Honeywell

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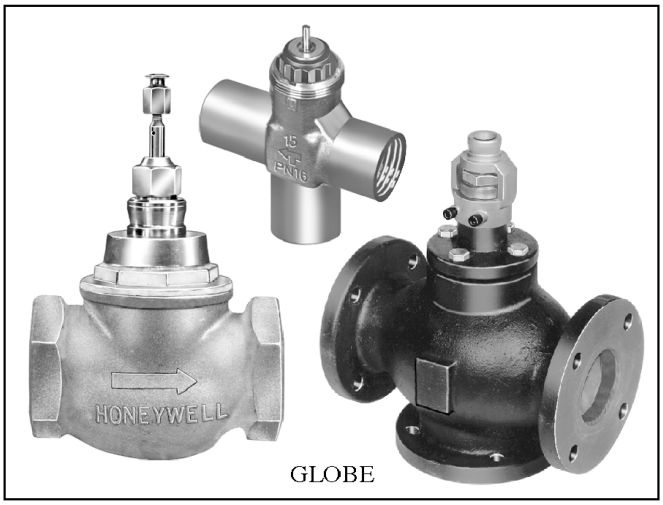
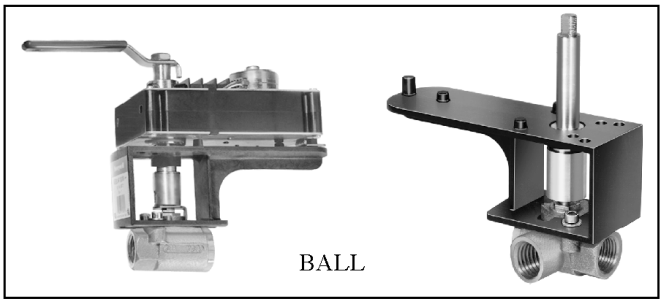
Design and Application Guide for the Honeywell Valves and Actuators

Includes Information on:

- Valve Types
- Valve Construction
- Valve Applications
- Sizing and Installation
- Actuator Types
- Installation Procedures
- Wiring Diagrams



GLOBE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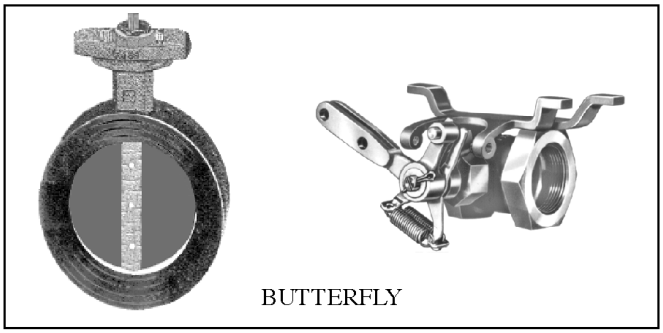
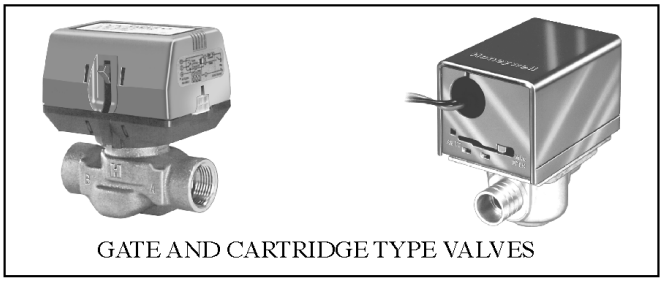
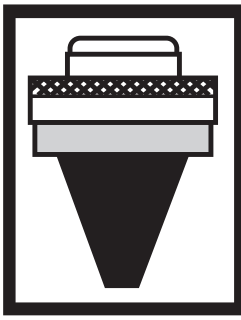

BUTTERFLY


GATE AND CARTRIDGE TYPE VALVES

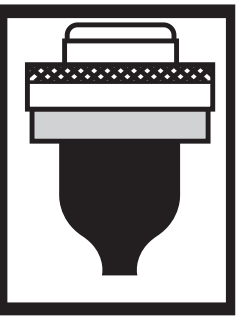
63-7035

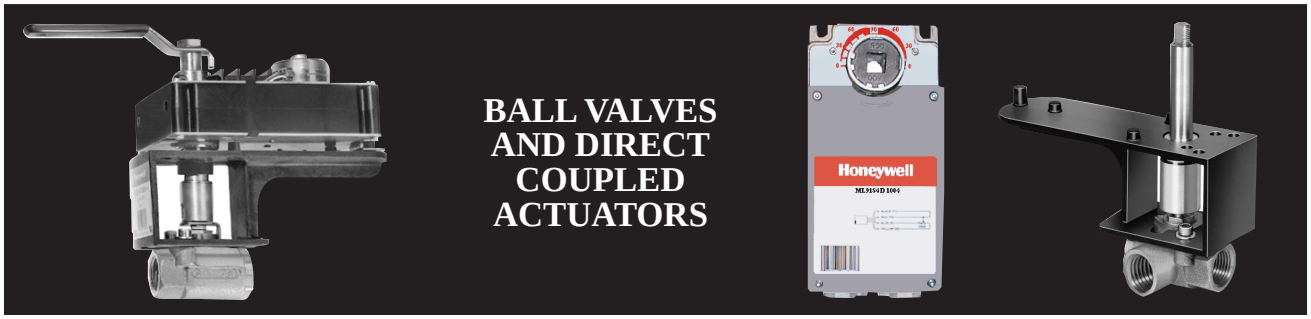


LINEAR PLUG

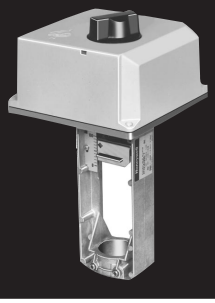
VALVE CONSTRUCTION AND APPLICATIONS

EQUAL PERCENTAGE PLUG

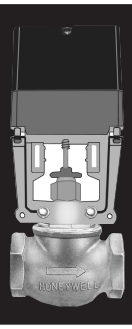




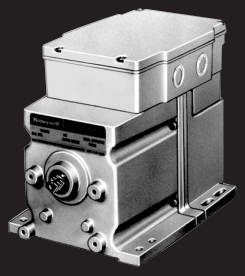
ML6421/ML6425/ML7421/ ML7425 VALVE ACTUATORS FOR COMMERCIAL GLOBE VALVES SERIES

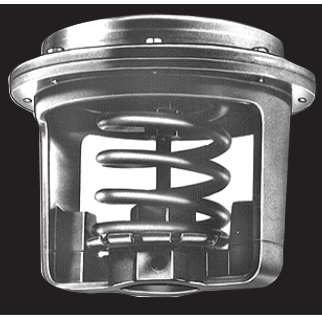


ML7984 VALVE ACTUATOR FOR GLOBE VALVES

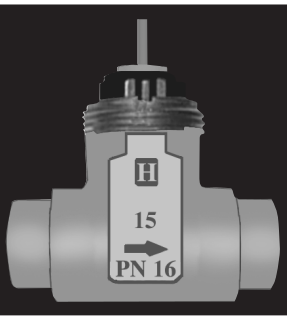


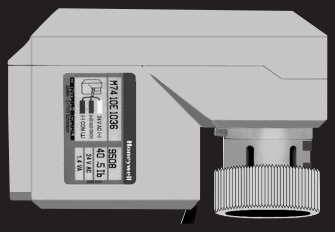
MOD IV ACTUATORS FOR COMMERCIAL GLOBE VALVES





PNEUMATIC VALVES AND ACTUATORS



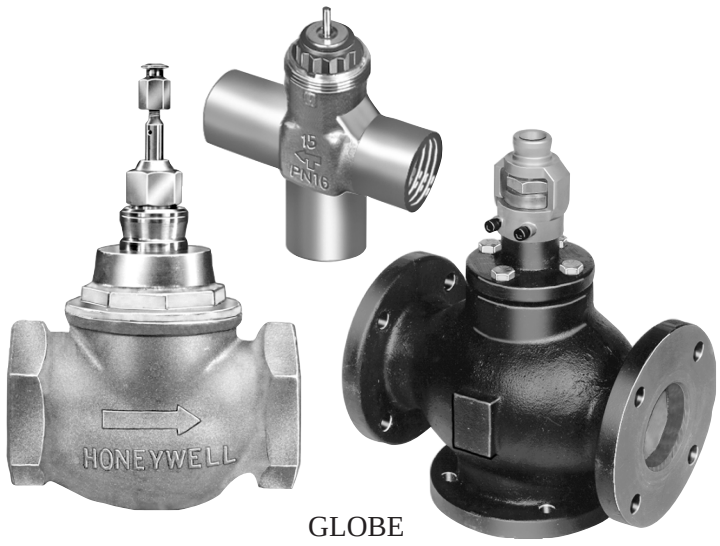


V5852/53 AND V5862/63 UNITARY VALVES AND ACTUATORS

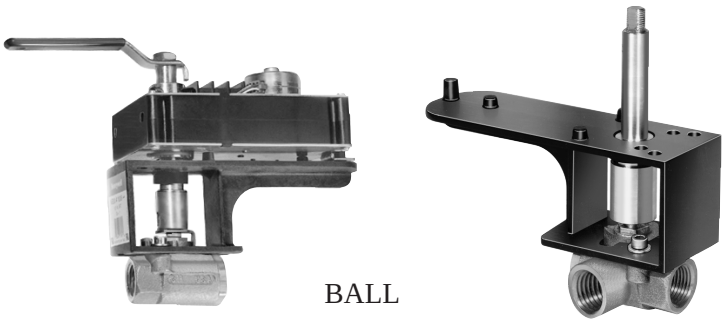
TYPES OF VALVES

Control valves are initially classified by their place of use into residential, commercial or industrial. The difference being not only pipe size and pressure ratings but also the type of actuator and complexity of the control circuit required. Industrial valves frequently are equipped with pneumatic actuators while residential units are virtually all supplied with electric. Ball and gate-type valves are available primarily in smaller pipe sizes while butterfly valves are typically applied only on the largest pipes. Globe valves are the most widely used type with a wide availability in virtually all the commercial and residential pipe sizes and adaptability to most actuators.

A further classification is the method of attaching the valve to the pipe. Threaded valves are available from 1/2 to 6 inches (1.3 to 15.2 cm) though most of them larger than 3 inches (7.6 cm) are flanged. The smaller units are generally designed to be used with the copper piping used in residences and small commercial buildings. These can either be soldered, sometimes referrred to as sweat, or flare which is a method of attaching to a copper or steel pipe by turning a nut that tightens an enlarged section of pipe around the valve body. Each method is rated for a certain amount of loop pressure and weight support. The type of valve connection method should be indicated in the mechanical specifications.



GLOBE



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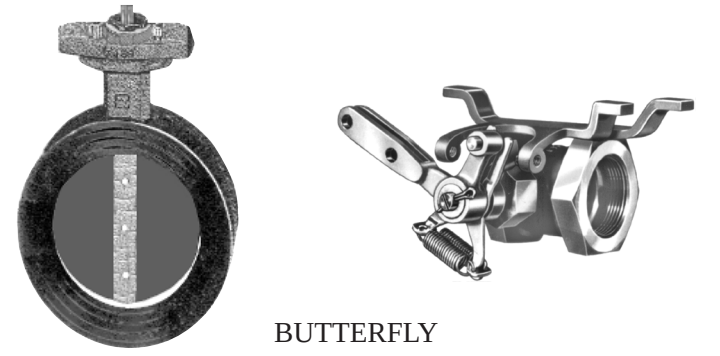
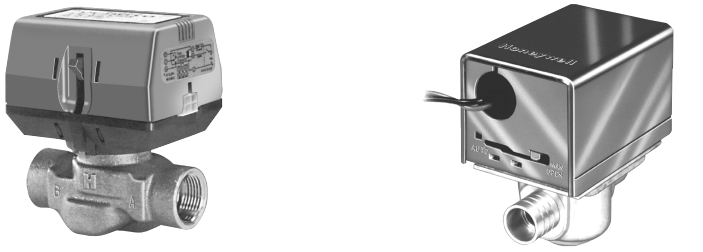


BUTTERFLY



GATE AND CARTRIDGE TYPE VALVES

APPLICATION OF VALVE AND DAMPER ACTUATORS

The conventional method to control a commercial damper or valve with electric or electronic actuators has been to use a three-piece assembly:

1. Actuator
2. Linkage
3. Valve or damper

Today there is a new type of actuator that is compact, economical and in many applications requires no linkages. Savings in both installation labor and material costs are realized.

Actuators are devices that are used to take a control signal and reposition a final control element such as a valve or damper. This causes an increase or decrease in the volume of air, steam, hot or chilled water. The actuator is seldom an integral component of the valve or damper. Instead actuators with various types of power supplies and control inputs are available. This results in greater flexibility for the installer and reduced inventory requirements for the building owner.

Actuators are used in virtually every aspect of heating, ventilating and air conditioning (HVAC). Many of them are shown in the illustration on the next page “Direct Coupled Actuator Usage in a 5 Story Building.”

An airhandler frequently requires multiple actuators. Though a smaller unit can be controlled with a single actuator that is linked to both the return and outside air dampers, larger, centralized airhandlers might require ten or more actuators just for the outside air. Multiple damper sections can be joined together, connected to a jackshaft and controlled with a single large actuator.

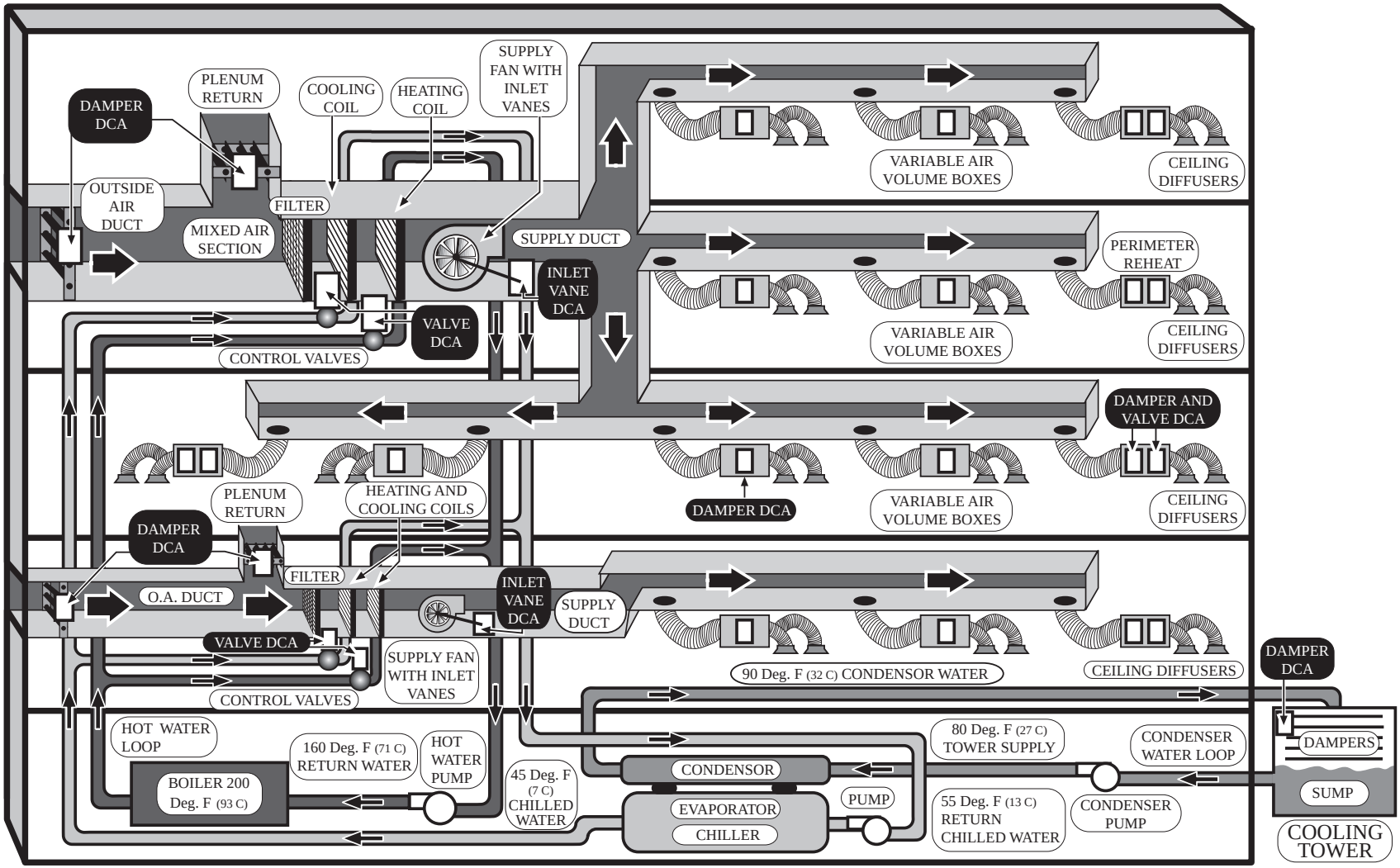
Heating and cooling coils are virtually always equipped with control valves. Some coils are sufficiently large to require multiple valves which are sequenced according to outside or supply air temperature. Changeover from heating to cooling or from one boiler or chiller to a backup unit typically requires large two-position valves. Butterfly valves are frequently used for this function.

Most office building HVAC equipment today is based on variable air volume (VAV). Modulation of the volume of air from the supply and return fans is required and there are many methods in use. Illustrated on the next page is a widely used method; inlet vane dampers on the supply fan. This is frequently a medium to high torque application. In a typical application the airhandler should not be started until the inlet vanes are full closed. This is done to prevent damage to the ducts caused by a excessive static pressure. This requires either an inlet vane actuator that is spring returned to a closed position or an electrical interlock circuit that prevents fan start-up till the vanes are closed.

The VAV boxes located throughout the building might require multiple actuators on each; one for the volume damper and one for the reheat coil. Dual duct VAV boxes could require two volume damper actuators each.

Other applications for actuators include valves for make-up water on cooling towers, diverting valves for condensor water lines, modulation of dampers on smaller cooling towers, pressure regulating valves for primary-secondary hydronic loops or control valves on steam-to-hot water converters.

DAMPER AND VALVE ACTUATOR USAGE IN A 5 STORY BUILDING

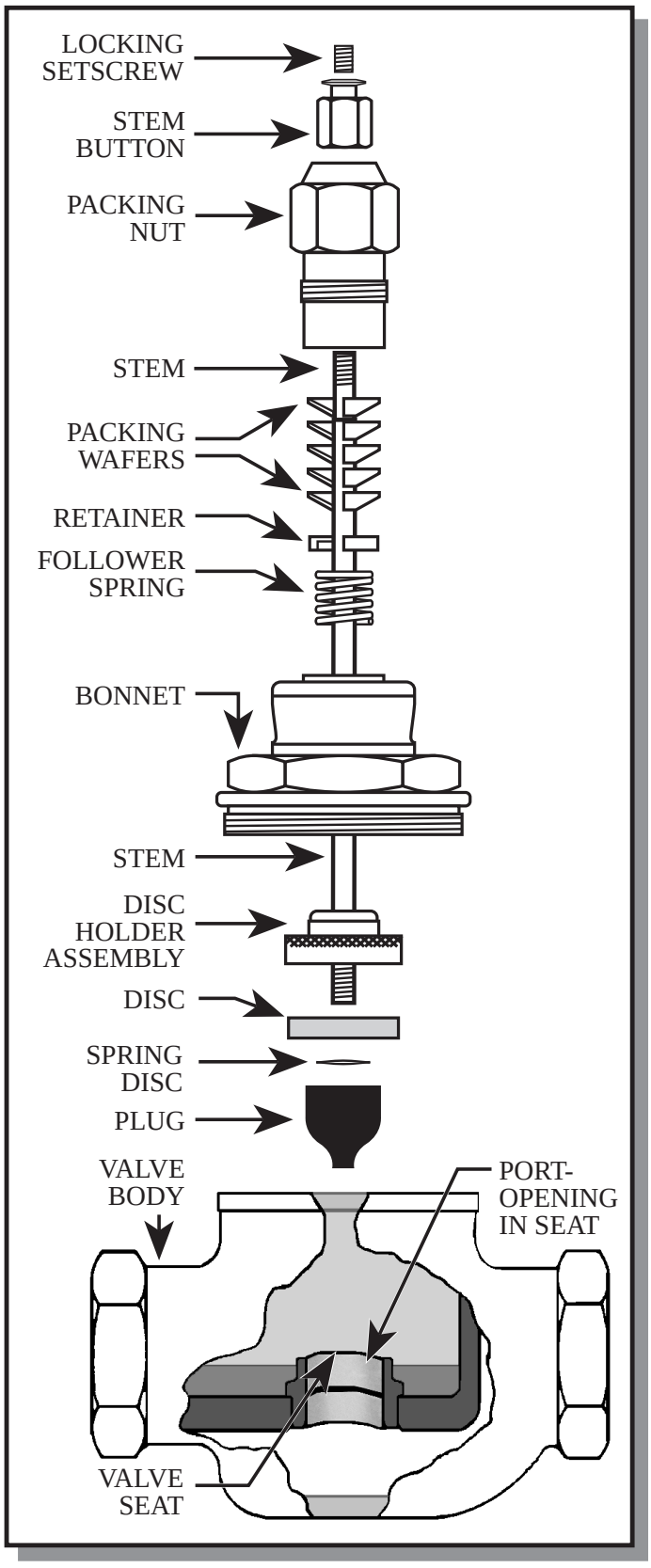


COMPONENTS OF A VALVE

Packing is used to prevent water or steam from leaking out around the stem. It can be made of teflon wafers or a rubber cartridge. The packing on this valve consists of several wafers. At one time packing was made of a rope covered with graphite. The packing nut had to be tightened every so often to reduce leakage. Newer designs commonly used on ball valves are 0-rings made with modern compounds which substantially reduces or eliminates repacking.

The term valve trim refers to all of the components of the valve except the valve body itself that are in contact with the fluid being controlled. In specifications the trim might required to be of a special material such as stainless steel to withstand high temperatures or corrosive substances.

