	S.5.7.
Meter Size	
4. Measuring elements.	
Vapor elimination	S.2.1.
Security seal on adjusting mechanism	G-UR.4.5., S.2.2.
Devices equipped with ATC	S.2.5.1., S.2.5.2., S.2.5.3., S.2.5.5., UR.2.5.
Provisions for thermometer well.	S.2.6. (1/1/12)
5. Piping.	
Directional flow valves and discharge line and valves.	S.2.3., S.3.
Antidrain valve.	S.3.6.
Leaks.	G-UR.4.1.
Facilitation of fraud.	G-S.2.
6. Devices Equipped with ATC.	
Provisions for deactivating	S.2.5., S.2.5.1. S.2.5.2.
Gross and net indications	S.2.5.3.
Provision for sealing ATC	S.2.5.4.
Temperature determination	S.2.5.5.

Pretest Determinations:

1. Determine that the test fluid in the tank compartment is similar in character to the fluid to be measured. N.1
2. Test draft size. Determine if the prover size is adequate. N.3.

Pretest Determinations (cont.):

3. Tolerances.

- Applicable requirements G-T., T.1.
- Tolerance values T.2., Table 1, Table 2
- Repeatability T.3.

Product Depletion T.4.

For example:

Maximum flow rate marked on device: 100 gpm

Applicable tolerance: 0.6%

The amount delivered in one minute at the maximum flow rate marked on the meter =

1 minute x 100 gallons/minute =
100 gallons

Product Depletion Test Tolerance = 0.6% x 100 gallons = 0.6 gallons

Devices equipped with ATC..... T.2.1.

4. Note totalizer reading.

Test Notes:

SAFTEY 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, eye protection (to prevent injury from splashed product), and a hard hat (to prevent injury from overhangs and projections).**
- **Use proper grounding procedures. Be sure that the prover is equipped with an explosion proof motor.**
- **Carefully inspect electrical supply lines to test equipment for wear and damage; correct potentially hazardous conditions before use.**
- **Device operator should be present at all times during test – the operator (not the inspector) should operate the device under test.**
- **Never leave equipment unattended while it is in operation.**

1. Record totalizer(s) indication before and after each draft to determine proper operation.
2. If prover is dry, wet prover. Follow proper draining procedures. Allow a 30-second drain period each time the prover is emptied.
3. 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.
4. Evaporation and volume change: exercise care so the product temperature is the same in the prover as at the meter..... N.2.

**H-44 General Code
and VTM Code
References**

Test Notes (cont.):

5. Temperature corrections are to be made for accuracy tests to account for any difference between the temperature of the liquid passing through the meter and the liquid in the prover. N.5.
6. After each test draft:
 - a. Print a ticket (if so equipped) G-S.5.2.2., G-S.5.6.
 - b. If computing type, check price computation on indicator and on recorded representations..... G-S.5.6., S.1.4.2., S.1.4.3., S.1.4.4.
 - c. Check for agreement between indicators G-S.5.2.2.
7. 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.
8. If the result of any test is at or near the tolerance limit, repeat that test. If necessary, conduct a repeatability test as outlined in Step 2 under “Tests: All Meters” below.

Tests:

SAFTEY REMINDER!!!

- **Avoid switch loading! Test devices dispensing low-vapor pressure products (e.g., diesel fuel, kerosene) before testing devices dispensing high-vapor pressure products (e.g., gasoline).**
- **If supply or return lines are not coupled at their discharge ends, they must be held in place continuously while product flows through the line.**
- **Use proper lifting techniques to lift and move equipment.**
- **Be aware of and attempt to eliminate potential ignition sources in or near the inspection site.**
- **Be aware of vehicular and pedestrian traffic in the area.**

Tests: Non-Temperature-Compensated Meters

1. Normal test - full flow, basic tolerance N.4.1., T.2.
2. Special test - slow flow, special tolerance N.4.2, T.2.
3. Proceed to “Tests – All Meters.”

Tests: Temperature-Compensated Meters

1. Normal test with compensator activated - full flow, normal tolerance. N.4.1., N.4.1.3. T.2.1.

**H-44 General Code
and VTM Code
References**

2. Deactivate temperature compensator and repeat normal test. Compare the compensated volume indicated or recorded to the actual delivered volume corrected to 15 °C (60 °F) ... N.4.2., N.4.1.3. T.2.1.
3. Special test - slow flow, special tolerance N.4.2., T.2.
4. Proceed to “Tests – All Meters.”

Tests: All Meters

1. Product Depletion Test S.2.1., N.4.5, T.4.

- a. Start test (normal flow rate) from a compartment containing less test fluid than one half the capacity of the prover and with pump in operation and pressure to the discharge nozzle.
- b. Permit test to continue until lack of fluid supply causes meter register to stop completely for at least 10 seconds.
- c. If the meter indication fails to stop completely for at least 10 seconds, continue to operate the system for 3 minutes.
- d. With pump in operation, shut manifold valve (or disconnect whip-hose connection) from now empty compartment.
- e. Finish the test by switching to another compartment with sufficient product to complete the test on a multi-compartment vehicle or by adding sufficient product to complete the test to a single compartment vehicle. When adding product to a single compartment vehicle, allow approximate time for any entrapped vapor to disperse before continuing the test.
- f. Test drafts are to be of the same size and run at approximately the same flow rate.

2. Repeatability Test. N.4.1.2., T.3.

If necessary, conduct a repeatability test. 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.

**3. RFI/EMI Test (electronic equipment only) G-N.2., G-UR.1.2.,
This testing is typically done only if a problem is suspected or during the inspection of a G-UR.3.2., G-UR.4.2.
new installation.**

Radio Frequency Interference (RFI)
Electromagnetic Interference (EMI)

4. Check automatic stop mechanism. G-UR.4.1.

The device should stop the flow within one-half the minimum interval indicated.

5. Check effectiveness of antidrain valve (with pump pressure off line)..... S.3.6., N.4.3.

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.

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

2. Record the number of gallons of product dispensed during test on the official report.

SAFETY REMINDER!!!

- **Avoid switch loading! Test devices dispensing low-vapor pressure products (e.g., diesel fuel, kerosene) before testing devices dispensing high-vapor pressure products (e.g., gasoline).**
- **Take precautions to isolate equipment when transporting it to avoid exposure to hazardous fumes.**

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.

