Field inspection manual—volumetric measuring devices–Part 2, Section 1

Types 50 and 51—Dispensers and high-speed dispensers for motor fuel and other automotive products

Category: Volume
Part: 2-IPO
Section: 1
Publication date: 2025-10-10
Revision number: 3
Supersedes: IPO-1 (rev. 2)

Purpose

This inspection procedure outline (IPO) defines the minimum tests which must be performed to ensure that basic volumetric measuring devices comply with legislation.

Application

This IPO applies to complete, built-for-purpose devices used for the measurement of motor fuel and other automotive or petroleum liquids in retail and wholesale trade, such as:

- diesel, biodiesel and renewable diesels,
- gasoline, ethanol and ethanol blends,
- aviation fuel,
- diesel exhaust fluid,
- windshield washer fluid,
- radiator anti-freeze.

These devices have been approved as complete units, including hydraulics and electronics or other registering equipment and all other components required to make a complete device. The liquids dispensed and measured by these devices are normally liquid and are low viscosity.

All of these devices are considered dispensers, but for the purpose of classification, the following applies:

- Slow-flow dispenser: Maximum approved flow rate of 20 L/min or less.
- Dispenser: Maximum approved flow rate of 90 L/min or less.
- High-speed dispenser (formerly referred to as a “refueller”): Maximum approved flow rate greater than 90 L/min.

This IPO does **not** apply to slow-flow dispensers used for the measurement of high viscosity automotive liquids or dispensers used for the measurement of liquefied petroleum gases. Consult IPO-5 and IPO-6 for these device types. This IPO also does **not** apply to liquefied natural gas meters.

Note: In the case of dispensers and high-speed dispensers, the meter technology is not considered relevant in the examination of the device. Specifically, mass flow meter requirements do not apply even if the dispenser incorporates a mass flow meter.

Symbols, abbreviations and definitions

Throughout this document, the following abbreviations are defined as indicated:

- **APC** = automatic pressure compensator
- **ATC** = automatic temperature compensator
- **IPO** = inspection procedure outline
- **KTQ** = known test quantity
- **LOE** = limit of error
- **MMQ** = minimum measured quantity
- **MTQ** = minimum test quantity
- **NOA** = Notice of Approval
- **PD** = positive displacement
- **R** = *Weights and Measures Regulations*
- **STP** = standard test procedure
- **SVM.1** = *Electronic Registers and Ancillary Equipment Incorporated in Metering Assemblies Specifications*
- **SVM.2** = *Metering Assemblies Incorporating Electronic ATCs Specifications*
- **SVM.3** = *Propane Dispenser Specifications*

Test standards

- Appropriate local volumetric standards, such as:
    - 5 L measures for testing dispensers with a flow rate of up to 20 L/min,
    - 20 L measures or provers for testing dispensers with a flow rate of up to 90 L/min,
    - 100 L or larger mobile provers for testing high-speed dispensers,
    - other test equipment officially recognized by Measurement Canada (MC),
- a product circulation vessel, and
- a certified thermometer (resolution ≤ 0.1 °C).

Provers and measures used to test gasoline dispensers and high-speed dispensers must have approved means to minimize vapour loss. Consult bulletin V-24 for additional information.

Measuring equipment used for assessing regulatory requirements must be designated as local standards. This equipment includes:

- temperature standards used for assessing automatic temperature compensation,

- pressure standards used for assessing automatic pressure compensation,
- Mass standards and volume (pycnometer) standards used for converting mass to density.

Measuring equipment used for other purposes, such as calculating the factors for temperature correction (Cts) or pressure correction (Cps) of the prover shell or temperature correction (Ctl) or pressure correction (Cpl) of the liquid in the meter or prover do not need to be designated local standards. It is necessary that traceability be determined so their reliability can be evaluated by the inspector during an examination.

Recertification periods

- Mobile narrow neck provers, including 20 L provers equipped with drain valves, must be recertified every 4 years.
- Test measures without a valve must be recertified every year.
- Mass standards used with gravimetric test equipment must be recertified every year.
- Electronic thermometers must be recertified every 2 years, and ice-point checks must be performed every 30 days or every time that the integrity or precision of the thermometer is questioned.
- Pycnometers must be recertified every 10 years.
- Pipe provers must be recertified every 4 years. Manufacturer recommendations may prescribe recertification periods of less than 4 years, but at no time should the recertification period exceed 4 years.

