

IAPMO IGC 349-2018^{e1}

Electronic Plumbing Supply System Integrity Protection Devices



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IAPMO Standard

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Electronic Plumbing Supply System Integrity Protection Devices

1 Scope

1.1 General

1.1.1 This standard covers electronic plumbing supply system integrity detection devices for commercial and residential applications and specifies requirements for materials, physical characteristics, performance testing and markings.

1.1.2 Electronic plumbing supply system integrity detection devices covered by this standard can include the following features:

- (a) Monitoring of the hydraulic conditions (pressure, temperature, flow) within the main or branch circuit.
- (b) Automatic shut-off or electronic alarm notification and/or isolation of the supply piping when conditions are detected that indicate a leak or equipment malfunction.
- (c) Iterative analysis of high-resolution readings of system conditions to ensure contiguous integrity; and
- (d) Micro leak testing (drip detection).

Note: Automatic water leak detection and control devices and Automatic water leak detection and shut-off devices that solely react to water contact to detect leaks are covered by IGC 115.

1.2 Alternative Materials

The requirements of this Standard are not intended to prevent the use of alternative materials or methods of construction provided such alternatives meet the intent and requirements of this Standard.

1.3 Terminology

In this Standard,

- (a) “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy to comply with the Standard;
- (b) “should” is used to express a recommendation, but not a requirement;
- (c) “may” is used to express an option or something permissible within the scope of the Standard; and
- (d) “can” is used to express a possibility or a capability.

Notes accompanying sections of the Standard do not specify requirements or alternative requirements; their purpose is to separate explanatory or informative material from the text. Notes to tables and figures are considered part of the table or figure and can be written as requirements.

1.4 Units of Measurement

SI units are the primary units of record in global commerce. In this Standard, the inch/pound units are shown in parentheses. The values stated in each measurement system are equivalent in application, but each unit system is to be used independently. All references to gallons are to U.S. gallons.

1.5 Amendments

Proposals for amendments to this Standard will be processed in accordance with the standards-writing procedures of IAPMO.

2 Reference Publications

This Standard refers to the following publications, and where such reference is made, it shall be to the current edition of those publications, including all amendments published thereto.

ANSI/ISA-S75.02.01 ANSI/IEC 60529	Control Valve Capacity Test Procedures Degrees of Protection Provided by Enclosures (IP Code) (identical national adoption)
ASME B1.20.1 ASME B1.20.3 ASME B16.18 ASME B16.22	Pipe Threads, General Purpose, Inch Dryseal Pipe Threads, Inch Cast Copper Alloy Solder Joint Pressure Fittings Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
ASSE 1061	Performance Requirements for Push-Fit Fittings
ASTM B858	Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys
ASTM C1619	Standard Specification for Elastomeric Seals for Joining Concrete Structures
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
ASTM D572	Standard Test Method for Rubber-Deterioration by Heat and Oxygen
ASTM D1414 ASTM D2000	Standard Test Methods for Rubber O-Rings Standard Classification System for Rubber Products in Automotive Applications
ASTM D2672 ASTM D2846/D2846M	Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot-and Cold-Water Distribution Systems
ASTM D6284	Standard Test Method for Rubber Property—Effect of Aqueous Solutions with Available Chlorine and Chloramine
ASTM F1807	Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing

ASTM F1960	Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) tubing
AWWA C200	Steel Water Pipe, 6 in. (150mm) and Larger
CSA B137 Series CSA B137.3	Thermoplastic Pressure Piping Compendium Rigid polyvinylchloride (PVC) pipe and fittings for pressure applications
CSA B137.5	Crosslinked polyethylene (PEX) tubing systems for pressure applications
CSA B137.6	Chlorinated polyvinylchloride (CPVC) pipe, tubing, and fittings for hot-and cold-water distribution systems
CSA C22.2 No. 0.15 CSA C22.2 No. 223	Adhesive Labels Power Supplies with Extra-Low-Voltage Class 2 Outputs
IAPMO IGC 115 IAPMO PS 117	Automatic Water Leak Detection Devices Press Connections
ISO 6509-1	Corrosion of Metals and Alloys -- Determination of Dezincification Resistance of Copper Alloys with Zinc – Part 1: Test method
ISO 6957	Copper Alloys – Ammonia Test for Stress Corrosion Resistance
NSF/ANSI 61	Drinking Water System Components - Health Effects
SAE AMS3320	Elastomer: Silicone (VMQ) Rubber Sheet, Glass Cloth Reinforced Heat and Weather Resistant 60 to 80 Type "A" Durometer Hardness
UL 969 UL 1310 UL 1951	Standard for Marking and Labeling Systems Standard for Class 2 Power Units Standard for Electrical Plumbing Accessories

