



LM2000-24

LM Series MagnaValve®

LM1000-24 and LM2000-24

Instruction Manual



Electronics Inc.
Shot Peening Control

56790 Magnetic Drive, Mishawaka, Indiana 46545 USA • 1-800-832-5653 or (574)256-5001 • www.electronics-inc.com

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Safety Notices

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

- Please note: The MagnaValve emits magnetic fields that can be harmful to people who wear pacemakers.
- The MagnaValve operates with internal air pressure. Refer all servicing to qualified personnel.
- Power off the AC-24 Controller before connecting or disconnecting the MagnaValve.

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

Product Overview

The LM Series MagnaValves—the LM1000-24 and LM2000-24—regulate the flow of ferrous media in shot peening and abrasive blast cleaning machines where the wheel motor amperage is used as the controlling parameter. These valves have a magnetic control section and an electromagnet section for flow rate regulation. These valves are typically used with either a manual control (Pot-24) or closed-loop control (Model AC-24). The LM Series MagnaValves have no moving parts, making them a low-maintenance valves.

Principle of Operation

The low-maintenance construction of the MagnaValve® features 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, the permanent magnet stops all flow. If the power is interrupted for any reason, the permanent magnet securely holds the shot.

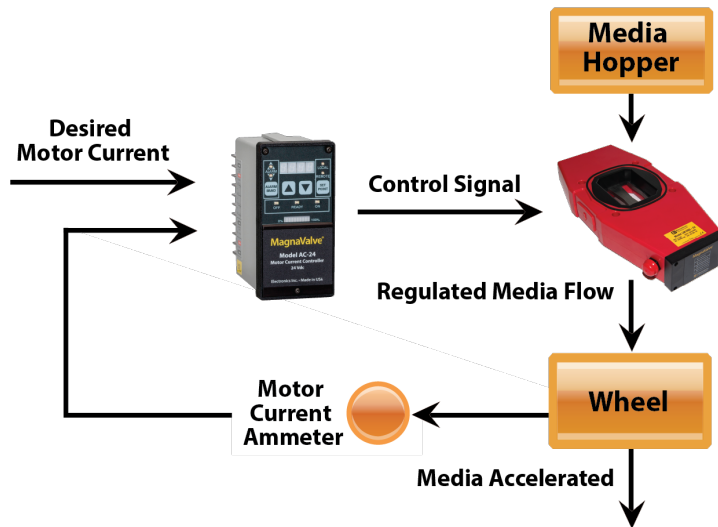
The MagnaValve is factory calibrated and results are supplied upon request.

Note: *The MagnaValve 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

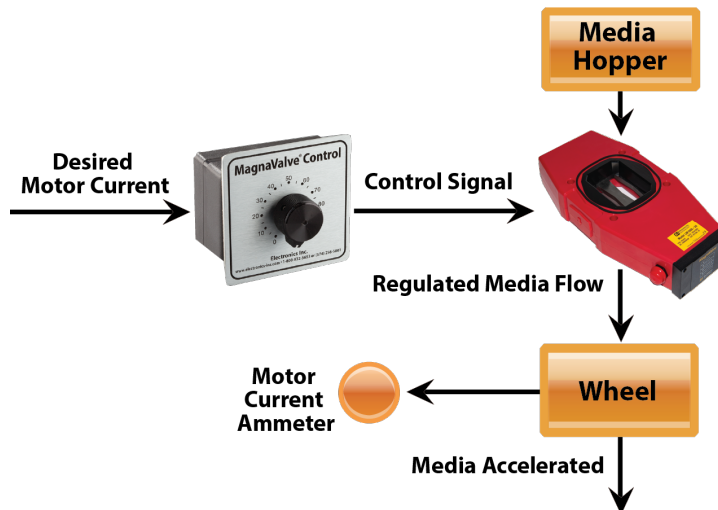
To achieve closed-loop servo control, the LM Series MagnaValves are paired with the AC-24 Controller (sold separately). Here is how the closed-loop system provides accurate and dependable media flow control:

- The desired media flow rate (motor amperage) is processed by the AC-24 Controller (0-10 Vdc)
- A control signal is sent to the MagnaValve® (0-10 Vdc)
- The motor amperage signal is sent to the AC-24 Controller for comparison to the desired motor current and the control signal is adjusted as required to maintain the desired motor current.
- The alarm circuit will trigger a high-flow or low-flow alarm if the flow rate is not within the alarm bandwidth



Open-Loop Operation with Model Pot-24

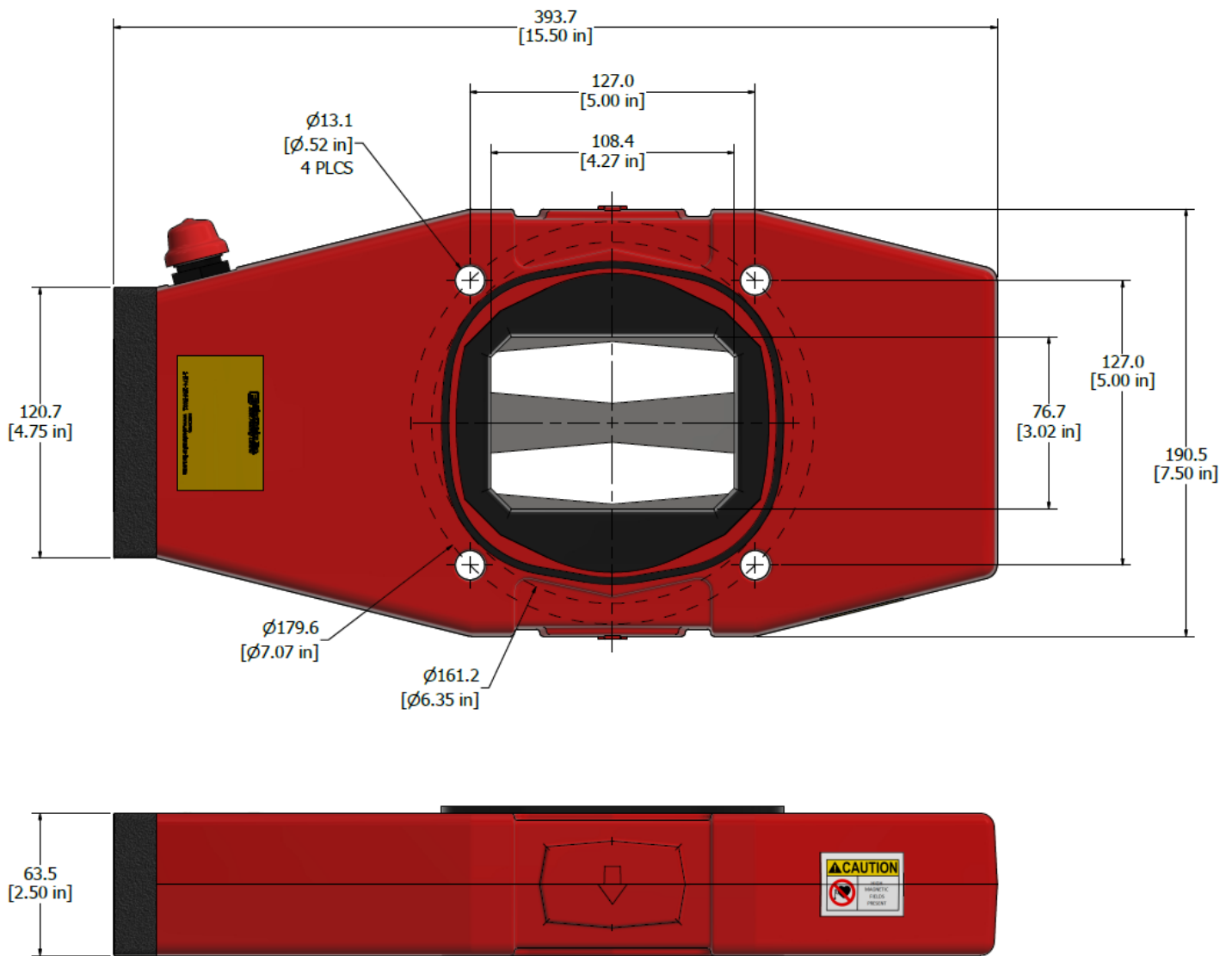
Model Pot-24 Control (sold separately) is used for manual open-loop applications on a wheel blast machine. A setpoint knob is available for the operator to select from 0-100% media flow rate. A setpoint limit adjustment is available on the rear of the control to restrict operation within the motor Horsepower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



Specifications and Product Dimensions

Power	24 Vdc @ 2A ±2Vdc
Media	Steel Shot and Grit
Mode	Normally Closed
Flow Output LM1000-24 LM2000-24	100 - 1000 lb/min (45 - 453 kg/min) 200 - 2000 lb/min (90 - 907 kg/min)
Temperature Range	32° - 167°F (0°-75° C)
Weight	14 lb
Servo Command Input	0-10 Vdc

1. Media- Do not use cast stainless steel shot since it is not magnetic. Stainless steel cut wire media may be used but consult the factory for assistance.
2. Factory testing is conducted with S-230 Cast Steel Shot. Larger media sizes will reduce the maximum flow rate.