Note: Consult bulletin V-24 and R.56 for additional information.

Test volume determination

Consult R.265, bulletin V-24 and STP-27 as required for additional information.

Open neck provers and volumetric measures

When selecting the appropriate capacity of proving standard, convention has been to use a 5 L test measure for dispensers with a rated flow capacity of less than or equal to 20 L/min, 20 L test measure or prover for dispensers with a rated flow capacity of less than or equal to 90 L/min and a 250 L prover for high-speed dispensers with a rated flow capacity of greater than 90 L/min. Proving standard capacities may, at times, be authorized for use outside of these conventions by volumetric technical authorities.

Gravimetric testing

In the case of a dispenser or high-speed dispenser that is tested gravimetrically, determine the MTQ by referring to STP-27 and refer to the KTQs prescribed in R.265 for applicable LOE.

Pipe provers

If using a pipe prover, the prover volume must equate to a minimum of 10,000 unaltered pulses or the prover must employ an evaluated and accepted pulse interpolator. Additionally, refer to the KTQs prescribed in R.265 for applicable LOE.

Pipe provers must not be used to perform a Product Depletion test (STP-8) as there is no means for pressurized air or vapour to be released from the pipe prover. Since the air or vapour cannot be released, the measuring element of the pipe prover will provide an inaccurate assessment of the volume of liquid dispensed. Consult the appropriate MC technical authority for guidance as required.

Requirements

This IPO defines the minimum tests which must be performed in order to certify a device. In some cases, additional testing may be appropriate.

Use

- Device and major components are approved for trade use: NOA, *Weights and Measures Act*, section 8
- Device and components are suitable for the actual use: NOA, R.271 and R.272
- Device has been initially examined and is appropriately marked: R.29, R.30, R.30.1, R.31, bulletins GEN-39, V-08 and V-09
- Flow rates are within the approved range: NOA, R.290
- Device uses a seasonal ATC or the trader has only completed a partial conversion: Bulletin V-19
- Device must not be used in trade when the ATC is not operational: Bulletin V-19
- Gasoline and diesel fuel sales by the gallon or litre: Bulletin V-02
- Volume correction factors are authorized (standard densities at retail level) for the actual measured liquid: R.236, bulletins V-10 and V-18, SVM.2-4
- Register with an ATC can’t be used to compensate the temperature of two liquids using the same programmed volume correction factor if the volume correction factors that apply to the liquids differ by more than 0.25% at a temperature of 0 °C: SVM.2-26

Visual examination

Markings and labelling

- Device is marked with the required information (manufacturer’s name, model and serial number, approval number(s), maximum and minimum flow rates, volume corrected to 15 °C, etc.): NOA, R.21
- Markings are appropriate and permanent (if applicable): R.18, bulletin GEN-39
- Marking plate is permanently affixed to the device: R.18
- Initial examination marks (die or approved label) are applied and appropriately located: R.30, bulletin GEN-39
- Examination sticker is applied, indicates the appropriate dates, and is appropriately located (if applicable): R.30.1, R.31, bulletin GEN-48

- Face plate markings for units of measurement and, if applicable, the price per unit (e.g. dollars or cents per litre) are appropriate (location, size, appropriate number of digits and decimal places): R.135, R.136 and R.137
- Marking of multiple outlet systems is appropriate (if applicable): R.282
- Marking of device usage restriction is appropriate (if applicable): NOA, R.70

Notes:

1. Consult applicable NOA for the marking of serial numbers (measuring chamber identification) on multi-product dispensers.
2. The requirement of SVM.2-15 for marking test thermal wells is no longer applied.

Printers, tickets and consoles

- Information is printed as required: R.129, R.295, SVM.1-27, bulletin V-20
- Devices equipped with money acceptors print the amount of money tendered and the change: SVM.1-36
- Quantity printed with adequate number of digits and decimal places: R.126, SVM.1-20, bulletin V-07
- Printed ticket provided to the customer prior to leaving premises (card locks only): R.292
- Displayed and printed values are legible: R.127

Seals

- The integrity of previously applied seals is verified and new seals are applied as prescribed after the examination: *Weights and Measures Act*, section 19(2)
- All seals are of the self-adhesive, self-locking or lead-and-wire type: R.32
- Calibration adjustments of the meter are sealable: R.235
- Pulse processing adjustments are sealable: SVM.1-8, SVM.1-9
- ATC adjustments are sealable: SVM.2-7
- ATC sensor and thermal well assemblies are sealable: SVM.2-10
- Flow control valve is sealed (if applicable): R.280

Notes:

1. Metrological parameters must not be accessible through external devices without breaking seals or being logged (event logger or audit trail) as prescribed.
2. The NOA must be consulted for special sealing provisions.

