HAYWARD FLOW CONTROL
HAYWARD TRUE UNION SOLENOID VALVES
INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

PLEASE READ THE FOLLOWING INFORMATION PRIOR TO INSTALLING AND USING ANY HAYWARD PRODUCT. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY, OR EVEN DEATH.

1. Hayward Flow Control (Hayward), a division of Hayward Industries, guarantees its products against defective material and workmanship only. Hayward assumes no responsibility for property damage or personal injury resulting from improper installation, misapplication, or abuse of any product.
2. Hayward assumes no responsibility for property damage or personal injury resulting from chemical incompatibility between its products and the process fluids to which they are exposed. Determining whether a particular PVC, CPVC, or PP product is suitable for an application is the responsibility of the user. Chemical compatibility charts provided in Hayward literature are based on ambient temperatures of 70°F and are for reference only.
3. Hayward products are designed for use with non-compressible liquids.

WARNING
Hayward PVC and CPVC products should NEVER be used or tested with compressible fluids such as compressed air or nitrogen. Use of PVC and CPVC products in compressible fluid applications may result in product damage, property damage, personal injury, or even death.

4. The maximum recommended fluid velocity through the solenoid valve is five feet per second (5 ft/s). Higher fluid velocity can result in damage due to the water hammer effect.
5. Piping systems must be designed and supported to prevent excess mechanical loading on Hayward products due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
6. The effect of temperature on plastic piping systems must be considered when the systems are initially designed. The pressure rating of plastic systems must be reduced with increasing temperature. Maximum operating pressure is dependent upon material selection as well as operating temperature. Before installing any Hayward product, consult Hayward product literature for pressure vs. temperature curves to determine any operating pressure or temperature limitations.
7. PVC and CPVC plastic products become brittle below 40°F. Use caution in their installation and operation below this temperature.

WARNING
Hayward PVC and CPVC products should not be used in services with operation temperatures below 34°F

8. Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration and pipe loading forces, **DIRECT INSTALLATION OF HAYWARD FLOW CONTROL PRODUCTS INTO METAL PIPING SYSTEMS IS NOT RECOMMENDED**. Wherever installation of Hayward product into metal piping systems is necessary, it is recommended that at least 10 pipe diameters in length of plastic pipe be installed upstream and downstream of the product to compensate for the factors mentioned above.
9. Published operating requirements are based on testing of new products using clean water at 70°F. Performance is affected by many factors including fluid chemistry, viscosity, specific gravity, flow rate, and temperature. These should be considered when sizing Hayward products.
10. Systems should always be depressurized and drained prior to installing or maintaining any Hayward product.

WARNING
Failure to depressurize and drain system prior to installing or maintaining any Hayward product may result in product damage, property damage, personal injury, or even death.

Hayward True Union plastic solenoid valves are designed for process systems requiring an instant ON-OFF actuated valve. They are designed for "FAIL CLOSE" service and will provide bubble-tight shutoff in the event of an electrical failure.
The valves are manufactured from PVC (Polyvinyl Chloride) or CPVC (Chlorinated Polyvinyl Chloride) and will operate safely at pressures and temperatures as shown on the chart below.
The valves are two-way direct acting, normally closed. They can be used for pressurized service to 120 PSIG, vacuum service to 26" HG or drainage applications. They do not require any line pressure to aid in opening or closing. There are no minimum pressure requirements.
The TRUE UNION Design allows for ease of removal from the piping system without having to disconnect any piping or electrical connections.
Visual inspection of the valve DIAPHRAGM or replacement of the SEAL CARTRIDGE is recommended at fifty thousand cycle intervals to assure trouble free operation.

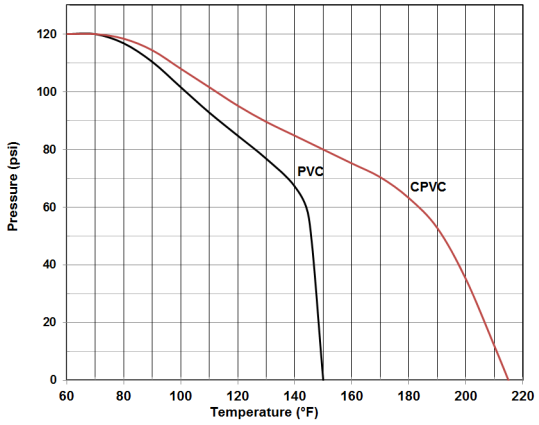
FEATURES

1. UL & CSA approved NEMA IV coil.
2. 100% duty cycle for continuous cycling applications.
3. TRUE UNION Design: Valve body can be removed without piping or electrical disconnection.
4. Body Mounting Lugs: For laboratory or panel mount.
5. All plastic construction: No metal parts in contact with process fluid.