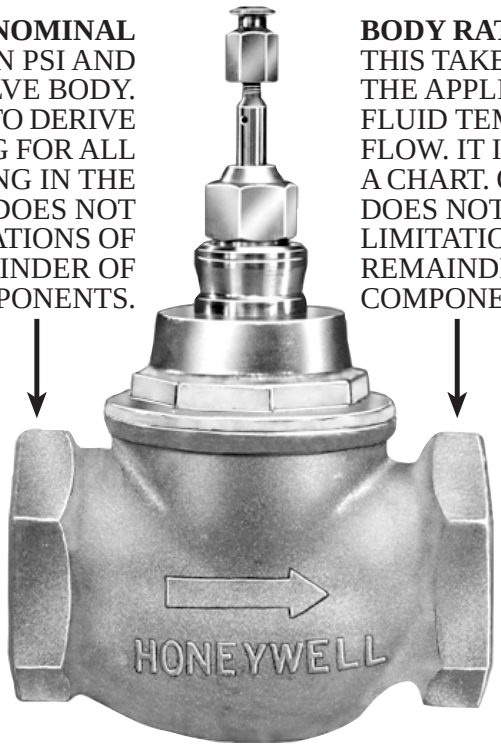
On larger valves the seat is threaded into the valve body. If replacement is required it can be removed with a deep socket and replaced. On most of the smaller and soldered valves the seat is molded into the valve body and is not replaceable. It can still be serviced by scraping or grinding scale deposits.



VALVE PRESSURE RATINGS

BODY RATING NOMINAL THIS IS TYPICALLY IN PSI AND CAST ONTO THE VALVE BODY. ITS PRIMARY USE IS TO DERIVE AN OVERALL RATING FOR ALL OF THE PIPING IN THE BUILDING. IT DOES NOT INCLUDE THE LIMITATIONS OF THE REMAINDER OF COMPONENTS.

BODY RATING ACTUAL THIS TAKES INTO ACCOUNT THE APPLICATION SUCH AS FLUID TEMPERATURE AND FLOW. IT IS DERIVED FROM A CHART. ONCE AGAIN THIS DOES NOT INCLUDE THE LIMITATIONS OF THE REMAINDER OF VALVE COMPONENTS.

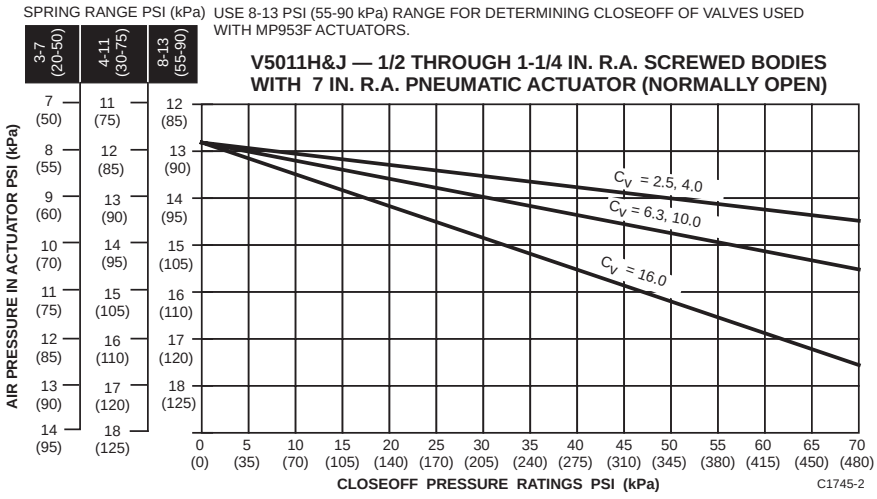


MAXIMUM PRESSURE AND TEMPERATURE THIS TAKES INTO ACCOUNT THE ENTIRE VALVE ASSEMBLY INCLUDING THE BODY, STEM, DISC AND PACKING. THIS WILL BE EQUAL TO OR LOWER THAN THE BODY RATING.

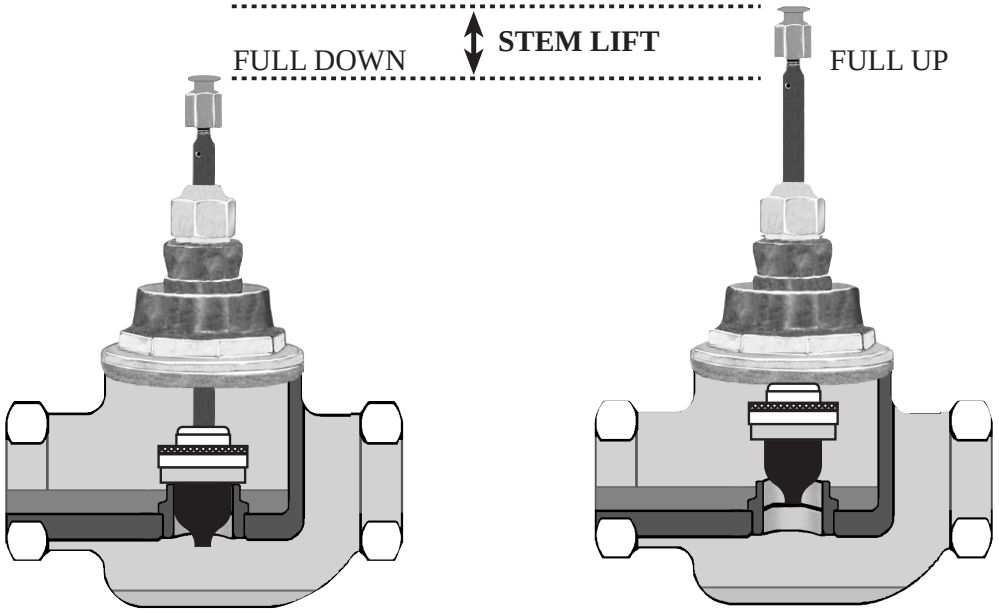
MAXIMUM DIFFERENTIAL PRESSURE IS THE GREATEST ALLOWABLE PRESSURE DIFFERENCE BETWEEN THE INLET AND OUTLET PRESSURES. EXCEEDING THIS RATING CAN CAUSE INADEQUATE CLOSE-OFF OR DAMAGE TO THE PLUG, DISC AND STEM.

PRESSURE DROP IS ALSO THE DIFFERENCE BETWEEN THE INLET AND OUTLET PORT; THIS TERM IS TYPICALLY USED WHEN SIZING THE VALVE FOR MODULATING APPLICATIONS. USUALLY SPECIFIED BY THE PIPING LAYOUT ENGINEER, COMMON VALUES ARE BETWEEN 2 AND 6 PSI (14 AND 41 kPa)

CLOSE-OFF THIS IS THE MAXIMUM DIFFERENTIAL PRESSURE AT WHICH A VALVE CAN BE CLOSED WITHOUT SUBSTANTIAL LEAK THROUGH. THIS IS DEPENDENT UPON THE TYPE OF ACTUATOR USED AND THE Cv OF THE VALVE. HIGHER Cv VALVES GENERALLY HAVE LARGER PORT OPENINGS AND LARGER DISCS AND REQUIRE A LARGER ACTUATOR FOR TIGHT CLOSE-OFF. IT IS FREQUENTLY GIVEN IN A CHART WITH SEPARATE LINES FOR Cv AND ACTUATORS USED. THREE-WAY VALVES WILL FREQUENTLY BE LISTED WITH TWO CLOSE-OFF RATINGS, ONE FOR EACH SEAT.

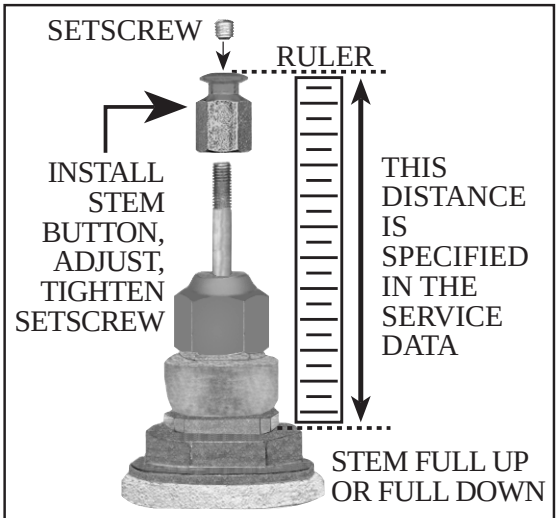


STEM LIFT



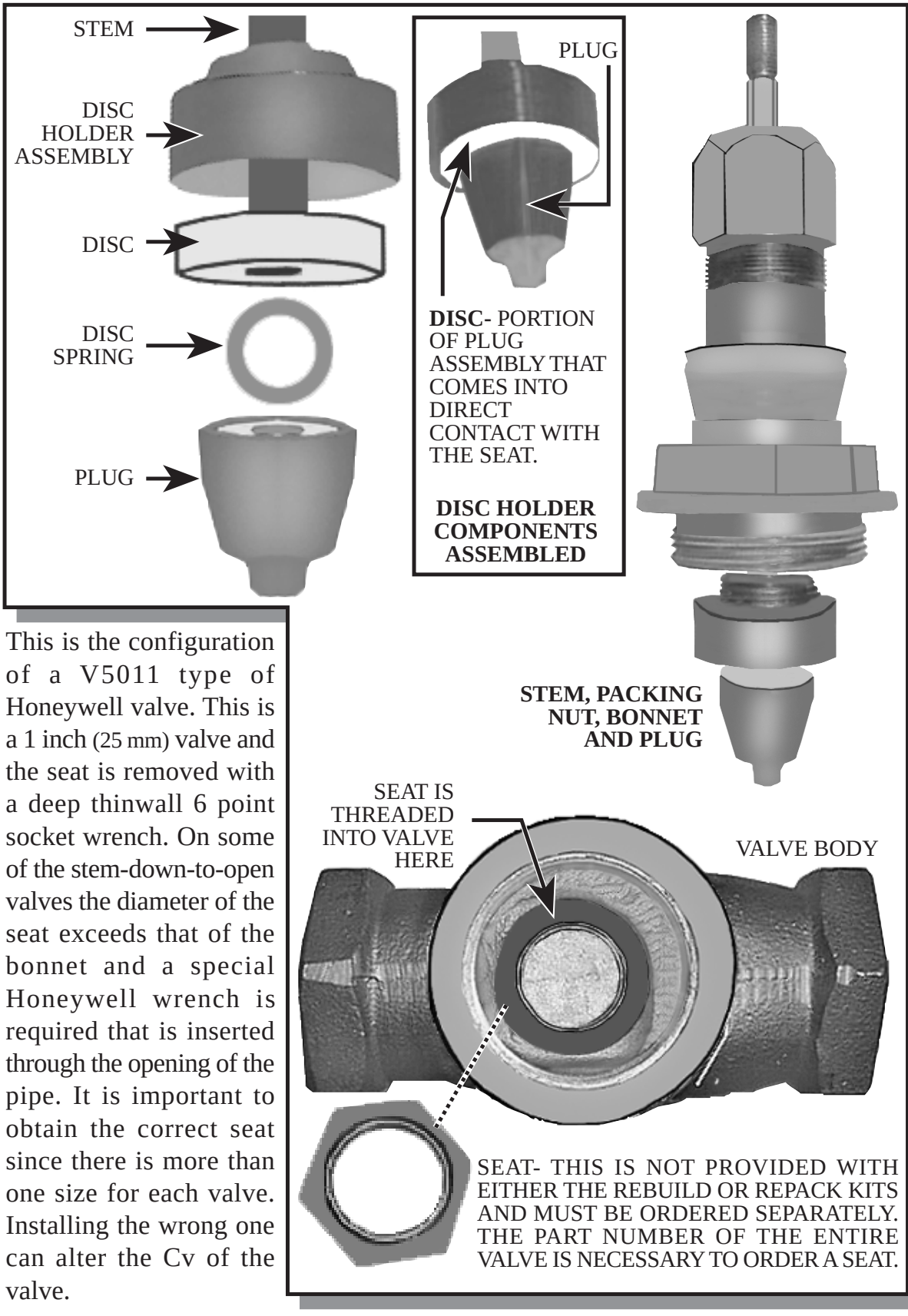
Valves are available as unitary or assembled units. The difference is that a unitary valve is designed to be used with a specific actuator. Unitary valves are typically smaller valves. An assembled unit consists of one of Honeywell's threaded or flanged valves and one of a wide selection of actuators. The actuator can be electric or pneumatic, spring return or non-spring return or one of any of the available close-off ratings.

When selecting an actuator for an assembled unit there are some criteria that have to be met. The stem diameter and lift both generally increase as the pipe size of the valve increases. Actuators are available with various stem lifts to meet these requirements. Lift on commercial globe valves such as those illustrated above are typically 3/4 inch (19 mm) on those valves 3 inch (76 mm) or less pipe size and 1.5 inch (38 mm) on 4 to 6 inch (102 to 152 mm) valves.



SERVICE NOTE: The stem lift can be adjusted slightly by threading the stem buttom upwards or downwards. It is then locked in position with a setscrew that is installed from the top. If the stem button is not adjusted correctly the rated close-off or Cv might not be attained with some of the actuators. On some valves it is adjusted with the stem full up and some with the stem full downwards. When installing an actuator on this type of valve be certain to measure the dimension indicated and compare to what is recommended in the literature.

DISC, STEM AND PLUG ASSEMBLIES



This is the configuration of a V5011 type of Honeywell valve. This is a 1 inch (25 mm) valve and the seat is removed with a deep thinwall 6 point socket wrench. On some of the stem-down-to-open valves the diameter of the seat exceeds that of the bonnet and a special Honeywell wrench is required that is inserted through the opening of the pipe. It is important to obtain the correct seat since there is more than one size for each valve. Installing the wrong one can alter the Cv of the valve.

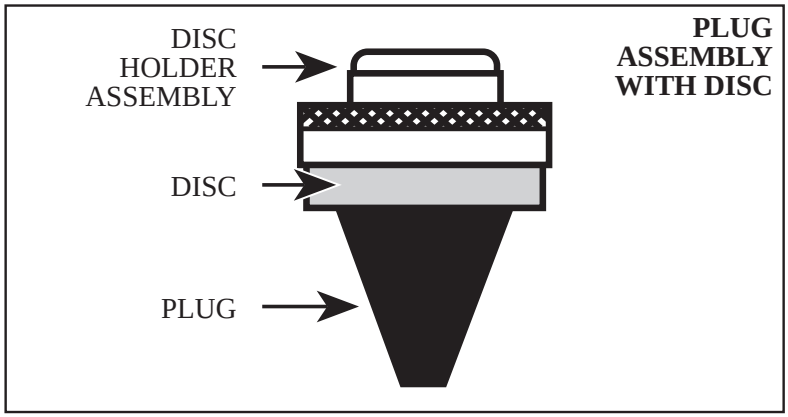
VALVE PLUGS

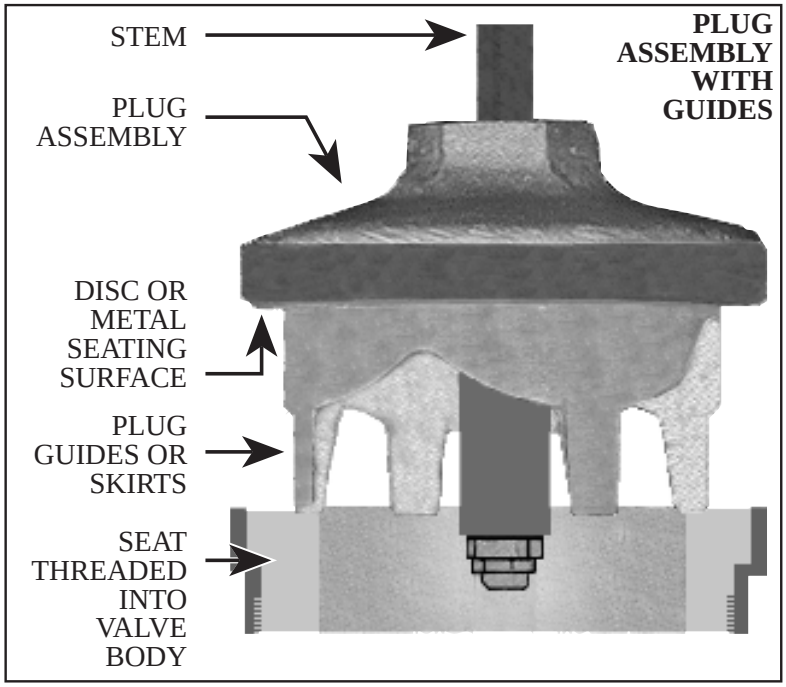
The plug of the valve is attached to the stem and is used to open or close the port in the seat. The one illustrated on top is most often used on the smaller valves since there are no guides or skirts attached to the plug assembly. The stem must be sufficient to overcome side-to-side forces.

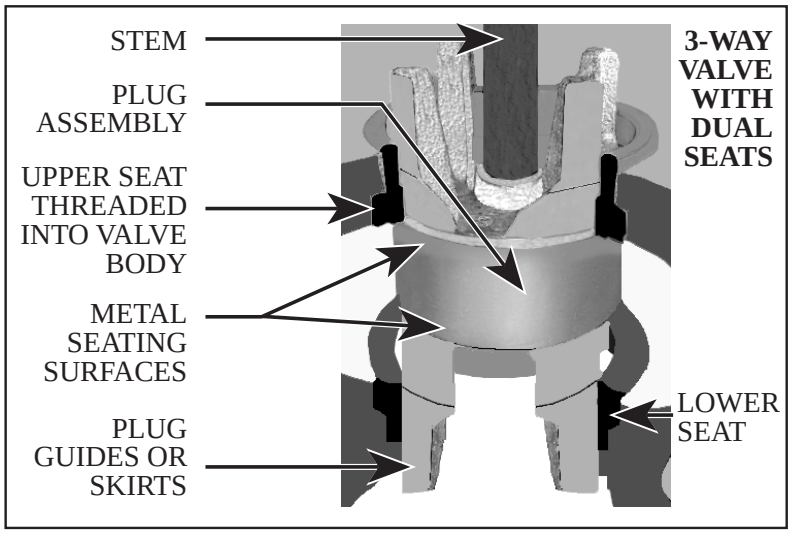
The plug illustrated in the middle is equipped with guides or skirts to maintain plug alignment as it is raised or lowered. These guides are necessary on larger valves since the stem is longer and might be bent or pushed against the packing with excessive force.

Both of the top two plugs on this page are constructed with discs that are used to make a tight seal with the seat to prevent leak through. Twenty years ago these seats were made of a fiber material referred to as composition, a rubber material for chilled water or metal for tight close-off with steam. Then the discs were changed to be made primarily of teflon or metal.

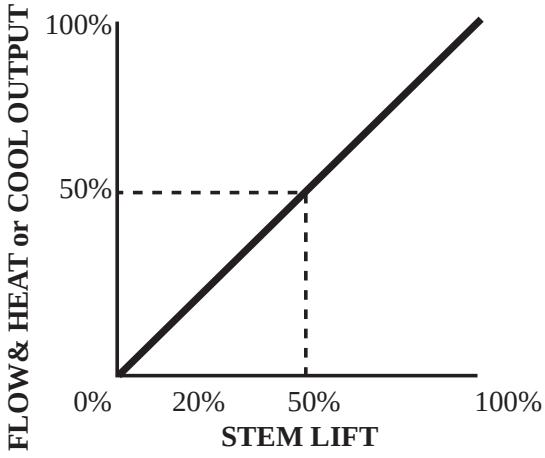
The three-way valve plug illustrated on the bottom is made without discs. Two seating surfaces are built into the plug assembly.

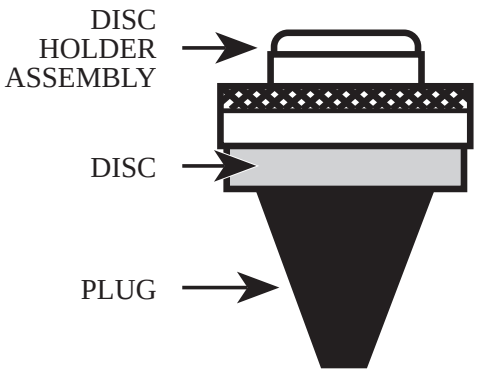






LINEAR AND EQUAL PERCENTAGE PLUGS



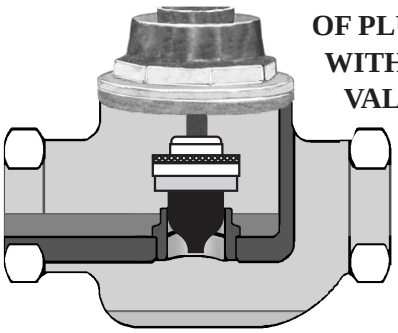


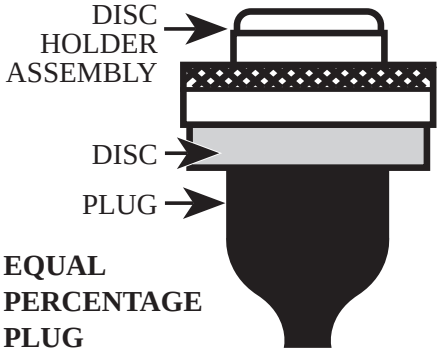
LINEAR PLUG

There are two primary types of plugs for globe valves. The one with straight sides is referred to as a linear plug and is used for modulating steam or chilled water. The other with the sloping sides is referred to as an equal percentage plug and is designed for modulation of hot water or two-position control of steam. It is equal percentage because each percentage of stem lift results in an equal percentage increase in heat output.

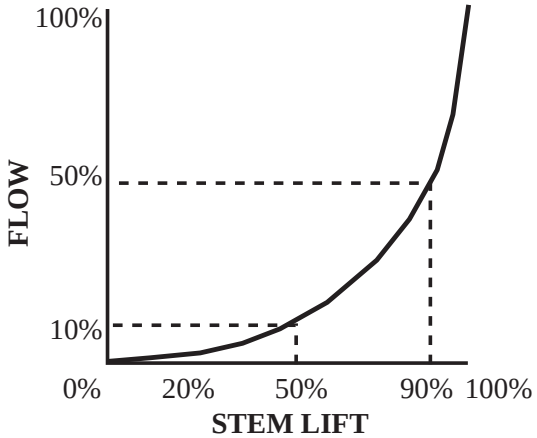
Some of the larger valves use a plug with guides or skirts on the side to keep it aligned with the seat as the valve is opened and closed. The shape of the sides of the plug and the guides make the plug linear or equal percentage and it is not visibly apparent which type it is.