3 Definitions and Abbreviations

3.1 Definitions

The following definitions shall apply in this Standard:

Adaptive plumbing system monitoring and control device - a plumbing appurtenance that utilizes sensor inputs to continuously monitor the hydraulic conditions (pressure and flow) and temperature and intelligently adapts to identify expected normal vs abnormal system states.

Automatic water leak detection and control device - a plumbing appurtenance that closes a valve when water is detected.

Automatic water leak detection and shut-off device - a plumbing appurtenance that receives inputs from a sensor and closes a valve when preset conditions are met.

Micro Leak – a water discharge through a pin or microscopic sized hole.

3.2 Abbreviations

The following abbreviations apply in this Standard:

AMS	—	Aerospace Material Specification
CPVC	—	Chlorinated Polyvinylchloride
CTS	—	Copper Tube Size
NPS	—	Nominal Pipe Size
PVC	—	Polyvinylchloride
SCC	—	Stress Corrosion Cracking

4 General Requirements

4.1 Joints and Connections

4.1.1 Threaded Pipe Connections

Threaded pipeline connections shall comply with ASME B1.20.1 or ASME B1.20.3.

4.1.2 Solder Connections

Solder connections shall comply with ASME B16.18 or ASME B16.22.

4.1.3 Plastic Socket Joints

Plastic socket joints made of:

- (a) PVC shall comply with ASTM D2672 or CSA B137.3; and
- (b) CPVC shall comply with ASTM D2846 or CSA B137.6.

4.1.4 Plastic Piping Material Fittings

Connections for PEX or PE-RT piping must comply with:

- (a) ASTM F1807, ASTM F1960 or CSA B137.5 for crimp connections; or
- (b) ASSE 1061 for push fit connections

4.1.5 Press fitting connections

Press connections shall comply with IAPMO PS 117.

4.2 Materials**4.2.1 Bodies and Operating Parts**

Bodies and operating parts shall be made of materials that are compatible and corrosion resistant.

4.2.2 Copper Alloys in Contact with Water

All copper-alloy components in contact with water containing more than 56% copper by weight and containing more than 15% zinc (Zn) by weight, shall be subject to the dezincification and stress corrosion testing specified in Section 5.2.

4.2.3 Stainless Steel Components

All stainless-steel components in contact with water shall be UNS S30200, S30400, S31600 or an alternate alloy with equivalent general and chloride-induced stress corrosion resistance.

4.2.4 Internal Springs

Internal springs, when used, shall be

- (a) made of bronze, stainless steel, or other corrosion resistant materials suitable for the intended application having a corrosion resistance equivalent to that of phosphor bronze; and
- (b) not susceptible to stress corrosion.

4.3 Toxicity

Materials and components intended to be in contact with potable water shall comply with the applicable requirements of NSF/ANSI 61.

4.4 Rubber Components

4.4.1 Rubber components, except for gaskets, shall be made of vulcanized natural rubber or synthetic rubber compounds that comply with ASTM D412 or ASTM D2000.

4.4.2 Silicone rubber sheets shall comply with SAE AMS3320.

4.4.3 Rubber components for devices intended for hot water applications shall comply with ASTM D572.

4.4.4 O-rings shall comply with ASTM D412, ASTM D1414, or ASTM D2000.

4.4.5 All elastomer components in contact with potable water shall be formulated to resist free chlorine/chloramine corrosion. Materials shall demonstrate compliance with ASTM D6284. {Criteria – Max durometer change 5 (AWWA C200)/ max weight and volume change 5% (ASTM C1619)}

4.5 Engineered Plastic Components

Thermoplastic components used must be suited to mechanical and environmental conditions.