Voltage	Current	Voltage	Current
12 VAC	1.6 amp	12 VDC	1.6 amp
24 VAC	0.8 amp	24 VDC	0.8 amp
120 VAC	.16 amp	220 VAC	0.09 amp

INSTALLATION

1. The valve should be installed in an accessible location. This will allow for ease of inspection or service.
2. Reliable electrical line voltage supply must be provided to the coil, per table below. Low line voltage will reduce the operating performance and possibly the service life of the coil.
3. It is recommended that a Hayward "Y-STRAINER" be installed upstream of the valve to prevent clogging or premature wear of the diaphragm due to suspended solids in the process fluid.



MOUNTING POSITIONS

The solenoid valve may be installed in a vertical, horizontal or upside down position. **CAUTION** should be taken when servicing, as accumulated fluid may be retained in the valve. ALWAYS drain system before servicing.

SOLVENT-WELD SOCKET ENDS (PVC and CPVC only):

CAUTION

Only solvent cement the end connector to a pipe end with valve separated.

Trapped primer and solvent cement vapors can degrade the plastic and the o-ring.

1. Disassemble true union from the valve. Remove the nut and end connector from the valve by rotating the nut counter clockwise.
2. Protect o-ring seal from being exposed to primer, solvent, glue, and other contamination.
3. Place nut over pipe end so that it can engage the end connector once the end connector is cemented to the pipe end. The open end of the thread will face the end of pipe so it can be threaded onto the valve during installation.
4. Refer to solvent-weld manufacturer's instructions and cure times.
5. Solvent weld the end connector to pipe.
6. Repeat steps 1-5 for opposite pipe.
7. Set solvent cemented end connectors aside until solvent cement has fully cured.
8. Once connections are fully cured, replace o-ring.
9. Make up the connection by threading nut onto the valve in a clockwise direction. Hand thread until tight.
10. Verify the connections have sealed.

THREADED CONNECTION ENDS:

1. Wrap male threads of pipe end with PTFE tape. Proper application of PTFE tape will provide a sufficient seal for PVC, CPVC and PP threaded joints.

WARNING

Do not use "pipe dope", liquid sealant, or thread sealant on any PVC, CPVC, or Polypropylene, threaded connections. Pipe dope and thread sealants may react with the PVC, CPVC, or Polypropylene, weakening the material and potentially resulting in failure of the joint, product damage, property damage, personal injury, or even death.

2. Place nut over pipe end so that it can engage the end connector once the end connector is threaded to the pipe end. The open end of the thread on the nut will face the end of pipe so it can be threaded onto the valve during installation.
3. Thread the pipe end into the end connector.
4. Using a strap wrench only (never use a pipe wrench), tighten the pipe into the end connector only to the point required to form a seal; 1/2 turn past hand tight is typically sufficient to form a seal. **(Caution: Tightening beyond this point may introduce excessive stress that could cause failure of the end connector or the threaded end of the pipe.)**
5. Verify the connections have sealed.

ELECTRICAL CONNECTIONS

IMPORTANT, **before beginning any electrical connections to the solenoid valve operator, be sure the electrical power to the connection service is off**.

The housing of the solenoid operator is non-metallic and should be connected to GROUND through the Hirshmann Connector. THE GROUND TERMINAL IS PERPENDICULAR TO THE (2) TWO PARALLEL POWER CONNECTORS.

The (2) two parallel connectors are to be connected to an appropriate power supply. All connections should be done in accordance with local electrical codes. The "PLUG-ON" connector should be installed onto the coil by with the supplied rubber gasket and mounting screw. POLARITY OF THE CONNECTIONS TO THE POWER TERMINALS IS UNIMPORTANT.

On A.C. (alternating current) installations the internal components are rated at a MAXIMUM of ONE (1) AMPERE and should be protected by the control circuit to the operator or an IN-LINE FUSE. DO NOT EXCEED ONE (1) AMPERE DRAW THROUGH THE SOLENOID OPERATOR.

OPERATION

The Hayward Solenoid Valve is rated for 100% duty cycle for continuous cycling operation. The valve can be used in either the closed (electrically de-energized) position, or with an ON-OFF-ON sequence. When operated at 100% duty cycle, the temperature of the operator can reach approximately 180° F.

HOW IT WORKS:

The Hayward Solenoid Valve is a TWO-WAY, DIRECT ACTING, NORMALLY CLOSED (fail close) actuated valve. When the solenoid coil is energized, a magnetic field is created which generates an upward pulling force on the valve piston, causing it to open. When the coil is de-energized (electrical power shut-off) both the piston spring and the force of inlet pressure and the piston seal close the valve. It must be understood that there are LIMITS as to how much force the operator can overcome to operate properly. These limitations are governed by the following:

1. The maximum "pull-in" force generated by the solenoid operator.
2. The inlet pressure of the process, applying forces to both the diaphragm to open the valve and to the piston seal to close the valve.
3. The back pressure, applying forces to both the diaphragm to open the valve and to the piston seal to close the valve.
4. Line velocity (flow rate in gallons per minute) applying forces to both the diaphragm to open the valve and to the piston seal to close the valve.