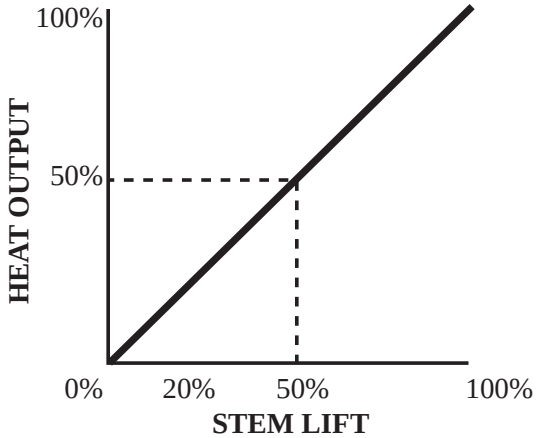
LOCATION OF PLUG WITHIN VALVE



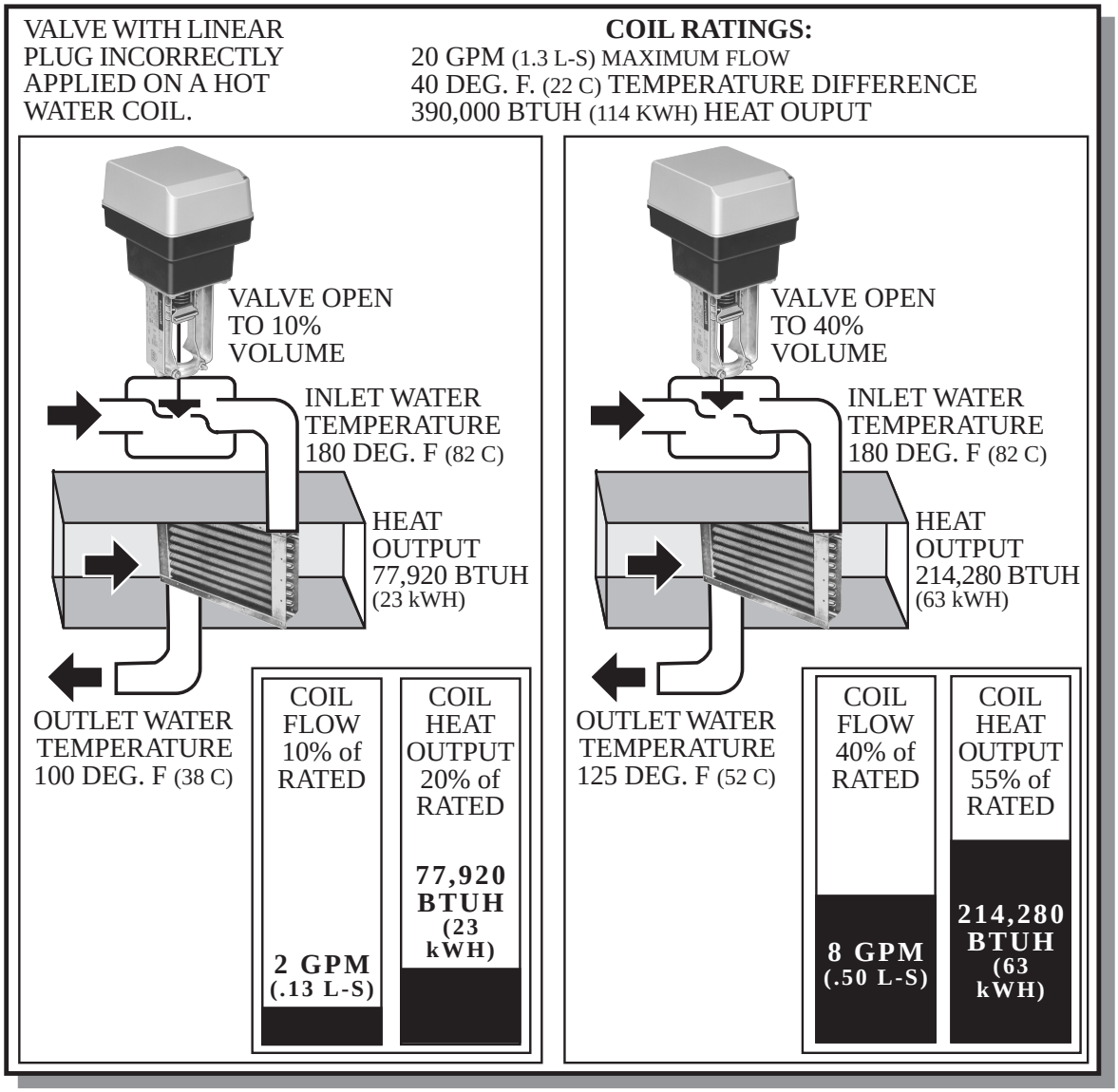


EQUAL PERCENTAGE PLUG





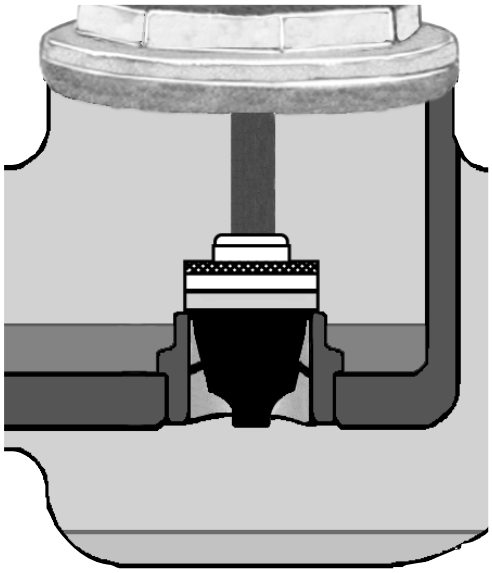
PURPOSE FOR NOT USING LINEAR PLUGS IN HOT WATER VALVES



An increase of the volume of steam being put into a coil results in a proportional increase in the heat output of the coil. This happens because all of the steam should condense in the coil and be returned to the condensate return tank. Hot or chilled water is different because the coil outlet water temperature varies with the flow rate and the amount of airflow over the coil. As the flow increases so does the velocity of the water in the coil and the length of time it is in contact with the coil decreases. Each volume of water absorbs less heat as the flow rate increases. What can occur if the valve plug is not designed to take this into account is illustrated above. Neither bar chart is proportional. Changes in the coil outlet temperature changes the heat output disproportionately.

An equal percentage plug is contoured so that a 50% repositioning of the stem only raises the flow rate by 10%. This 10% increase in flow however causes a 50% increase in heat output.

MODIFIED PLUGS

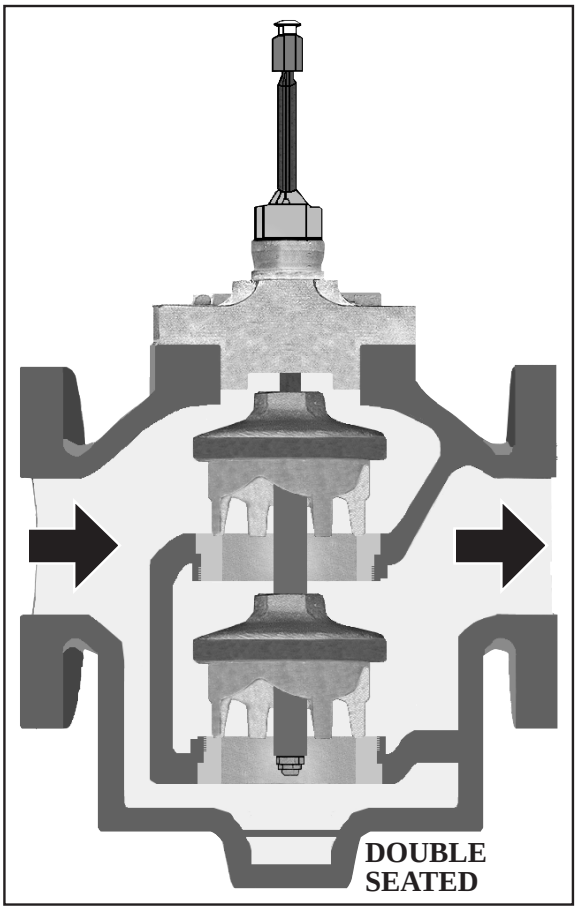


MODIFIED LINEAR

In the Honeywell Valve Selection Guide 63-8038 valves are listed with the options available for each. Some of them are listed with a plug referred to as a modified linear. This is a plug that is primarily linear for approximately 90% of the stem lift. 10% is curved similar to an equal percentage plug to improve modulation at low flow rates. Most valves using this plug are metal-to-metal seating and are primarily for steam modulation.

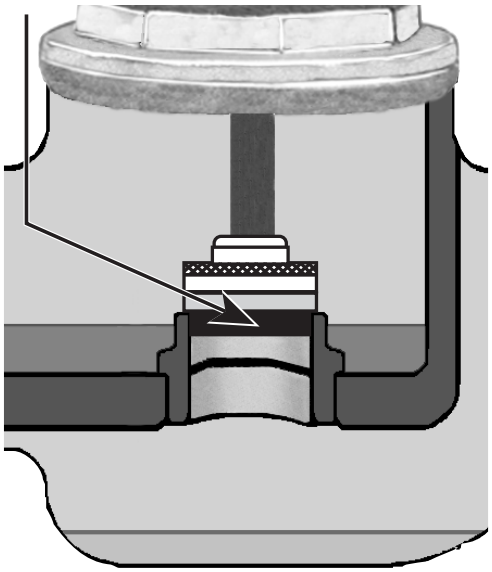
Double seated or pressure balanced valves are used where fluid pressures are too high to permit a single seated valve to close. They do not provide tight shut-off and are more costly than single seated valves.

Quick-opening plugs are for two-position applications. The plug is designed to seat tightly and open completely within the first portion of stem lift.



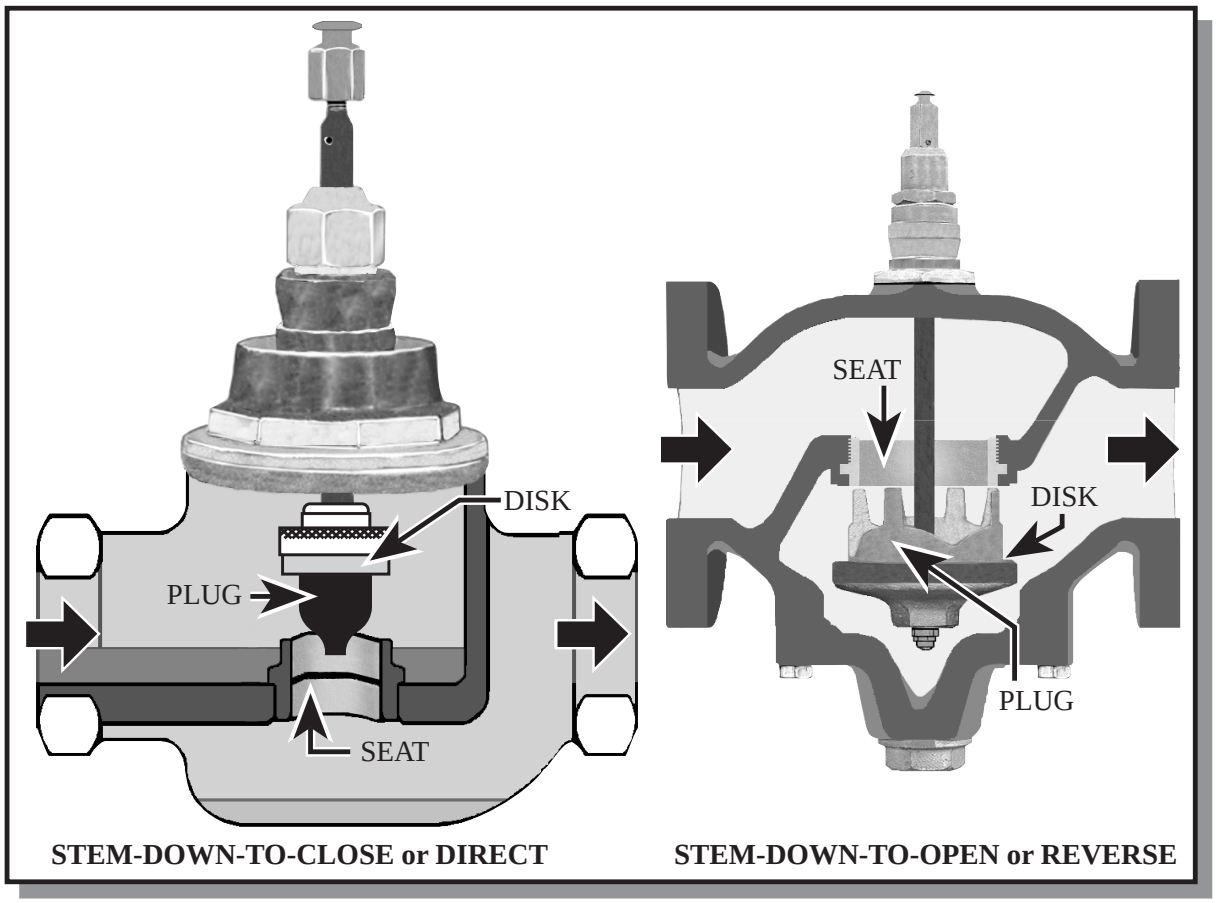
DOUBLE SEATED

DISC IS JUST A FLAT PIECE. THERE IS FULL FLOW ALMOST IMMEDIATELY AFTER OPENING.



QUICK OPENING PLUG

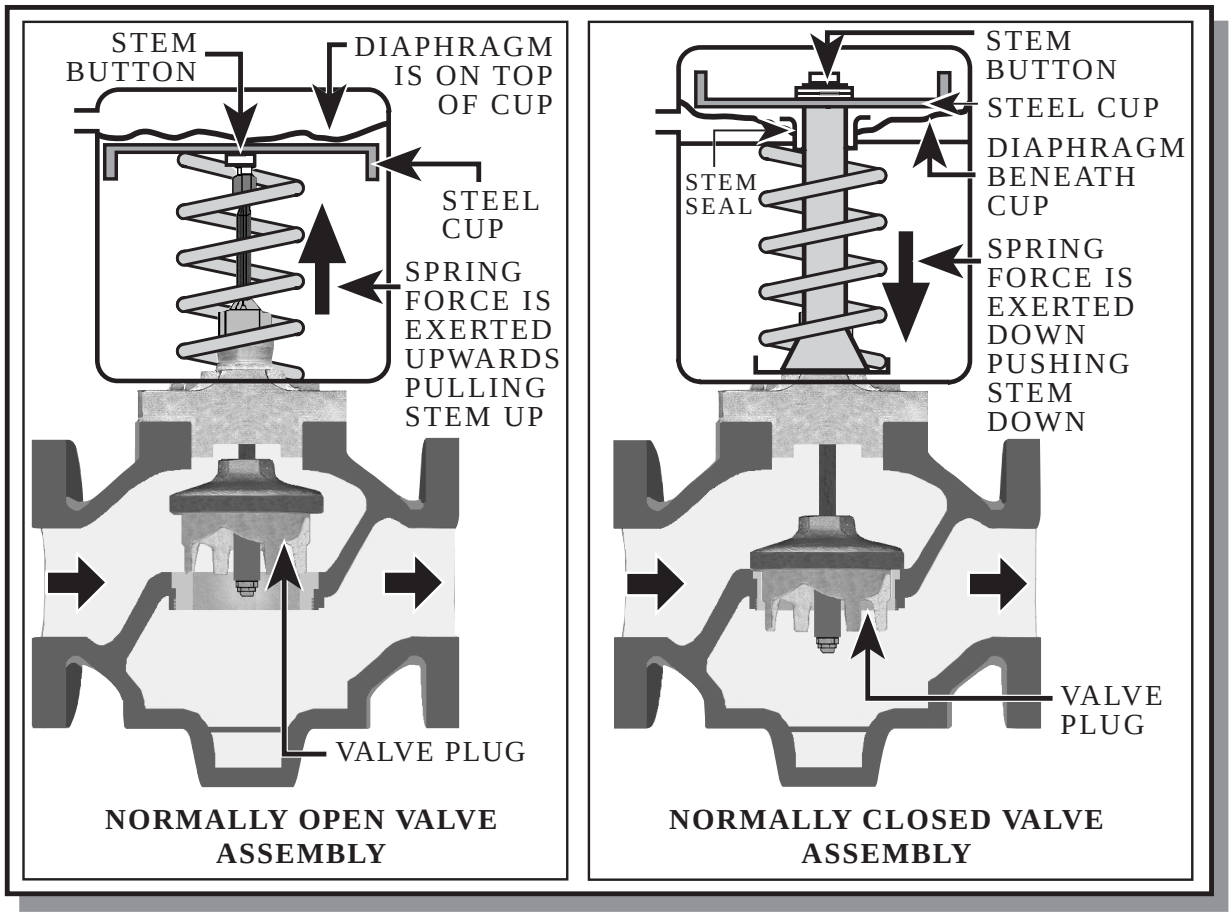
STEM-DOWN-TO-OPEN AND STEM-DOWN-TO-CLOSE VALVES



The flow of liquids or steam through a valve port and the intrinsic changes of direction produce many hydraulic forces that can push a plug off the seat or the stem from side to side. At its worst these forces can cause chattering which is a rapid and cyclical opening and closing of the valve when it is in a low flow position. Rapid closing of a valve can cause a hydraulic ramming of the pipe referred to as water or steam hammer. This results from a sudden rush of fluid against a stationary object. An audible manifestation of this can be a knocking noise that reverberates throughout the entire building. Damage to strainers, coils, pipe connections, supports and steam traps can also result from water or steam hammer.

The designer of mechanical equipment attempts to use a consistent flow of fluid at the correct pressure drops to minimize noise and damage. A valve for a coil on an airhandler or converter is frequently specified as stem-down-to-close or stem-down-to-open to meet the designer's requirements. While it is feasible to match the same control output with a different valve and actuator assembly there can be unintended results if the position of the stem is not kept in mind. Honeywell produces valves in virtually any configuration required for commercial applications. It is important for the person selecting retrofit valves to ensure consistency with the previously installed equipment.

NORMALLY OPEN AND NORMALLY CLOSED VALVE ASSEMBLIES

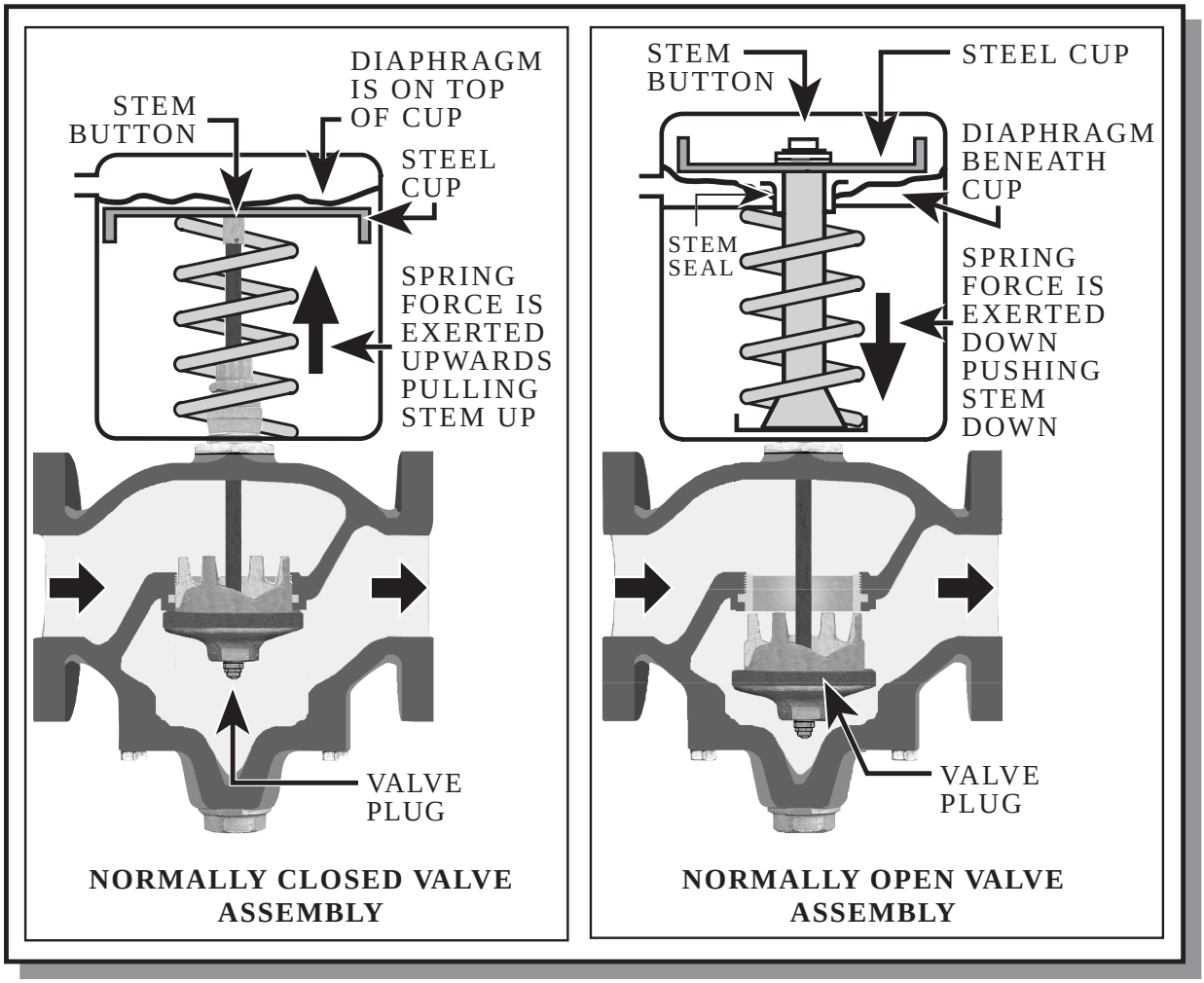


Normally open and normally closed are terms that refer to the position of an actuator and valve or actuator and damper assembly when the power is removed. Coils are prevented from freezing in an airhandler if the coil has full flow through it during the off cycle. Similarly a reheat coil on a variable air volume box does not require freeze prevention and the actuator should be closed if there is no airflow to prevent tripping plenum heat detectors.

A valve by itself is seldom normally open or normally closed. It is the actuator and valve assembly that provides this functionality. Illustrated above is the same stem-down-to-close valve with two different actuators installed. One assembly will open when air pressure is removed and one will close. The use of a stem-down-to-open valve with the same two actuators illustrated above would reverse the normal positions of both valve assemblies.