4.6 Lubricants

Lubricants used for assembly or to sustain operational performance must be non-toxic and compatible with elastomers and thermoplastics used in the assembly, even if not in direct material contact. Lubricant that may contact potable water in service must meet NSF/ANSI 61 requirements.

4.7 Electrical Components

4.7.1 Leak detection devices with electrical features or components shall comply with the applicable CSA or UL standards.

4.7.2 Power Supplies intended for outdoor use must meet the supplemental requirements of UL 1310, UL 1951 or CSA C22.2 No. 223. Installation instructions must clearly identify any restrictions on the location or required system components for power connections.

4.8 Environmental Protection

4.8.1 Water Intrusion

Devices that support outdoor installation must meet requirements of IEC 60529 IPX5 protection from water intrusion. If this criterion is not met, the installation instructions must clearly indicate "For Indoor Installation Only".

4.8.2 UV Exposure

For outdoor applications, all exposed materials shall be formulated or treated to resist product degradation by ultraviolet light.

4.9 Manual Shut-Off

A means for closing the valve without the aid of electricity shall be provided. The device shall either have an:

- (a) integrated means for manually closing the valve; or
- (b) a manual shut-off valve installed upstream and within 152 mm (6 in) of the device.

4.10 Automatic Water Leak Detection

Electronic plumbing supply system integrity protection devices that include integrated automatic water leak detection and control devices and automatic water leak detection and shut-off devices shall comply with the applicable requirements of IGC 115.

5 Testing Requirements

5.1 Test Conditions

Unless otherwise specified in the test procedure, all hydraulic tests are to be conducted with water under the following conditions:

- (a) Temperature: $21 \pm 5^{\circ}\text{C}$ ($70 \pm 10^{\circ}\text{F}$); and
- (b) Pressure: $552 \pm 34 \text{ kPa}$ ($80 \pm 5 \text{ psi}$)

5.2 Copper Alloys in with 56% or More Copper and More than 15% Zinc (Zn)

- 5.2.1** Copper alloy in contact with potable water shall have a copper (Cu) content not less than 56% by weight.
- 5.2.2** Copper alloy in contact with water and containing more than 15% zinc (Zn) by weight shall be resistant to dezincification. When tested in accordance with ISO 6509-1, the maximum depth of dezincification shall not exceed 200 μm .
- 5.2.3** Copper alloy in contact with water and containing more than 15% zinc (Zn) by weight shall be resistant to stress corrosion. There shall be no evidence of cracking when tested in accordance with ASTM B858 or ISO 6957 in a test solution of 9.5 pH.

5.3 Shut-off Tightness Test

- 5.3.1** With valve in closed position, apply static water supply pressure of 1200 ± 34 kPa (175 ± 5 psi) on inlet.
- 5.3.2** Observe outlet for any evidence of leakage through valve.
- 5.3.3** Sustain pressure for 1 h.
- 5.3.4** Verify tight closure of device. Maximum allowable leakage 0.2 ml/h (53×10^{-6} gal/h).

5.4 Flowing Closure Test (Electronic)

- 5.4.1** With valve in closed position, apply static supply pressure of 550 ± 34 kPa (80 ± 5 psi) on inlet.
- 5.4.2** Electronically command valve to open position.
- 5.4.3** Using downstream throttling valve establish flow per Table 1.
- 5.4.4** Initiate electronic signal to command device to close valve.
- 5.4.5** Verify that valve has shut off within 60 s.
- 5.4.6** Verify tight closure of device. Maximum allowable leakage 0.2 ml/h (53×10^{-6} gal/h).

5.5 Flowing Closure Test (Manual)

- 5.5.1** With valve in closed position, apply static supply pressure of 550 ± 34 kPa (80 ± 5 psi) on inlet.
- 5.5.2** Following manufacturer instructions manually adjust valve to open position.
- 5.5.3** Measure maximum torque during manual actuation. Torque shall not exceed 4.5 N·m (40 in-lbf) for a knob actuator, 9.0 N·m (80 in-lbf) for handwheel or 13.6 N·m (120 in-lbf) for lever actuator.
- 5.5.4** Using downstream throttling valve establish flow per Table 1.
- 5.5.5** Manually adjust valve to closed position.