



**NSF International**  
Recreational Water Program  
Component Certification Specification  
CCS-14530

**Gas Injection Systems**





## **NSF Recreational Water Program Component Certification Specification for Gas Injection Systems (CCS-14530)**

This product is covered by the scope of NSF/ANSI Standard 50 – 2015. The purpose of this document is to specify the evaluation and testing criteria to enable appropriate assessment of gas injection systems dosing chemicals other than for disinfection.

### **1 Scope**

Gas injection equipment covered by this section are not intended for dosing disinfection chemicals into the circulation system of public and residential recreational water facilities including but are not limited to: pools and spas/hot tubs, therapy pools, and interactive aquatic play features. Since these products are not intended to produce residual levels of disinfectant within the body of the water, an EPA registered disinfection chemical shall be added to impart a measurable residual as required by the regulatory agency having authority. Claims of ozone generation and advanced or enhanced oxidation disinfection are excluded from the scope of this standard.

### **2 Limitations and Variations**

#### **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 safety, installation and performance criteria. The gas injection systems covered under this standard are intended to produce a residual concentration. This standard does not address the health effects of the injected gas as a residual pool chemical.

#### **2.2 Variations in design and operation**

A gas injection system 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 gas injection systems shall meet the requirements for materials (health safety and corrosion resistance) and performance: burst pressure and durability, head loss or pump curve, operational protection, and output rate, as well as the requirements for marking, installation and use instructions in this standard.

### **3 Definitions**

**3.1 Automated controller:** A system of at least one chemical probe, a controller, and auxiliary or integrated component, that senses the level of one or more swimming pool or spa/hot tub water parameters and provides a signal to other equipment to maintain the parameter(s) within a user established range.



- 3.2 Gas injection system:** A system designed to dose a gaseous treatment chemical into pool or spa water which may be installed on the main recirculation line or a bypass line.
- 3.3 Gas injector output rate:** Mass of gas delivered by the injection system expressed per unit of time for a given set of parameters.
- 3.4 Head loss:** Total pressure drop in psi (kPa) or feet (meters) of water (head) between inlet and outlet of a component.
- 3.5 Integral:** Part of the device (e.g. static mixer, impeller, etc.) that cannot be removed without compromising the device function or destroying the physical integrity of the unit.

## **4 Gas Injection System Components**

Gas injection systems may include some or all, but also are not limited to, the following components:

- Gas Concentrator
- Static Mixer
- Venturi Injector
- Booster Pump
- pH Monitor/Controller
- Gas Flow Meter
- Gas Pressure Regulator
- Water Flow Meter
- Pressure Switch

## **5 Materials**

All gas injection 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 the specified end use – pool (75°F) and/or spa (107°F) conditions.

### **5.1 Compatible materials for operation**

Materials in contact with the gas stream or treated water shall be suitable for use with intended gas and shall show no signs of degradation during testing.

## **6 Design, construction, and performance requirements**

### **6.1 Design and construction**

Gas injection devices shall

- Be designed and constructed to prevent the accumulation of dirt and debris, and to facilitate inspection, maintenance, servicing and cleaning.
- Meet the applicable requirements of Section 4.



## **6.2 Gas flow meter**

If the performance of a unit is dependent on a specified gas flow rate, a means to monitor and control the flow shall be provided or the installation and operation instructions shall require the use of a separate device.

## **6.3 Water flow meter**

If the performance of a unit is dependent on a specified water flow rate, a means to monitor and control the flow shall be provided or the installation and operation instructions shall require the use of a separate device.

## **6.4 Flow-indicating device**

Gas injection systems shall be provided with a flow-indicating device on the unit, or the installation instructions shall provide for the installation of a flow-indicating device for the full range of flow rates.

NOTE – Gas injection systems operated by an NSF/ANSI Standard 50 automated controller shall be exempt from this requirement.

## **6.5 Accessibility**

Gas injection systems, devices, and components shall be installed in an accessible location for inspection, maintenance, repair and/or replacement.

## **6.6 Working pressure and pressure testing**

Units and components of gas injection equipment that are subjected to pressure shall meet a working pressure of 50 psi (33 kPa), be equipped with a pressure-reducing valve set at the manufacturer's working pressure, or be required to have one installed as part of the installation instructions.

Pressure testing shall be performed in the following sequence on one unit or product (hydrostatic pressure, cyclic pressure, and then design burst).

### **6.6.1 Burst hydrostatic pressure testing**

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

### **6.6.2 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.



### **6.6.3 Design 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 device.

### **6.7 Head loss**

The manufacturer shall make available a head loss claim for systems installed into the main line. The actual head loss shall not exceed the claimed head loss by more than 10% (when tested in accordance with NSF/ANSI Standard 50 Annex B, B.3). The head loss claim shall include both with and without gas injection.