Electric actuators with spring return provide similar benefits as the pneumatic. On some units the direction of actuator spring return must be matched to the type of valve to have the correct normal position on loss of power. There is also battery-powered or electric return available for some non-spring return valve actuators. These are generally higher torque than spring return. The battery is recharged during the on cycle.

VALVE ASSEMBLIES AND CLOSE-OFF RATINGS



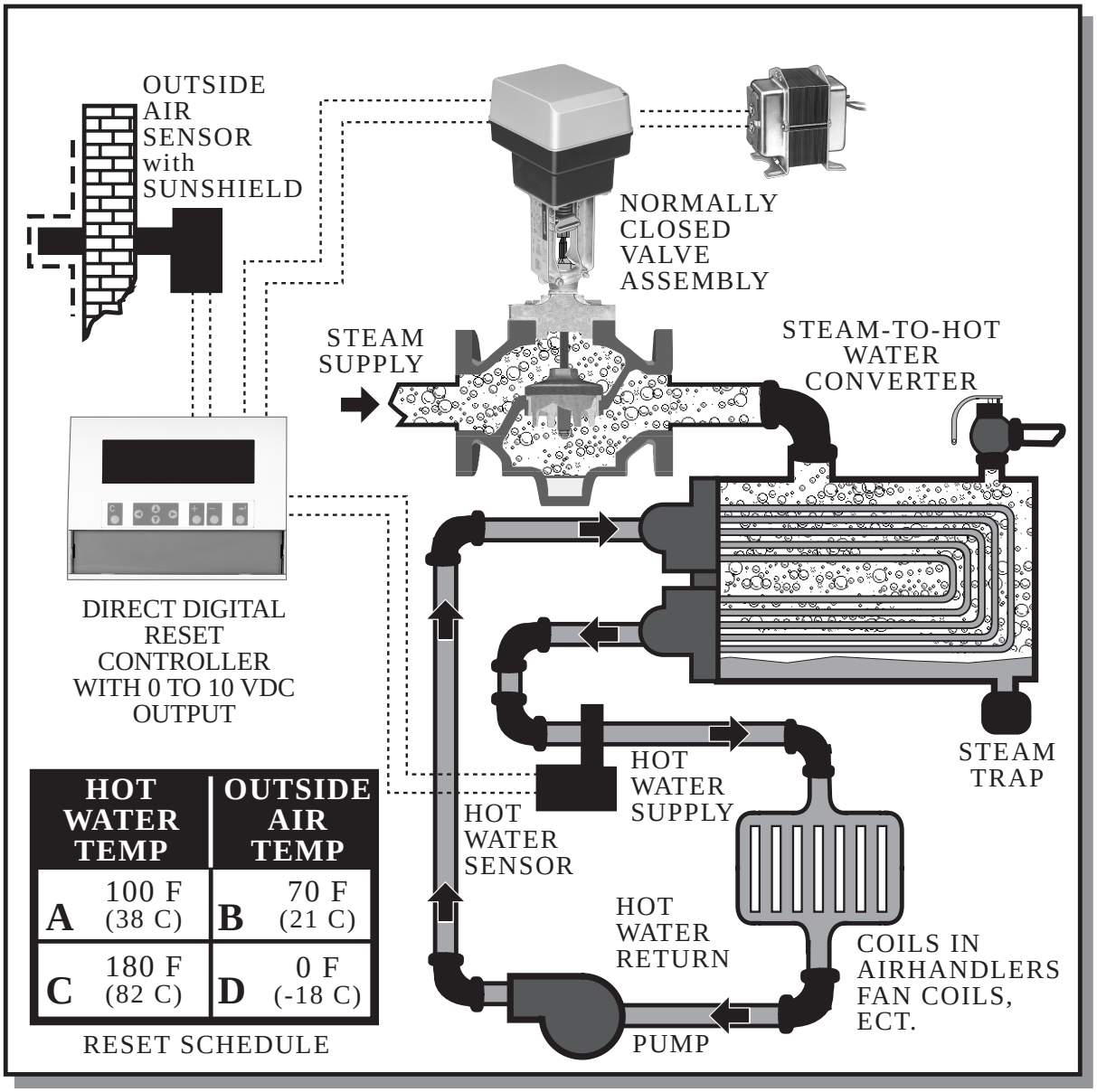
These are the same two actuators as on the previous page. The valve however is stem-down-to-open which reverses the normal position of the two assemblies.

Generally the close-off rating will be higher on the assemblies using the stem-down-to-close valves on the previous page. Of those two the normally open unit would be rated higher than the normally closed.

The difference in close-off is due to the force of the water or steam flow pushing the plug off the seat on both of the assemblies on this page. The force of the water flow has the opposite effect on the valves with stem-down-to-close.

Additionally the valves with the force of the actuator closing the valve will have a higher close-off rating than the ones closed with the spring. This would be the normally open units on both pages. This is due to the requirement of most actuators that the force of the actuator has to overcome that of the spring to be able to provide modulation. This does not apply to some of the newer electric actuators since the spring return is fully wound and locked during modulation and is not opposed by the motor.

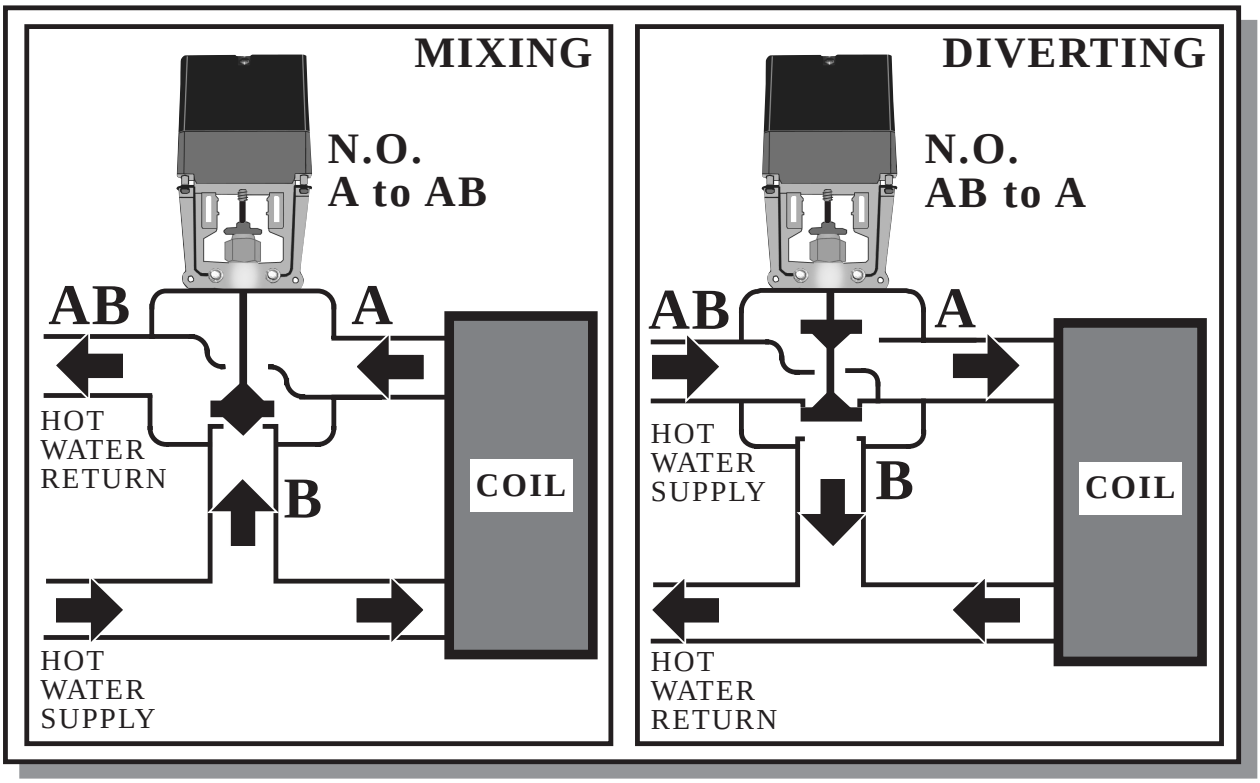
STEAM-TO-HOT WATER CONVERTER



Most modern buildings are heated with hot water boilers. Facilities constructed prior to 1940 were probably heated with steam. Additions to these buildings are typically hot water heat due to its controllability, safety and maintenenace benefits. The use of a steam-to-hot-water converter permits retaining the steam boiler while heating new areas of the building with hot water. Other facilities such as hospitals and industrial facilities often require the availability of steam for humidification and other applications.

The valve on a converter is typically normally closed to prevent boiling of the water when the pump is turned off. A linear plug should be used on the valve to prevent excessive cycling. Except for the valve the control devices are identical to those for hot water reset with a three-way mixing valve.

THREE-WAY VALVES



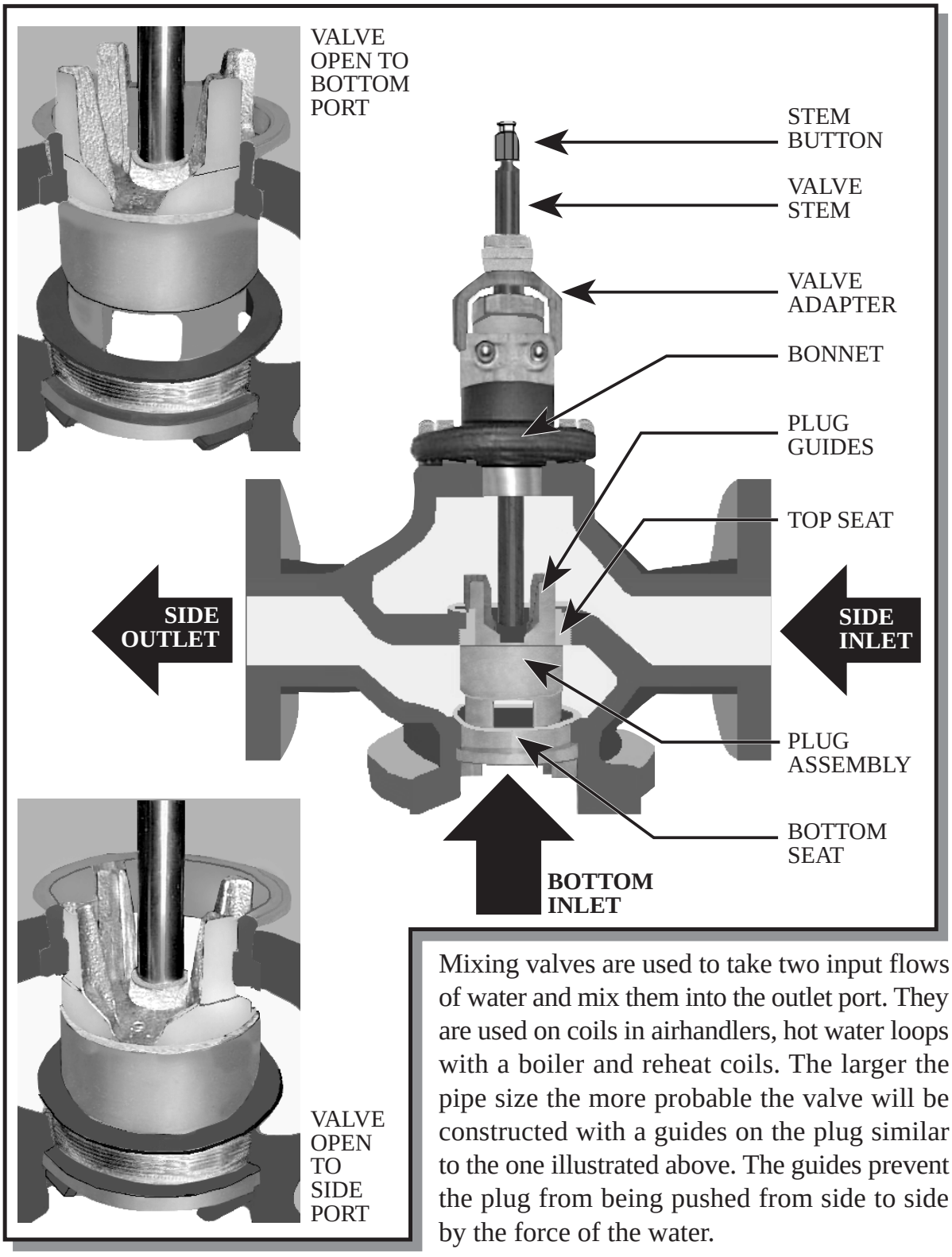
Three-way valves are primarily used for water applications and infrequently to switch compressed air. It is typically open to one port or the other. There are smaller three-way valves which sequence ports and can be closed or open to both ports simultaneously. Most of the larger valves though, are of the type illustrated here and would be labelled "Normally Open A to AB", or "Normally Open AB to B."

A diverting valve is also a three-way valve. Typically used to bypass a coil and/or reduce water pressure in a hydronic loop. They are frequently applied on a cooling tower to either send water to the cooling tower or to the bypass line.

There is constant flow in gallons per minute (liters per second) through three-way valves. This facilitates the design of the piping equipment for a building since the pump pressures and the loop pressure drops will remain virtually constant. The cost of pumping the water throughout the building remains constant also.

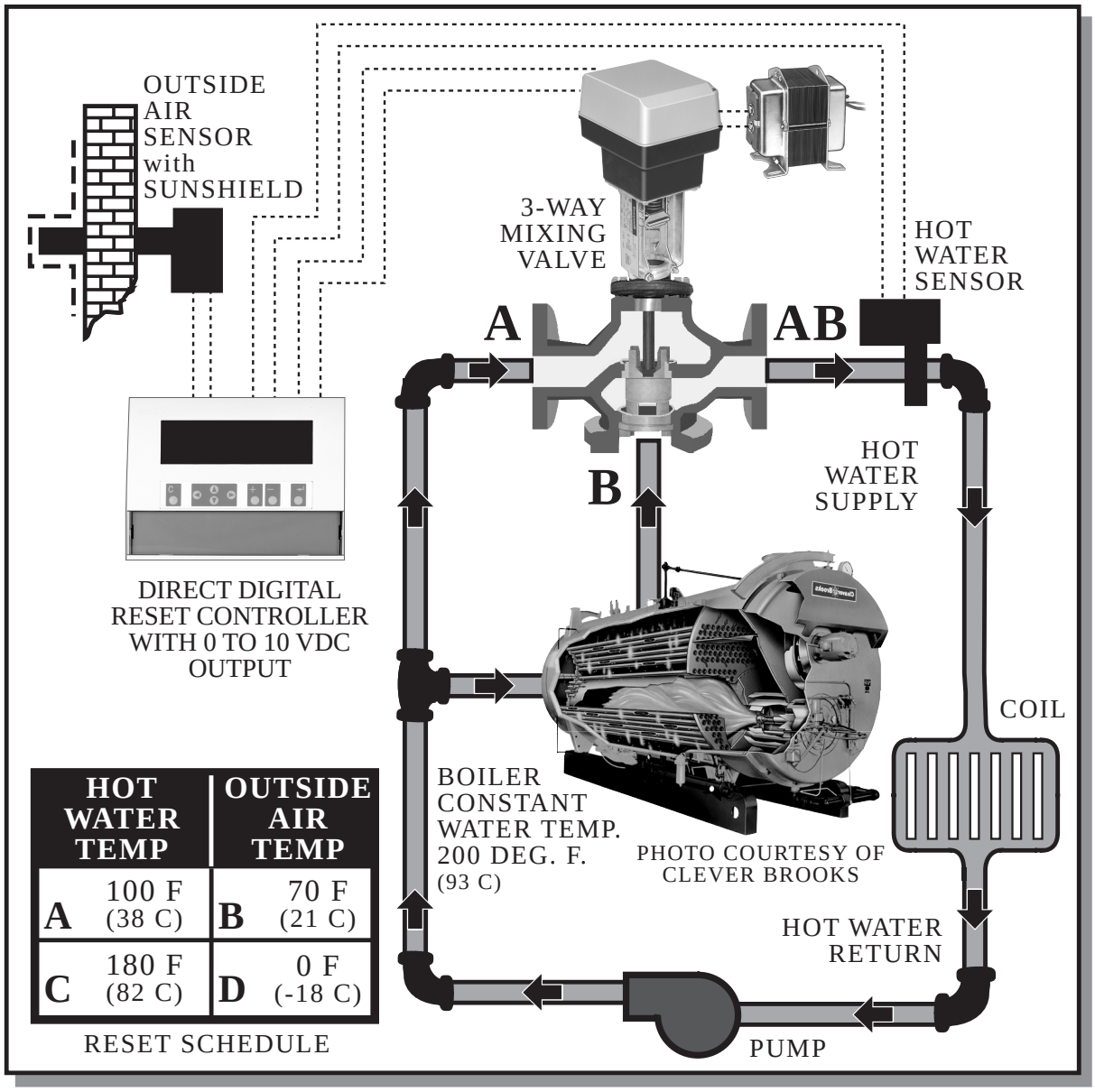
Using a two-way valve on a coil causes the loop pressures to change as it is closed. If a sufficient number of two-way valves in a building are simultaneously closed the pressures on the pump can become excessive. This can cause opening of safety valves and high water pressures that push valve plugs off the seats. A solution is to install pump speed controls that reduce loop pressure when needed. Since this results in a reduction in pumping costs it is frequently being used in modern buildings and three-way valves are being used less often.

THREE-WAY MIXING VALVE COMPONENTS



Mixing valves are used to take two input flows of water and mix them into the outlet port. They are used on coils in airhandlers, hot water loops with a boiler and reheat coils. The larger the pipe size the more probable the valve will be constructed with a guides on the plug similar to the one illustrated above. The guides prevent the plug from being pushed from side to side by the force of the water.

THREE-WAY MIXING HOT WATER RESET APPLICATION



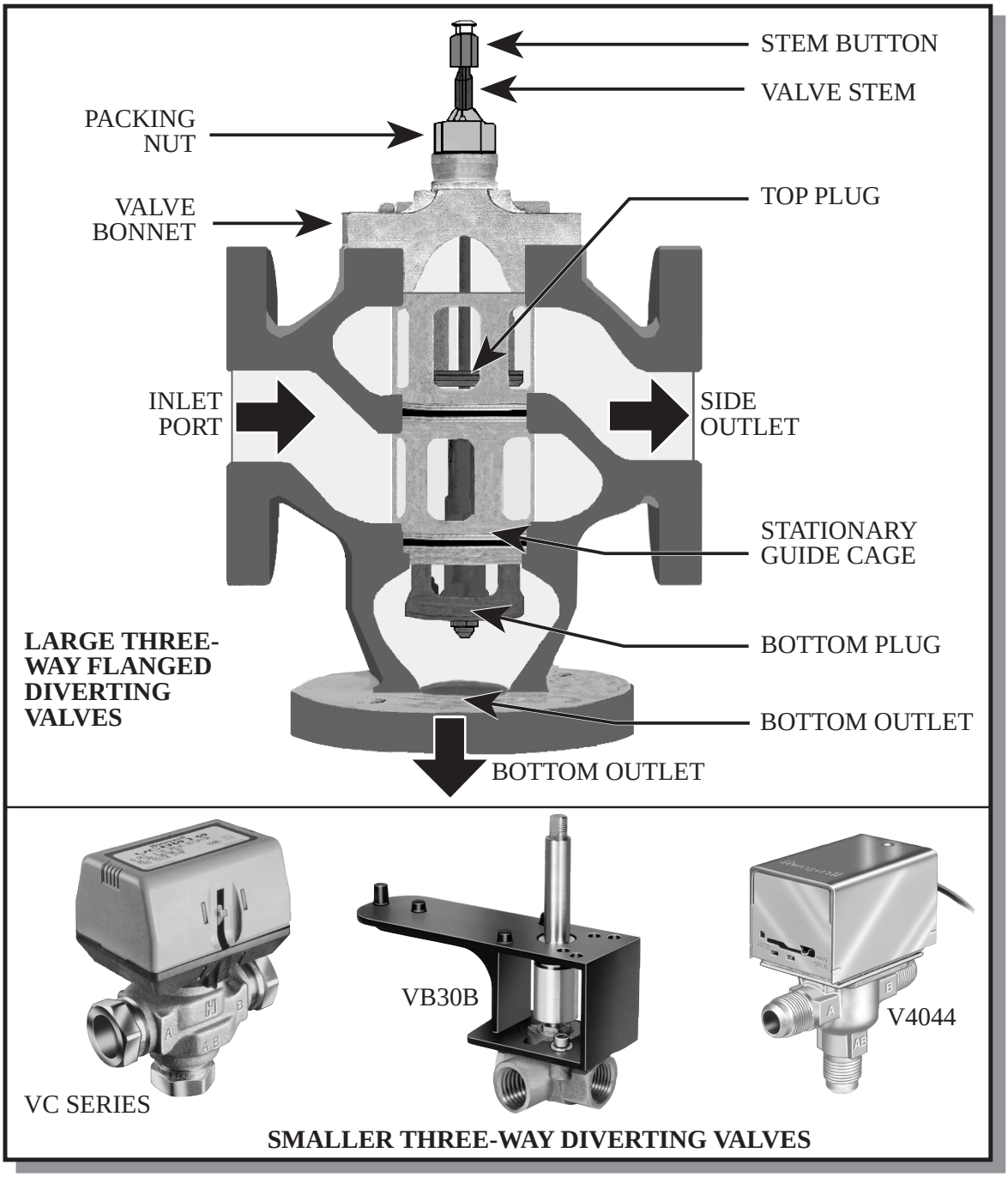
	HOT WATER TEMP		OUTSIDE AIR TEMP
A	100 F (38 C)	B	70 F (21 C)
C	180 F (82 C)	D	0 F (-18 C)

RESET SCHEDULE

The water used to heat a building is typically supplied from either a boiler or a steam-to-hot water converter. The building illustrated here is heated from a boiler. The temperature of the water should be varied inversely with the outdoor air temperature. This is referred to as hot water reset and it reduces overheating during moderate weather. The required temperatures are listed in the reset schedule.

