

MSA FiveStar® Alarm with PulseCheck® Pump

[Integrating Power, Control and Alarm Circuitry]

Featuring innovative technology in a compact package, MSA's FiveStar® Alarm sets new benchmarks in design and performance of gas monitors for use in confined spaces. For remote sampling, the FiveStar Alarm offers yet another innovation: the high-efficiency PulseCheck pump (Pat. Pending).

New to MSA's line of add-on pumps, the PulseCheck pump draws its power from the FiveStar Alarm battery pack. This unique, single-power design not only eliminates the need for a separate power supply for the pump but, more importantly, ensures that users are alerted to changes in pump performance. Unlike competitive two-power systems in which pump operation can cease without instrument warning, the FiveStar Alarm with PulseCheck pump is an integrated system that dynamically monitors and controls the pump, and alarms when flow fault conditions occur.

FiveStar Alarm: "Intelligent" Pump Control

The electrical link between the FiveStar Alarm and the PulseCheck pump allows the FiveStar Alarm's microcomputer to monitor proper pump function and to control the pump motor.

The FiveStar Alarm's microcomputer uses Pulse Width Modulation (PWM) of the power to efficiently drive the pump. PWM is a method whereby the transistor supplying power to the pump motor is rapidly turned on and off (approximately 350 cycles/second). When the transistor is in the "ON" state, the motor receives power from the FiveStar Alarm battery pack. During the "OFF" state, the motor armature continues to rotate due to inertia, producing a voltage that is proportional to its speed. The FiveStar Alarm microcomputer measures this voltage to determine the pump motor speed. If the motor speed deviates from the normal value, the microcomputer automatically adjusts the pulse width to counteract the change. As a result, the speed of the motor, and thereby the flow rate of the pump, are controlled in a relatively small operating range.

FiveStar Alarm: Three-Way Detection of Flow Faults

Using PWM, the FiveStar Alarm dynamically detects a full range of flow fault conditions. Built into its microcomputer memory are maximum and minimum pulse width values for extremes in operating conditions, i.e., the longest recommended sampling line and the highest/lowest battery voltage and operating temperature. These values are used to determine normal operating limits for the motor and to detect problems in the flow system. A clogged sample line or a stalled motor, for example, causes a drop in the measured motor voltage and requires an increase of the pulse width above the maximum value allowed by the microcomputer (see Figure 1). Similarly, should the pump become disconnected from the motor, an increase in the measured motor voltage causes a decrease in the pulse width. If these conditions occur, the microcomputer will activate an alarm on the FiveStar Alarm.

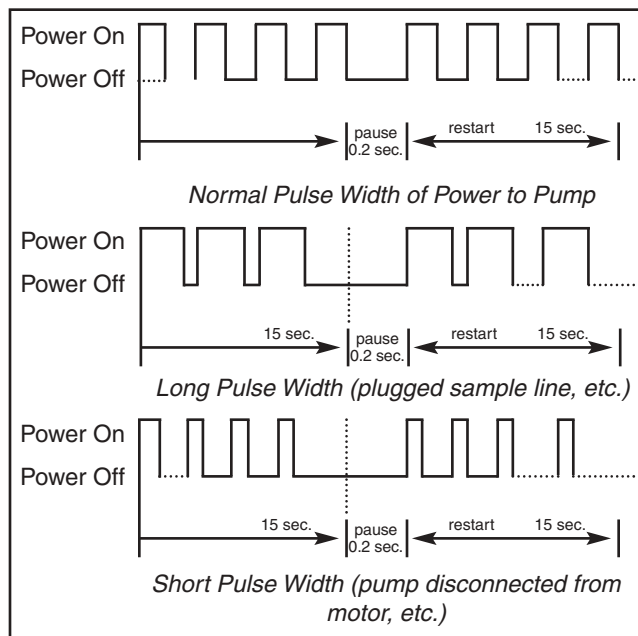


Figure 1. Variations in Pulse Width of Power to PulseCheck Pump

In addition to comparing the pulse width to preset normal values to detect flow fault conditions, the FiveStar Alarm's microcomputer also monitors the rate of change of the pulse width and triggers an alarm if this rate suddenly changes. For example, if a liquid is inadvertently drawn into the free end of the sample line there is an immediate change in the pneumatic loading of the pump and thus a sudden change in the pulse width. Recognizing that this value exceeds the allowable rate of change stored in its microcomputer memory, the FiveStar Alarm activates an alarm.

The FiveStar Alarm's microcomputer also includes Pulse Check, a feature that helps detect marginal flow problems. In a sampling situation where the pneumatic loading is gradually increased—typically, when an end-of-line filter slowly clogs with dust—the rate of change in the pulse width may fall below the alarm limit and an alarm would not be activated.

However, with the Pulse Check function, the microcomputer periodically (every 15 seconds) shuts down the PWM supply for 0.2 seconds—a time duration that allows the motor to almost stop but does not materially interrupt the sample flow. The microcomputer then measures the time interval required for the motor to accelerate to its normal operating speed when the PWM supply is resumed. Slower acceleration from the higher loading indicates a flow fault condition, and the FiveStar Alarm triggers an alarm. With Pulse Check, the FiveStar Alarm and PulseCheck pump provide users with an early warning that sample flow is compromised.

The PulseCheck Pump: High Efficiency In A Simple Design

Requiring no tools, the PulseCheck pump easily attaches to the FiveStar Alarm for convenient use in the field. It requires minimal electrical power—and its use of the FiveStar Alarm's battery pack means charging of only one power supply. Efficient yet powerful, the PulseCheck pump enables remote sampling using lines up to 50 feet in length.

Combining elegant design with state-of-the-art control and alarm technology, the FiveStar Alarm with PulseCheck pump offers users convenience and added peace of mind when monitoring gases in remote or inaccessible locations. For more information, call MSA Customer Service at 1-800-MSA-2222 (1-800-672-2222).

Note: As with all sampling system alarm designs, the MSA FiveStar Alarm with PulseCheck pump must be tested before each use. With the pump installed and sampling line and/or probe attached, the user simply blocks the end of the sample line or probe to activate the FiveStar Alarm function. This test also verifies the operation of all sampling system components and ensures that there are no cuts in the sampling line or leaks in the connections.

Note: This Data Sheet contains only a general description of the products shown. While uses and performance capabilities are described, under no circumstances shall the products be used by untrained or unqualified individuals and not until the product instructions including any warnings or cautions provided have been thoroughly read and understood. Only they contain the complete and detailed information concerning proper use and care of these products.

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