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.
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 can flow. The LM1000-24 will flow approximately 1000 lb/min based on material and shot size. The LM2000-24 will flow approximately 2000 lb/min based on material and shot size.

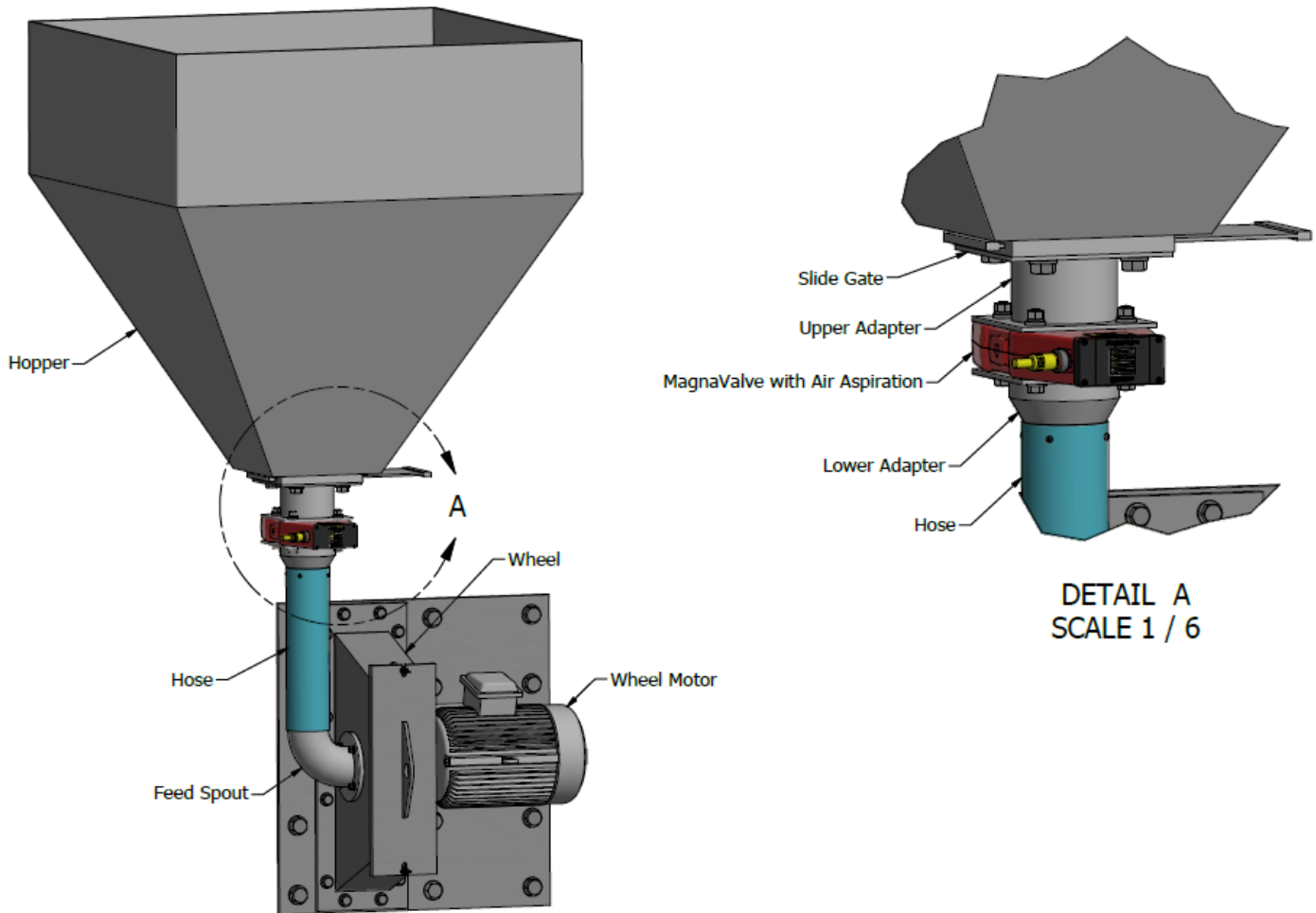
4. Apply 24 Vdc to the Enable Input on the AC-24 to start flow and apply 0 Vdc to the Enable Input to stop flow.
- 5.

Installation

Overview

To ensure proper operation and the long life of the MagnaValve®, proper installation is important. The images below show an example of the recommended installation of the LM1000-24 and LM2000-24 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.

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

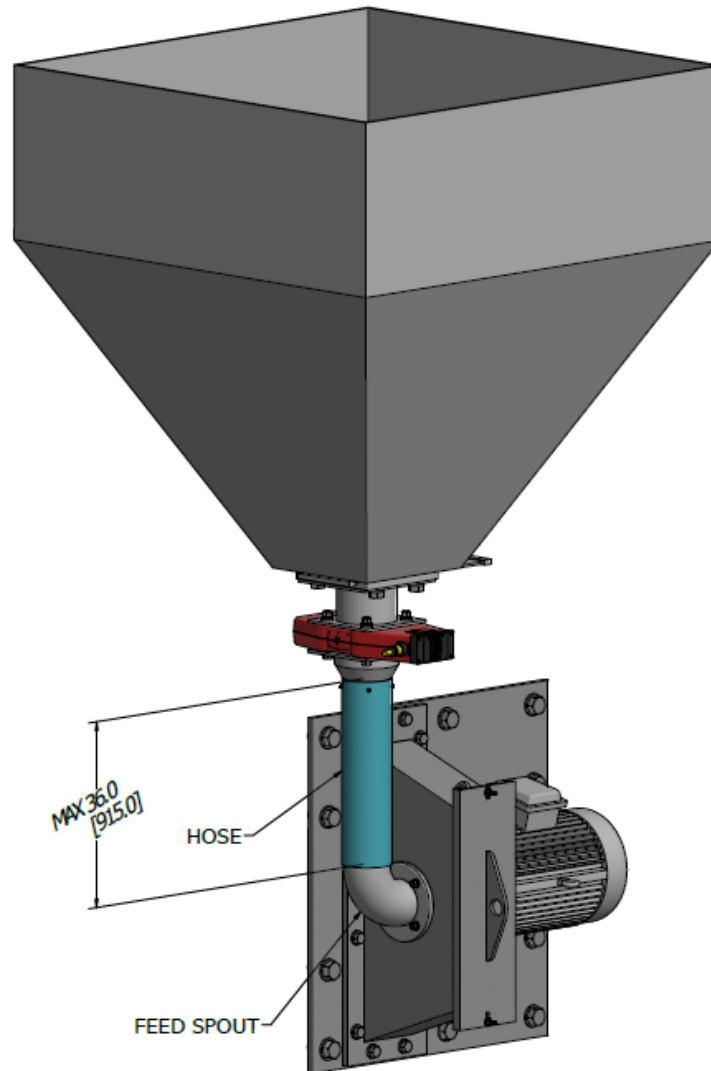


Upper Adapter: The upper adapter attaches the MagnaValve to the slide gate so the MagnaValve can be removed without removing the Slide Gate.

LM Series MagnaValve: The MagnaValve is a magnetic valve that controls the flow rate of steel shot or grit in a shot peening/blasting operation. The built-in air aspiration inlet allows air to enter below the MagnaValve to prevent shot or grit leakage when the MagnaValve is off.

Lower Adapter: The lower adapter adapts the MagnaValve output to the hose that connects the MagnaValve to the feed spout.

Mounting the MagnaValve®



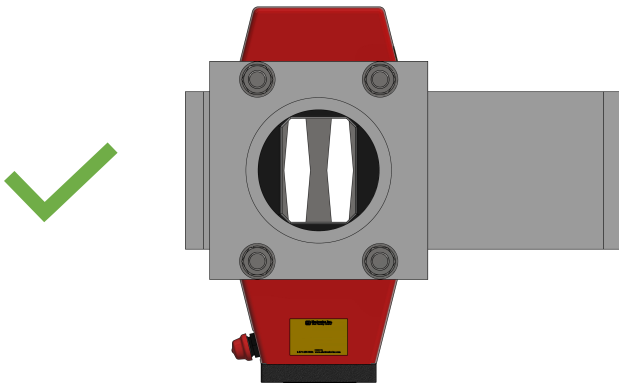
The LM1000-24 and LM2000-24 MagnaValves are one-way valves and must be installed with the arrow pointed downward. The MagnaValve is mounted between the upper adapter and lower adapter. The MagnaValve must be mounted horizontally and should be located within 36 inches (one meter) of the wheel's feedspout. 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 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 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.