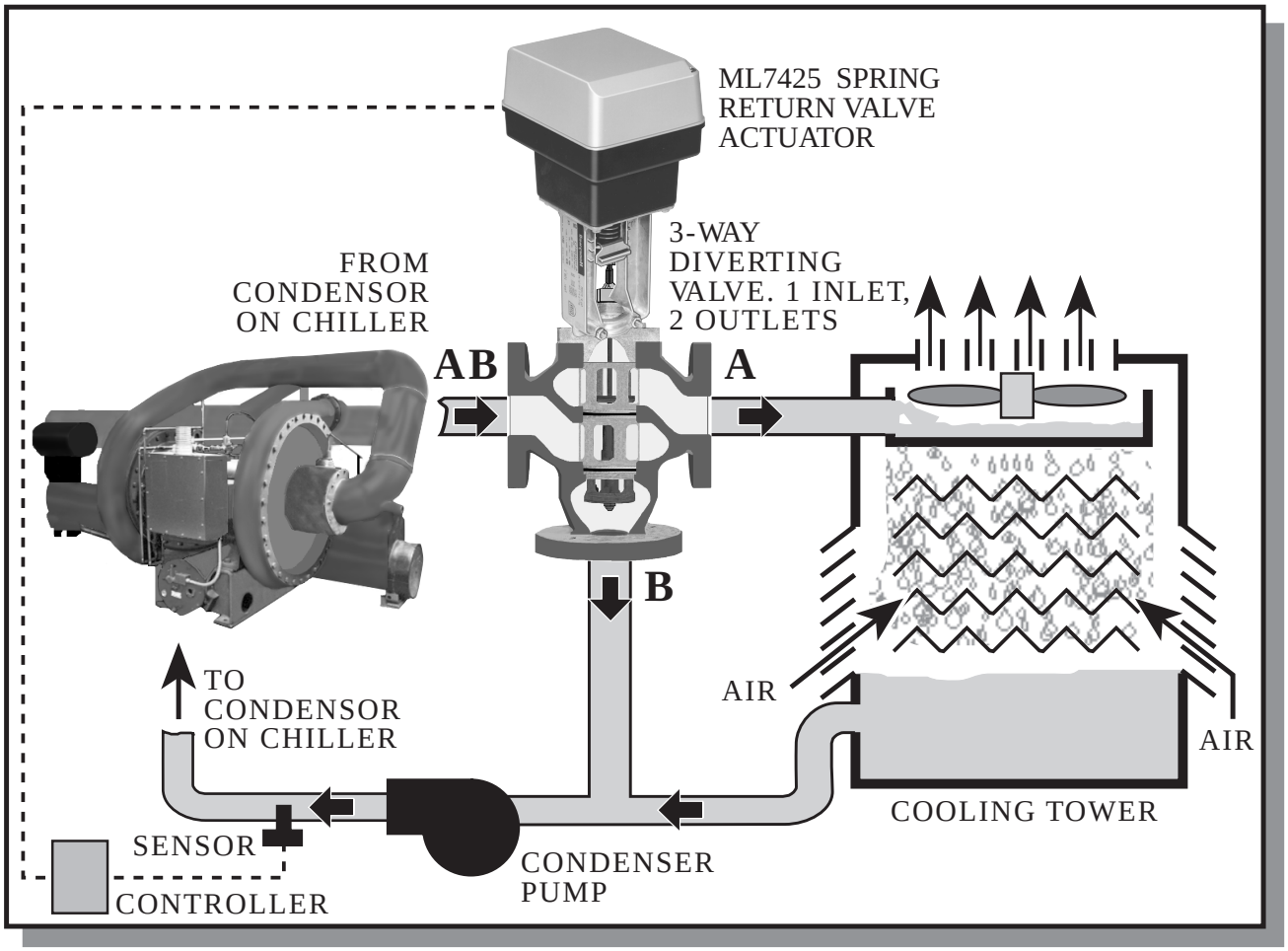
Most boilers though should have a constant temperature water within them to prevent thermal stratification and warping of the metal. A three-way mixing valve can be used to vary the loop temperature while keeping the boiler temperature constant. The valve can also be used during a cold start to prevent potentially damaging large flows of cold return water through the boiler.

DIVERTING VALVE COMPONENTS



Diverting valves are used to take a single input flow of water and divert it to either of two ports. Some of the smaller valves can be piped backward to become a mixing valve. The larger valve illustrated above though cannot be piped backwards without incurring damage or water hammer. This is because of the complexity of the cage that contains the plugs. The opposing plugs provide counter-balancing pressures on the valve stem which substantially reduces slamming of the disk against the seat at low flow rates.

COOLING TOWER APPLICATION OF DIVERTING VALVE

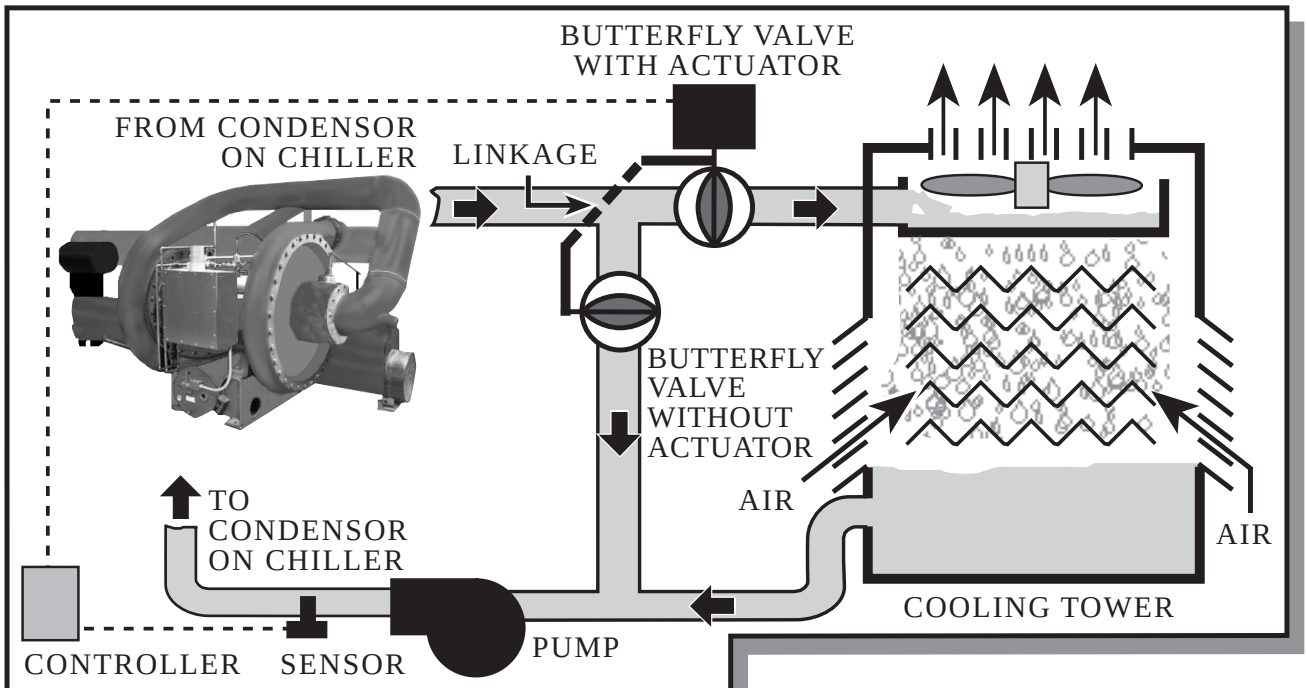


Chillers are used to generate chilled water to cool a building. While some of these are paired with air cooled condensors most of the larger units are connected to cooling towers. Cooling towers are used to dissipate the heat taken from inside of the building to the outdoors. A valve is generally required to control the temperature of the condensor water being returned to the chiller.

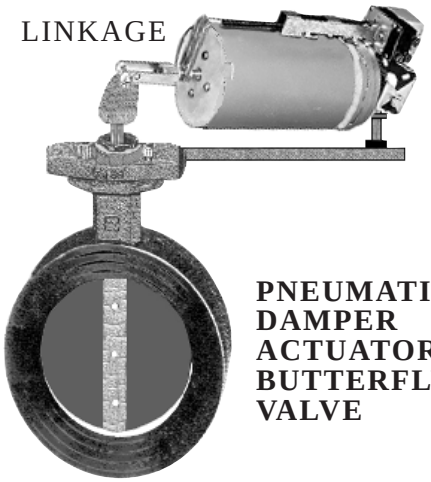
A sensor is installed on the return condensor water line and it is used with the controller to modulate the three way diverting valve. If the condensor water is below 70 Deg. F. (21 C) the valve is opened AB to B and it is sent back to the chiller without being cooled in the tower. This is done to prevent oil and refrigeration migration within the chiller. As the chiller capacity is increased and the condensor water temperature increases above 70 Deg. F. (21 C) the diverting valve is modulated towards opening AB to A.

A separate control loop is used to modulate the amount of cooling done within the cooling tower. The water is controlled to a typical setpoint of 75 Deg. F. (24 C) by turning the tower fans on and off, controlling the fan speed or modulating dampers on the sides.

BUTTERFLY VALVES



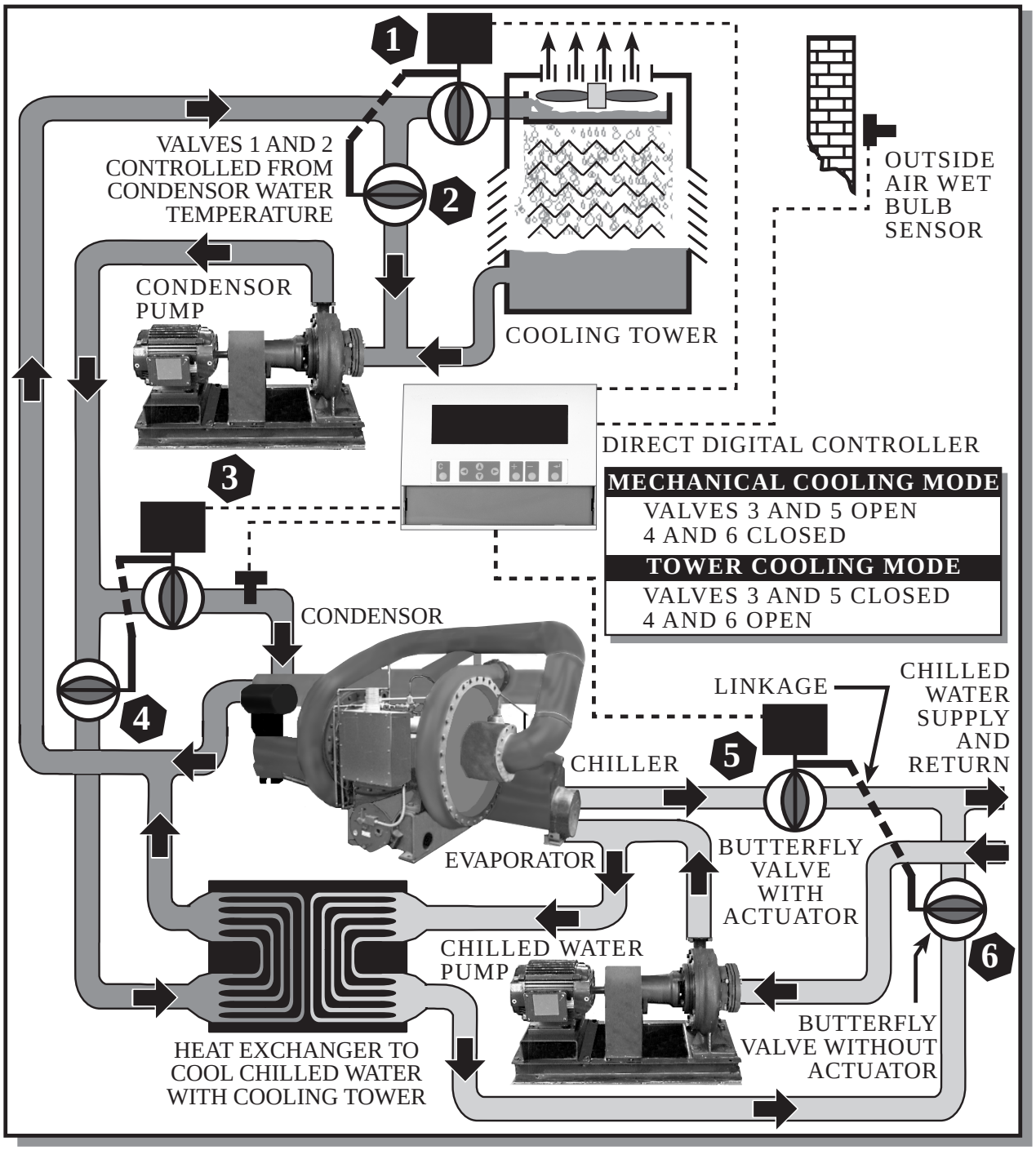
Few mixing or diverting three-way valves are available commercially in larger pipe sizes. To provide two-position or modulation control two butterfly valves can be used. In this illustration there is only one actuator and the second valve is controlled with a linkage connected to the first. Two actuators without connecting linkage can also be used if the actuators can be made to modulate in unison.



PNEUMATIC DAMPER ACTUATOR ON BUTTERFLY VALVE

Butterfly valves are applied on gases and liquids. They are used in conjunction with safety shut-off valves on natural gas burners to modulate the capacity of the boiler. Generally this type of valve does not provide a tight close-off unless the valve body is constructed with special seals. They are used commercially primarily on larger pipe sizes to provide modulation or two-position control of water. The type of actuator varies with the torque requirements. Multiple damper actuators can used on a single larger valve. Standard electric or pneumatic actuators are available for smaller valve sizes.

BUTTERFLY VALVES ON A TOWER COOLING APPLICATION



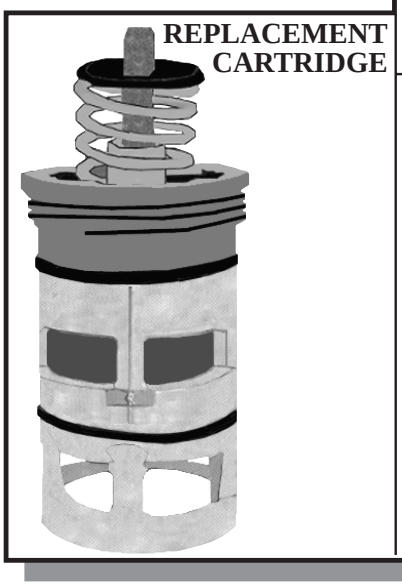
Heat exchangers can be used to cool a building using only the cooling tower. If the outside air humidity is sufficiently low the chiller can be turned off and just the tower fans and pumps energized. There is a substantial amount of rerouting of water flow required on typically larger pipe sizes so butterfly valves are frequently used. All of them illustrated on this page are configured as three-way diverting valves. The control sequence is frequently complex due to the requirement of measuring outdoor humidity so typically direct digital controls will be used for this control loop.

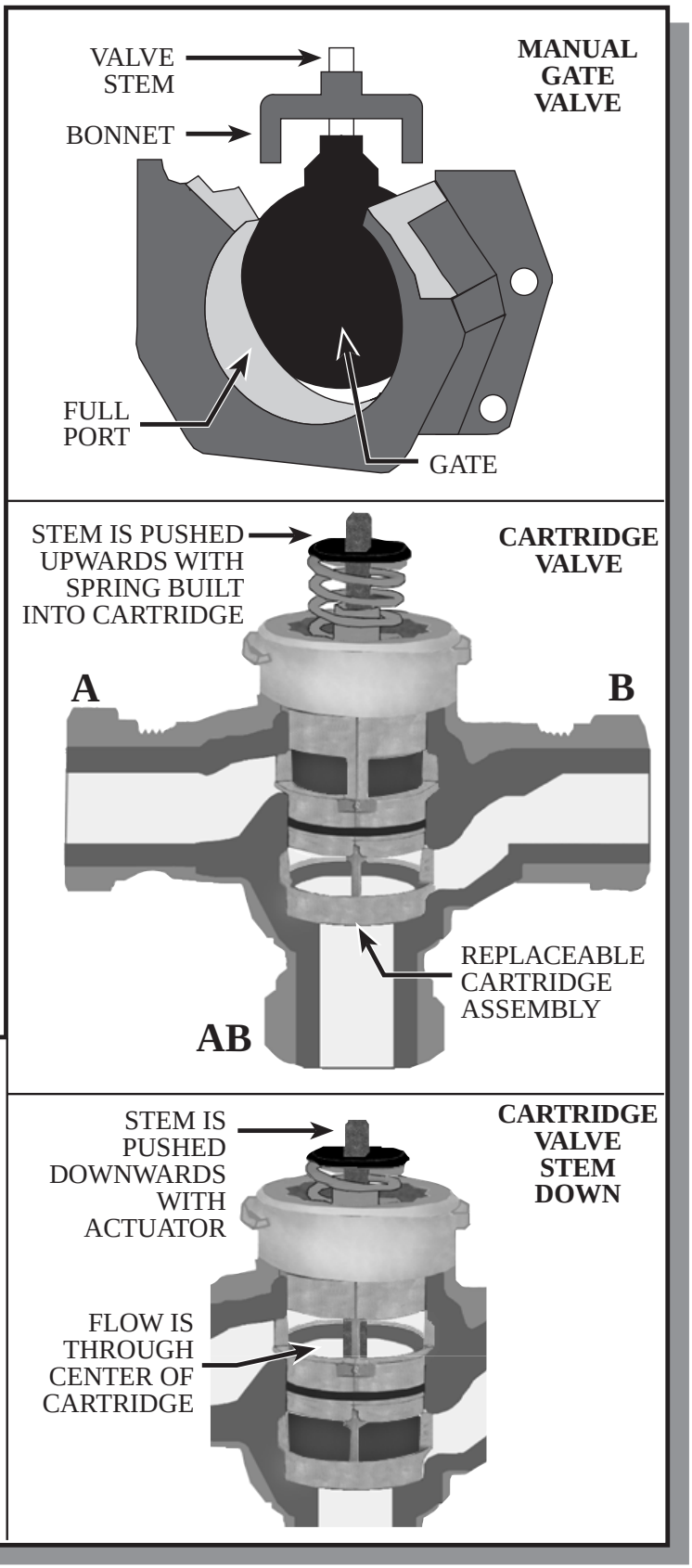
GATE AND CARTRIDGE TYPE VALVES

Gate valves are widely used for manual shut-off on larger pipe size applications and for modulation of smaller water volumes. The close-off rating is very high so this makes them useful for stopping all flow to service mechanical equipment.

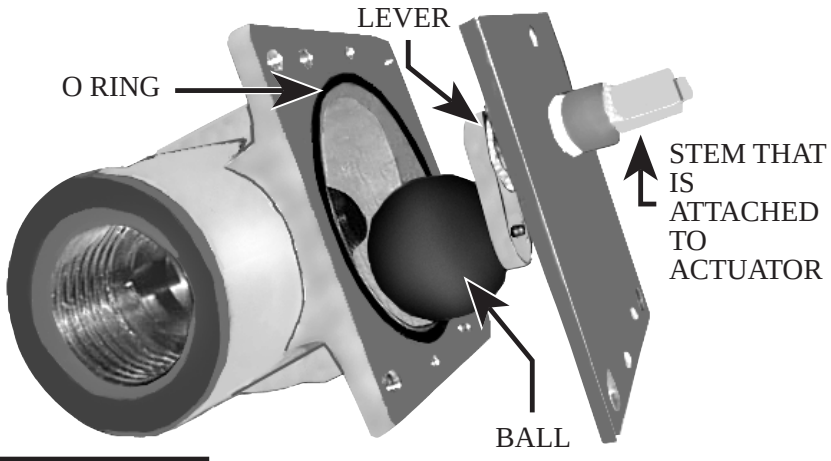
A form of the gate valve used for temperature control is this cartridge valve. They are available as two- or three-way valves. The three-way valve illustrated can be piped with port AB as an inlet or outlet to make it either a diverting or mixing valve. The actuator is either two-position or floating series 60.

The replaceable cartridge includes all of the components necessary to rebuild the valve.

