

# WM 3000-24 MagnaValve® Instruction Manual



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# **Safety Notices**

Good safety practices must be followed when operating and handling the MagnaValve<sup>®</sup>. Improper usage could result in damage to the product or personal injury.

- Please note: The MagnaValve<sup>®</sup> emits magnetic fields that can be harmful to people who wear pacemakers.
- Power off the AC-24 Controller before connecting or disconnecting the MagnaValve<sup>®</sup>.

Additional safety notices can be found throughout this manual and should be adhered to at all times.

# **Product Overview**

The MagnaValve<sup>®</sup> WM 3000-24 is a normally closed valve that regulates the flow of steel shot or grit in wheel-blast machines for blast cleaning applications. It is a powerful valve with a flow rate capacity of up to 3,000 lb/min (1,361 kg/min) for wheels up to 125 hp. The Remote VD-17 Valve Driver for the MagnaValve<sup>®</sup> comes with a 6-ft cable for installation in the customer's electrical panel, making it an ideal valve for blast machines in high-temperature environments.

The MagnaValve® reduces media usage, energy costs, machine downtime, and wear and tear on equipment.

### **Principle of Operation**

The MagnaValve's<sup>®</sup> maintenance-free construction includes a rare earth permanent magnet for normally closed operation and an electromagnet for controlling shot flow rates. With power applied, the magnetic field is neutralized and shot is allowed to flow through the valve. When no power is applied to the MagnaValve<sup>®</sup>, the permanent magnet stops all flow. If the power is interrupted for any reason, the permanent magnet securely holds the shot.

The MagnaValve<sup>®</sup> is factory tested and results are supplied upon request.

*Note:* The MagnaValve<sup>®</sup> is factory tested using a manual control in the open loop mode. A 0-10 Vdc signal is applied to the valve and the resulting flow rate is recorded and depicted on the calibration graph.

# **Closed-Loop Operation with Model AC-24**

For an "automatic" closed-loop operation, an Electronics Inc. AC-24 Controller (sold separately) will detect the current load on the wheel motor and regulate the flow of media to the WM 3000-24. The WM 3000-24 MagnaValve<sup>®</sup>, with the AC-24 Controller, provides reliable, repetitive, and consistent media flow rates for blast cleaning applications. The MagnaValve<sup>®</sup> system makes it easy to document flow rates and establish or repeat a good set-up.



### **Open-Loop Operation with Model Pot-24**

Model Pot-24 Control (sold separately) is used for manual open-loop applications on a wheel blast machine. A setpoint knob is available for the operator to select from 0-100% media flow rate. A setpoint limit adjustment is available on the rear of the control to restrict operation within the motor Horsepower and current range. The operator must monitor the wheel motor amperage manually since there is no feedback available.



# Specifications

Power	+24 Vdc ± 2 Vdc @ 2A
Signal Inputs	0 - 10 Vdc Flow Signal <sup>1</sup>
	24 V Flow Enable
Media	Steel Shot and Grit
Flow Rate	0 - 3,000 lb/min (0 - 1,361 kg/min) <sup>2</sup>
Weight	32 lb (14.5 kg)
Mode	Normally Closed
Temperature Range	Valve: 50°- 230° F (10°-110° C)
	Valve Driver: 50°- 149° F (10°- 65°C)

<sup>1</sup> Transfer function (input signal to output flow) is nonlinear. AC-24 Controller must be used for proper closed loop servo capability based on wheel amps.

<sup>2</sup> Flow rate based on S390 cast steel shot

# MagnaValve® Operation Quick Start

#### Flowing Media Using an AC-24 Controller

This section describes the basic operation of the MagnaValve® when wired to an AC-24 Controller.

AC-24 Settings:

- On/Off/Ready Ready
- Servo On

Use the following steps to start and control media flow from a PLC using the AC-24 Controller:

- 1. Wire the MagnaValve® to the AC-24 and PLC, as shown in the Electrical section.
- 2. Apply 24 Vdc supply to the AC-24 Controller and the MagnaValve<sup>®</sup>.
- 3. Apply the Analog Input Signal (0-10 Vdc) to the Remote Setpoint on the AC-24.

