



NSF International
Recreational Water Program

Component Certification
Specification for Flow
Measurement or
Metering Device
(CCS-12485)

The Public
Health and Safety
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NSF Recreational Water Program Component Certification Specification for Flow Measurement or Metering Device (CCS-12485)

Scope:

NSF/ANSI Standard 50 – 2012 has many requirements for technical evaluation, testing, and certification of a variety of materials, components and systems used at pools spas, hot tubs, spray pads or water parks. The purpose of this document is to specify the evaluation and testing criteria to enable appropriate assessment of a flow metering device for material health safety, corrosion resistance, durability and burst pressure safety, pressure loss, and flow measurement accuracy.

Physical Evaluation:

- The product shall bear the NSF 50 certification mark and other markings as required herein.
- The product shall include installation and use instructions in the owner's installation and use manual.

Material Requirements:

- A health effects toxicological risk assessment shall be completed on parts of the final product in accordance with NSF/ANSI Standard 50, Section 3 and Annex A.
- Corrosion resistance shall be evaluated in accordance with NSF/ANSI Standard 50, Section 3 and the requirements herein.

Performance Testing:

- The product shall be tested and certified in accordance with the requirements herein and those from other standards noted including:
 - o NSF/ANSI Standard 50-Equipment for Swimming Pools, Spas, Hot Tubs and other Recreational Water Facilities
 - o ANSI/APSP-16 (aka ANSI/ASME A112.9.8) Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs.
 - o UL61010 Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements
 - o UL 1563 Standard for Electric Hot Tub, Spas and Associated Equipment



Flow measuring devices or related equipment for public or residential use shall be evaluated for conformance to the requirements of this document in order for the product to be certified to NSF/ANSI Standard 50.

1.1 Scope

This establishes evaluation and testing criteria including: health safety, corrosion resistance, design and construction, marking, installation and use instructions, burst pressure and durability and accuracy performance testing requirements for flow measurement devices.

1.2 Limitations and Variations

1.2.1 Limitations

This standard does not purport to address all possible variables and conditions of use and installation. This standard was designed to address common pool, spa, and related hydraulic installation orientations and configurations. Flow measuring devices shall be tested in certain orientations and configurations of piping including pipe diameter size (ie size such as 2" Sch 40 PVC, orientations such as horizontal, vertical flowing upward, downward, etc. and configurations such as installed near elbows or in straight pipe runs) as noted herein.

1.2.2 Variations in design and operation

A flow measuring device of varying design and/or operation may qualify under these requirements. Appropriate tests and investigations shall indicate the components perform as well as systems complying with this section. Alternate flow measuring devices shall meet the requirements for materials (health safety and corrosion resistance) and performance: UV resistance, burst strength and pressure safety, pressure loss, flow measurement accuracy, life testing, electrical safety, as well as the requirements for marking, installation and use instructions in this standard.

1.3 Definitions

1.3.1 Flow Meter: A device used to estimate the flow rate of water.

1.3.2 Integral: Part of the device (ie flow meter flap, paddle wheel, bolt, spring, etc.) that cannot be removed without compromising the device function or destroying the physical integrity of the unit.

1.3.3 Indoor use: A product that is not designed, tested or certified for use outside or exposed to the elements and weather.

1.3.4 Outdoor use: A product that is designed, tested, or certified for use outside or exposed to the elements and weather.

1.4 Materials

All flow measuring devices with materials in contact with pool and spa water shall meet the health effects and corrosion resistance requirements of Section 3 and Annex A of NSF/ANSI Standard 50. Materials shall be designed to withstand operating temperatures up to 107°F and shall be evaluated for spa temperature use conditions.

1.4.1 Alternate materials

If specific materials are mentioned, other materials equally satisfactory from the standpoint of public health and performance may be permitted so long as they meet the requirements of this standard.



1.5 Electrical components

Flow measurement devices that utilize electrical components shall comply with the relevant electrical safety standard requirements based upon product design. Common electrical safety standards which may apply to measurement and laboratory devices are:

- UL61010 Electrical Equipment For Measurement, Control, and Laboratory Use
- UL 1563 Standard for Electric Hot Tub, Spas and Associated Equipment

1.6 Design, construction, and performance requirements

1.6.1 General

Flow measuring devices shall be designed and constructed to prevent the accumulation of dirt and debris, and to facilitate inspection, maintenance, servicing and cleaning. The flow measurement device shall be evaluated for protrusions, extensions, or other obstructions that create air bubble entrainment or trapping which may impact flow measurement results.