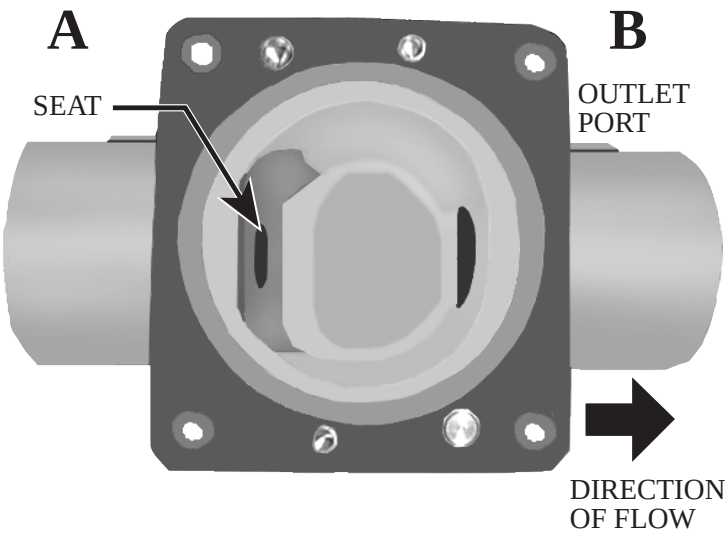


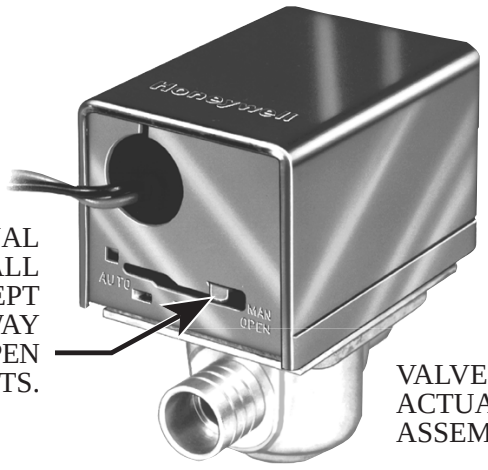


V4043, V4044, V8043, V8044 TWO-POSITION VALVES

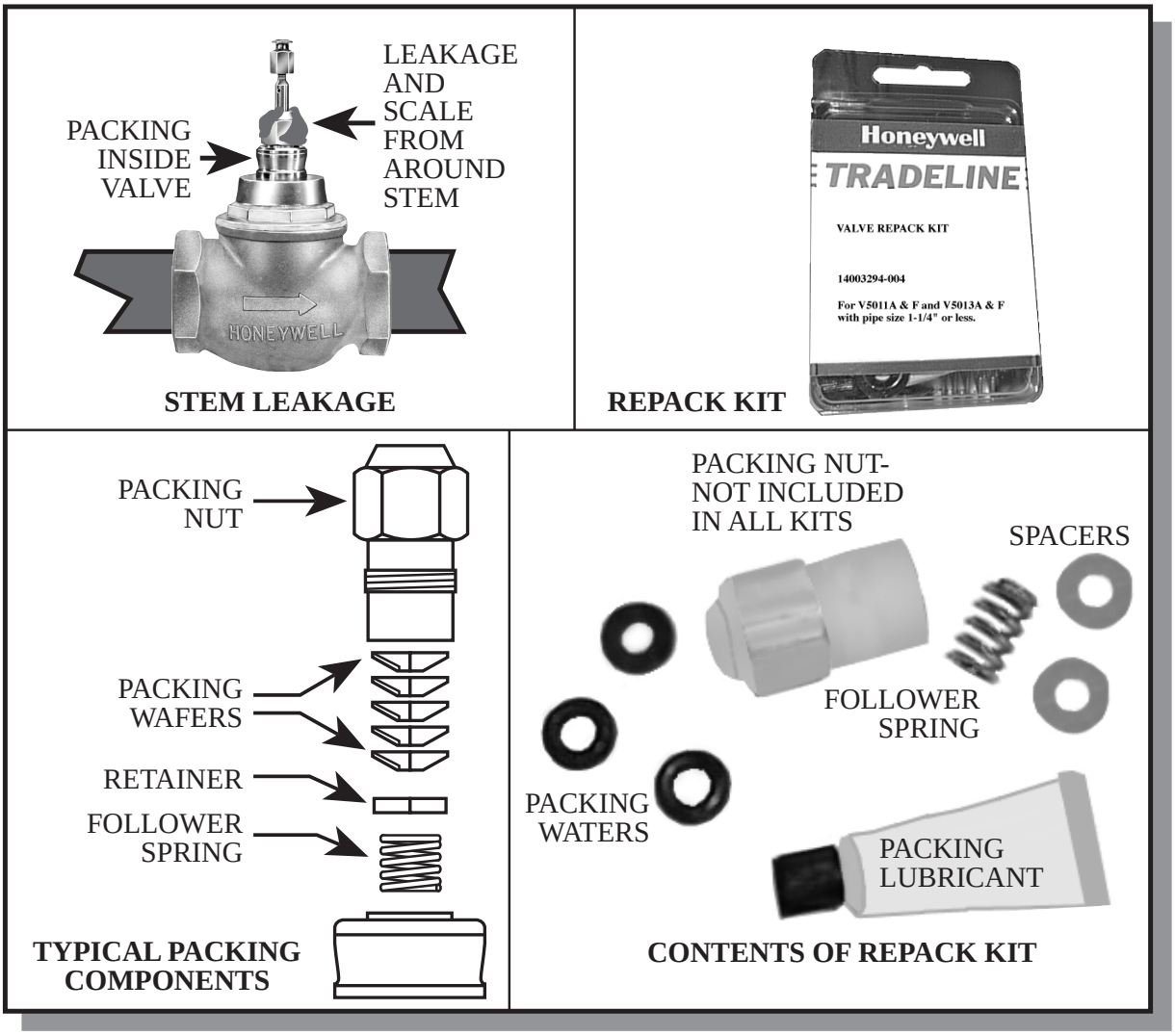


The V4043, V4044, V8043 and V8044 are two-position control valves used for hot water and steam. They are available threaded, soldered or flared. Except for the straight through normally open valves all are equipped with a manual opener to provide flow in the event of a power failure. For hydronic loops that are both hot and chilled water some of these valves are available with integral changeover aquastats® which automatically reverse the opening of the valve depending on the temperature of the water in the line. Some valves are equipped with auxiliary switches to control equipment such as a pump.





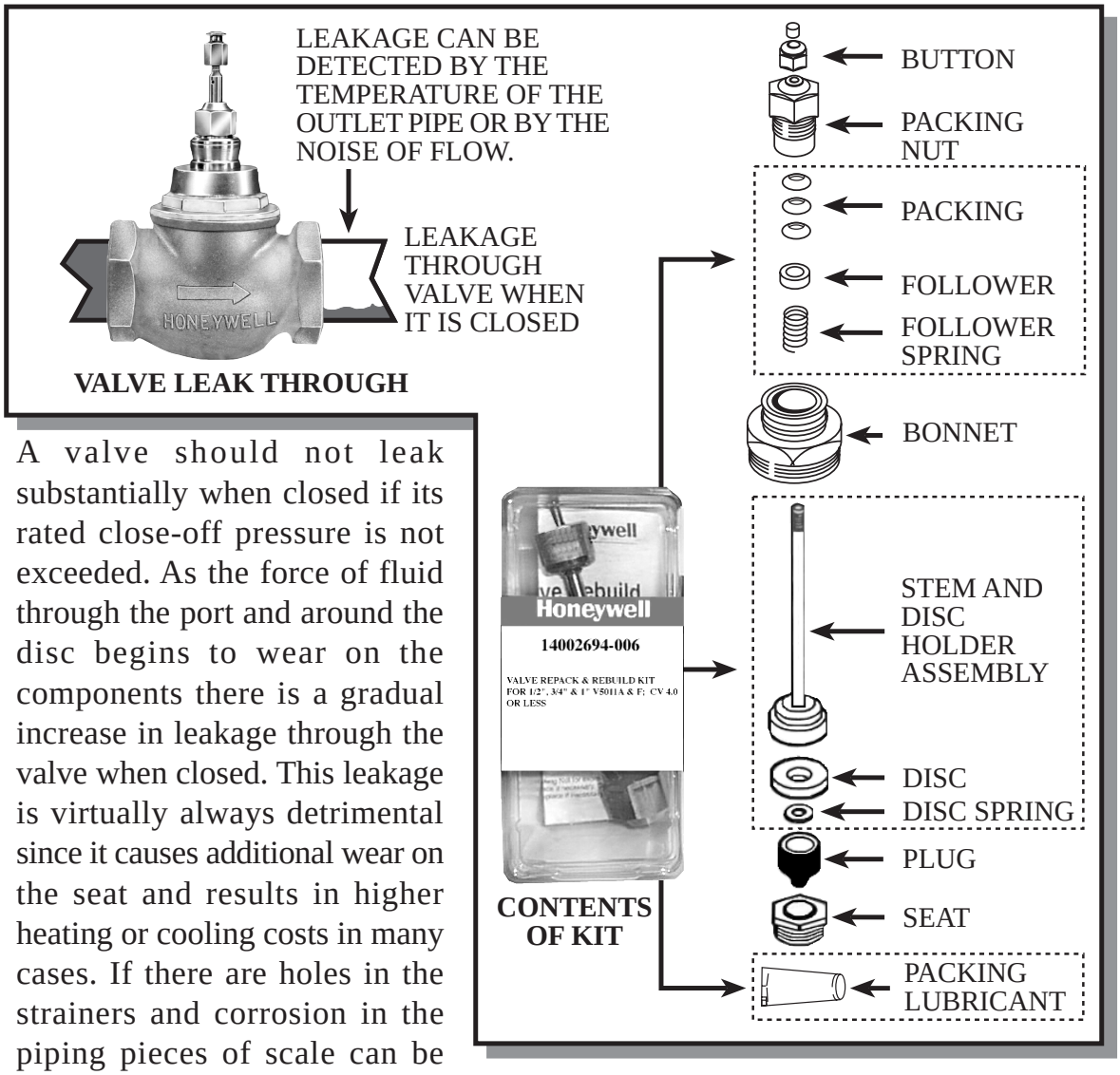
VALVE REPACKING



There are two primary types of valve servicing procedures: repack and rebuild. A rebuild is a more complete procedure and includes the entire repack procedure. Repacking is done more frequently and done equally as often on steam and hot water. Rebuild is done more frequently on steam valves.

The need for repacking is readily apparent due to leakage of water or steam from around the valve stem. As the water evaporates scale is typically left behind. The actuator and stem button must be removed first. Then the packing nut is removed and the packing wafers are taken out.

In the repack kit there is a diagram with the correct number and location of the components. There are many variations. Some wafers are installed with the open side up and others with the open side down. The number of wafers varies from valve to valve. Spacers are required on some units. There are some valves for which the packing is encased pre-assembled in a steel cup.



A valve should not leak substantially when closed if its rated close-off pressure is not exceeded. As the force of fluid through the port and around the disc begins to wear on the components there is a gradual increase in leakage through the valve when closed. This leakage is virtually always detrimental since it causes additional wear on the seat and results in higher heating or cooling costs in many cases. If there are holes in the strainers and corrosion in the piping pieces of scale can be deposited on the seat causing additional leakage. In the early days of control maintenance valve seats were cleaned or ground to eliminate the effects of wear.

Today on most valves the seat is replaced instead. It is typically removed with a standard deep six point socket. On some valves the seat is larger in diameter than the bonnet thereby eliminating the use of a socket. For these valves there is a special wrench removal tool available from Honeywell which is inserted from the pipe opening on the side of the valve.

Not all rebuild kits include all of the components illustrated above though the devices for repacking are always included. For those valves for which it is available the seat is typically ordered separately. Most service personnel will always have a rebuild kit available prior to opening a valve for repacking in the event more repairs are needed.

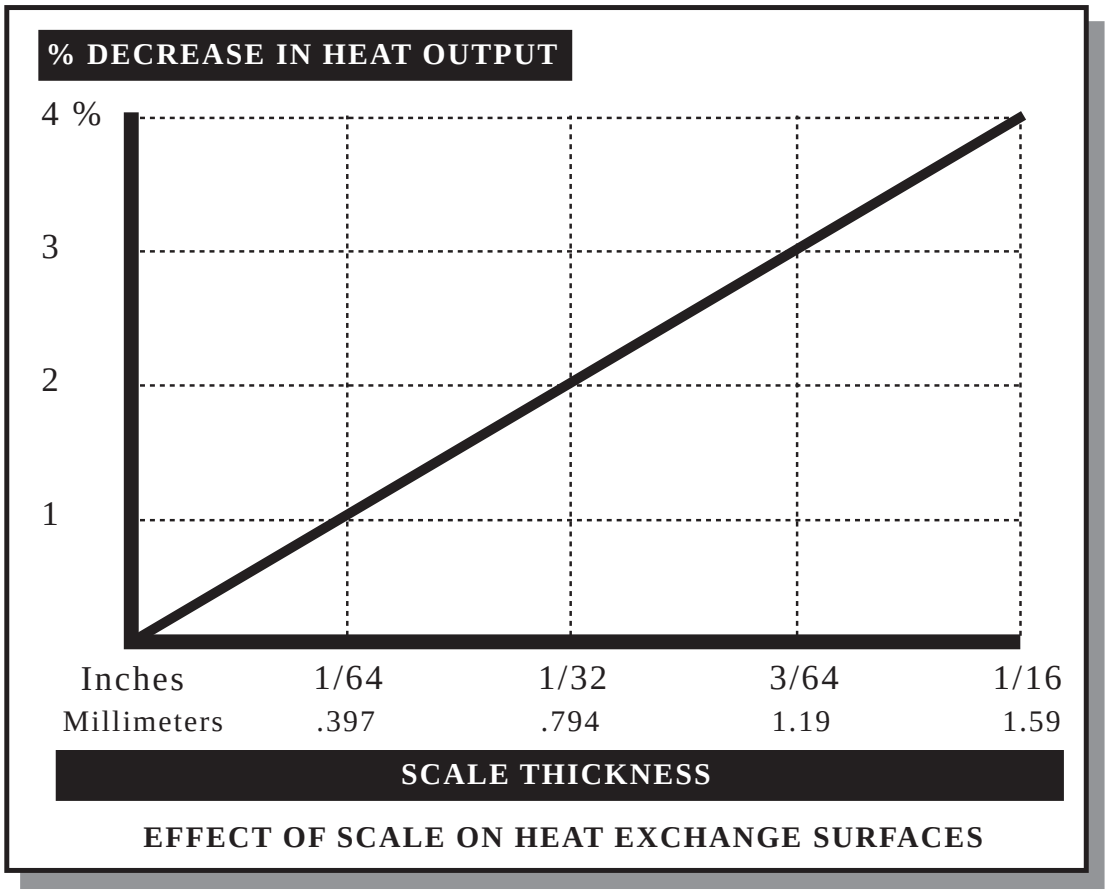
CV AND FLOW RATES THROUGH VALVE PORTS

Cv FOR WATER	Cv FOR STEAM
$Cv = \frac{Q\sqrt{G}}{h}$	$Cv = \frac{(1 + 0.00075s)Q\sqrt{V}}{63.5\sqrt{h}}$
Q = flow in GPM gallons per minute **G** = specific gravity of fluid, for water is 1.0 **h** = pressure drop in PSI, correction factors available for glycol solutions	**Q** = steam quantity in pounds per hour **V** = specific volume of steam in cubic feet per pound **h** = pressure drop in PSI **s** = superheat in Deg. F

Much of the calculations of sizing and selecting a control valve might be done by the designer of the mechanical equipment. The flow rate, normal position of the assembly or pipe size might be listed on the mechanical specifications. Other designers might leave it totally to the control company and only specify a heating or cooling output given in BTUH or KWH. Honeywell provides information on valve sizing in the Engineering Manual of Automatic Control for Commercial Buildings. An automated method is also available as software for desktop personal computers, Valve Sizing and Selection Software form number 63-8558.

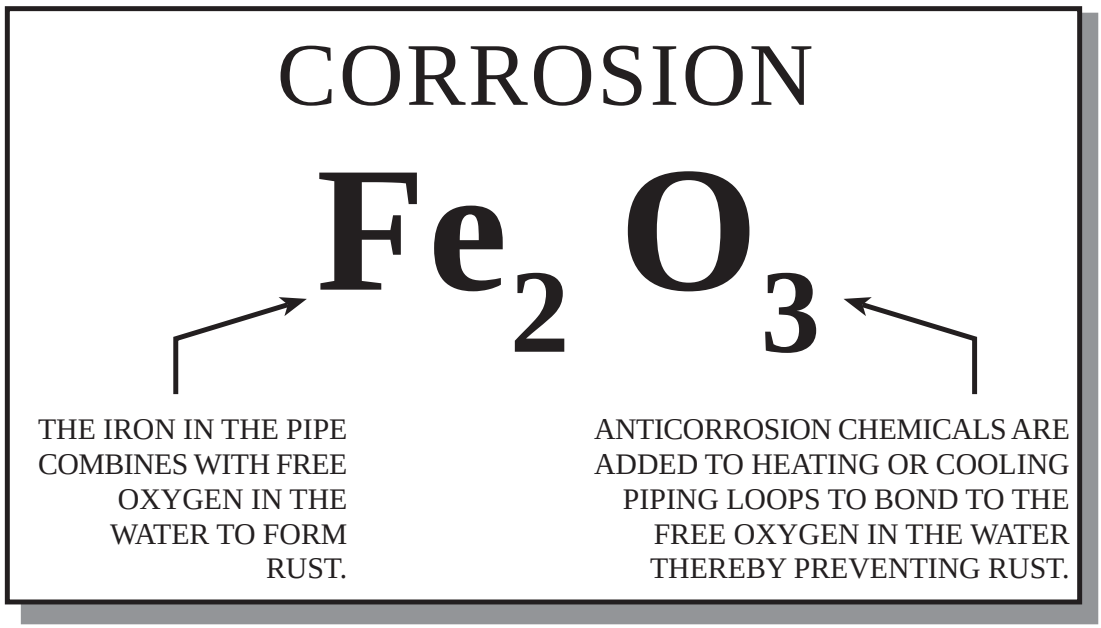
Regardless of the method used there are certain principles applicable to valve sizing. First, the pipe size is seldom an indication of the required flow through the valve. Heating or cooling coils that vary in size by 200% might all be connected to the same diameter pipe. Secondly, a valve that is a certain pipe size is typically available with many different flow capacities or Cv's. Selecting the highest Cv will result in oversized valves in most applications. An oversized control valve frequently will result in inadequate modulation and accelerated valve component wear. This is due to forcing the valve plug and disk into a minimum flow position, perhaps 10 or 20% of rated flow, for excessive lengths of time to compensate for the oversized port. A correctly sized valve would be at the low flow position only during moderate weather. Consistently forcing a plug to a near closed position increases the probability of seat erosion due to the increased fluid velocity. This is referred to as wire drawing of a valve seat and is common on steam valves.

The preferred solution is to select and size control valves based on the required flow or Cv. A Cv of 1.0 is equal to one gallon per minute with a one PSI pressure drop through the valve. The metric equivalent is Kv represented by the formula Kv = 0.865 Cv. A valve with a Cv of 10 is ten times larger in capacity than that of a valve with a Cv of 1. Cv for steam is based on steam quantity in pounds (kg) per hour, specific volume and superheat of steam.



EFFECT OF SCALE ON HEAT EXCHANGE SURFACES

Selecting the correct Cv or port size for a control valve is only one component of a correctly functioning installation. Whether new construction or retrofit the installation of a control valve effects the fluid flow throughout the piping loop. All of the cutting oils, greases and chemical compounds should be removed after making any modification to a heating or cooling loop. This is done by adding a cleaning compound to the lines and circulating the mixture, sometimes with the boiler at maximum heat, for a certain length of time. The loop is drained, refilled and drained again. If the water appears clear then it is refilled and all air is removed. Anticorrosion chemicals should be added at the correct concentration at this time. Omitting the cleaning of the lines or the addition of anticorrosion chemicals can coat the inside of the pipes, strainers and coils with a layer of insulation in the form of a greasy slime or corrosion. Studies indicate a coating as thin as 1/8 inch (.3 cm) can reduce output of some coils by 10 to 20%. Many a control valve or coil has been needlessly replaced when the actual cause of insufficient heating or cooling output was the reduction of heat exchange efficiency due to inadequately cleaned or maintained piping.



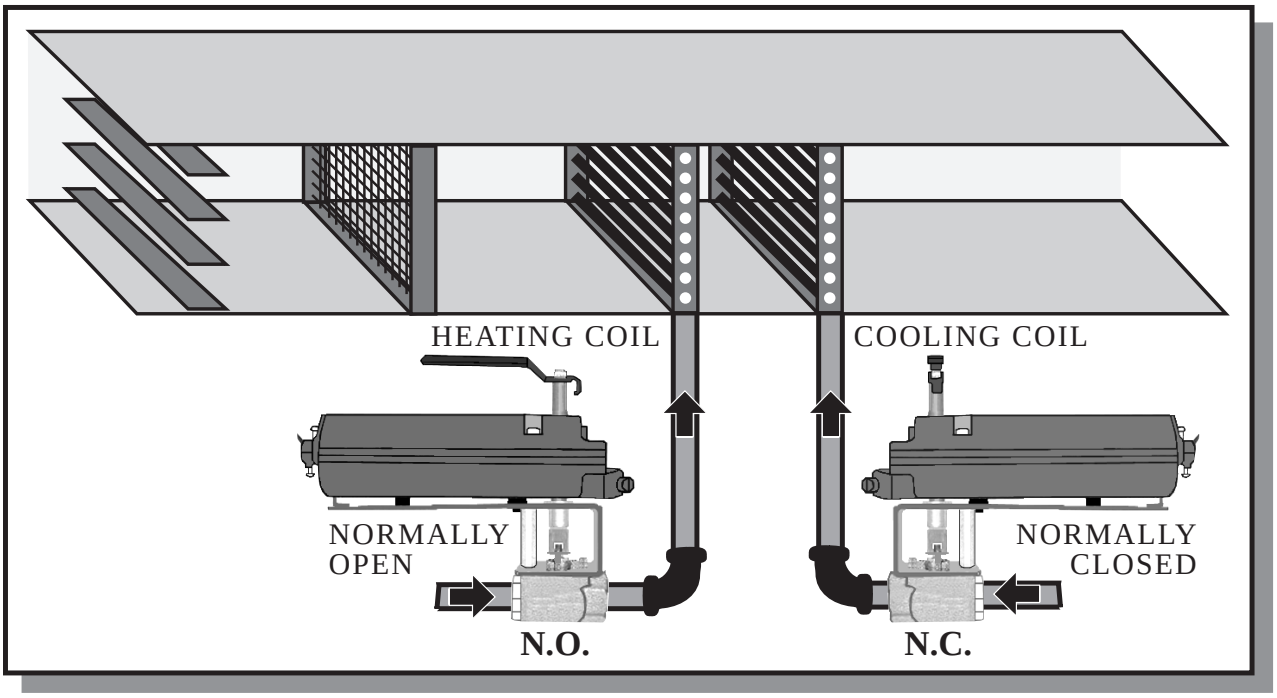
The flow rate in gpm, pressure drop and normal position of the valve assembly are typically specified by the mechanical designer. Every length of pipe, manual or balancing valve, automatic valve, coil and pump connection is taken into account to design the piping loop and calculate the pressure drops. A factor is added to the calculations to account for unknown installation requirements and the gradual degradation of the piping over years of usage since most heating and cooling equipment is rated for 40 years.

Since the combination of oxygen and water is one of the most corrosive substances on earth many buildings can be subjected to flow degradation in excess of acceptable limits in a few years. This changes the velocity of the water flow through the pipes. It can be compared to a river when the width is narrowed and the velocity of the water is increased. If the distance between the banks is widened the velocity slows. Obstructions in the piping due to slime, corrosion, scale or broken components can narrow the pipe diameter raising the velocity. The result is noise, vibration, water hammer, valve damage and decreased controllability of fluid flows.

The solution is maintaining chemicals in the loop and having fluid flows checked on a regular basis by a professional water balance technician with records kept of all results.

Glycol usage as a freeze avoidance measure is a factor in valve maintenance. Concentration and corrosion inhibitor levels must be checked on a regular basis. Excess glycol levels can cause valve stem and pump seal leakage. All components of the piping must be rated for glycol.

SPRING RETURN AND NON-SPRING RETURN ACTUATORS



Most actuators can be classified by what occurs to them when power is removed. Non-spring return devices will remain at the position they were in when the electricity or air pressure is removed. Spring return actuators will automatically be driven fully to one full position or the other. This is typically done on an airhandler to open the heating coil valve and close the cooling valve whenever the fan is turned off. This prevents freezing either coil during cold weather and unnecessary cooling, dehumidification and pump horsepower during warm weather. The valve assembly is referred to as being normally open or normally closed. The normal position is that which occurs when power is removed. This is frequently denoted on mechanical or control drawings by making the abbreviation “N.O.” or “N.C.” next to the symbol for the control device.

