



APLMF Survey on the test methods for verification of bulk flowmeters

Economy Name: _____

Name of person completing the survey: _____

Organisation responsible for verifying bulk flowmeters within your economy: _____

- Please complete this survey to indicate how your economy's test procedures align with the summary test procedures described below.
- Only tick (✓) one box per test.
- Send your completed survey to Secretariat@aplmf.org by: _____
- Currently bulk flowmeters are verified
- Bulk flowmeters are not verified in this economy (No need to complete this survey please return survey)

TEST NAME	TEST DESCRIPTION	Fully aligns	Partially aligns	Does not align
VISUAL INSPECTION	<ul style="list-style-type: none"> • Visually inspect the characteristics of the bulk flowmetering system for compliance with its certificate(s) of approval • Inspect the bulk flowmetering system for compliance with any relevant safety requirements /regulations /environmental factors/mode of use. 	•	•	•
INDICATING DEVICE Mechanical Indicator Electronic Indicators	<ul style="list-style-type: none"> • For mechanical indicator, if the device comprises several elements, it shall be arranged in such a way that the reading of the measured volume can be made by simple juxtaposition of the indications of the different elements. The decimal sign shall appear distinctly. <ol style="list-style-type: none"> 1. Start a delivery. 2. Circulate or dispense product through the flowmetering system for at least 1 minute at maximum attainable flow rate. 3. Stop the delivery. 4. Check that the volume indicating device is operating and provides an easy, unambiguous indication. 5. Determine whether the indicator has passed or failed. • For electronic indicator, the checking facility for an electronic indicating device shall provide visual checking of the entire display, which shall meet the requirements of NMI R 117-1, clause 4.3.4.2 or as described in the certificate of approval. <ol style="list-style-type: none"> 1. Check that the display segments are not faulty. This may be achieved by powering down and then powering up the indicator. 2. Determine whether the indicator has passed or failed. 	•	•	•
ZERO SETTING Mechanical Indicator	<ul style="list-style-type: none"> • Determine whether the indicator is mechanical or electronic and conduct the appropriate test: • For mechanical indicating devices, the volume indication after returning to zero shall not be more than 0.2 of a scale interval: <ol style="list-style-type: none"> 1. Start a delivery. 	•	•	•

<p>Electronic Indicator</p>	<ol style="list-style-type: none"> 2. Circulate or dispense product through the flowmetering system for at least 1 minute at maximum attainable flow rate. 3. Stop the delivery. 4. Reset the volume indicating device to zero by operating the zero setting function once. 5. Determine if the zero setting function has passed or failed. <ul style="list-style-type: none"> • For electronic indicating devices, the volume indication after returning to zero shall be zero without any ambiguity: <ol style="list-style-type: none"> 1. Start a delivery. 2. Circulate or dispense product through the flowmetering system for at least 1 minute at maximum attainable flow rate. 3. Stop the delivery. 4. Reset the volume indicating device to zero by operating the zero setting function once. 5. Check that the volume indicating device is indicating zero. 6. Determine whether the zero setting function has passed or failed. 			
<p>NON-RETURN VALVE (Reverse Flow)</p>	<ul style="list-style-type: none"> • This test is only required for vehicle-mounted flowmetering systems to ensure liquid does not flow in the opposite direction to that of normal flow when the pump is stopped: <ol style="list-style-type: none"> 1. Prime the flowmetering system. 2. Stop the delivery by closing the delivery nozzle or a valve downstream of the meter. 3. Stop the pump. 4. After 2 minutes reset the indicator to zero. 5. Start the pump and check the volume indication remains on zero. 6. Determine whether the non-return valve has passed or failed. 	•	•	•
<p>INTERLOCK TEST</p>	<ul style="list-style-type: none"> • This test is only required where a common pumping system is used for two or more flowmetering systems to ensure it is not possible for product to be delivered from any of these flowmetering systems unless the product is measured and indicated on the indicating device. • For Systems Sharing a Common Indicator: <ol style="list-style-type: none"> 1. Select and initiate a delivery from any other flowmetering system that shares the indicator with the flowmetering system under test. 2. Check that it is not possible to make a delivery from the flowmetering system under test unless the product is measured and indicated on the indicating device. 3. Determine whether the flowmetering system has passed or failed. • For Systems Sharing a Common Pumping Unit: <ol style="list-style-type: none"> 1. Select and initiate a delivery from any other flowmetering system that shares the common pumping unit. 2. While the pumping unit is operating, attempt to make a delivery from the flowmetering system under test by opening the transfer device without a delivery being authorised from the system. 3. Ensure it is not possible to make a delivery from the flowmetering system under test unless the delivery is indicated by the indicating device. 4. Determine whether the flowmetering system has passed or failed. 	•	•	•
<p>MAXIMUM FLOW RATE</p>	<ul style="list-style-type: none"> • The maximum achievable flow rate shall be within the approved range marked on the data plate. <ol style="list-style-type: none"> 1. Commence a delivery and allow the flow rate to stabilise at the maximum achievable flow rate. 2. Time a 30 second delivery noting the initial and final volume indications. 	•	•	•