*Note:* The Flow Limit is the maximum flow rate for which the MagnaValve<sup>®</sup> can flow. The WM 3000-24 will flow approximately 3000 lb/min based on material and shot size.

4. Apply 24 Vdc to the Enable Input on the AC-24 to start flow and apply 0 Vdc to the Enable Input to stop flow.

# MagnaValve® Installation

### **Overview**

To ensure proper operation and the long life of the MagnaValve<sup>®</sup>, proper installation is important. The images below show an example of the recommended installation of the WM 3000-24 and describe the individual parts that are typically found on a peening/blasting machine. The following sections provide details of the proper installation of the MagnaValve<sup>®</sup>.

Slide Gate/Maintenance Valve: The slide gate or maintenance valve is located above the MagnaValve<sup>®</sup>. The maintenance valve allows for the removal of the MagnaValve<sup>®</sup> without draining the shot from the hopper.



**Upper Adapter:** The upper adapter attaches the MagnaValve<sup>®</sup> to the slide gate so the MagnaValve<sup>®</sup> can be removed without removing the Slide Gate.

**WM 3000-24 MagnaValve®:** The MagnaValve® must be mounted in a vertical position with an adequate supply of media above it.

**Lower Adapter:** The lower adapter adapts the MagnaValve<sup>®</sup> output to the hose that connects the MagnaValve<sup>®</sup> to the feed spout.

The MagnaValve<sup>®</sup> is mounted between the upper adapter and lower adapter. The MagnaValve<sup>®</sup> must be mounted vertically and should be located within 36 inches (one meter) of the wheel's feed spout. Mounting it further away will cause "Transport Lag"—a term used in closed-loop control theory. Transfer Lag is the time that media is discharged from the MagnaValve<sup>®</sup> before the feedback mechanism recognizes a change in the flow rate. This is undesirable since the servo needs the information very quickly to maintain stable closed-loop operation. It is essential that the top of the MagnaValve<sup>®</sup> is secured properly with the O-ring touching the adapters. Make sure there is no gap. This seal will prevent media and air from leaking between the adapter and MagnaValve<sup>®</sup>.



# **Media Supply**

To operate properly and prevent damage to the MagnaValve<sup>®</sup>, always supply more than the full flow capacity of the valve. For example, the WM 3000-24 will flow a minimum of 3000 lb/min. Even if the application only calls for 400 lb maximum, the MagnaValve<sup>®</sup> must be supplied with more than 3000 lb/min to operate correctly. Keeping the valve full of media is needed to make a protective layer of media over the internal components. If this layer is not maintained, the media will cause damage and erode the internal components. If an amount less than that value is supplied, the shot may travel through the valve at a high velocity and damage the valve.

To ensure maximum life from the MagnaValve<sup>®</sup>, there must not be any restriction of media flow to the valve. One potential source of restriction is the slide gate or maintenance valve. The maintenance valve must be either fully open or fully closed (see images below). A fully closed slide gate above the MagnaValve<sup>®</sup> is used to keep shot/grit inside the hopper while the MagnaValve<sup>®</sup> is removed from the machine. A fully open slide gate allows steel shot/grit to be properly controlled by the MagnaValve<sup>®</sup>.



It is important to always run the valve with the slide gate fully open. This is because a partially closed slide gate will starve the MagnaValve<sup>®</sup>. A starved valve will result in damage to the internal components and increase overall wear of the valve. The slide gate needs to be fully open to protect the valve with a layer of protective media.

# Air Aspiration

An air aspiration inlet below the valve is required for proper operation. Three examples of this follow:

### A Gap Below the MagnaValve

Create a gap between the MagnaValve<sup>®</sup> and the lower adapter. The gap can be created by placing shim, washers, or nuts between the MagnaValve<sup>®</sup> and the lower adapter.



# Feed Spout Modification

Create a gap for air to enter the system at the feed spout. Using a feed spout larger than the hose will create a gap between the hose and the feed spout, allowing air to enter.



