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Explanation of symbols, which are used throughout this manual:

⚠️ Notice: indicates a special comment or instruction.

⚠️ Warning: Indicates the presence of a hazard that can cause severe personal injury or property damage if not observed carefully.

This manual provides instructions and guidelines. The remarks and warnings inform the operator of the hazards involved in calibrating Yenen meters and dispensers. Reading these instructions and preventing hazardous situations is strictly in the hands of the operator of the equipment. Neglecting this responsibility is not within the control of Yenen.

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1.0 Introduction

The Yenen LPG flow meter, as installed in LPG dispensers for motor vehicles, is a liquid measuring device used in autogas applications. This volume-measuring unit operates with four pistons. The flow measurement is performed by positive displacement of four cylinder volumes by oscillating piston movement.

LPG (liquid) passes through four cylinders transforming flow energy into a piston movement. Four pistons are grouped in pairs and each pair is attached to a crankshaft generating a rotation of the crankshaft.

The rotation of the crankshaft is transferred outside the flow meter through the magnetic coupling. Mechanical seals are not required. The rotations are transferred through a pulse generator to an electronic register or directly to a mechanical register.

One full revolution is equivalent to a measured volume of 0.5 liter.

This manual provides instructions and guidelines. The remarks and warnings inform the operator of the hazards involved in calibrating Yenen meters and dispensers. Reading these instructions and preventing hazardous situations is strictly in the hands of the operator of the equipment. Neglecting this responsibility is not within the control of Yenen.

1.1 Accuracy requirements

Depending on local regulations, standards and codes, accuracy requirements differ from country to country. Proper understanding of these local regulations is essential before calibrating meters and dispensers.

OIML R117 states the following for LPG dispensers:
- Accuracy class 1.0.
- Maximum permissible error 1.0% (or ± 0.5%).

1.2 Safety requirements

- Only trained and qualified personnel familiar with handling liquids under pressure, such as LPG, may service Yenen equipment.
- Make sure that all necessary safety precautions have been taken before commencing the calibration. Make sure that proper ventilation, fire prevention, evacuation and fire procedures are provided.
- Provide easy access to fire extinguishers. Understand and adapt all local safety codes.
- Read this manual as well as other available literature and drawings.
- See appendix B for a DOs and DON'Ts notice.
1.3 Safety equipment

- Fire extinguisher
- Safety cones and barrier tape
- Protective gloves, safety glasses and brightly colored vests.

1.4 Required tools

- Prover or master meter certified by local weights and measures authorities.
- Stopwatch
- Seal pliers
- Adjustment pliers
- 10 – 11 wrench
2.0 Calibration procedure

⚠️ Take the necessary safety precautions around the work area. Take note of the safety requirements in 1.2 and the DOs and DON’Ts from appendix B.

⚠️ Preferably, perform calibration tests between 0 – 30°C to minimize thermal expansion of LPG. A constant temperature will contribute to more reliable tests.

⚠️ Preferably, arrange a shaded work area to reduce thermal expansion or contraction during the tests. Prevent direct sunlight into the cabinet while maintaining the safety requirements.

⚠️ Circulate at least 100 liters through the dispenser and master meter to balance any temperature differences.

⚠️ Limit the time intervals between tests to reduce the influence of temperature on the results.

2.1 Preparing for the calibration

- Record the totalizer readings from the dispenser in coordination with the station manager.
- Open the front and rear panel of the dispenser. The rear panel should be opened as well to ensure proper ventilation.
- Remove the plug from the dispenser test port.

- Connect the dispenser nozzle to the master meter.
- Connect the nozzle of the master meter to the maintenance port in the dispenser cabinet.

- If the master meter has an electronic register, connect the power supply to the master meter.

![Image of master meter](image1)

Make sure that the electric power connections are safe and secure.

A master meter with a mechanical register does not require power to operate.

- Activate the dispenser with the ON / OFF button and the master meter.

- Slowly open the valve on the master meter.

- Circulate at least 100 liters through the dispenser and master meter to balance temperature differences.

- While circulating LPG, perform a few functionality tests (see appendix C).

- While circulating LPG through the dispenser:
  
  a. Determine whether the dispenser is equipped with automatic temperature compensation (ATC).
  
  b. Determine whether the master meter is equipped with automatic temperature compensation (ATC).

  During the calibration (2.2) use both the dispenser and the master meter either with or without ATC. Operating one with and the other without ATC will corrupt the test results. Disengage the dispenser ATC if the master meter is not fitted with ATC.

- When at least 100 liters is dispensed and the dispenser passed the functionality tests: Turn off the valve of the master meter.

  Immediately deactivate the dispenser with the ON / OFF switch.

The dispenser is now ready for calibration.
2.2 Calibrating the dispenser

⚠️ Only trained and qualified personnel may calibrate meters and dispensers.

⚠️ Proper understanding of the local weights and measures regulations is essential before calibrating meters and dispensers.

⚠️ Take the necessary safety precautions around the work area. Take note of the safety requirements in 1.2 and the DOs and DON'Ts from appendix B.

⚠️ During the calibration a series of tests will be executed. Limit the time intervals between tests to reduce the influence of temperature on the results.