General installation

- Device is installed in accordance with restrictions and conditions listed in the NOA and in accordance with the manufacturer’s instructions: NOA, R.68, R.69 and R.70

- Device is adequately secured, protected against abnormal environmental factors, connected to an adequate and compatible electrical supply as prescribed by the manufacturer and attached components do not adversely affect its performance: R.124, R.141, R.142
- Primary register is positioned for customer view (if applicable): R.143, R.144
- Minimum increment of registration is in compliance with requirements (displayed and printed): R.68(2), R.126, SVM.1-20, bulletin V-07
- Sufficient number of digits appears on means of registration of total price: SVM.1-21
- System designed to allow for testing and examination: R.284
- If one meter of a blending dispenser is equipped with an ATC, all meters of the dispenser must be: SVM.2-27

Settings

- Multiple products or meters: Means of selection of liquids or meters is interlocked: SVM.1-16
- Register that is used with more than one meter or for more than one liquid prevents the delivery of more than one liquid at a time: SVM.1-18
- The coefficient of expansion setting is interlocked when the ATC is used for multiple products: SVM.2-12
- Adjacent linearization factors must not deviate by more than 0.25%: SVM.1-10
- If applicable, the device is configured as described in the NOA and the software version is approved: NOA

Notes:

1. The piping of a multiple-product or multiple-meter system must be equipped with the necessary automatic valves or other means interfaced with the electronic register to make the interlocking system operational as prescribed by the requirements.
2. If the linearization factors are interpolated between entered values, the 0.25% restriction between adjacent factors is not applicable.
3. Additional tests at intermediate flow rates are recommended if the lowest linearization factor or the highest linearization factor programmed into the register exceeds the applicable LOE.

Upstream and downstream piping and hoses

- Short and unencumbered suction piping: R.273
- Piping and accessories are installed so as to minimize the passage of air or vapour: R.274
- Adequate air prevention and elimination system is in place and the air eliminator’s exhaust line has not been obstructed (if applicable): R.245, R.276, R.279
- Filter, strainer or other approved means are located immediately upstream from the meter: R.277, NOA

- Sealed flow control valve installed (if necessary): R.280
- Check valve or other approved means installed to keep the system primed and prevent back flow (if necessary): R.281, SVM.1-34
- All product is delivered downstream from the transfer point and retained upstream from the transfer point. Piping/hose downstream from the meter can be readily examined: R.282, R.289
- Multiple outlet systems comply with installation and marking requirements: R.282, R.289
- Quick-acting valve is installed near the outlet for examination purposes (high-speed dispensers installed in a cabinet): R.283
- Multiple product systems are equipped with automatic means to prevent the delivery of more than one liquid: SVM.1-38
- Automatic valve having throttling effect is located downstream from the meter: R.285
- Provision for systems having one or more hoses longer than 5 m (if applicable): Bulletin V-01
- Spring-loaded anti-drain valve installed at the outlet of the delivery hose: R.286
- ATC temperature sensor and test thermal well are installed within 1 m of the meter (if applicable); no components are installed between the ATC sensor and the meter: SVM.2-23, SVM.2-25
- Test thermal well is installed adjacent to the ATC temperature sensor and oriented such that it will retain appropriate thermal conducting fluid or paste during a test (if applicable): SVM.2-24
- ATC requirements for metering systems composed of more than one meter; all meters must be equipped with an ATC: SVM.2-27
- Multiple outlets downstream of a meter that are used exclusively to refuel trucks may be concealed: R.289(2)

Notes:

1. Piping downstream from the meter should be closely examined to determine whether the product can be redirected during a transaction.
2. Piping, valves and other components must be examined for leakage. Particular attention must be paid when examining suction piping. For safety and accuracy, any leakage should be fixed before examination.

Performance

Prior to each use, all standards must be examined to ensure their physical integrity and calibration have not been compromised (seals are intact, no physical damage, dents, leaks, broken probes or cracked or broken sight glasses). Also, validate that the certificate of designation for each of the standards has not expired.