A valve body by itself is typically not normally closed or normally open. Only the installation of a spring return actuator gives the damper or valve assembly a normal position. Smaller unitary valves with integral actuators are an exception to this.

A wound spring is the typical method of positioning an actuator when the power is removed. Generally spring return actuators are lower torque than non-spring return devices. Honeywell 50 lb-in (6 N-m) actuators are equipped with a unique circuit that winds the spring and locks it into position prior to starting the actuator. The inactive spring is fully wound and available to provide spring return at all times with no load on the actuator motor. Pneumatic actuators are virtually all spring return. They are generally of a higher torque rating than electric units. The spring return must be sufficient to close the valve against the pressure flowing inside the pipe.

TYPES OF CONTROL CIRCUITS USED WITH DIRECT COUPLED ACTUATORS

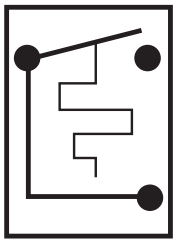
SERIES	TYPE
40	Line voltage. Two-position spring return actuator
60	SPDT controller, some floating. Reversible motors, some spring return
70	Electronic controllers and actuators
80	Low voltage. Two-position spring return actuator
90	Modulating, low voltage. Potentiometer or electronic simulation controller

Actuators should match the type of thermostat or controller from which they are controlled. Control circuits, especially direct digital, vary from product to product and from company to company. Some actuators are supplied with electrical power from a built-in transformer while others require a separate power supply. All factors must be taken into account when selecting a DCA for an application.

Honeywell has historically classified control circuits into groups and referred to them as Series 40, 60, 70, 80 and 90. Knowing the series group provides much useful information. In most Honeywell part numbers the series designation is in the first number. A ML9175 is Series 90 and therefore is 135 ohm or electronic 135 ohm simulation modulation control.

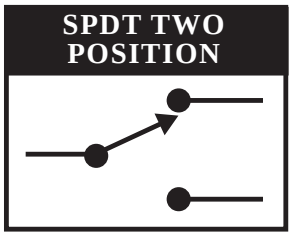
CONTROLLER TYPES

40 and 80

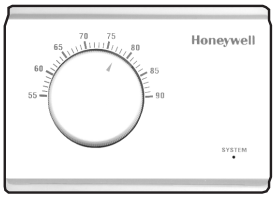


SPST TEMPERATURE CONTROLLER

60

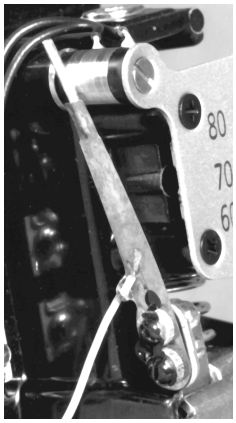


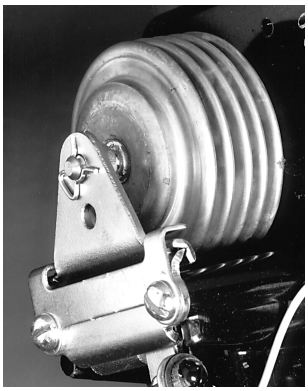
70



2 TO 10 VDC, 4 TO 20 mA OR DIRECT DIGITAL CONTROLLER

90

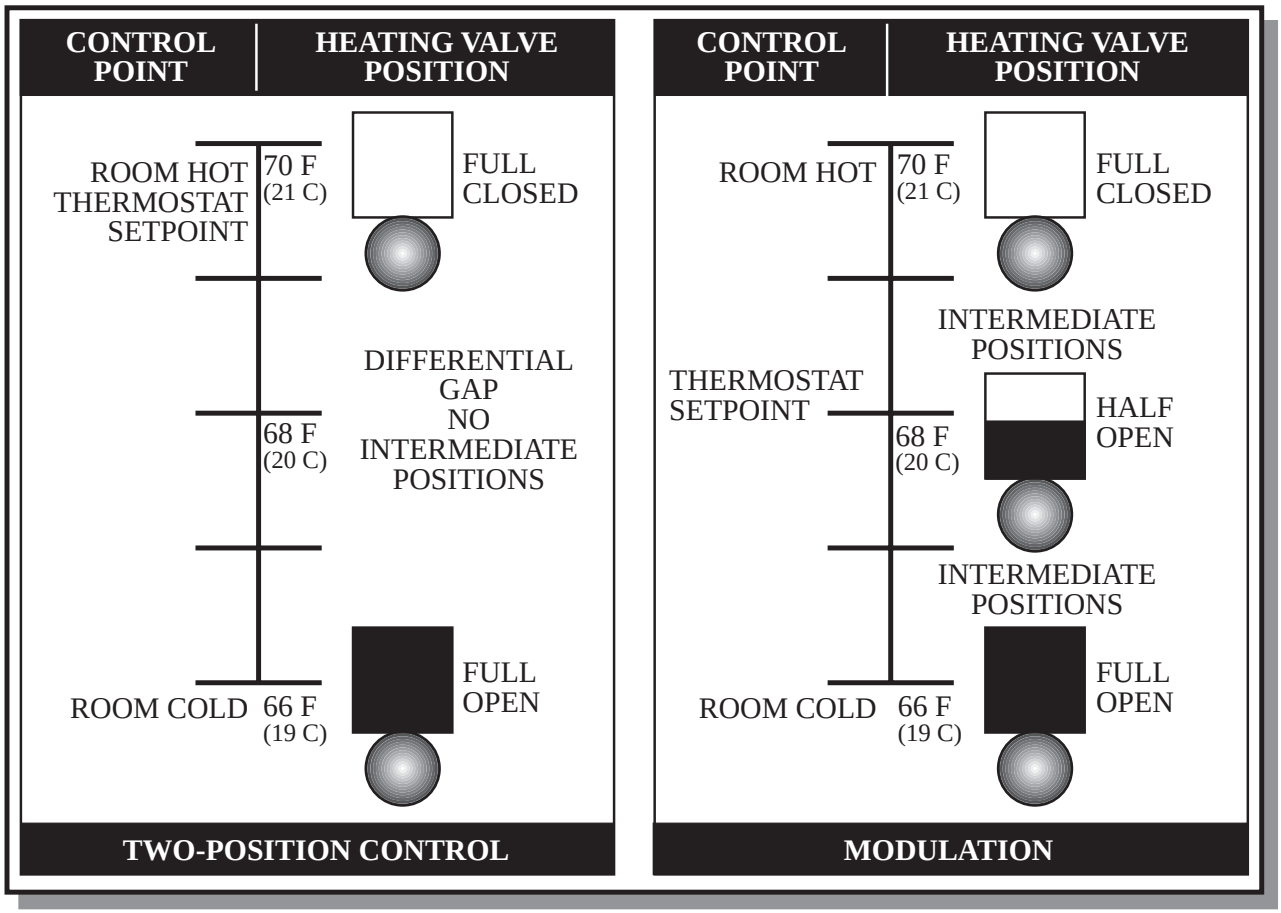




SLIDEWIRE AND BELLOWS

OR ELECTRONIC 135 OHM SIMULATION

TWO-POSITION AND MODULATION CONTROL MODES



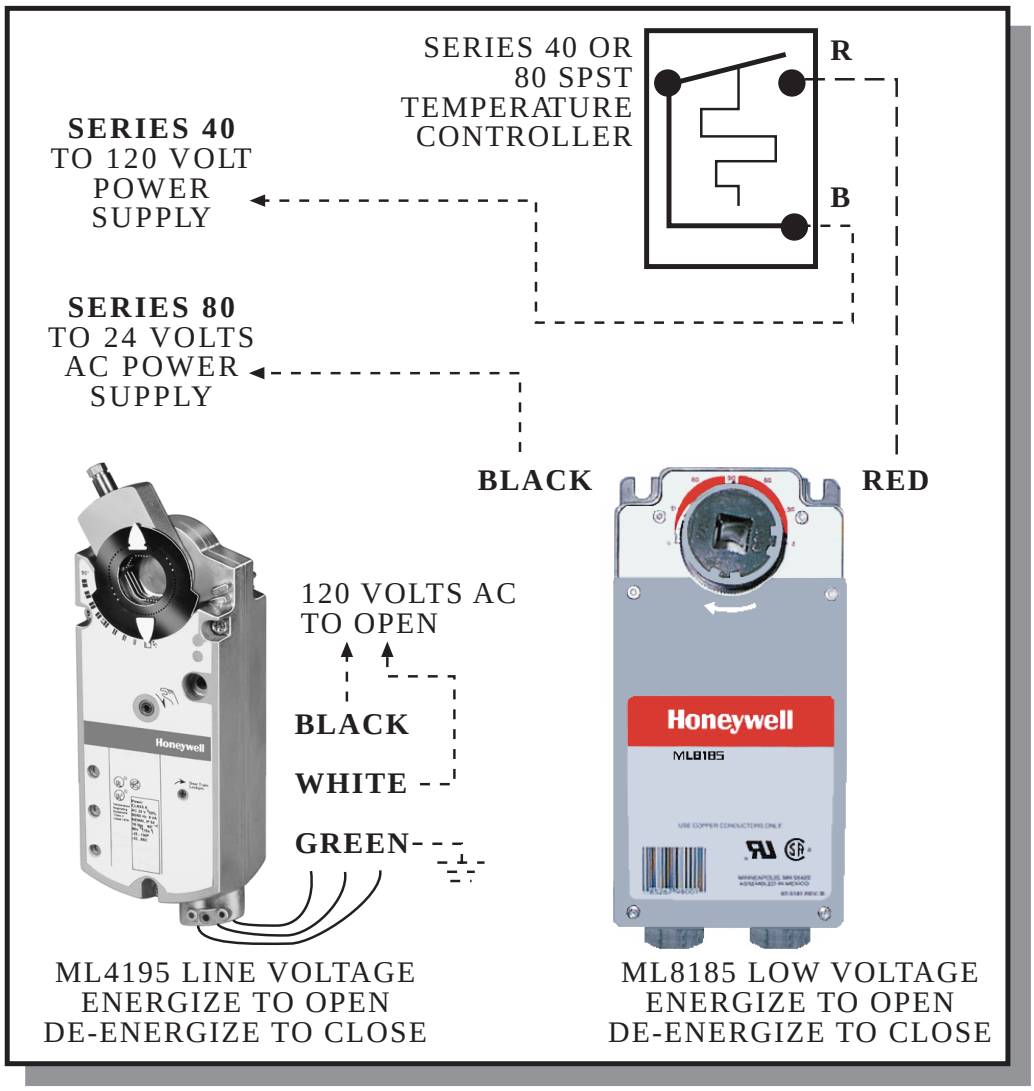
The most fundamental of control categories is 2-position or modulation. This indicates that the final control element is either full open or full closed with no intermediate positions. Most of these will use thermostats or controllers with single-pole-single-throw (SPST) or single-pole-double-throw (SPDT) switching. While this may appear to be a limited form of control it is adequate for many slow changing environments such as a room thermostat controlling a baseboard electric heater.

Series 40, 80 and sometimes Series 60 are 2-position.

Modulation, also referred to as proportional, has many more output positions for the actuator other than just open or closed. The total number of output positions is dependent upon the resolution of the control equipment. Typically the actuator is half open if the ambient temperature or humidity matches the setpoint of the controller. Modulation is preferable for most applications since it is feasible to more closely match the output of the controlled equipment with the requirements in the controlled area. This reduces cycling of the mechanical equipment while providing better temperature control.

Series 70, 90 and sometimes Series 60 are modulating.

SERIES 40 AND 80 CONTROL



Series 40 and 80 are identical except for the voltage of the control circuit. Series 40 is line, typically 120 volts AC, while Series 80 is low, typically 24 volts AC. A controller with SPST switching, similar to a light switch, is used. The actuator is energized and repositioned fully to its other position. When the ambient temperature, or control point, is attained the controller switch is opened, the actuator is de-energized and it is spring returned to its normal position.

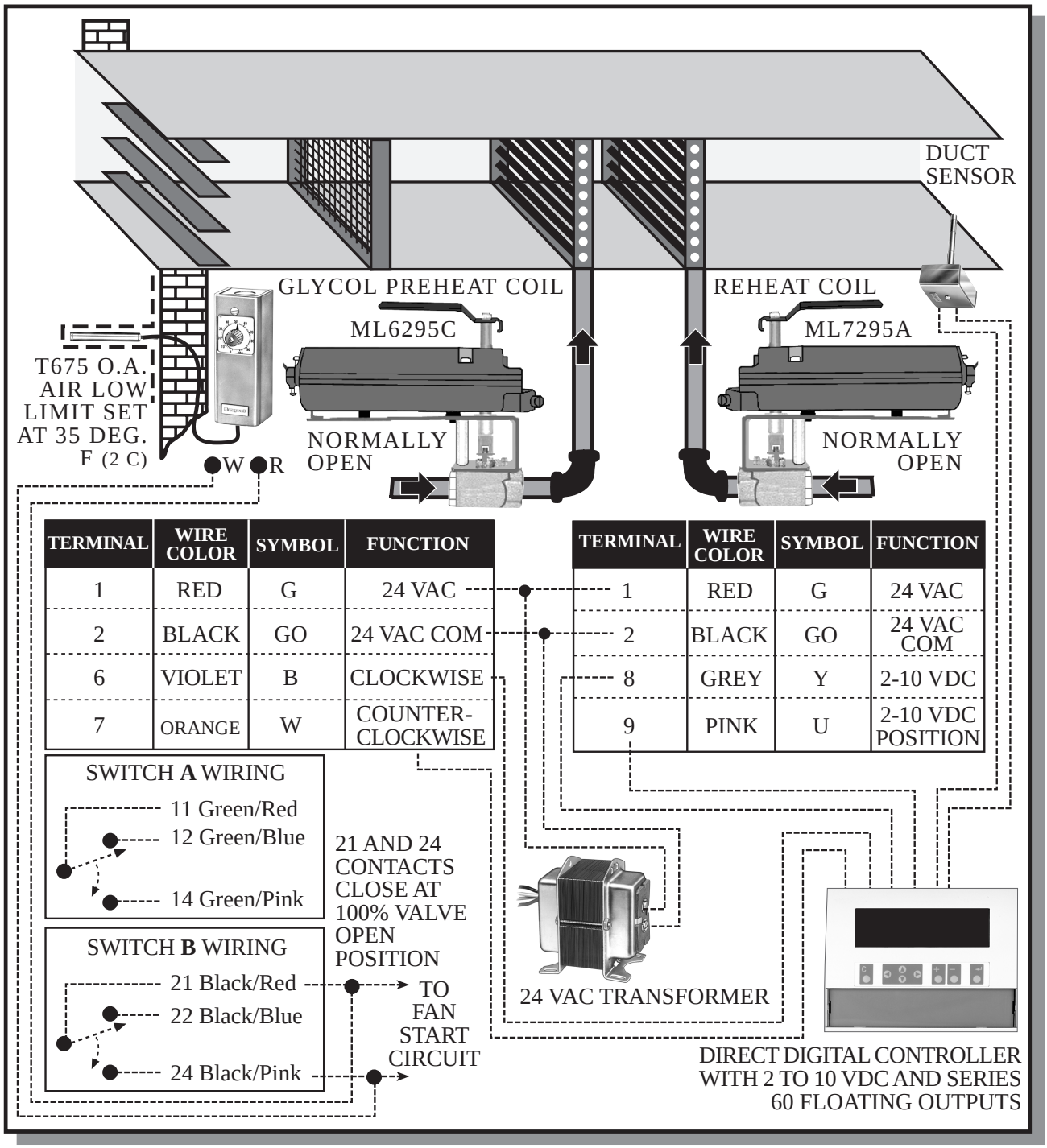
Applications for this type of actuator are:

Two-position preheat valves on 100% outside air, or make-up, airhandlers that are fully opened at a certain outside air temperature.

Coil valves on airhandlers that are opened fully and the heat output is modulated with face and bypass dampers.

Seasonal changeover valves to switch water flows in piping from heating to cooling.

AUXILIARY SWITCH APPLICATION

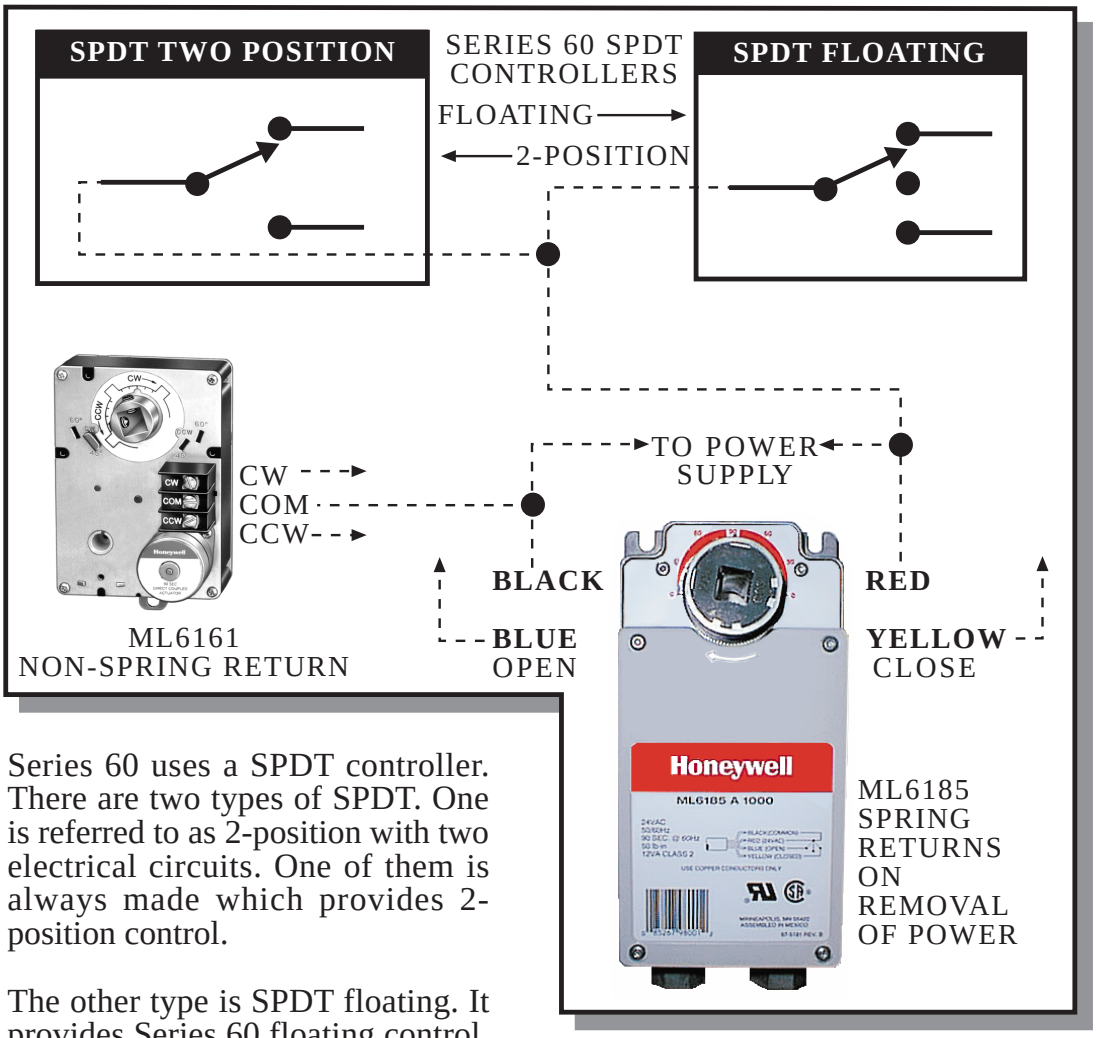


TERMINAL	WIRE COLOR	SYMBOL	FUNCTION
1	RED	G	24 VAC
2	BLACK	GO	24 VAC COM
6	VIOLET	B	CLOCKWISE
7	ORANGE	W	COUNTER-CLOCKWISE

TERMINAL	WIRE COLOR	SYMBOL	FUNCTION
1	RED	G	24 VAC
2	BLACK	GO	24 VAC COM
8	GREY	Y	2-10 VDC
9	PINK	U	2-10 VDC POSITION

This is an airhandler with 100% outside air usage. There is a glycol preheat coil that must be opened fully whenever the outside air temperature is below 35 Deg. F. (2 C). This is accomplished with the direct digital controller. Additionally as a freeze avoidance measure the preheat coil must be fully opened prior to starting the fan if the outside air temperature is below 35 Deg. F. (2 C). This is done with a T675 with its bulb in the outside air. Once the preheat coil valve is opened fully during cold weather the reheat valve is then modulated.

SERIES 60 CONTROL



Series 60 uses a SPDT controller. There are two types of SPDT. One is referred to as 2-position with two electrical circuits. One of them is always made which provides 2-position control.

The other type is SPDT floating. It provides Series 60 floating control. Similar to 2-position Series 60 there are two separate control circuits. There is, however, an additional position in the center at which neither circuit is made. This has the effect of stopping the actuator regardless of its position. The actuator remains there till either of the two circuits, open or close, is made again. Longer motor timing, 3 or 7 minutes, frequently provides improved results. Floating control such as this approximates modulation.