Media Supply

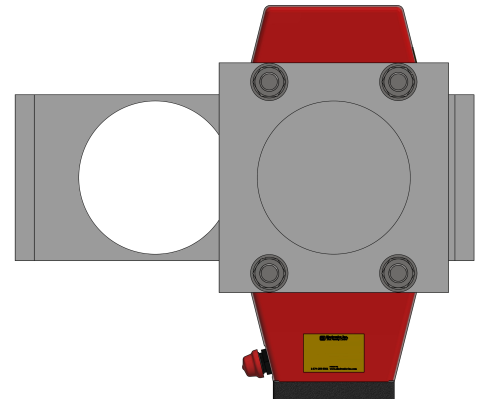
To operate properly and prevent damage to the MagnaValve, always supply more than the full flow capacity of the valve. For example, the LM1000-24 will flow a minimum of 1000 lb/min while the LM2000-24 will flow a minimum of 2000 lb/min. Even if the application only calls for 400 lb maximum, the MagnaValves must be supplied with more than 1000 lb/min and 2000 lb/min respectively to operate correctly. Keeping the valve full of media is needed to make a protective layer of media over the internal pole pieces. If this layer is not maintained, the media will cause damage and erode the pole pieces. If an amount less than those values is supplied, the shot may travel through the valve at a high velocity and damage the valve.

To ensure maximum life from the MagnaValve, 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 in and above the MagnaValve is used to keep shot/grit inside the hopper while the MagnaValve is removed from the machine. A fully open slide gate allows steel shot/grit to be properly controlled by the MagnaValve.

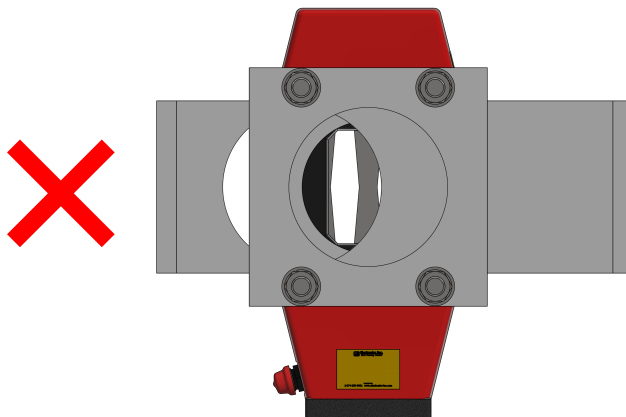
Closed Slide Gate



Open Slide Gate



Partially Open Slide Gate

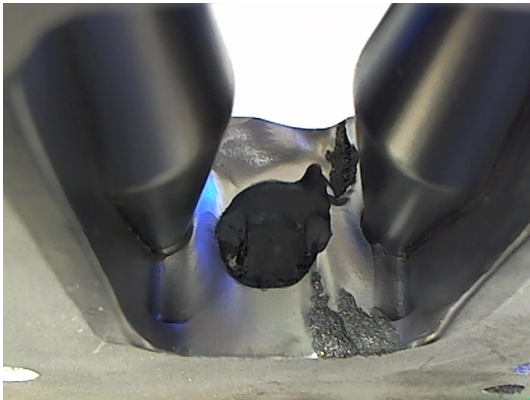
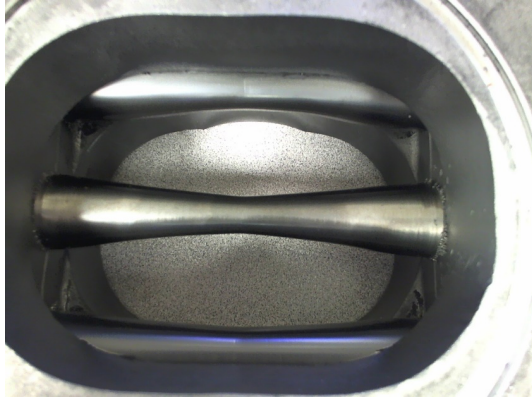


It is important to always run the valve with the slide gate fully open. This is because a partially closed slide gate will starve the MagnaValve®. A starved valve will result in damage to the pole pieces and increase overall wear of the valve. The slide gate needs to be fully open to protect the valve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

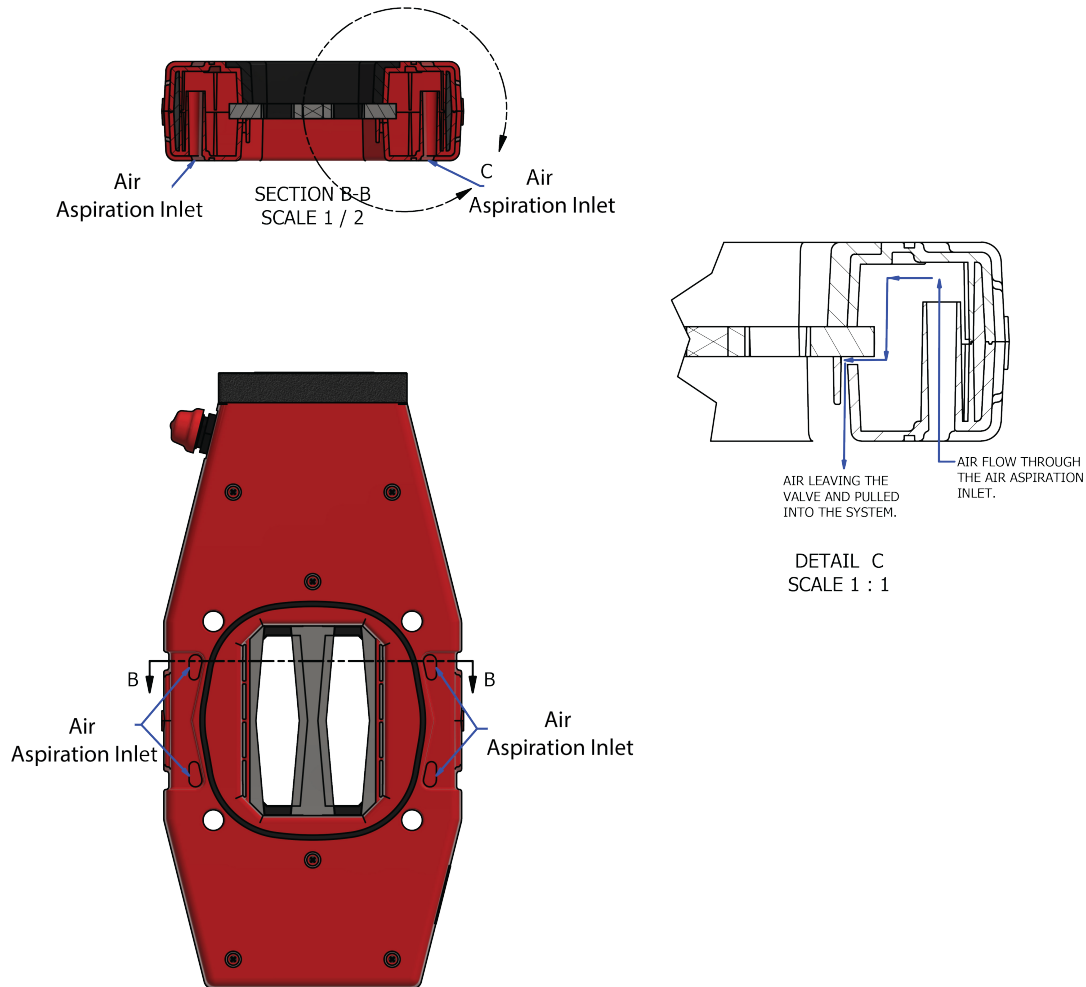
A solid stacked column protects the pole pieces. When the valve is starved, the pole pieces are not protected and erosion occurs. Erosion is caused by shot/grit hitting the pole pieces directly.

To reduce the possibility of permanent damage to the valve body, a replaceable wear plate lines the flow path through the LM Series MagnaValve. The wear plate is made of an abrasion-resistant material and creates a barrier between the steel shot/grit and the plastic body of the MagnaValve. To replace the wear plate, see the section titled "Wear Plate Replacement". See examples of erosion due to improper use on the next page.