### Lower Adapter Modification

Add air inlet holes or slots in the lower adapter. Drilling holes or machining slots or cutouts into the lower adapter will allow air to enter the system.



### **Product Dimensions**

To aid in proper installation, the following product dimensions for the WM 3000-24 MagnaValve® are listed below.

#### \*Dimensions: Inches [mm]





Panel spacing for the Remote VD-17 Valve Driver: 5" on cable side, 0.5" on top and sides.

# **Mounting Flanges**



### **Installation Check List**

- 1. There is no restriction above the MagnaValve®
- 2. The hole in the hopper matches the plumbing
- 3. A maintenance valve/slide gate is installed above the MagnaValve®
- 4. There is no partial blockage preventing flow through the MagnaValve®
- 5. The plumbing must be straight and not at an angle for a minimum of six (6) inches above and below the MagnaValve<sup>®</sup>
- 6. The MagnaValve® is less than 36 inches above the feed spout
- 7. There is sufficient air aspiration below the MagnaValve®





# Connector

# MagnaValve<sup>®</sup>

The WM 3000-24 MagnaValve<sup>®</sup> is equipped with a connector that contains the necessary power and control lines for normal operation of the MagnaValve.



The connector is the communication link between the VD-17 Remote valve driver and the MagnaValve<sup>®</sup>. Only two wires are used to connect the VD-17 Remote and the WM 3000-24. See table below.



Wire	Function
Red	Not Used
Black	Not Used
Green	Valve Input
Orange	Not Used
White	Valve Input
Blue	Not Used

### VD-17 Remote



The connector on the VD-17 Remote is the communication link between either the AC-24 or Pot-24 and the MagnaValve<sup>®</sup>. The connector contains the following signals: power, signal common, analog input, enable, and the two control lines to the WM 3000-24 (see illustration below). These signals will control the MagnaValve<sup>®</sup> during operation. Each signal's function will be discussed in detail in the following sections.



Wire	Function	Voltage
Red	24 Vdc Supply	24 Vdc
Black	Signal Common	0 V
Green	Valve Output	-
Orange	Analog Input	0 – 10 V
White	Valve Output	-
Blue	Enable Input	OV or 24 Vdc

# **Power and Flow**

#### 24 Vdc Supply

#### Power Supply per MagnaValve®

Parameter	Value	Tolerance
Voltage	24 Vdc	±10 %
Current	2 Adc per connected valve	1.75 Adc min

The 24 Vdc Supply Input consists of two wires on the connector: the Supply Input (RED wire), and the Signal Common (BLACK wire). The Supply Input and the Signal Common provides power to the MagnaValve<sup>®</sup>. It is requested that the customer provide a DC supply capable of 2.0 amps of current for each MagnaValve<sup>®</sup> connected to the supply. The MagnaValve<sup>®</sup>, when flowing 100%, typically has a current draw of 0.8 A to 1.3 A. The requested 2.0 A supply is meant to handle surge currents while the MagnaValve<sup>®</sup> is pulsing.

#### **Enable Input Requirements**

Parameter	Value	Tolerance
Voltage	24 Vdc	30.0 V to 14.7 V
HIGH IN	Flow Media	14.7 V to 30.0 V
LOW IN	NO Flow Media	0.0 V to 5.9 V

The Enable Input commands the MagnaValve<sup>®</sup> to start flowing media. The input is pulled LOW (0.0 V) for the NO flow condition and driven HIGH (24 V) for the media flow condition.

#### Analog Input Requirements

Parameter	Value
Voltage Input	0 V to 10 V

The Analog Input is the flow request signal. The Analog Input controls the MagnaValve<sup>®</sup> in the open-loop mode. Where the 0 Vdc to 10 Vdc input signal translates to 0% to 100% PWM output signal to the valve driver. For an input of 0 Vdc, the valve will turn ON 0% or 0 lb/min of flow. For an input of 10 Vdc, the valve will turn on 100% or the maximum flow capability of the WM 3000-24 MagnaValve<sup>®</sup>. See the graphs on the next page.