	<ol style="list-style-type: none"> 3. Use these volume indications to calculate the maximum achievable flow rate. 4. Determine whether the flowmetering system has passed or failed. 									
ACCURACY	<ul style="list-style-type: none"> • Use one of the following test methods to test accuracy: <ol style="list-style-type: none"> 1. Volumetric method using a reference volume measure as the traceable reference standard; 2. Volumetric method using a master meter as the traceable reference standard; and 3. Gravimetric method using masses in conjunction with a weighing instrument as the traceable reference standard • Make three deliveries at the maximum achievable flow rate and one delivery at the minimum flow rate. The test quantity should be equal to or greater than 5 times the MMQ • Analyse the results to determine whether the flowmetering system is operating within the relevant maximum permissible error (MPE): When Q_{min} is not specified in the certificate of approval, Q_{min} is deemed to be 20% of Q_{max}. 	•	•	•						
REPEATABILITY	<ul style="list-style-type: none"> • This test is not required for vehicle mounted flowmetering systems and is only required for flowmetering systems approved to operate at a nominal flow rate: <ol style="list-style-type: none"> 1. Calculate the repeatability error by subtracting the minimum relative error from the maximum relative error determined in the accuracy tests at the maximum achievable flow rate. 2. Determine whether the result is within the relevant maximum permissible difference (MPD). • The MPD is defined as: <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Accuracy Class</th> <th>MPD</th> </tr> </thead> <tbody> <tr> <td>0.3</td> <td>0.12%</td> </tr> <tr> <td>0.5</td> <td>0.2%</td> </tr> </tbody> </table> 	Accuracy Class	MPD	0.3	0.12%	0.5	0.2%	•	•	•
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METER CREEP Only required when the transfer device is a nozzle.	<ul style="list-style-type: none"> • Where the pump continues to operate after a delivery for 2 minutes without any flow of product, the delivery shall not exceed the relevant MPE. 	•	•	•						
CONVERSION DEVICE Only required for systems fitted with a conversion device.	<ul style="list-style-type: none"> • Where applicable the MPD between the percentage error for the unconverted volume and the volume converted to 15°C shall not exceed the relevant MPD for the applicable accuracy class. • The MPD is defined as: <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Accuracy Class</th> <th>MPD</th> </tr> </thead> <tbody> <tr> <td>0.3</td> <td>0.1%</td> </tr> <tr> <td>0.5</td> <td>0.2%</td> </tr> </tbody> </table> 	Accuracy Class	MPD	0.3	0.1%	0.5	0.2%	•	•	•
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GAS ELIMINATION DEVICE Only required where a gas elimination device is fitted.	<ul style="list-style-type: none"> • The MPD between tests without air/gas and with introduced air/gas shall not exceed the allowable error (0.5% for petrol & 1.0% for diesel and kerosene): <ol style="list-style-type: none"> 1. Check that the vent from the gas elimination device is not blocked. Some systems may require a valve to be fitted for safety reasons. This valve must be sealed in the open position. 2. Calculate and record the average error of the three deliveries at maximum achievable flow rate recorded during the accuracy test. 3. Conduct an additional accuracy delivery at maximum flow rate. 4. Approximately half way through the delivery introduce air into the flowmetering system upstream of the pumping system until the flow decreases noticeably or stops. Stop the introduction of air and complete the delivery. 5. Calculate and record the relative error. 6. Determine the error for the gas elimination device. 	•	•	•						

