

HG S.M.A.R.T. FLUSHING SYSTEM (SYSTEM MANAGEMENT AND REMOTE TELEMETRY) DIRECT DISCHARGE UNIT

HYDRO-GUARD

Remote Water Quality Monitoring and Distribution Flushing

1. GENERAL DESCRIPTION

- 1.1 The device furnished under this Section shall be an automatic water distribution flushing device designed to be utilized in a permanent or semi-permanent manner for monitoring of water quality conditions; recording water quality results; and automatically flushing of potable water distribution lines when select water quality conditions fail to meet the water quality standards identified by the utility and entered into the logic of the S.M.A.R.T. Flush Management software of the device.
- 1.2 The primary purpose of this device shall be to automatically flush the necessary amounts of water from the water distribution system for the purpose of improving and/or maintaining water quality without exceeding the volume necessary to mitigate for a specific condition.
- 1.3 Secondly, this device shall allow authorized water quality and utility personnel to receive and send critical field data from the remote monitoring/flushing station so that they may periodically ascertain current water quality conditions and establish a cost effective and system efficient flushing response program.

2. PERFORMANCE

- 2.1 This device shall be connected to a water distribution line as required by the plans or standard installation detail. The self-contained unit is designed for automatic flushing of the water distribution line through the opening of a control valve that is an integral part of the unit.
- 2.2 All programming shall be accomplished by means of an integrated telemetry based PLC with proprietary programming logic that will consistently analyze the water quality readings taken by the integrated chlorine (total) analyzer. The system will be powered by 120VAC (alternative power supply options may be available for certain models and installation locations).
- 2.3 This device shall be capable of measuring, logging and mitigating (by way of initializing a flush event) the following water quality conditions:

(Check all that apply):

- Free Chlorine Analyzer, pH, and Temperature
 - Total Chlorine Analyzer, pH, and Temperature
 - pH
 - A Turbidity Analyzer
 - Temperature of Water
 - Turbidity
 - TOC
 - Others: _____
- 2.4 This device shall be capable of being programmed to activate when chlorine or chloramine residual pH; and/or water temperature levels fall below acceptable standards determined by the operator/end-user.

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2.5 The device shall be capable of monitoring and logging the following conditions:

(Check all that apply):

- Pressure
- Flow
- Temperature of Water
- pH
- Cabinet temperature
- Security of cabinet

2.6 Device must allow for scheduled flush events. A minimum of 10 events per day with durations of one minute to 24 hours per event are required.

- Communication (check all that apply)
 - Utility Supplied (not to be included by manufacturer)
 - Cellular Radio: ___ CDMA or ___ GSM
 - Ethernet Radio
 - Bluetooth® Radio
 - 2.4 GHz
 - Wi-Fi
 - Other: _____
- A 33-inch tall, 36"-wide and 18-inch deep protective external enclosure that shall include a heating kit, two access doors and locking hasps (only select if backflow is an air gap);
- A 60-inch tall, 36-inch wide, and 18-inch deep protective external enclosure that shall include a cooling fan and light kit;
- Power Supply (120VAC) shall include circuit breakers and a UL certified electrical box;
- A tamper switch (with optional SMS or email reporting); and
- A manual ON/Off switch for on-site shut down.

2.7 This device must be capable of performing the following monitoring and condition mitigation activities:

- a. The device shall be capable of monitoring a variety of water quality conditions including free or total chlorine, pH, temperature, turbidity, TOC, flow (both gallons per minute and total flow) and system pressures from a single installation point.
- b. The device shall initiate a flush event based on client input when chlorine, temperature, pH, turbidity or a time-based schedule requires such action to mitigate a less than desirable water quality condition or to create a temporary demand on the water service line to prevent water age and conditions associated with water age.

3. ACCEPTABLE MANUFACTURERS

3.1 The two-way communication (MODBUS TCP; SCADA compatible required) remote telemetry based automated flushing and water quality management device to be supplied under this specification shall be **Hydro-Guard®** as manufactured by the Mueller Company.

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4. AUTOMATIC WATER DISTRIBUTION FLUSHING SYSTEM COMPONENTS

The remote water quality monitoring/management and water distribution flushing system is comprised of a premium commercial grade chlorine analyzer (total or free), turbidity analyzer, pH sensor, temperature sensor, pressure sensor, etc.