*Note:* The open-loop flow rate of the MagnaValve<sup>®</sup> is non-linear. An Example is shown on the next page.



# **Electrical**



Wiring the MagnaValve® using an AC-24 Controller and Current Transformer



#### Wiring the MagnaValve® using an AC-24 Controller and VFD

Wiring the MagnaValve® directly to a Pot 24



# Adjustments

### **MagnaValve®**

No adjustments are required or recommended. The valve has been tested at the factory prior to shipment.

### **Remote VD-17 Valve Driver**

Adjustments to the Remote VD-17 Valve Driver can be made from the back of the driver; however, the factory settings should not be changed. See page 5 for additional information on the Remote VD-17 Valve Driver.

# Operation

### MagnaValve®

Signals used to operate the MagnaValve<sup>®</sup> and Remote Valve Driver originate at the AC-24 Controller. There are three conditions necessary for correct operation.

- 1. **Power.** 24 Vdc power must be continuously applied to the valve. The valve requires 2 Amps for operation and a power supply rated at 50 Va. The voltage should be 24 ±2 Vdc.
- 2. Enable Signal. The 24 Vdc Enable Signal is used to activate the media through the MagnaValve®
- 3. Input Signal. The analog 0 -10 Vdc input signal must be above 0.25 Vdc as a minimum flow command signal.

### **LED Status Indicators**

The Remote VD-17 Valve Driver should be mounted in an electrical panel that conforms to the temperature range of 50 $^{\circ}$  149 $^{\circ}$ F (10 $^{\circ}$  65 $^{\circ}$ C).



#### \*Diagnostic LEDs

- 1. **VALVE ON** Green LED indicates the valve flow status
  - OFF = No flow
  - ON = The valve is opened to full capacity and the media is allowed to flow
  - Blinking = The valve is pulsing and dispensing the amount of shot flow as determined by the AC-24 Controller
- 2. Vin > 0.25 Vdc Amber LED indicates the status of the servo input analog signal
  - ON = Servo signal exceeds the 0.25 Vdc threshold and the media flow control signal is present
  - OFF = Servo signal is less than the required 0.25 Vdc threshold signal and no media will flow
- 3. 24 Vdc ENABLE Amber LED indicates the operating status
  - ON = Valve is enabled and if the Vin LED is illuminated, then media will flow
  - OFF = The valve is not enabled and no media is allowed to flow
- 4. **24 Vdc Power** Red/Green LEDs indicate the status of 24 Vdc power
  - OFF = No 24 Vdc power is available
  - Red ON = 24 Vdc power is available (within tolerance)
  - Red Blinking = Power is available but not within the tolerance band 24 Vdc, ±2 Vdc
  - Green ON = Microprocessor failure return valve driver to Electronics Incorporated for service

#### All four LEDs must be on to have media flow.

### Certification

**Factory Certification** – This is the date the MagnaValve<sup>®</sup> was certified at the factory. The Factory Certification date may be the certification at the time of purchase or when the MagnaValve<sup>®</sup> was sent back to the factory for recertification.

The Pulse Rate Adjustment changes the Pulse Frequency. Turning the adjustment clockwise will increase the Pulse Rate. Turning the adjustment counterclockwise will decrease the Pulse Rate. Increasing the rate will change the open loop profile. The Pulse Frequency or Pulse Rate comes set at 8Hz but can be set between 6Hz-20Hz.



### **Adjustment Pulse Rate**

Rate at which the valve dispenses shot. The Valve Pulse is factory set to match the best flow characteristics of the media (cast steel or cut wire). The typical operation rate is 8 Hertz.

### Wire Terminals

- 1. Red +24Vdc
- 2. Black Ground
- 3. Orange 0-10Vdc flow signal
- 4. Blue Enable signal +24Vdc
- 5. White Valve power Positive
- 6. Green Valve power Negative

### Maintenance

The MagnaValve has no moving parts and is thereby maintenance free.

### **Spare Parts List**

The MagnaValve has no moving parts to replace.