Examples of Erosion Due to Improper Use



The Air Aspiration Inlet



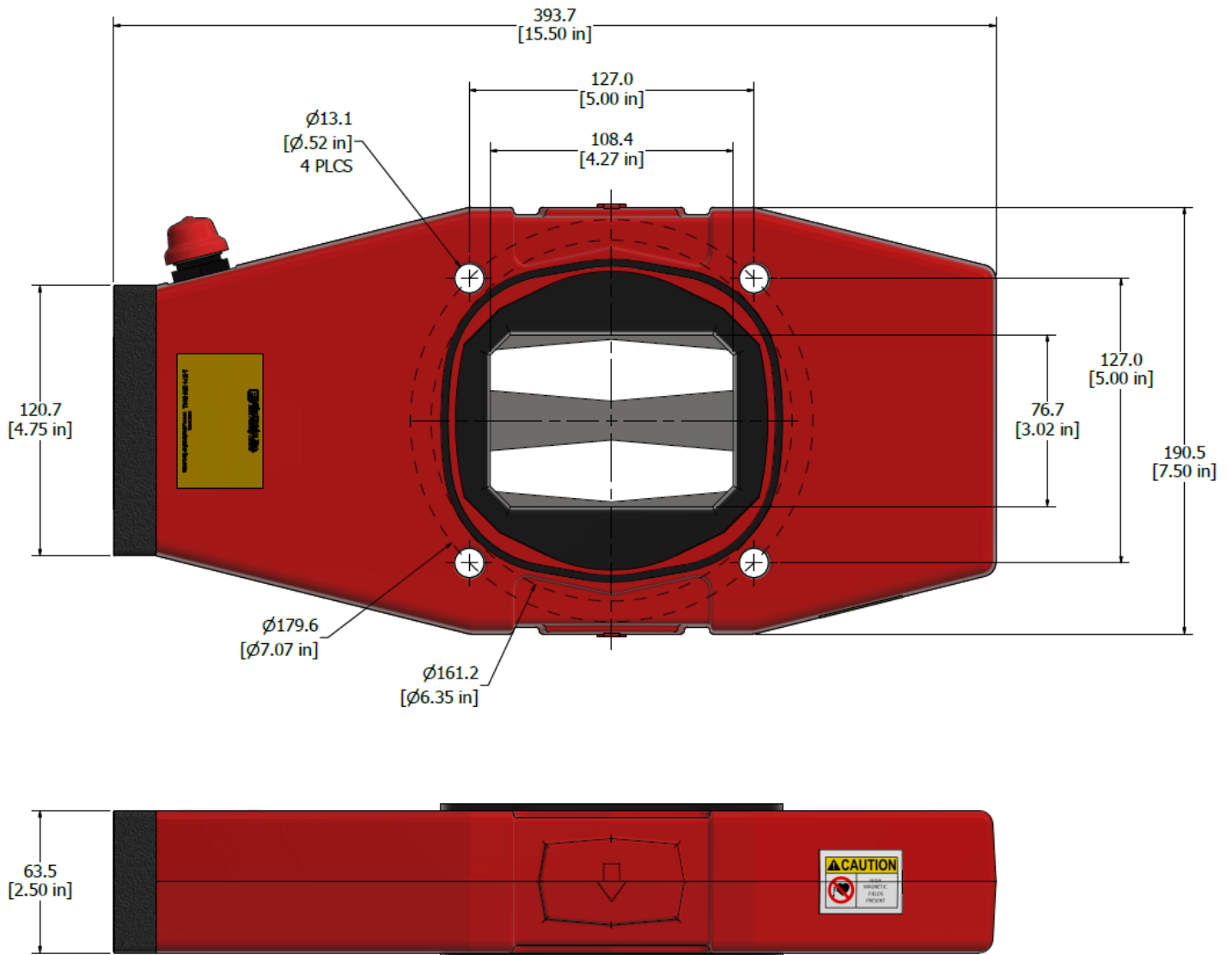
The LM1000-24 and LM2000-24 MagnaValve® have an aspiration air inlet built into the valve body. During the wheel assembly operation, the wheel's spinning blades create a low pressure below the MagnaValve. If the pressure differential created across the MagnaValve is large enough, the magnetic field in the MagnaValve may not be strong enough to hold the blasting media. When this happens, air and media are pulled from the hopper and through the MagnaValve. To prevent media and air from leaking through the MagnaValve, air must be allowed to enter the system below the MagnaValve in the “off” state.

In the past, spacers were used to add a gap between the MagnaValve and the lower adapter. This gap allows air to enter the system but also allowed media to leave the system, leaving media on the floor around the machine. The new aspiration air inlet built into the MagnaValve allows air to enter the system without allowing media to exit the system. This is achieved by having air inlet holes on the bottom of the MagnaValve that are routed to ventilation located directly below the pole pieces. See the images above for more information.

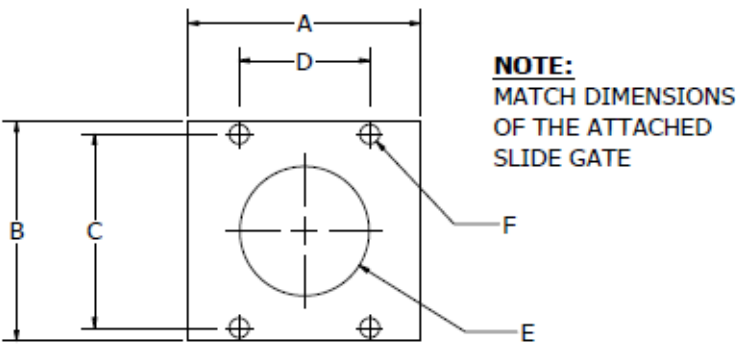
The holes on the bottom of the MagnaValve prevent dust and debris from entering the system. At the same time, the long narrow vents below the pole pieces prevent media from leaving the system. The shielding of the pole pieces and the downward angle of the vents reduce the media's ability to escape through the air inlet.

Mounting

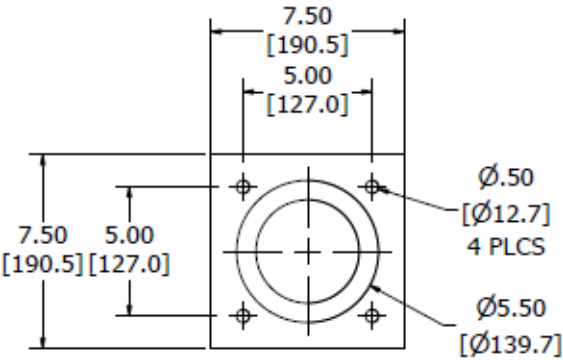
To aid in proper installation, the following are example drawings for the upper and lower adapters to mount the MagnaValve®.



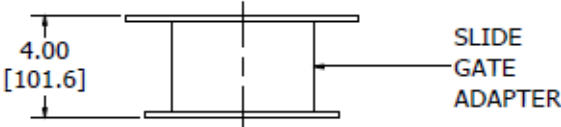
UPPER SLIDE GATE ADAPTER



LOWER HOSE ADAPTER

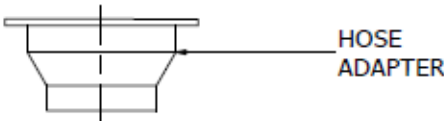


SLIDE GATE
SIDE

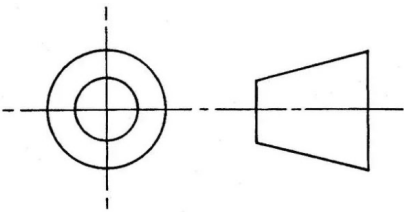
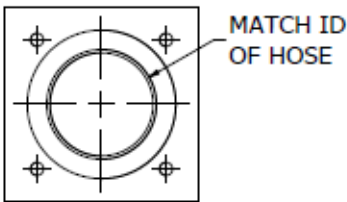
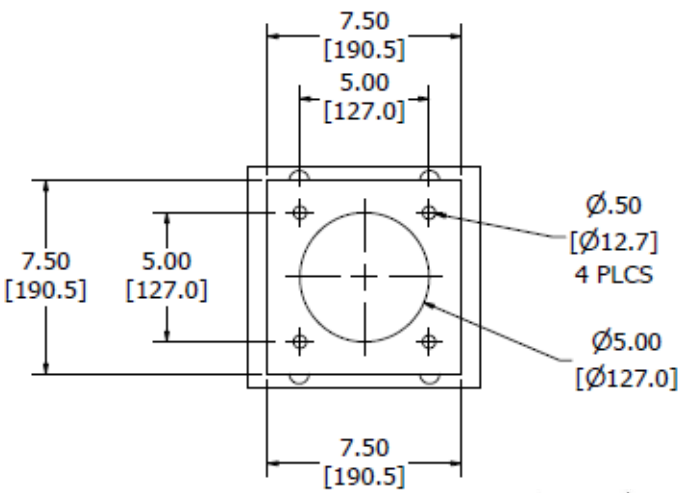