1.6.1.1 Outdoor use

Flow measuring devices marketed as “outdoor use”, “indoor and outdoor use”, shall have the exterior surfaces sealed to prevent damage from environmental exposure of sun and rain and be tested in accordance with the following requirements. (products not recommended by the manufacturer for outdoor use do not require rain or UV testing nor product marking relative to indoor or outdoor use)

1.6.1.1.1 Rain and precipitation

Flow measurement devices with electrical components and for outdoor use shall be evaluated for resistance to damage from rain and precipitation by conducting tests from UL1563 prior to conducting flow meter accuracy testing. Flow meters with electrical components for outdoor use shall meet UL1563, requirements for: Water exposure test, section 54.2 Splashing, 54.3 Seal test and 54.4 Simulated rain.

1.6.1.1.2 UV exposure

Flow measurement devices for outdoor use which are constructed of polymeric parts that would be exposed after installation shall have the polymeric materials evaluated for UV degradation of plastics in accordance with APSP-16 for UV exposure and strength retention. The UV exposed plastic materials or parts must maintain at least 70% of the impact and tensile strength of un-exposed plastics to evidence compliance with UV exposure and resistance requirements.

1.6.2 Accessibility

Flow measuring device components shall be installed in an accessible location for viewing, inspection, maintenance, repair and/or replacement.

1.6.3 Information to be made available at the production location

The production location shall maintain a record of the quality assurance procedure for flow meter production. This procedure shall be made available during conformity assessment inspections. The production location shall maintain the manufacturer recommended procedure for in-plant quality assurance and quality control testing to assure product quality continues to meet the requirements of this standard during ongoing production.

NOTE: For example, a flow meter manufacturer may specify QA/QC procedures, or testing frequencies during production runs to verify dimensional fit of components smooth functioning of moving parts, proper uploading of software, flow rate accuracy, etc.

1.6.4 Fastener evaluation



When metal fasteners are used, they shall be 316 stainless steel or a better alloy grade for corrosion resistance. All fasteners that provide access to replaceable parts or service areas shall be tested for 15 cycles of insertion/removal without damage, and must have at least 3 threads of engagement

1.6.5 Working pressure and pressure testing

Flow metering products must have a minimum working pressure of 345kPa (50 psi) or greater as claimed by the product manufacturer. Pressure testing shall be performed in the following sequence on one unit or product (hydrostatic pressure, cyclic pressure then burst pressure).

1.6.5.1 Burst hydrostatic pressure testing

Conduct testing at 1.5x manufacturer claimed working pressure in accordance with NSF/ANSI Standard 50 Annex B.1.4.

1.6.5.2 Cyclic pressure testing

Conduct cyclical pressure testing for 20,000 cycles of 0 kPa - 207 kPa - 0 kPa (0 psi – 30 psi – 0 psi) in accordance with NSF/ANSI Standard 50 Annex B.1.4.

1.6.5.3 Burst pressure testing

Conduct testing at 2.0x manufacturer claimed working pressure in accordance with NSF/ANSI Standard 50 Annex B.1.4. There shall be no rupture, leakage, burst or permanent deformation of the flow metering device.

1.6.6 Failure burst pressure safety

The product shall be designed for a 4:1 safety factor against burst. The product shall be tested for ultimate burst failure by increasing the pressure at a consistent rate until the device yields, leaks, or bursts. The rate of pressure increase shall be no greater than 1 (one) psi per second until the device yields, leaks, or bursts. The failure pressure shall be a minimum of 4 (four) times the rated working pressure.

1.6.7 Head loss

Test the flow measuring device with manufacturer recommended piping type(s) and size(s). The device shall be installed with 20 (twenty) times the nominal pipe diameter in straight pipe runs before and after the flow meter. There shall be 10 (ten) times the nominal pipe diameter before the pressure measurement point on the influent side of the device and 5 (five) times the nominal pipe diameter prior to the pressure measurement location on the effluent side of the device. Head loss values shall be recorded at 8 (eight) points evenly distributed across the entire claimed flow range of the device. The head loss results shall be within 10% of the manufacturer claimed head loss.