# **Contacting Electronics Inc.**

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# **Limited Warranty**

The warranty obligations of Electronics Inc. for this product are limited to the terms set forth below.

#### Length of Warranty Period

This limited warranty lasts one (1) year from the shipping date of this product.

#### What is Covered

This limited warranty covers defects in materials and workmanship in this product.

#### What is Not Covered

This limited warranty does not cover any damage, deterioration or malfunction resulting from any alteration, modification, improper or unreasonable use or maintenance or use of a media for which the MagnaValve was not calibrated, misuse, abuse, accident, neglect, exposure to excess moisture, fire, improper packing and shipping (such claims must be presented to the carrier), lightning, power surges, or other acts of nature. This limited warranty does not cover any damage, deterioration or malfunction resulting from the installation or removal of this product from any installation, any unauthorized tampering with this product, any repairs attempted by anyone unauthorized by Electronics Inc. to make such repairs, or any other cause which does not relate directly to a defect in materials and/or workmanship of this product. This limited warranty does not cover equipment enclosures, cables or accessories used in conjunction with this product.

#### How to Obtain a Remedy Under this Limited Warranty

To obtain a remedy under this limited warranty, contact Electronics Incorporated by letter, email, fax or telephone with the following information:

- Product name and model
- Product serial number
- Original shipping date (see label on product)
- Company name and location
- Name of contact person for description of symptoms
- Return shipping address and any special instructions

If it is determined that the product must be returned under this limited warranty, a Returned Goods (RG) number, obtained from Electronics Inc., will be required. This product should be properly packed to prevent damage in transit. Cartons not bearing a RG number will require additional processing time and repair service may be delayed.

#### What Electronics Inc. Will Do Under This Limited Warranty

Electronics Inc. will, at its sole discretion, provide one of the following remedies to whatever extent it shall deem necessary to satisfy a proper claim under this limited warranty:

- 1. Elect to repair or facilitate the repair of any defective parts within a reasonable period of time, free of any charge for the necessary parts and labor to complete the repair and restore this product to its proper operating condition. Electronics Inc. will pay the shipping costs necessary to return this product once the repair is complete.
- 2. If the defective product cannot be repaired, it will be replaced with a new unit and the original warranty period will be extended by six (6) months. Electronics Inc. will pay the shipping costs necessary to replace this product.

If this product is returned to Electronics Inc., the product must be insured during shipment, with the insurance and shipping charges prepaid. If this product is returned uninsured, Electronics Inc. does not assume any risk of loss or damage during shipment. Electronics Inc. will not be responsible for any costs related to the removal or re-installation of this product.

#### **Out-of-Warranty Product**

Product that is out-of-warranty will be repaired at customer's request and the cost of repair will be disclosed prior to proceeding with the repair. A purchase order must be received prior to repair. If the product cannot be repaired, Electronics Inc. will provide one of the following remedies:

- 1. New unit at current pricing with a one (1) year Limited Warranty from the shipping date of product.
- 2. Refurbished unit (if available) at a discounted price with a six (6) month Limited Warranty from the shipping date of product.

#### Limitation on Liability

The maximum liability of Electronics Inc. under this limited warranty shall not exceed the actual purchase price paid for the product. Electronics Inc. is not responsible for direct, special, incidental or consequential damages resulting from any breach of warranty or condition, or under any other legal theory to the maximum extent permitted by law.

#### **Exclusive Remedy**

To the maximum extent permitted by law, this limited warranty and the remedies set forth above are exclusive and in lieu of all other warranties, remedies and conditions, whether oral or written, express or implied. To the maximum extent permitted by law, Electronics Inc. specifically disclaims any and all implied warranties, including, without limitation, warranties of merchantability and fitness for a particular purpose. If Electronics Inc. cannot lawfully disclaim or exclude implied warranties under applicable law, then all implied warranties covering this product, including warranties of merchantability and fitness for a particular purpose, shall apply to this product as provided under applicable law.

#### **Rights Under State Law**

This warranty defines specific legal rights relative to these products provided by Electronics Inc. Legal rights may also vary from state to state.