Limits of error

- In-service limits of error apply to tests performed in the field: R.265, bulletins V-03, V-23 and V-24
- Acceptance limits of error apply to tests performed under controlled conditions (e.g. in the factory): R.265, bulletins V-03, V-09, V-23 and V-24

Standard test procedures

To improve the overall accuracy of tests, it is recommended that the temperature of the product at the meter be stabilized to within 1.0 °C (±0.5 °C of the mean temperature) by circulating the product before beginning any test runs to determine accuracy.

- Certified volumetric provers and measures must be wetted and dripped in accordance with their certificates of designation: STP-22
- Volume correction factor for the thermal expansion or contraction of the prover or test measure shell (Cts) must be calculated and applied to the observed volume reading: STP-23
- Return-to-zero test: STP-1
- Interlock test: STP-2
- Segment test (display): STP-3
- Slow flow test: STP-4
- Fast flow test: STP-5
- Intermediate flow test (if necessary): STP-6
- Repeatability test: STP-7
- Agreement between registrations test: STP-9
- Computed price value test: STP-10
- Check valve, anti-drain valve, spin-up and creep tests: STP-11
- Hose expansion test (if necessary): STP-12
- Backlash test (if electronic pulser): STP-14
- Delivery crossover test (if applicable): STP-15
- Product blend test (if applicable): STP-16
- Prepay test (if necessary): STP-17
- Automatic temperature compensator test (if applicable): STP-18
- Automatic temperature sensor failure test (if applicable): STP-19
- Electromagnetic interference and radio frequency interference susceptibility test (if applicable): STP-20
- Masking and suppression of volumetric displays (if necessary): STP-24

Notes:

1. Annotate the examination certificate with products used during testing and which may be measured for trade use. Ensure programmed calibration factors are applied to appropriate products.
2. The accuracy of meters with a single calibration factor, but used to measure several grades of products, must be tested using product grades with the highest and the lowest viscosities.

Particular products and metering systems

Coriolis effect mass flow meters

Dispensers equipped with mass flow meters indicating in units of volume are tested in the same manner as any other dispenser and no special considerations need to be made for the metering technology. Mass flow meters indicating in units of mass must only be tested gravimetrically.

These devices are also to be coded as dispensers or high-speed dispensers, as appropriate, and not as Coriolis effect mass flow meters.

Other approved test equipment

Test equipment that is not described in this document may be used at times to test dispensers and high-speed dispensers, though these standards are not normally used by MC. All test equipment being used must be officially recognized by MC for the application before proceeding.

Consult bulletin V-24 to find specific requirements for local standards that are acceptable for the testing of dispensers and high-speed dispensers. Consult with the appropriate MC technical authority for guidance as required.

Revisions

The purpose of revision 3 was to:

- modify and standardize the format,
- correct or update various references throughout the document,
- replace the term “refuellers” with “high-speed dispensers” in the document title,
- update the Application section to expand upon and clarify the scope of this document as well as the device types and the normally liquid, low viscosity products associated with these devices,
- add a Symbols, abbreviations and definitions section,
- change title of the Equipment section to “Test standards” and expand upon the notes in that section to better clarify differences in test methods,
- add examination sticker and replacement marking requirements to the Visual examination (Markings and labelling) subsection,
- improve the Visual examination (Seals) subsection to better identify the requirements stating that a component must be “sealable” as opposed to “sealed”,
- update the STP titles in the Performance section and reformat that section for better readability, and

- remove items that cannot be assessed in the field which are evaluated at the time of approval.

The purpose of revision 2 was to:

- remove the reference to gas and diesel fuel in the title and Application section,
- under the Application section, replace "gas and diesel" with "motor fuel and other automotive or petroleum liquids", and remove a reference to how the devices used to measure gas and diesel are enclosed and approved,
- add statements under the Equipment section and related note to ensure test standards are checked for damage prior to use and standards used to test gasoline dispensers have approved means to minimize vapour loss during tests; test standards used to test diesel and other non-volatile automotive liquid product dispensers may continue to be used without means to minimize vapour loss,
- add printed ticket check for card locks under the Visual examination (Printers, tickets, consoles) subsection, and
- make minor editorial corrections.

The purpose of revision 1 was to add a note under the Performance section to reduce the uncertainty of examination results for fuel dispensers and refuellers, as it is important to reduce temperature fluctuations and any significant difference in temperature between the product in the measure and that in the meter.