ASSE International

Listing Evaluation Criteria for Proportional Flow Controller, with Backflow Protection, for use in Drinking Water Installations

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Foreword
This foreword shall not be considered a part of the listing evaluation criteria (LEC); however, it is offered to provide background information.

ASSE standards and LECs are developed in the interest of consumer safety.

ASSE International considers LEC’s to be of great value in the development of improved plumbing systems.

The working group that developed this LEC was set up within the framework of the Product Standards Committee of ASSE International.

These devices are commonly found in European hydronic systems. This LEC seeks to import the requirements surrounding the product and add the appropriate US and Canadian code needs. This LEC adapts translated requirements from DIN 3555 and ASSE 1012 for low hazard backflow protection.

Typically these products are installed as a part of an integrated system to balance flow into both sides of a double-wall heat exchanger. One side increases the cold water supply temperature to supply domestic hot water, the other side receives hydronic hot water that is cooled to supply the hydronic loop. The device controls the flow of water of both the cold water supply and the hydronic loop based on the temperature and flow requirements of the hydronic loop. This helps minimize dead legs in the hot water distribution system to supply fittings.

Recognition is made of the time volunteered by members of the working group and of the support of the manufacturers who also participated in meetings for this LEC.

This LEC does not imply ASSE’s endorsement of a product which conforms to these requirements. Compliance with this LEC does not imply acceptance by any code body.

It is recommended that these devices be installed consistent with local codes by qualified and trained professionals. It is recommended that these devices be maintained and serviced per the manufacturer’s recommendation, filters are replaced at regular intervals per the manufacturer’s instructions.
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Listing Evaluation Criteria for Proportional Flow Controller, with Backflow Protection, for use in Drinking Water Installations

1. General

1.1 Application
The purpose of the device is to control the flow of potable water based on the pressure of non-potable water from a hydronic system. The device performs this hydraulically and has integral backflow protection between potable and low hazard non-potable water. This device is typically installed in conjunction with a heat exchanger and a part of a hydronic system loop.

1.2 Scope

1.2.1 Description
This device consists of a single potable cold water supply inlet and outlet, and a single non-potable supply inlet and outlet, a means of dynamic flow control, an atmospheric vent, and two sets of three dynamic seals between the potable and non-potable flow paths.

1.2.2 Connections
Pipe threads and other connections shall conform to local plumbing and mechanical codes.

1.2.3 Size Range
Inlet and outlet sizes are ¾” ISO 228.

1.2.4 Flow Range
The maximum flow rate on the potable flow path is 9.25 GPM (35 L/min).
The maximum flow rate on the non-potable flow path is 9.25 GPM (35 L/min).

1.2.5 Temperature Range
The maximum operating temperature for the device is 195 °F (90 °C).

1.2.6 Pressure Range
The maximum static pressure, on the potable and non-potable flow paths, is 232 psi (1600 kPa.)

1.3 Reference Documents
Referenced industry standards shall be to the revision stated below.
- ASME A112.18.1-2018/CSA B125.1-18, Plumbing Supply Fittings
• ASSE 1012-2009, Backflow Preventers with Intermediate Atmospheric Vent
• ASTM B258-18, Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors
• CSA B64.3-11 (R2016), Dual Check Valve Backflow Preventers with Atmospheric Port (DCAP)
• NSF 372-2016, Drinking Water System Components – Lead Content
• NSF 61-2019, Drinking Water System Components – Health Effects
• UL 969-2017, Marking and Labeling Systems
2. Test Specimens and Test Laboratory

2.1 Samples Submitted
Three samples of each model/size shall be submitted for testing.

2.2 Samples Tested
Tests shall be performed in the order listed in this standard on one sample of each model submitted.

An additional sample shall be used for section 3.2. The same two samples shall be tested in section 3.3.

2.3 Documentation
Assembly drawings, installation instructions and other data which are needed to enable a testing agency to determine compliance with this standard shall accompany devices when submitted for examination and performance tests under this LEC.

2.4 Rejection
Failure of one sample shall result in a rejection of that type, model, and size.
3. Performance Requirements and Compliance Testing

3.1 Tightness Test

3.1.1 Purpose
The potable and non-potable water side of the device must be pressure-tight when a pressure of 232 psi (1600 KPa) is applied for 60 seconds. This test is adapted from DIN 3555 section 4.3.

3.1.2 Procedure

a. Install the device per Figure 1. Maintain the inlet temperature at T1 to 86 ± 3.5 °F (30 ± 2 °C), and at T2 to 149 ± 3.5 °F (65 ± 2 °C).
b. Open solenoid S1 to drain to vent all air from the potable water line. Close solenoid S1.
c. Apply a pressure of 232 psi ± 14.5 psi (1600 KPa ± 100 KPa) for 60 seconds at P1.
d. Open valves V2 and V3 and close valve V4 to vent all air from the hydronic water line. Close valve V3.
e. Apply a pressure of 145 psi ± 14.5 psi (1000 KPa ± 100 KPa) 60 seconds at P2.