MAGNAVALVE
SIDE

MAGNAVALVE
SIDE



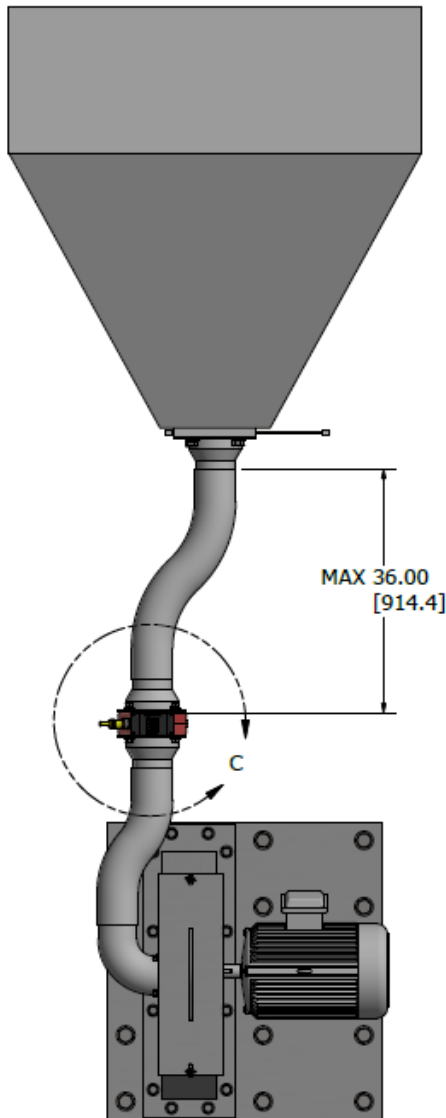
HOSE
SIDE



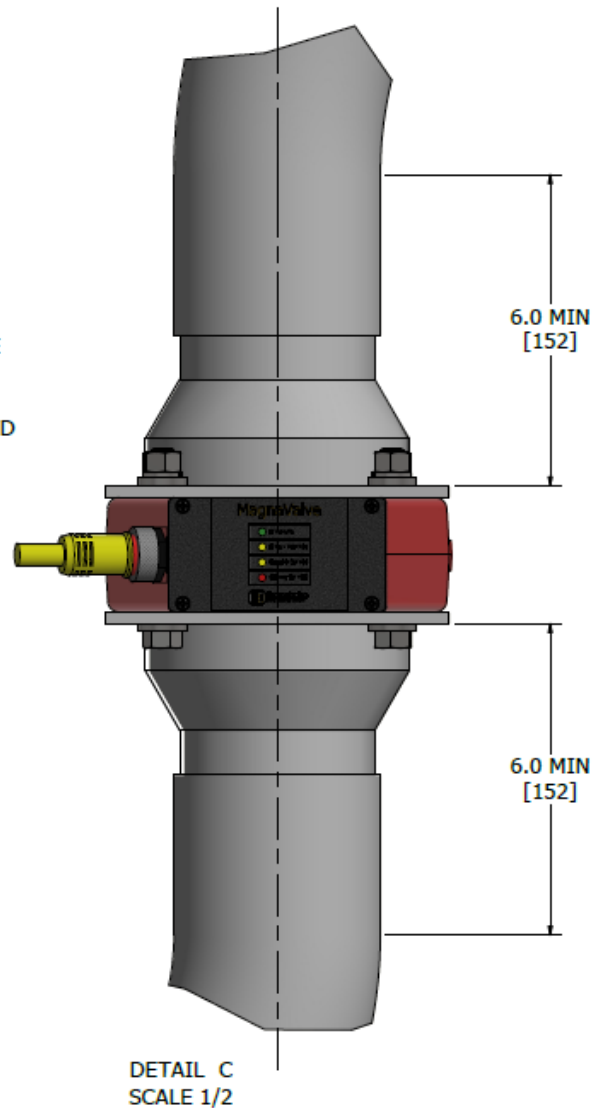
3rd ANGLE PROJECTION

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 is a minimum of six (6) inches above and below the MagnaValve must be straight and not at an angle
6. Ensure the MagnaValve is less than 36 inches above the feed spout

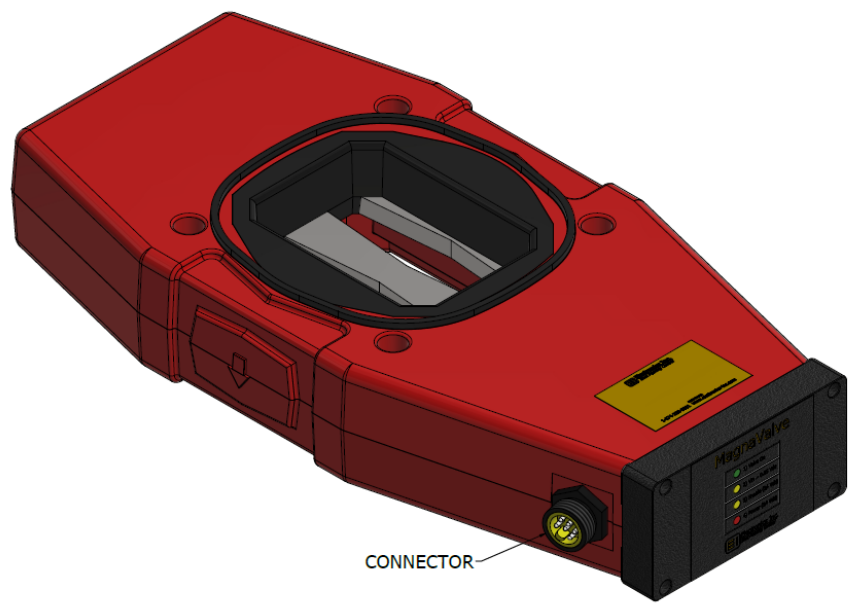


NOTE:
ENSURE THE MAGNAVALVE
AND PLUMBING 6 INCHES
ABOVE AND BELOW THE
MAGNAVALVE ARE PLUMBED
VERTICAL

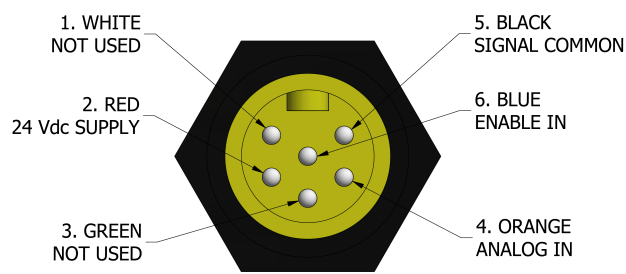


Connector

The LM1000-24 and LM2000-24 MagnaValve® are equipped with a connector that contains the necessary power and control lines for normal operation of the MagnaValve.



The connector is the primary communication link between either the AC-24 or Pot-24 and the MagnaValve. The connector contains the following signals: power, signal common, analog input, and enable (see illustration below). These signals will control the MagnaValve during operation. Each signal’s function will be discussed in detail in the following sections.



Connector Pin Functions

Wire	Function	Voltage
Red	24 Vdc Supply	24 Vdc
Black	Signal Common	0 V
Green	Not Used	
Orange	Analog Input	0 – 10 V
White	Not Used	
Blue	Enable Input	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. It is requested that the customer provide a DC supply capable of 2.0 amps of current for each MagnaValve connected to the supply. The MagnaValve, 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 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