- Activate the dispenser with the ON / OFF button and the master meter (also activate the ATC if necessary).
- Ensure that the display readings on the dispenser and the master meter reset to zero.
- Use the stopwatch to determine the flow rate per minute.
- Slowly open the valve on the master meter and start the stopwatch.
- When the required flow rate is dispensed, close the ball valve on the master meter.
- Stop the stopwatch.
- Deactivate the dispenser with the ON / OFF switch.
- Master meters with electronic registers: deactivate the master meter.
- Record the display readings of the dispenser and the master meter.
- Calculate the accuracy of the dispenser with this formula:

\[
\text{Error} = \frac{(\text{dispenser volume} - \text{master meter volume})}{\text{master meter volume}}
\]
2.3 Tests for the dispenser

A series of accuracy tests have to be performed depending on local weights and measures regulations. Typical tests are for example:

1. 3 x dispensing 100 liters at Qmax.
2. 3 x dispensing 50 liters at Qmin.
3. 3 x dispensing 100 liters at Qmax.

The average of each series will be documented.

Some authorities may require a minimum delivery and a flow interruption test as well.

⚠️ Limit the time intervals between the tests to reduce the influence of temperature on the results.

Local authorities state the permissible errors. OIML R117 states a maximum permitted error for LPG dispensers of 1.0%.

2.4 Adjusting the dispenser's accuracy

The dispenser needs to be adjusted if it does not meet the accuracy requirements stated by the authorities.

⚠️ The dispenser is sealed against forbidden modification or removal of parts. Only trained and qualified personnel certified by the authorities may break and reseal dispensers.

- Remove the seal.
- Unbolt the adjustment cover on the flow meter.

Drawing right: side view of adjustment disc area.
Calibration is accomplished with a series of holes at the adjustment disc. The disc contains 12 holes. To decrease the quantity delivered with respect to the master meter, move the disc left or counter clockwise. Turning the disc right or clockwise will increase the volume delivered with respect to the master meter. Moving the disc one hole in either direction will increase or decrease the quantity delivered with approximately 0.05%.

Return to paragraph 2.2 to test the dispenser for accuracy again.
Reporting

Local regulations prescribe the reporting requirements.

Log the totalizer readings from the dispenser in coordination with the station manager once the tests are completed.

Appendix A shows a sample calibration report.
### LPG Dispenser Calibration Report

**Company name:**

**Address – 1:**

**Address – 2:**

**Telephone Number:**

**Ser. # dispenser:**

**Number of nozzles:**

**Ser. # master meter:**

**Calibration date master meter (mm/dd/yyyy):**

<table>
<thead>
<tr>
<th>Totalizer 1</th>
<th>Volume before</th>
<th>Volume after</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totalizer 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totalizer 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totalizer 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CALIBRATION RESULTS

<table>
<thead>
<tr>
<th>Flow Meter Serial Number</th>
<th>Master Meter Result</th>
<th>Flow Meter Result</th>
<th>% 0.xx Deviation</th>
<th>Calibration Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Meter 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Meter 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Meter 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Meter 4</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Calibration Notes:**

**Installation Notes:**

<table>
<thead>
<tr>
<th>Final Checks</th>
<th>Result YES/NO</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preset</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Operator**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Signature:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date (mm/dd/yyyy):</td>
<td></td>
</tr>
</tbody>
</table>

**Representative of The Company**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Signature:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date (mm/dd/yyyy):</td>
<td></td>
</tr>
</tbody>
</table>
DOs and DON'Ts CHECK LIST

DO...

- **DO** discuss the project and procedures with station manager or operator before performing service on a dispenser.

- **DO** evaluate the hazards at the testing location and use your safety training and experience in determining any precautions to be implemented.

- **DO** locate and be familiar with fire extinguishers in the area prior to beginning any LPG related work on the forecourt.

- **DO** be aware of vapors and other hazardous conditions.

- **DO** know the associated hazardous location classifications.

- **DO** use safety cones, barricades, barrier tape or a vehicle to isolate work area and protect the technician.

- **DO** wear appropriate safety clothing including brightly colored vests, goggles and gloves.

- **DO** be aware of and monitor your work area surroundings.

- **DO** connect the nozzles on master meter and dispenser carefully.

- **DO** take totalizer readings and record it in coordination with station manager or operator.

- **DO** show the certificate of master meter and report the results to the station manager or operator.
DON’T…

• DON’T allow unauthorized individuals near the dispenser or work area when calibrating dispensers.

• DON’T use an unapproved master meter to calibrate dispensers.

• DON’T leave doors off the dispenser after calibration is complete.

• DON’T allow smoking, flame or spark-producing devices near the work area.

• DON’T place tools or equipment outside the barricaded work area.

• DON’T work outside the barricaded work area.

• DON’T remove safety cones, barricades, barrier tape or the service vehicle until work is completed.

• DON’T leave the station unless the station manager or operator signed the report.
Appendix C – Functionality tests

Before calibrating the dispenser a few simple tests can be performed.

⚠️ Take the necessary safety precautions around the work area. Take note of the safety requirements in 1.2 and the DOs and DON'Ts from appendix B.

<table>
<thead>
<tr>
<th>Description of test</th>
<th>In order (yes/no)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>1. Check the emergency stop button.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Check the incoming power supply.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Check the differential pressure.</td>
<td>Yes</td>
</tr>
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<td></td>
<td></td>
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<tr>
<td>4. Check the filter for dirt.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Check for leaks.</td>
<td>Yes</td>
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<td></td>
<td></td>
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<tr>
<td>6. Check the 3-way solenoid valve.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>7. For dispensers with presets, check the 2-way solenoid valve.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Check the differential valve.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>