Figure 1
f. Open valve V3. Apply a static pressure of 232 psi ±14.5 psi (1600 KPa ± 100 KPa) for 60 seconds at P2.

3.1.3 Criteria
No leakage at any time shall appear from the device.

3.2 Pressure Test

3.2.1 Purpose
The device must not show any deformations, damages of cracks or breaks when a pressure of 363 psi (2500 KPa) is applied for a period of 10 minutes. This test is adapted from DIN 3555 section 4.4.

3.2.2 Procedure
a. Install the device per Figure 1. Maintain the inlet temperatures at T1 and T2 to 86 ± 3.5 °F (30 ± 2 °C)
b. Open solenoid S1 to drain to vent all air from the potable water line. Close solenoid S1.
c. Apply a pressure of 363 psi ± 14.5 psi (2500 KPa ± 100 KPa) for a period of 10 minutes at P1.
d. Open valves V2 and V3 and close valve V4 to vent all air from the hydronic water line. Close valve V3.
e. Apply a pressure of 363 psi ± 14.5 psi (2500 KPa ± 100 KPa) for a period of 10 minutes at P2.

3.2.3 Criteria
The device shall not show any deformations, damages of cracks or breaks.

3.3 Suitability for Use

3.3.1 Purpose
Purpose is to validate whether device performs as advertised. This test is adapted from DIN 3555 sections 4.5.

3.3.2 Procedure
1. Install the device per Figure 2. Flow water to purge all air from the device.
2. Begin continuously recording the flow rate of potable at F1 and non-potable water side at F2.
3. Increase the flow rates at the potable and non-potable water side to the maximum flow rates given in the manufacturer's literature.

3.3.3 Criteria
The assembly shall produce a flow rate that meets the maximum flow rate given in the manufacturer's literature.

3.4 Endurance Test

3.4.1 Purpose
Purpose is to validate the ability of the device to withstand minimum of 10 years being service (corresponds 50 taps/day for 10 years) while activating the safety valve upon damage. This test is adapted from DIN 3555 section 4.6. (Endurance test)

3.4.2 Procedure

1. Install the device per Figure 2. Flow water to purge all air from the device. Continuously record the flow rates, pressures, and temperatures.
2. Set and maintain the temperatures at T1 to 50-68 °F (10-20 °C) and T2 to 122-158 °F (50-70 °C).
3. Set and maintain the dynamic pressures at P1 to 43.5 psi ± 1.45 psi (300 KPa ± 10 KPa) and P2 to 36.3 psi ± 1.45 psi (250 KPa ± 10 KPa).
4. Open solenoid S1 for 5 ± 1 seconds, and close solenoid S1 for 5 ± 1 seconds representing one cycle. Repeat for 182,500 cycles.
5. Repeat section 3.1.

![Figure 2 – Endurance Test Setup](image)

3.4.3 Criteria
No leakage at any time shall appear from the device.

3.5 Backsiphonage - Vacuum with Air

ASSE LEC 2010 – 201x
Listing Evaluation Criteria for Flow Control Device with Double Diaphragm and Safety Valve
3.5.1 Purpose
The purpose of this test is to determine if backsiphonage will occur from the non-potable piping into the potable line when all seals have failed, a vacuum is created on the potable line of the device, and the non-potable pressure is at atmospheric. This test is adapted from ASSE 1012 section 3.9.

![Figure 3 – Backsiphonage Test Setup](image)

3.5.2 Procedure
a. Foul the sealing members between the atmospheric vent and the potable waterline with an appropriately sized fouling wire as shown in Table 2.
b. Remove the sealing members between the vent and the non-potable water lines.
c. Install the device per Figure 3.
d. Apply and hold a vacuum of 25.0 in-Hg (635 mm-Hg, 85 kPa) at the inlet for not less than 1 minute.
e. Slowly raise the vacuum from 0 to 25.0 in-Hg (0 to 635 mm-Hg, 85 kPa) and then slowly reduce it from 25.0 to 0 in-Hg (635 to 0 mm-Hg, 85 to 0 kPa).
f. By means of the solenoid valve, create a surge effect by quickly opening and closing the valve. During this test the vacuum shall drop from 25.0 to 0 in-Hg (635 to 0 mm-Hg, 85 to 0 kPa).