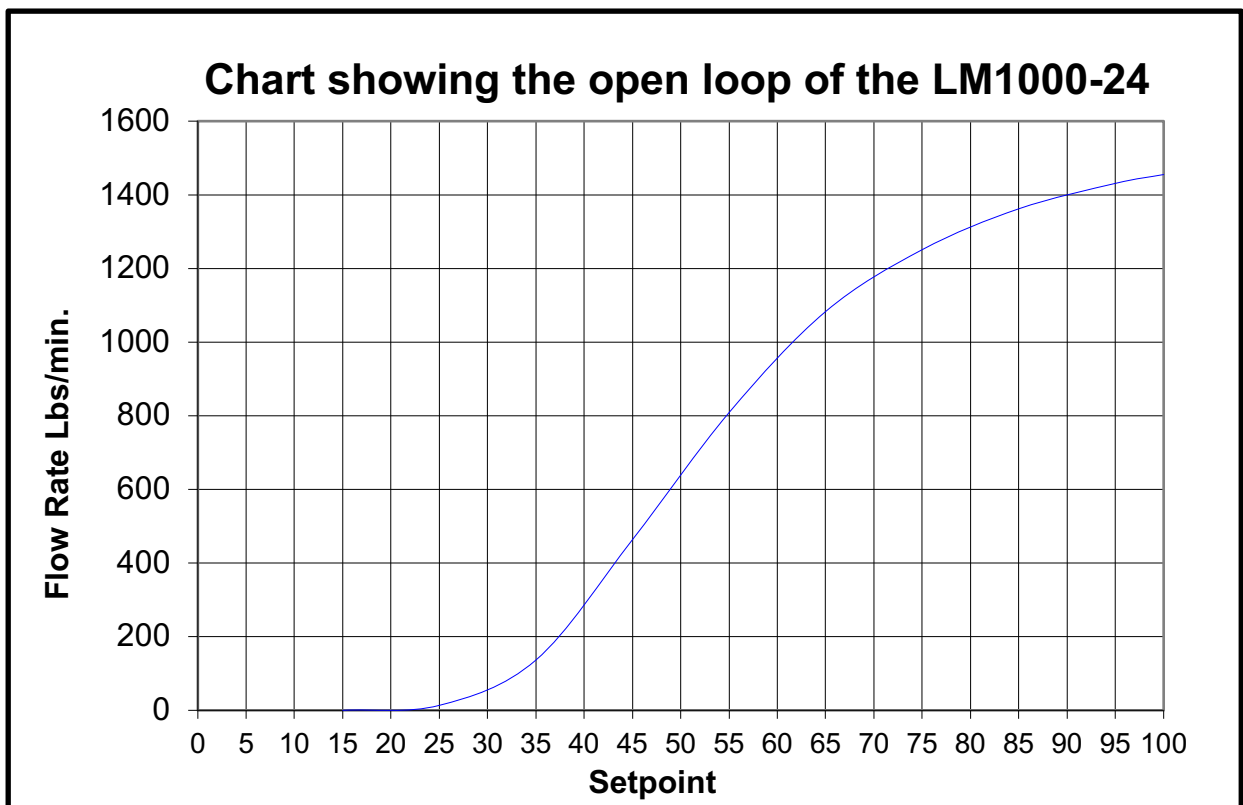
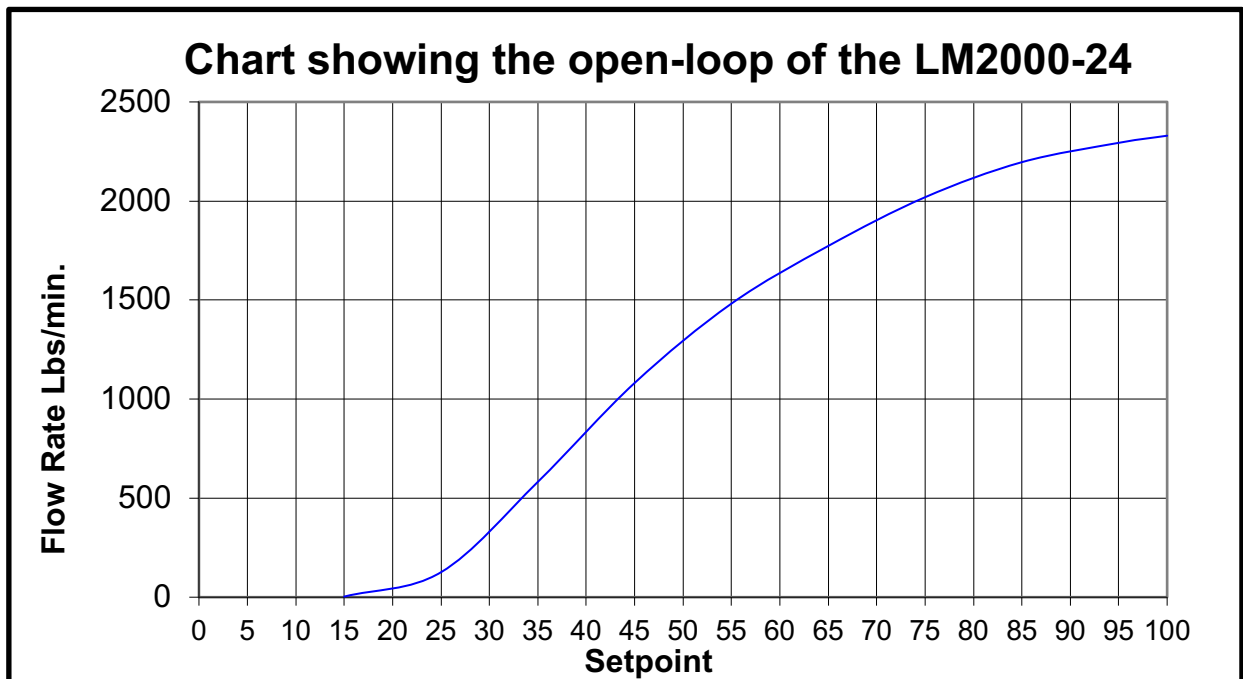
The Enable Input commands the MagnaValve to start flowing media. The input is pulled LOW (0.0 V) for the NO flow condition and driven HIGH (24 V) for the media flow condition.

Analog Input Requirements

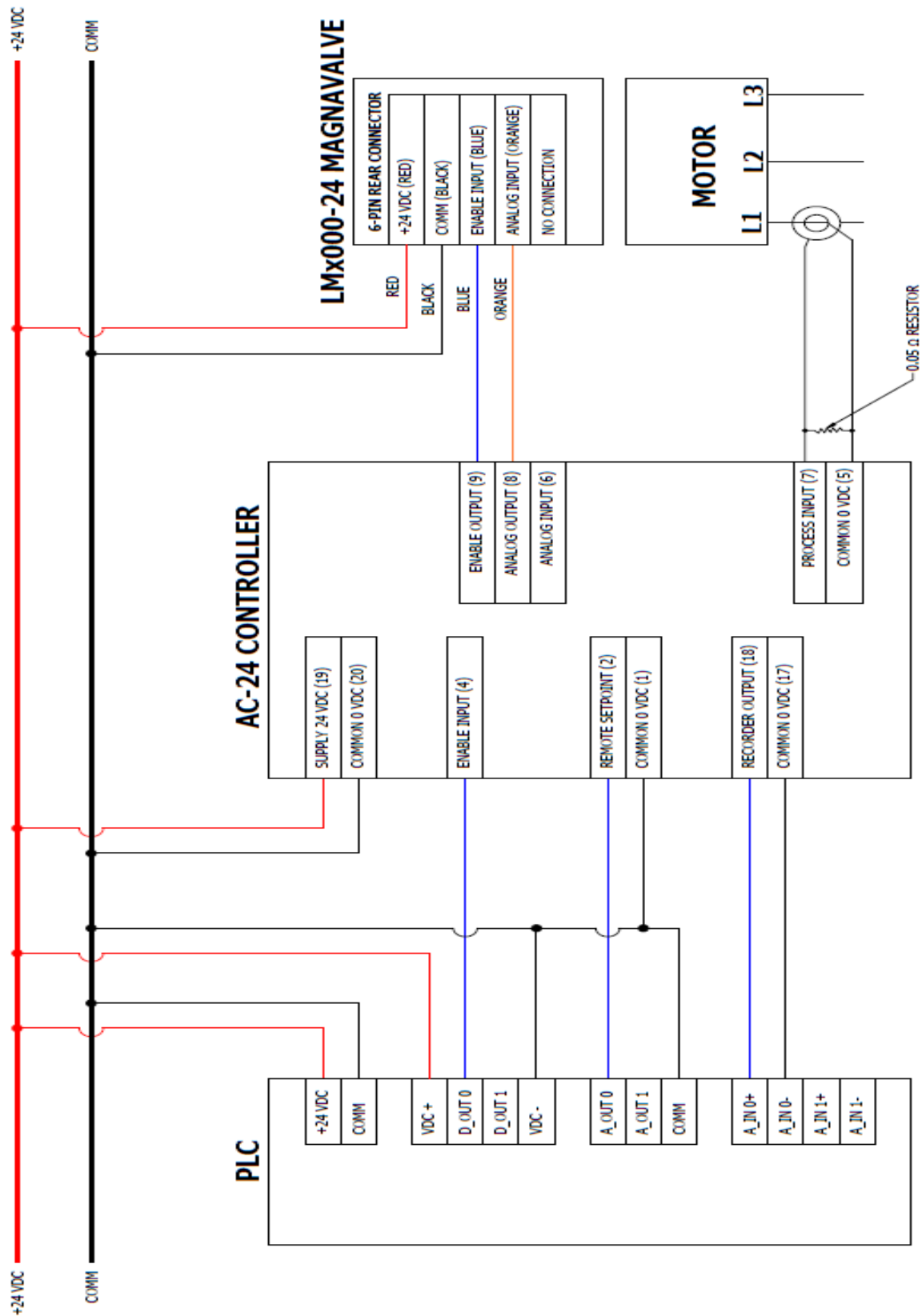
Parameter	Value
Voltage Input	0 V to 10 V

The Analog Input is the flow request signal. The Analog Input controls the MagnaValve 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 LMx000-24 MagnaValve, see the graphs on the next page.