	7. Determine whether the flowmetering system has passed or failed by ensuring the MPD is within the allowable limit.			
LOW LEVEL CUT OFF Only required at: <ul style="list-style-type: none"> o Initial verification; o when any system changes affecting low level cut-off occur; or o at the discretion of the regulatory authority. 	<ul style="list-style-type: none"> • This test must be carried out either volumetrically using a reference volume measure or gravimetrically. This test may be simulated: <ol style="list-style-type: none"> 1. Ensure the quantity of product in the tank is above the low level cut-off device is less than the capacity of the reference volume measure. 2. Conduct an additional accuracy delivery at maximum flow rate 3. Allow the low level cut off to automatically stop the delivery. 4. Determine whether this result is within the allowable MPE 	•	•	•
PRE-SET Not required if the pre-set device is not used for trade.	<ul style="list-style-type: none"> • Pre-set Indications <ol style="list-style-type: none"> 1. Check that all pre-set buttons are operational. 2. Enter a suitable pre-set value using the pre-set facility. 3. Commence a delivery and check the volume indication on the display corresponds exactly to the pre-set amount. 4. Determine whether the flowmetering system has passed or failed. • Accuracy of Pre-set <ol style="list-style-type: none"> 1. Enter and record a suitable pre-set amount. 2. Conduct an additional accuracy delivery at maximum flow rate 3. Allow the flow control valve to stop the delivery. 4. Determine whether the results are within the allowable MPE 	•	•	•
ANTI-DRAIN / HOSE DILATION Only required for flowmetering systems which use a nozzle as the transfer device	<ul style="list-style-type: none"> • Conduct the appropriate test below • Without a hose-reel <ol style="list-style-type: none"> 1. Once a delivery has been started, stop a delivery by suddenly releasing the nozzle trigger valve. 2. Stop the flowmetering system pump. 3. Whilst holding the nozzle down, drain for 5 seconds. 4. Open the nozzle trigger valve and allow the pressure in the hose to reduce whilst draining the nozzle 5. Close the nozzle trigger valve when the flow stops, or after 30 seconds. If product continues to leak from the nozzle after 30 seconds, the nozzle trigger valve should be repaired. 6. Reset the indicator to zero. 7. Start the pump and note the increase in indication. 8. Determine whether the instrument has passed or failed by ensuring the increase in indication is within the allowable MPE. • With a hose-reel <ol style="list-style-type: none"> 1. Fully uncoil the hose from its reel. 2. Once a delivery has been started, stop a delivery by suddenly releasing the nozzle trigger valve. 3. Stop the flowmetering system pump. 4. Fully coil the hose back on its reel. 5. Whilst holding the nozzle down, drain for 5 seconds. 6. Open the nozzle trigger valve and allow the pressure in the hose to reduce whilst draining the nozzle into receiving vessel. 7. Close the nozzle trigger valve when the flow stops, or after 30 seconds. If product continues to leak from the nozzle after 30 seconds, the nozzle should be repaired. 8. Fully uncoil hose from its reel. 9. Reset the indicator to zero. 10. Start the pump and note the increase in indication. 11. Determine whether the instrument has passed or failed by ensuring the increase in indication is within the allowable MPE. 	•	•	•

PRINTING DEVICES	<ul style="list-style-type: none"> • Examine a printed transaction to ensure that: <ul style="list-style-type: none"> o the digits in the printing are correctly aligned; o all printings are clear, indelible and unambiguous and include the units of measurement; o the scale interval of the printer is the same as the scale interval of the indicator; o the volume indicated on the transaction detail agrees exactly with the meter reading. 	•	•	•
FOR ALL TESTS	<ul style="list-style-type: none"> • Record the results on a test report 	•	•	•

Please note tests used to compile this summary are fully described in the document [5.2 NITP Verification of Bulk Flowmetering Systems for Liquid Hydrocarbons other than LPG.](#)

Thank you for completing this Survey

Best Regards

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