<table>
<thead>
<tr>
<th>Nominal Pipe Size</th>
<th>Fouling Wire Diameter (nominal size)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPS</td>
<td>DN</td>
</tr>
<tr>
<td>¼</td>
<td>8</td>
</tr>
<tr>
<td>3/8</td>
<td>10</td>
</tr>
<tr>
<td>½</td>
<td>15</td>
</tr>
<tr>
<td>¾</td>
<td>20</td>
</tr>
</tbody>
</table>

Wire material shall be of sufficient hardness so as to not noticeably change in cross-sectional area after undergoing a test. Recommended materials are copper alloys, 300-series stainless steels, and low carbon steels. Wire size shall conform to ASTM B258.

3.5.3 Criteria

ASSE LEC 2010 – 201x
Listing Evaluation Criteria for Flow Control Device with Double Diaphragm and Safety Valve
Any rise in the water level of the sight glass shall result in a rejection of the device. The sight glass shall be 1.0 inch (25.4 mm) minimum diameter. In any test in which there is an upward bowing of the meniscus of the water in sight glass, the crown of the meniscus shall not exceed a rise of 1/8 inch (3.2 mm) above the level of the water in the reservoir or basin.

3.6 Backsiphonage - Pressurized with Water

3.6.1 Purpose
The purpose of this test is to determine that backsiphonage from the non-potable piping into the potable piping shall not occur if one set of seals become fouled, a vacuum is created at the potable piping, and there is a positive pressure on the hydronic piping. This test is adapted from ASSE 1012 section 3.10.

3.6.2 Procedure
a. Foul the seals between the potable water inlet and the atmospheric vent with an appropriate size fouling wire as shown in Table 2.
b. Install the device per Figure 3. Close valve V2 and open valve V3.
c. Use colored water in the pressurized line connected to the non-potable side of the device.
d. Tests shall be conducted in the sequence described in section 3.5.
e. Run the test with a backpressure of 15.0 psi (103.4 KPa), and again with a backpressure of 50.0 psi (344.8 KPa).
f. Replace the seals that were fouled. Foul the three seals between the hydronic water outlet and the atmospheric vent with an appropriate size fouling wire as shown in Table 1.
g. Repeat steps d and e with the non-potable piping seals fouled as above and remove the fouling wire from the potable piping seals.

3.6.3 Criteria
Any backsiphonage of water from the downstream piping into the supply line shall result in a rejection of the device. Any indication of flow of colored water into the inlet piping shall result in a rejection of the device.

3.7 Backflow through the Potable Piping Seals

3.7.1 Purpose
The purpose of this test is to determine if water can flow back into the water supply system when the vent port outlet is sealed closed, the non-potable piping seals are removed, and the maximum rated working pressure is applied to the non-potable piping side of the device. This test is adapted from ASSE 1012 section 3.7 and CSA B64.3
3.7.2 Procedure
   a. Remove the non-potable piping seals. Seal the vent outlets closed.
   b. Install the device per Figure 4 with the reservoir filled with colored water.
   c. Gradually raise the pressure at the outlet of the reservoir until the pressure equals 6.0 inch (152.4 mm) water column. Hold for 5 minutes.
   d. Observe for the appearance of colored water into the potable side of the device.
   e. Repeat with a pressure of 15.0 psi (103.4 KPa) and then with a pressure equal to the manufacturer’s maximum rated working pressure of the device.

3.7.3 Criteria
Any backflow of water into the potable piping side of the device during the testing shall result in a rejection of the device.
4. Detailed Requirements

4.1 Materials
Devices covered by this standard shall comply with the applicable requirements of NSF 61.

Solder and fluxes in contact with potable water shall not exceed, by mass, 0.2% lead content. Metal alloys in contact with potable water shall not exceed 8% lead content.

Fittings and devices intended to convey or dispense water for human consumption through drinking or cooking shall not contain a weighted average lead content in excess of 0.25% when evaluated in accordance with the test method specified in NSF 372.

4.2 Installation and Maintenance Instructions
Instructions for installing, adjusting, and maintaining the device shall be included with each device.

The installation instructions for the device shall include the following information:
- Inlet and outlet connection sizes.
- Manufacturer’s maximum working pressure.
- Manufacturer’s stated minimum and maximum flow rate.
- Recommended maintenance schedule and instructions

The instructions shall indicate that the device shall be accessible for replacement and repair.

4.3 Identification and Markings
Each device shall have the following information marked on the label or cast, etched, or otherwise permanently marked:
- Name of manufacturer or trademark.
- Information identifying the manufacturing date
- Flow direction
- Pressure ratings for each flow path
- Model number.

Labels shall comply with UL 969 for permanence.
5. Definitions
Definitions not located in this section are located in the Plumbing Dictionary, Sixth Edition, published by ASSE.