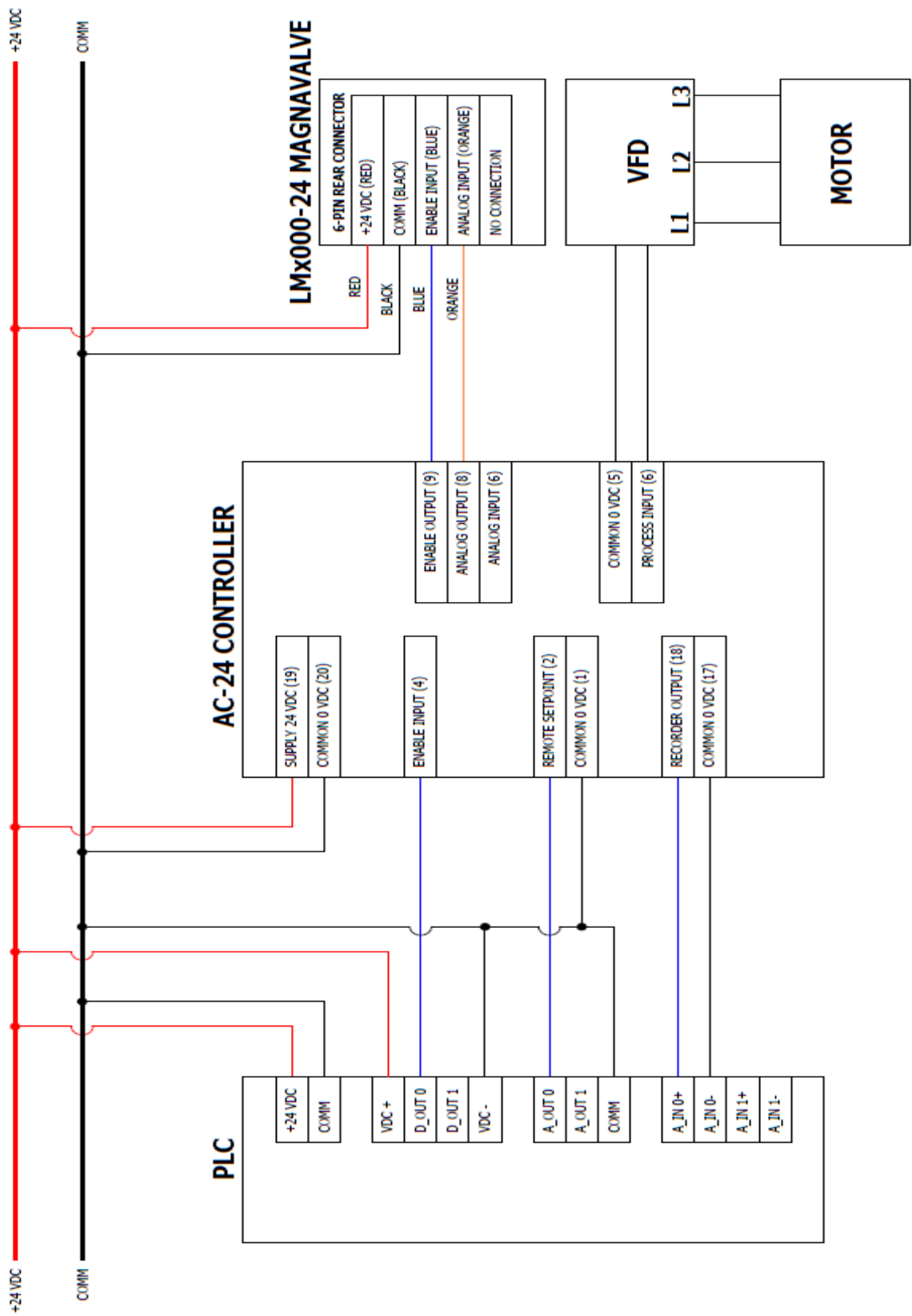
Note: The open-loop flow rate of the MagnaValve is non-linear. Examples are shown on the next page.



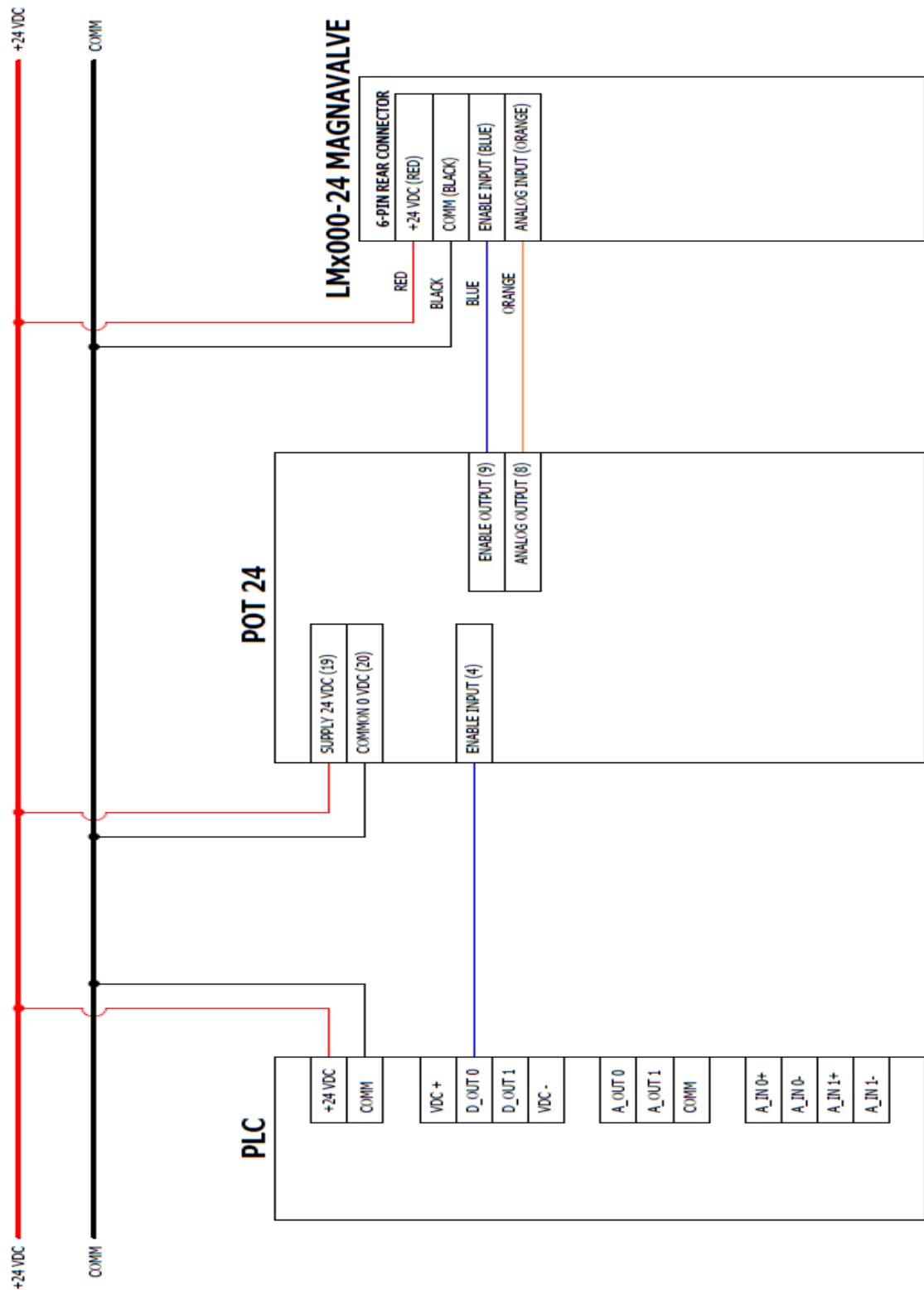
Wiring the MagnaValve® Using an AC-24 Controller and Current Transformer