1.6.8 Flow rate measurement accuracy

Flow meter flow rate accuracy testing shall be performed with all manufacturer recommended pipe sizes, orientations, and configurations.

1.6.8.1 Orientation

Flow rate accuracy testing shall be performed with the flow meter installed in each of the following orientations unless such an installation is prohibited by the manufacturer's installation instructions:

- Horizontally oriented with water flow,
- Vertically oriented with water flowing upward, and
- Vertically oriented with water flowing downward

1.6.8.2 Configuration

Flow rate testing shall be performed with the flow meter installed in each of the following configurations,



- with straight pipe run lengths of 20 (twenty) times the nominal pipe diameter before and after the flow meter, or less as recommended in accordance with the manufacturers written installation instructions.
- with 90° elbows placed within 6 (six) inches of the flow meter or at closest recommended distance before and after the flow meter in accordance with the manufacturers written installation and use instructions.

1.6.8.3 Size of piping

Flow rate testing shall be performed with each of the manufacturer recommended piping sizes (i.e. 2" SCH 40 PVC, etc.)

1.6.8.4 Flow meter testing and accuracy levels

Flow meter accuracy testing shall be performed using an NIST traceable flow meter accurate to +/- 4 Lpm (+/- 1 gpm) or 2% of reading at each point of the flow (whichever is greater). Results shall be recorded at 8 different flow rates throughout the claimed flow rate range. Results shall be reported in a table and graph and show the deviation from actual flow rates at each of the tested points throughout the manufacturer claimed flow rate range. Results of flow measurement testing shall meet one of the following accuracy requirement categories:

For level 1 (L1) flow meter,

1. Average of the absolute values of all single point deviations must be $\leq 5.0\%$
2. Single point deviations shall not exceed $\pm 7.5\%$

For level 2 (L2) flow meter,

3. Average of the absolute values of all single point deviations must be $\leq 10.0\%$
4. Single point deviations shall not exceed $\pm 12.5\%$

For level 3 (L3) flow meter,

5. Average of the absolute values of all single point deviations must be $\leq 12.5\%$
6. Single point deviations shall not exceed $\pm 15\%$

For level 4 (L4) flow meter,

7. Average of the absolute values of all single point deviations must be $\leq 15\%$
8. Single point deviations shall not exceed $\pm 20\%$

For level 5 (L5) flow meter,

9. Average of the absolute values of all single point deviations must be $\leq 20\%$
10. Single point deviations shall not exceed $\pm 25\%$

1.6.9 Life testing

Flow meters with moving parts shall be tested after the equivalent of 5 years of use or 5,000 cycles of actuation (such as mechanical actuation of full sweep of the indicator) on one flow meter unit. The aged sample shall be tested in at least one of the installation configurations and methods noted in section 1.6.8. The test results of the aged and non-aged samples shall be compared. The average of the absolute value of all single point deviations from the aged sample shall not exceed the absolute value of all single point deviations of the un-aged sample by more than 2 (two) times the absolute value of the un-aged sample.

1.7 Product marking or data plate

Flow metering devices shall have a data plate that is permanent and easy to read. The data plate shall have, at a minimum, the following information:

- Manufacturer's name (or trademark) and address or website;
- Model designation or number
- Production date, date code or serial number
- Maximum working pressure



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- Allowable connection or pipe size(s) including schedule
- Indoor/Outdoor use (if recommended by the manufacturer and the product meets UV/Rain requirements) if the manufacturer does not recommend outdoor installation, no reference to indoor/outdoor shall be marked on the product
- Certifier mark attesting to compliance with all requirements
 - The NSF Certification mark is



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1.8 Installation and operation manual

A manual shall be provided with each flow meter and shall include:

- instructions for installation, including details of acceptable pipe sizes, piping configurations, installation orientations, etc.
- any non-allowable piping sizes, configurations and installation orientations, etc.
- instructions for use
- head loss claim for each allowable or recommended piping size, configuration, and installation,
- trouble shooting guide (if applicable)
- instructions for service and serviceable components and parts (if applicable);
- manufacturer recommended replacement parts (if applicable)
- manufacturer warranty statement,
- contact information for the manufacturer or service company