- 4.1 Must be constructed of Schedule 80 PVC, no-lead brass, or stainless-steel.
- 4.2 A premium grade, industry recognized, double check valve; a multi-function PLC with proprietary system management logic for the control of at least three water quality condition sensors—minimum of pH, chlorine and temperature monitoring— (with the potential for future expansion).
- 4.3 Dechlorination system for both flushed water and water utilized by the analyzing device(s) is mandatory.
- 4.4 Must be housed in a protective external enclosure that shall include the features indicated (indicated by check) ___ cooling fan and ___ light kit; the protective cabinet shall include the following (Check all that apply):
 - Free Chlorine Analyzer, pH, and Temperature
 - Total Chlorine Analyzer, pH, and Temperature
 - A Ductile Control Valve with Flow Meter (GPM / Total Flow)
 - A Turbidity Analyzer
 - A Pressure Monitoring sensor
 - The flushing components shall be located above grade and separated from the electronic components of the device
 - Communication (check all that apply)
 - Utility Supplied (not to be included by manufacturer)
 - Cellular Radio: ___ CDMA or ___ GSM
 - Ethernet Radio
 - Bluetooth® Radio
 - Other: _____

5. AUTOMATIC FLUSHING UNIT

The advanced system management/monitoring and flushing station shall be a single unit consisting of the major components described below:

- 5.1 **Integral System Management Control Hardware and Software** – The S.M.A.R.T. System management and monitoring components shall include the following:
 - a. The device's internal control system shall allow for a minimum of three independently operating condition assessment / water quality analyzers (i.e., chlorine, pH, flow, temperature; turbidity, pressure, etc.).
 - b. The device's internal control system shall be programmable via both a remote web or SCADA interface and an on-site Ethernet option.
 - c. The device's internal control shall be capable of being managed via Windows® Internet Explorer® (or other web browsers) and shall not require a proprietary interface software.
 - d. The device's internal control shall be equipped with a unique IP address and shall utilize a proprietary viewer web interface to protect against unauthorized usage.
 - e. The device's management system shall allow owners to change or update the IP address of the device.

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- f. The devices shall feature user access level settings that will allow the utility to establish permission levels for Administrators/Engineers, Technicians, and Users with access to the data generated by the device. The purpose of this functionality is to limit function control yet provide access to critical system data to all authorized personnel.
- g. The device's internal controller shall be capable of two-way communication, in real-time if so desired, via such communication methods as cellular (GSM or CDMA), Wi-Fi, Ethernet, Bluetooth®, or other methods.
- h. The device's internal controller must be capable of sending and receiving data packages, as well as storing information on-site for up to one (1) calendar year.
- i. The device's internal controller must be capable of sending alarm codes in the event of a probe failure; the device's protective enclosure is accessed (when equipped with the entry detection option); or when a flow or no-flow condition occurs in contrast with what the device's controller has initiated.
- j. The Analyzer, PVC, electrical components and protective enclosures shall be UL certified.
- k. The device internal controller must be SCADA compatible and be capable of communicating with SCADA networks via MODBUS-TCP.

5.2 Integral Piping and Control Valve – The piping and control valve components shall include the following:

- a. Adjustable control valve powered by a constant powered, 24VDC solenoid. (Select preferred Control Valve option; identify with an "X").
 - **DUCTILE CONTROL VALVE WITH FLOW METERING:** The device's internal 2-inch ductile iron control valve shall be capable of being activated by a 24VDC solenoid and must feature a built-in flow meter capable of providing GPM and Total Flow.
 - **COMPOSITE CONTROL VALVE WITHOUT METERING:** The device's internal 2-inch nylon reinforced composite control valve shall feature a straight through pass and a single piece EPDM rubber diaphragm.
- b. The control valve shall be a globe valve type design capable of passing sand and other debris up to 5/8" in diameter without obstructing the valve's throat.
- c. The device standard internal and external piping shall be Schedule 80 PVC.
- d. The device internal piping and control valve shall have an operational rating of 200 psi (where consistent pressures range above 110 psi it is recommended that a Pressure Reducing Valve be utilized ahead of the automatic flushing system for the protection of the device and its critical components).
- e. Internal piping and control valve shall be capable of being removed from the housing by means of a flange coupling allowing for quick disassembly, permitting easy maintenance and repairs.
- f. The control valve shall be constructed of a non-corrosive glass-reinforced nylon, or equal, and shall be fitted with stainless steel hardware. The valve shall be of the type that can be easily rebuilt.
- g. The unit shall be supplied with a 2-inch modular double check valve backflow prevention system that can be removed from its cradle system for annual checks without being disassembled from the piping of the device.