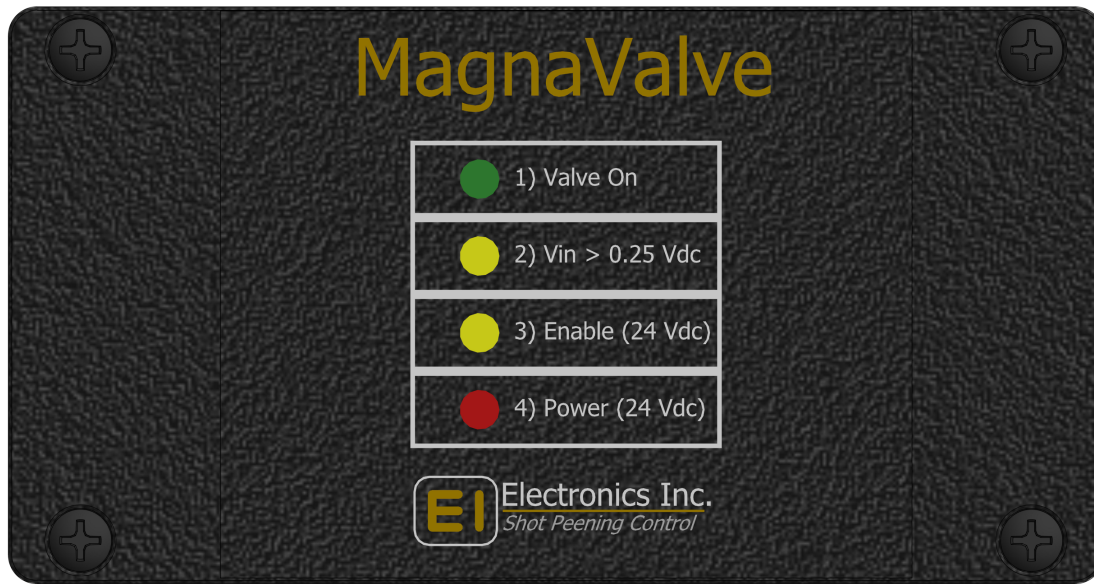
Wiring the MagnaValve® Using an AC-24 Controller and VFD



Wiring the MagnaValve® Directly to a Pot 24



LED Status Indicators



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

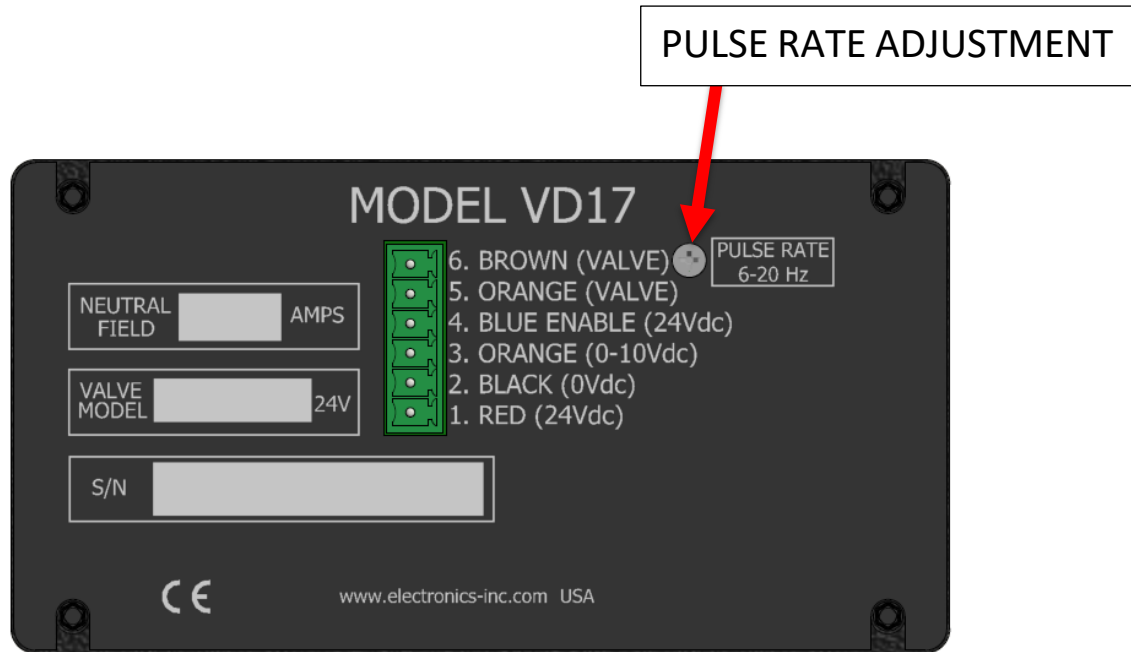
4) 24 Vdc Power – Red/Green LEDs indicate the status of 24 Vdc power

- 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

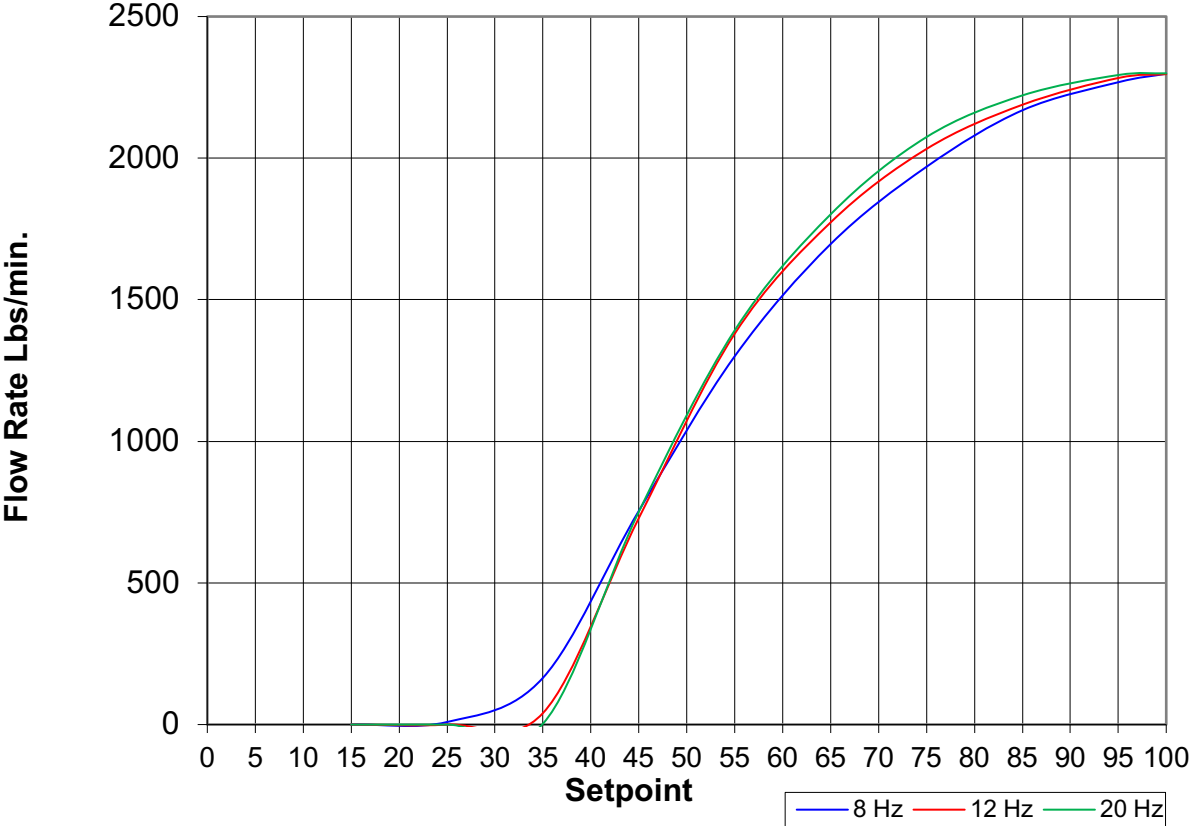
Certification

Factory Certification – This is the date the MagnaValve® was certified at the factory. The Factory Certification date may be the certification at the time of purchase or when the MagnaValve 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 as seen in the graph below. The graph represents the open loop flow of shot/grit at 8 Hz, 12 Hz, and 20 Hz. The Pulse Frequency or Pulse Rate comes set at 8Hz but can be set between 6Hz-20Hz.



LM2000-24 OPEN LOOP FLOW RATE



MagnaValve® Maintenance

Replacement Parts

Wear Plate - CPN 806182

Wear Plate Replacement

To remove the wear plate, follow the steps below:

1. Remove the LM Series MagnaValve from the machine.
2. Remove the wear plate by pulling the wear plate straight up from the flow path.

Re-install the wear follow the steps below:

1. Clean media from the flow path

Note: If possible, power the valve ON and turn on 100%. This will remove almost all the magnetic field from the flow path making it easier to clear the steel shot/grit from the flow path.

Warning: Using compressed air to blow the steel shot/grit from the flow path can cause serious injuries to the eyes, ears, or other body parts. Please wear appropriate safety gear.

2. Insert new wear plate inside the flow path. Ensure it is fully seated.
3. Re-install the LM Series MagnaValve on the machine.



Contacting Electronics Inc.

Mailing and Shipping Address:

Electronics Inc.
56790 Magnetic Drive
Mishawaka, IN 46545 USA

Telephone: 1-800-832-5653 (Toll-free in USA and Canada) or (574) 256-5001

Fax: (574) 256-5222

Email: sales@electronics-inc.com

Website: www.electronics-inc.com

Limited Warranty

LM1000-24 and LM2000-24 MagnaValve®

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, 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.