Each solenoid model has unique operating characteristics, making it essential properly select the correct model based on process parameters. MAXIMUM INLET PRESSURE (120 PSIG), MAXIMUM BACK PRESSURE (25 PSIG FOR PRESSURES ABOVE 25 PSIG), MAXIMUM FLOW RATES (GALLONS PER MINUTE) AND MAXIMUM LINE VELOCITY (FLOW RATE BELOW 5 FEET PER SECOND). DUE TO THE RAPID RATE AT WHICH SOLENOID VALVES TYPICALLY CLOSE, HIGH LINE VELOCITY MAY CAUSE "WAVE SURGES"(WATER HAMMER) WHICH MAY ULTIMATELY RESULT

IN A FAILURE OF THE PIPING SYSTEM AND OR THE SOLENOID VALVE DIAPHRAGM. See chart to calculate "WATER HAMMER EFFECT".

THE FOLLOWING WAVE SURGE CONSTANTS MAY BE USED TO QUICKLY CALCULATE LINE PRESSURE RISE DUE TO WATER HAMMER WHERE:"C'= THE WAVE SURGE CONSTANT FROM THE TABLE: BELOW. MULTIPLIED BY -"V"- THE LINE VELOCITY IN FEET PER SECOND. THE RESULTANT NUMBER IS THEN ADDED TO THE LINE PRESSURE TO DETERMINE THE RESULTING WAVE SURGE (WATER HAMMER EFFECT)
MAXIMUM RECOMMENDED FLUID VELOCITY IS FIVE (5) FEET PER SECOND.

PIPE SIZE	¼"	½"	¾"	1"	1 ½"	2"
CONSTANT	40	35	32	31	27	25

SERVICING THE VALVE

Should the orifice of the valve (.405 dia. for 1/4" & 1/2" ; .500 dia. for 3/4" & 1" valve;) become clogged, the Hayward True Union design allows for quick removal of the valve body for cleaning.

1. Turn off electrical supply.
2. Shut off all flow in the piping system.
3. Drain all fluid from the piping system and valve. (consult appropriate **MSDS** data for proper handling of the process fluids)
4. Carefully loosen the bonnet nut connecting the solenoid operator module to the valve body. Remove the bonnet nut with solenoid from the valve body. (Keep track of the spring between the solenoid and the cartridge sub-assembly.)
5. Remove the cartridge sub-assembly from the valve body by slowly twisting while pulling them apart. (Note: be sure to keep the bonnet o-ring clean for reassembly)
6. Carefully loosen the two (2) union nuts connecting the valve body to the piping system.
7. Remove the two (2) union nuts from the valve body, sliding them onto the adjacent pipe.
8. Carefully remove the valve body from the line.
9. Clean the orifice and internals of the valve as required. Replace cartridge sub-assembly as needed.
10. Reassemble in the reverse order, making sure that spring is in place on the end of the metal core, the bonnet o-ring is clean, and HAND TIGHTEN ONLY the bonnet nut and each of the union nuts. Verify connections have sealed.
11. Turn on electrical supply.

OPERATION TIPS

1. Be sure that the system is clean before installing the valve. It is recommended that a Hayward Y-STRAINER or BASKET STRAINER be installed upstream of the solenoid valve as insurance against clogging and for extending the life of the diaphragm.
2. If the flow requirement of the system is greater than the capacity of the largest Hayward Solenoid Valve, two (2) or more can be installed in parallel, to satisfy the application.
3. There is a flow arrow molded into the outside of the valve body, indicating proper installation direction.

TROUBLE SHOOTING

SHOULD THE SOLENOID VALVE FAIL TO OPERATE AS EXPECTED, CHECK THE FOLLOWING,

1. VALVE WILL NOT OPEN:
   a) Check electrical supply and connections. Be sure correct voltage is applied to solenoid.
   b) Inlet pressure is too high. (exceeds 120 PSIG)
   c) Solenoid coil is burned out. (Typically the result fluid leaking into the coil from ruptured diaphragms caused by excessive dirt in the process, or the result of water hammer).
   d) Valve orifice clogged.

2. VALVE WILL NOT CLOSE:
   a) System has a flow restricting device installed downstream inducing high backpressure (i.e. spray nozzle, partially closed valve, etc.)
   b) Piston face seal is worn. Replace cartridge assembly.
   c) Valve orifice is clogged.
   d) Valve installed backwards. Check flow direction.
   e) Line velocity too high. (Exceeds 5 ft/s)
   f) Diaphragm has failed.