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- h. The unit shall be a directed discharge system, utilizing flange connections, to connect the inlet and outlet piping to the utility's service lines and discharge piping; optional designs can discharge to atmosphere.

5.3 Housing

The self-contained unit shall be supplied with an above-grade, NEMA 3R (minimum) environment-resistant, vented cabinet to provide stability and protection for the internal components of the device. The cabinet shall be constructed of high grade, heavy gage aluminum. A secondary NEMA 6x (minimum) cabinet must be used to house the system-management electronics.

5.4 System Sampling (Required) – The sampling system shall include the following features:

- a. The sampling system shall be constructed of polyethylene or stainless with equal or greater resistance to bacterial regrowth and be connected with brass or stainless fittings.
- b. The sampling system shall be designed in such a way to reduce the potential for sampling system contamination by allowing access and inspection of the internal piping compartment and components without disassembly or depressurization of the sampling system.
- c. Connection to the device sampling system shall be by means of a quick access sample valve located at the top of the device for ease of access. The device sampling connection shall be housed in a secure weather-tight area to minimize contamination of the sampling connection.
- d. The sampling system must allow water quality samples to be obtained on-site with the flushing device in either a flushing or non-flushing state.

5.5 Electrical/Electronic System - The Electrical/Electronic System shall include the following features and capabilities:

- a. Be capable of storing instructions and data for a minimum of 12 months via an integrated programmer and capable of operating the device internal control valve using a 120VAC power supply (or an alternative power source).
- b. Offer continuous monitoring of water quality conditions and 10 flushing program events per day.
 - b.1. Analyzer must sample water quality conditions (chlorine) a minimum of every five (5) minutes.
 - b.2. S.M.A.R.T. Management System must record conditions in a daily mode a minimum of every five (5) seconds.
 - b.3. S.M.A.R.T. Management System must record conditions in a monthly mode a minimum of every ten (10) minutes.
- c. Capable of transmitting data to a remote site in real-time or on a periodic basis determined by authorized operators.
- d. Capable of receiving data from a remote site in real-time or on a periodic basis determined by authorized operators.
- e. Offer downloadable data transfers that can be saved as CSV or XLSX files for use in management spreadsheets.
- f. Offer both graphical and running text logs for data viewing and management.
- g. Must feature on-site Ethernet interface to allow for on-site access to data and system management controls.
- h. Incorporate a chlorine analyzer with an LCD readout.

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- i. Offer optional manual on and off functions on-site with remote on/off functionality via remote management software.
- j. Be secured and water-resistant.
- k. Use an integrated 24-volt solenoid to operate the control valve that directly turns into a 2-inch control valve.

5.6 Dechlorination System (Required)

- a. A tablet feeder designed to accommodate 2 5/8th inch sodium sulfite or ascorbic acid tablets shall be installed on the unit.
- b. A portion of the water being flushed shall be directed through the tablet feeder in the creation of a concentrated solution of the dechlorinating agent.
- c. The directly treated, concentrated solution shall be introduced to the non-directly treated discharge on the device's splash plate resulting in a homogenous mixture effectively treating the entire discharge.
- d. A minimum of 64,000 gallons of flushed water shall be neutralized by the dechlorination system when the chamber is filled to capacity.

5.7 Execution

- a. Recommended installation must be provided on drawings (PDF and DW6) supplied by the manufacturer.
- b. Electrical wiring schematics must be provided by the manufacturer.
- c. Prior to the installation, the drainage patterns for the intended installation location shall be viewed to ensure that any discharged water will not create hazardous conditions for pedestrian or vehicular traffic. The selected location's drainage pattern shall also permit discharged water to flow away from the automatic flushing valve or be absorbed by the surrounding soil as to prevent pooling.
- d. Remove debris that might create uneven pressure on the unit from the bottom of the hole. Compact the bottom of the hole to minimize settling after installation.
- e. Install a 4" lift of non-compacted sand or similar bedding material into the bottom of the hole.
- f. Backfill the hole around the automatic flushing valve with clean fill, #57 stone and/or a combination of other appropriate materials. Backfilling shall be accomplished in 6" lifts. Use a level to ensure the unit is level after each lift.
- g. The area 36" around the automatic flushing valve shall be prepared to prevent erosion.
- h. The automatic flushing valve shall be disinfected in accordance with ADH and AWWA standards.
- i. Installers must adhere to all manufacturer recommendations; state and local regulations and codes; and the guidance provided by the owner.



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