NOTE – Gas injection systems installed with a booster pump are exempt from this requirement.

### **6.8 Pump Curve**

For each pump model or model series used with the gas injection systems, they shall comply with the pump curve requirements of NSF/ANSI Standard 50 Section 6.6.

NOTE – Gas injection systems without a booster pump are exempt from this requirement.

### **6.9 Operational protection**

**6.9.1** Gas injection systems shall possess adequate safety mechanisms, or shall have mandatory instructions to be installed with ancillary equipment possessing such safety mechanisms, such as an NSF/ANSI Standard 50 Certified automatic controller, so to lessen the probability of introducing elevated chemical concentrations at any location in the pool or spa circulation system, to minimize the probability of exposing any part of the pool or spa circulation system to pressures higher than 50 psi, and to alert end users if the equipment is not functioning properly. Examples of such possible scenarios include:

- loss of water flow (including during backwash cycle)
- loss of power to the main recirculation pump
- when a component is not functioning properly

**6.9.2** Moving parts shall be covered.

**6.9.3** The components of the equipment requiring cleaning or maintenance shall be easily accessible

**6.9.4** If a gas source is used that has the potential to supply gas at a pressure higher than the maximum working pressure of the system, the device is supplied with a regulator that has a maximum output pressure equal to or less than the maximum rated working pressure. Or the installation instructions require the use of such a regulator.



**6.9.5** Units with UV lamps shall be equipped with an automatic mechanism for shutting off the power to the UV light source whenever the cover is removed.

## **6.10 Protection against overdosing**

The manufacturer shall provide printed materials warning the user of the potential for elevated chemical concentrations and hazardous gas introduction into the pool or spa. At a minimum, the printed materials shall describe the potentially hazardous conditions, such as backwash and periods of no flow in the recirculation system. The steps to be taken during installation and operation to prevent such conditions shall be included.

## **6.11 Gas output**

The gas injection system shall have an output rate control mechanism, or require to be installed with one, that is adjustable in at least four increments over the full operating range. The mechanism for regulating the output rate shall be readily accessible when the feeder is installed in accordance with the manufacturer's instructions.

The uniformity of output for a gas injection system shall be tested and evaluated at settings of the output rate control mechanism equivalent to 50% and 100% of the rate of gas output recommended by the manufacturer. Gas injection systems designed for one output rate shall be evaluated at 100% of the maximum gas output. The output of a gas injection system shall be within  $\pm 20\%$  of the output specified by the manufacturer at each test setting of the output rate control mechanism. For each test setting, the output of the gas injection system shall be repeatable within  $\pm 10\%$  when tested in accordance with NSF/ANSI Standard 50 Section G.3.

## **7 Product marking or data plate**

Gas injection systems and 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
- Electrical information (volts, amps, Hz, etc)
- Maximum water working pressure
- Designed water flow rate
- Maximum gas output rate for Pool and Spa end use
- Pool or Spa end use statement, if not evaluated for both
- Applicable gas type
- Maximum allowable gas pressure
- Design gas flow rate range
- Certifier mark attesting to compliance with all requirements indicating the CCS certification, not NSF-50.
- Certification statement



## 8 Installation and operation manual

A manual shall be provided with each gas injection device and shall include:

- Instructions for installation, including details of acceptable pipe sizes, piping configurations, installation orientations, etc.
- Instructions for use
- Ventilation requirements if applicable to dosed gas (e.g. ozone, etc)
- Output claims for designed pressure/flow ranges
- Head loss claim, if no booster pump is utilized
- Pump curve, if booster pump is utilized
- Warning for elevated chemical concentrations and conditions (backwash, no-flow, etc) that can produce them
- Statement to require a gas pressure regulator not to exceed maximum operating pressure of the device
- Trouble shooting guide (if applicable)
- Instructions for service and serviceable components and parts (if applicable);
- Parts list and diagram for replacement parts
- Manufacturer recommended replacement parts (if applicable)
- Contact information for the manufacturer or service company
- Certification statement

## 9 Certification Statement

Equipment shall be provided with a certification statement. This is a statement identifying the type of certification that has been achieved.

The manufacturer shall add the certification statement to the manual and data plate. The certification statement shall identify the exact function(s) have been certified for the product. If a manufacturer makes claims of product performance and/or function outside of the scope of certification, the certification statement shall make clear which claims or functions, such as disinfection, have not been certified.

Example: This product is certified for the volume of gas injected into the pool circulation system. It has not been certified for efficacy such as disinfection or pH adjustment.

Marking, labelling, and statements on the product or manuals shall not misrepresent the type of certification, performance, or function. The certification mark shall make clear the certification is to CCS-14530, not NSF/ANSI 50.