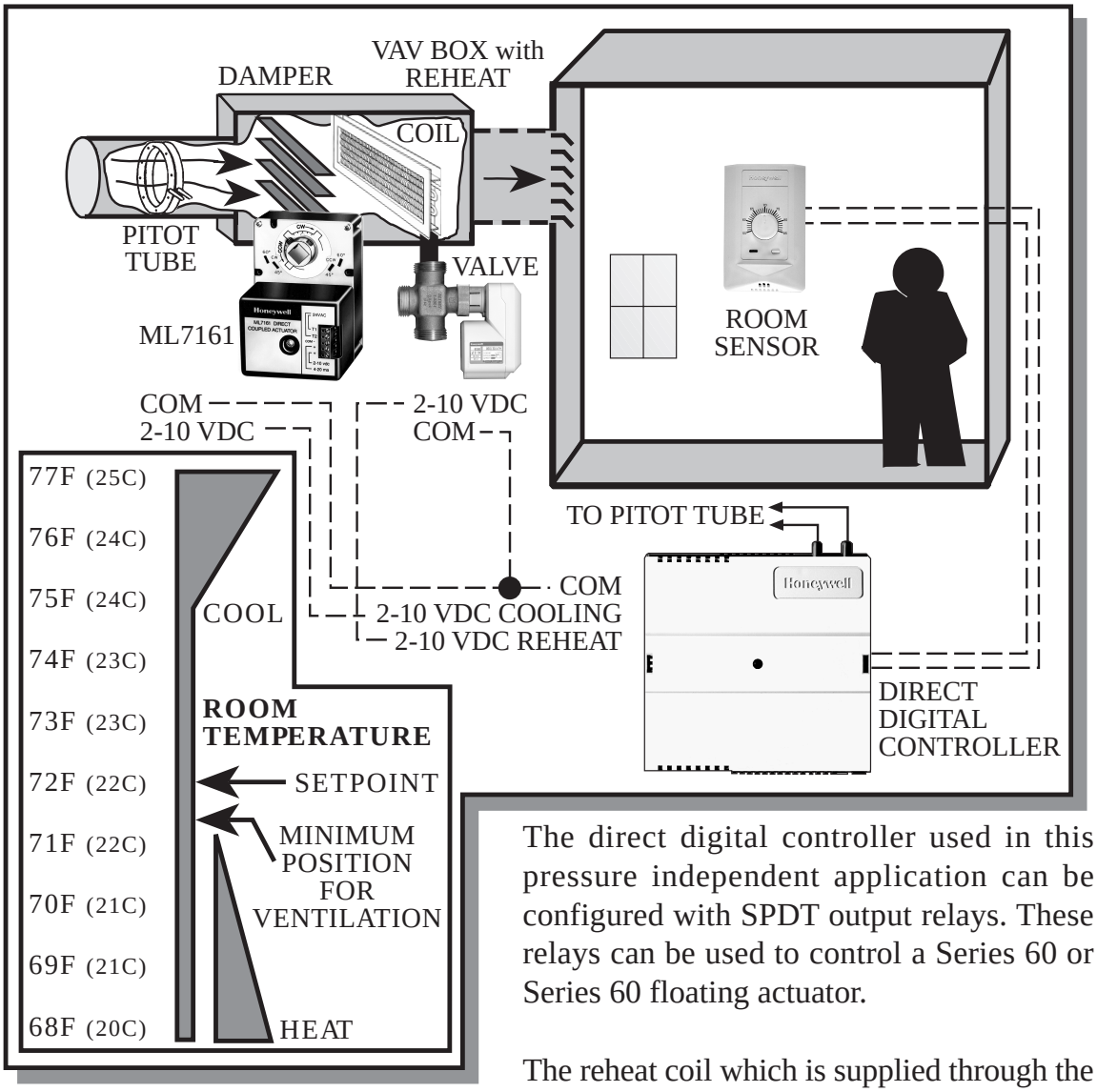
Series 60 floating control actuators can be selected with (ML62xx) or without (ML61xx) feedback signal. Feedback models are selected if the actuator output hub position or equipment (valve or damper) position is important. Direct Digital Control systems use the feedback signal to display equipment position.

Non-feedback models are selected when:

1. The controller (T775, W973, T6984) is incapable of receiving a feedback signal

2. The position of the actuator is not significant. This includes inlet vane control of VAV airhandlers and VAV box damper blade control

SERIES 70 WITH DIRECT DIGITAL CONTROLLER

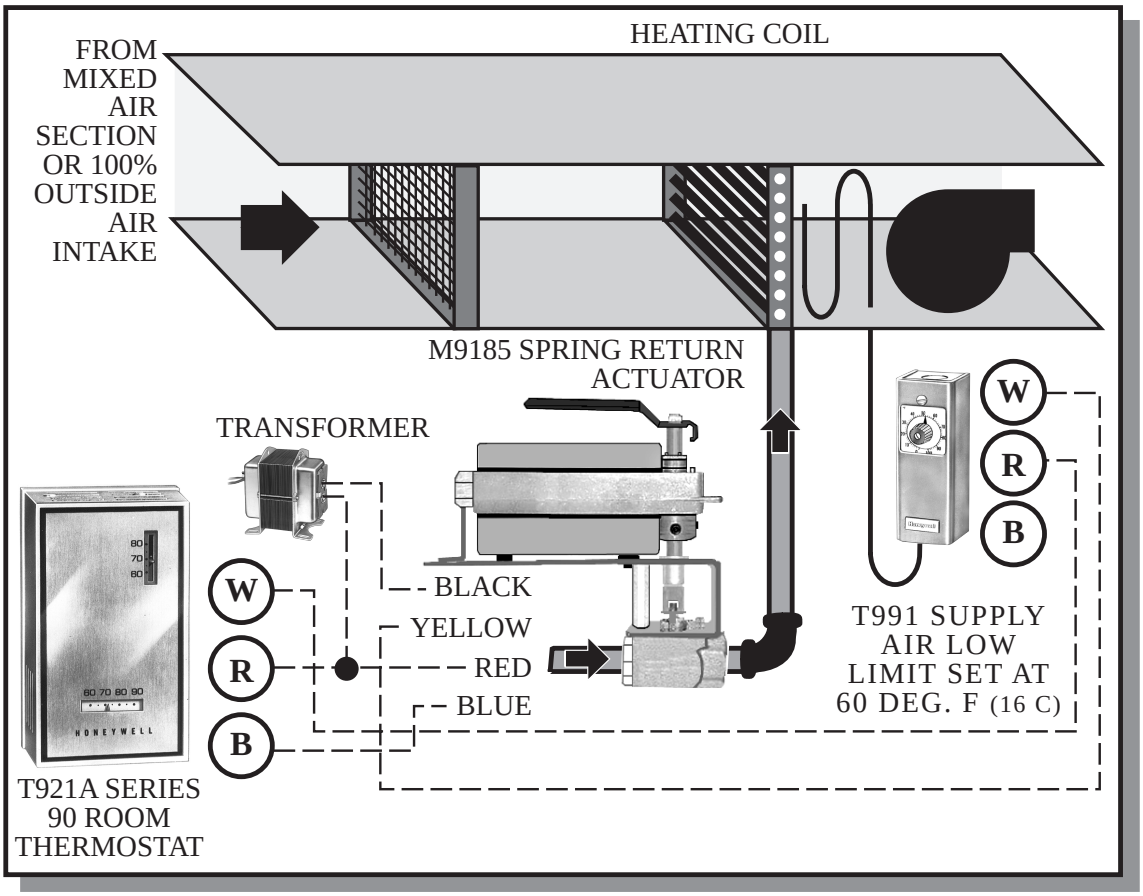


Series 70 devices use 0 to 10 volts dc (Vdc), 2 to 10 Vdc or 4 to 20 milli-amp (mA) control circuits. These control circuit voltages are very prevalent today, making replacement of other company's actuators with Honeywell devices economically feasible. Series 70 is intrinsically modulating with actuator feedback either built into the signal voltage or from a feedback potentiometer. Both actuators in this illustration are supplied with 24 volts AC.

The direct digital controller used in this pressure independent application can be configured with SPDT output relays. These relays can be used to control a Series 60 or Series 60 floating actuator.

The reheat coil which is supplied through the valve should be sequenced with the damper. When the room is warm the valve should be full closed and the damper should be full open to supply maximum cooling volume to the area. As the room temperature drops the damper should be modulated closed. When the temperature is at the setpoint desired for the area the damper should be at a minimum position sufficient for ventilation purposes. If the temperature drops below setpoint the damper should remain at minimum and the heating valve should be modulated toward the open position.

SERIES 90 CONTROL



Series 90 has long been a Honeywell standard and controllers and thermostats with this circuit are still being produced. Initially it consisted of a three wire potentiometer with a slidewire. The slidewire is connected to a bellows which expands or contracts as the temperature or humidity changes. (Note illustration on page 38.) This repositions the slidewire, changes the potentiometer resistance and opens or closes the actuator proportionally. Many control circuits in devices made by Honeywell and other companies electronically simulate the Series 90 potentiometer. Honeywell Series 90 direct coupled actuators can be used with either 135 ohm or electronic Series 90 control input signals.

This application is a heating coil in an airhandler that is being modulated from a room thermostat through a supply air low limit. The inlet air flow to the heating coil comes either from a mixed air section or a 100% outdoor air intake. The function of the low limit is to prevent the supply air to the conditioned area from ever falling below its setpoint of 60 Deg. F (16 C). The room might be kept at warm by the lights or the number of people adjacent to the thermostat causing the heating valve to be closed. On a cold day the temperature of the air being supplied from the coil might cause cold drafts in the room. A supply air low limit prevents this by opening the heating valve when needed regardless of the room temperature.

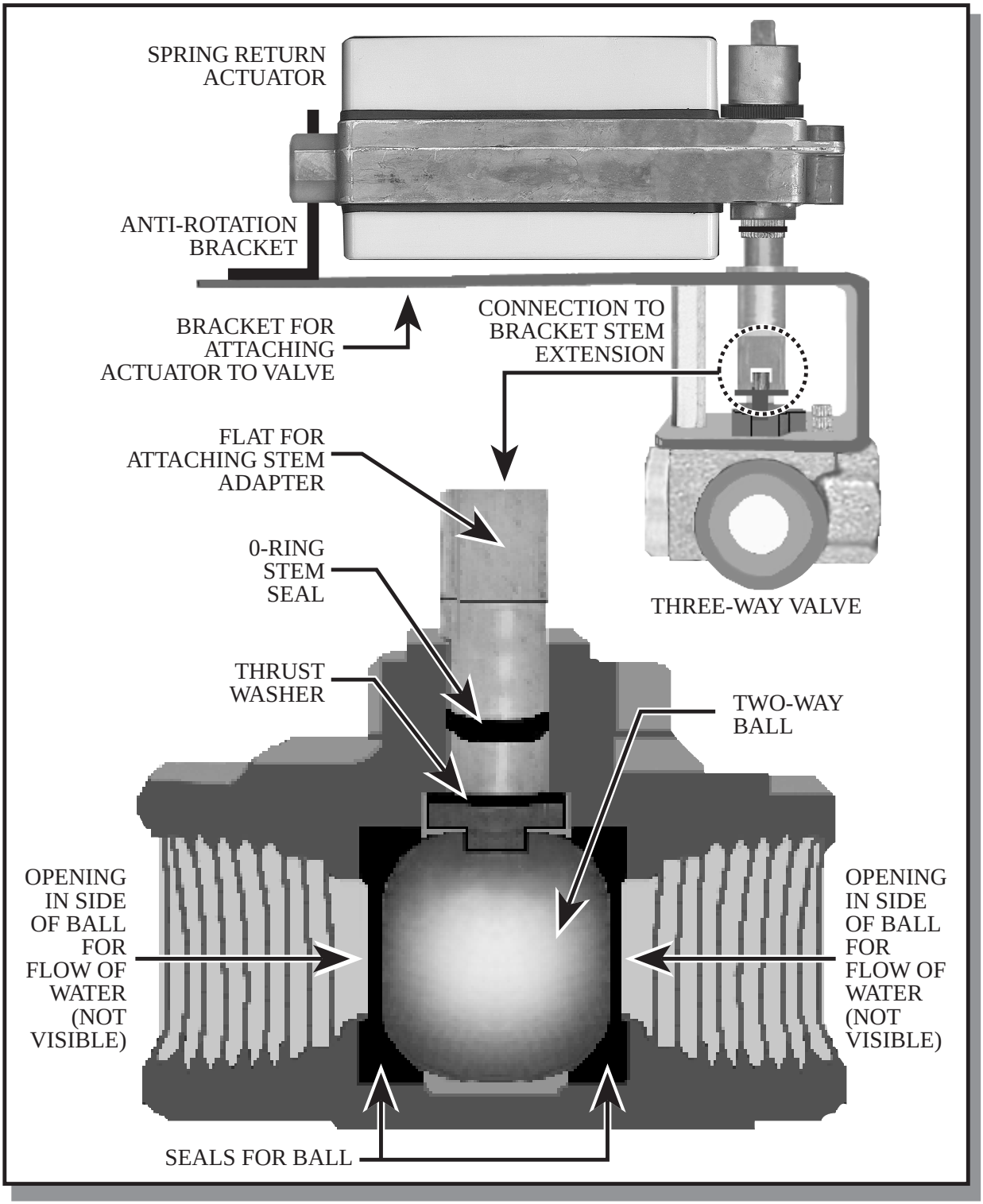
TABLE LISTING OF HONEYWELL COMMERCIAL VALVES PAGE 1

Valve Series Group	Page No.	Configuration	Application	Plug Type	Connections	Pipe Size Inch (mm)	Stem Lift Inch (mm)	Actuator
Globe Valves								
V5011 A, B, F, H, G, J	11, 78	Two Way Globe All Except B Stem Up to Open	Hot, Chilled Water, Glycol, Steam	A,B,F,H are Equal Percentage. G and J are Linear	Threaded and Flanged	1/2 to 6 (13 to 150)	3/4 and 1.5 (19 and 38)	ML64/74 Series ML7984 and Pneumatic
V5013 B, C, F	25, 26, 78	Three Way Globe B and F are mixing C is 2-position diverting	Hot or Chilled Water, Glycol	Equal Percentage	Threaded and Flanged	1/2 to 6 (13 to 150)	3/4 and 1.5 (19 and 38)	ML64/74 Series ML7984 and Pneumatic
V335/ 345		Two Way Globe A-Stem down to close B-Stem down to close C-Stem down to open D-Stem down to open	A-Water, Glycol B-Steam C-Water, Glycol D-Steam	A-Equal Percent. B-Linear C-Equal Percent. D-Linear	Flanged	2.5 to 6 (63 to 150)	3/4 and 1.5 (19 and 38)	ML64/74 Series ML7984 and Pneumatic
V336/ 346	23, 24	Three Way Globe Mixing Only	Hot or Chilled Water, Glycol	Modified Equal Percentage	Flanged	2.5 to 6 (63 to 150)	3/4 and 1.5 (19 and 38)	ML64/74 Series ML7984 and Pneumatic
V5045		Two Way Globe	Hot Water or Steam	Quick Opening	Threaded	1/2 to 2 (13 to 50)	1/4 to 3/8 (6 to 9)	V2045
V5047	17	Two Way Double Seated Globe	Hot or Chilled Water Two-Position	Equal Percentage	Threaded	1 to 2 (25 to 50)	9/16 to 3/4 (6 to 14)	Pneumatic or Mod IV with Linkage
V5051		Two Way Cage	Hot or Chilled Water, Steam	Modified Linear	Flanged	2.5 to 6 (63 to 150)	1.5 (38)	Pneumatic or Mod IV with Linkage
V5086		Thermostatic Radiator	Hot Water or Steam	Linear	Threaded	1/8 to 1.25 (3 to 31)	1/4(6)	Integral Thermostatic
V5852/ 62	97	Two Way Globe	Hot or Chilled Water, Glycol	Equal Percentage	52 is Soldered 62 is Threaded	1/2 and 3/4 (13 and 19)	1/4(6)	Electronic M64/ 74 or MP958 Pneumatic
V5853/ 63	97	Three Way Globe Mixing Only	Hot or Chilled Water, Glycol	Equal Percentage and Linear	53 is Soldered 63 is Threaded	1/2 and 3/4 (13 and 19)	1/4(6)	Electronic M64/ 74 or MP958 Pneumatic
Ball Valves								
VB30A	49 to 65	Two Way Ball Valve	Water, Glycol, Steam	Equal Percentage	Threaded	1/2 to 2 (13 to 50)	Rotary	Direct Coupled Actuator
VB30B	49 to 65	Three Way Ball Valve	Hot or Chilled Water, Glycol	Linear	Threaded	1/2 to 2 (13 to 50)	Rotary	Direct Coupled Actuator

TABLE LISTING OF HONEYWELL COMMERCIAL VALVES PAGE 2

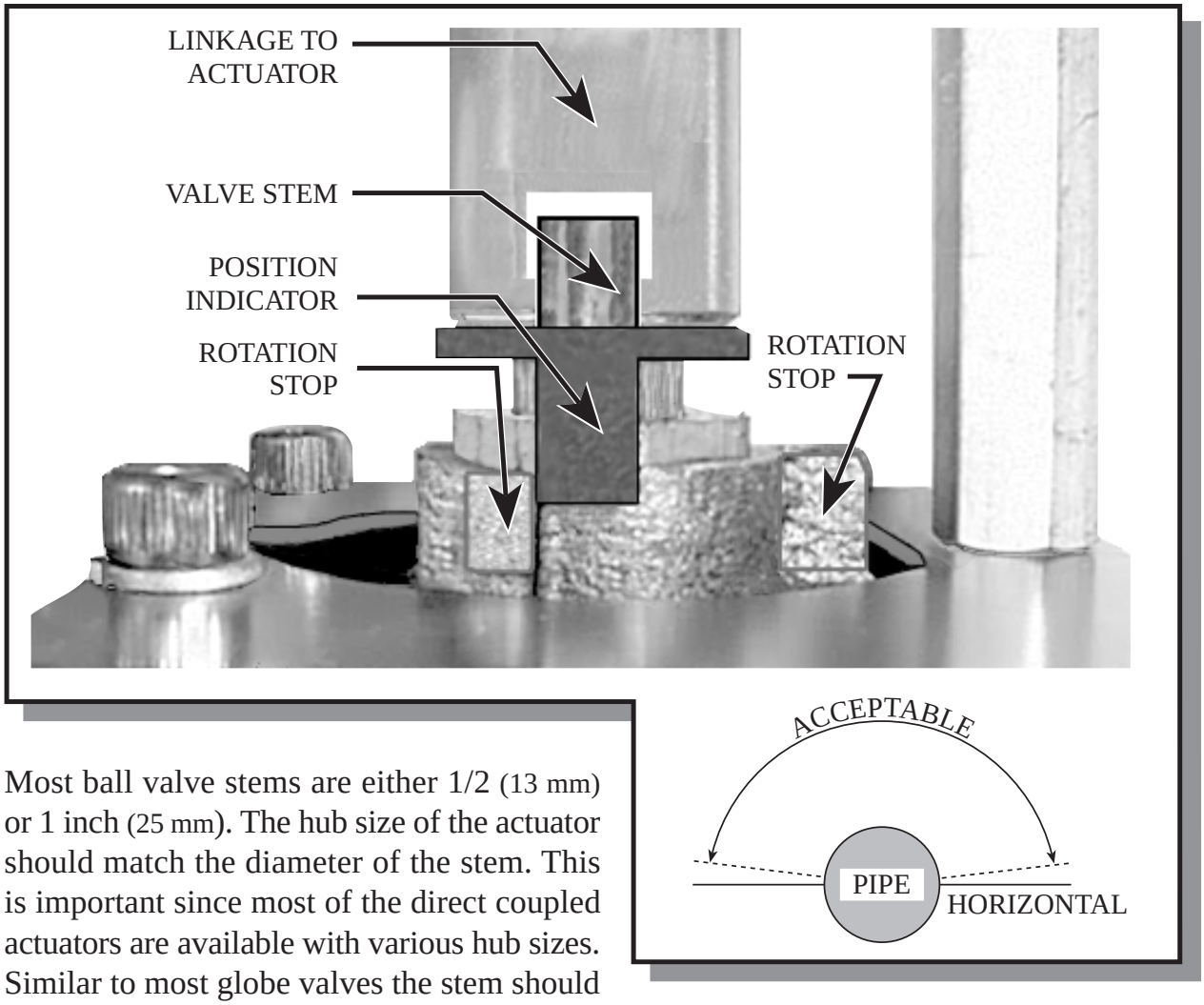
Valve Series Group	Page No.	Configuration	Application	Plug Type	Connections	Pipe Size Inch (mm)	Stem Lift Inch (mm)	Actuator
Cartridge-Type Valves								
V4043 V8043	30	Two Way Gate-Type Valve	Hot or Chilled Water, Steam	Round Ball	Flare, Soldered and Threaded	1/2,3/4, 1(13, 19, 25)	Rotary	Integral Series 40 or 80 Actuator
V4044 V8044	30	Three Way Gate-Type Diverting Valve	Hot or Chilled Water	Round Ball	Flare, Soldered and Threaded	1/2, 3/4 inch (13,19)	Rotary	Integral Series 40 or 80 Actuator
VC	29	Two-Way or Three-Way Mixing or Diverting Valve	Hot or Chilled Water	Quick Opening or Linearized Cartridge	Soldered and Threaded	1/2,3/4, 1(13, 19, 25)		Integral Floating or Two-Position
Butterfly Valve								
V51	7	Butterfly Valve	Water or Steam	Plate	Threaded	1.5 to 4 (38 to 100)	Rotary	Mod IV with Linkage
Pneumatic Unitary Globe Valves								
VP512		Two-Way Normally Open	Hot Water or Steam	Equal Percentage	Threaded	1/2 to 1.25 (13 to 31)		Integral Pneumatic
VP513		Two-Way Normally Open or Normally Closed	Hot or Chilled Water, Steam	Equal Percentage	Flare	5/8 or 7/8 (16 or 22)		Integral Pneumatic
VP517		Three-Way Mixing	Hot or Chilled Water	Constant Total	Flare	7/8 (22)		Integral Pneumatic
VP522		Three-Way Sequencing	Hot or Chilled Water	A-Equal Percent. B-Quick Opening	Flare	1/2, 5/8, 7/8 (13, 16, 22)		Integral Pneumatic
VP525		Two-Way Normally Open	Hot Water or Steam	Modified Linear	Threaded	1/2, 3/4 (13, 19)		Integral Pneumatic
VP526		Three-Way Mixing	High Pressure Hot or Chilled Water	Linear and Constant Total	Flare	1/2 and 5/8 (13, 16)		Integral Pneumatic
VP527		Two-Way Normally Open	High Pressure Hot or Chilled Water	Equal Percentage	Flare	1/2 (13)		Integral Pneumatic
VP531		Two-Way Normally Open	Hot or Chilled Water, Steam	Modified Equal Percentage	Threaded and Soldered	NPT 1/2, 3/4 (13, 19) Solder 5/8, 7/8 (16, 22)		Integral Pneumatic

BALL VALVE COMPONENTS



The bracket for ball valves is fastened to the top of the valve with bolts that are threaded into the body. The stem extension is fastened to the valve stem without any setscrews or bolts. Brackets are available for use with the various direct coupled actuators that Honeywell produces.

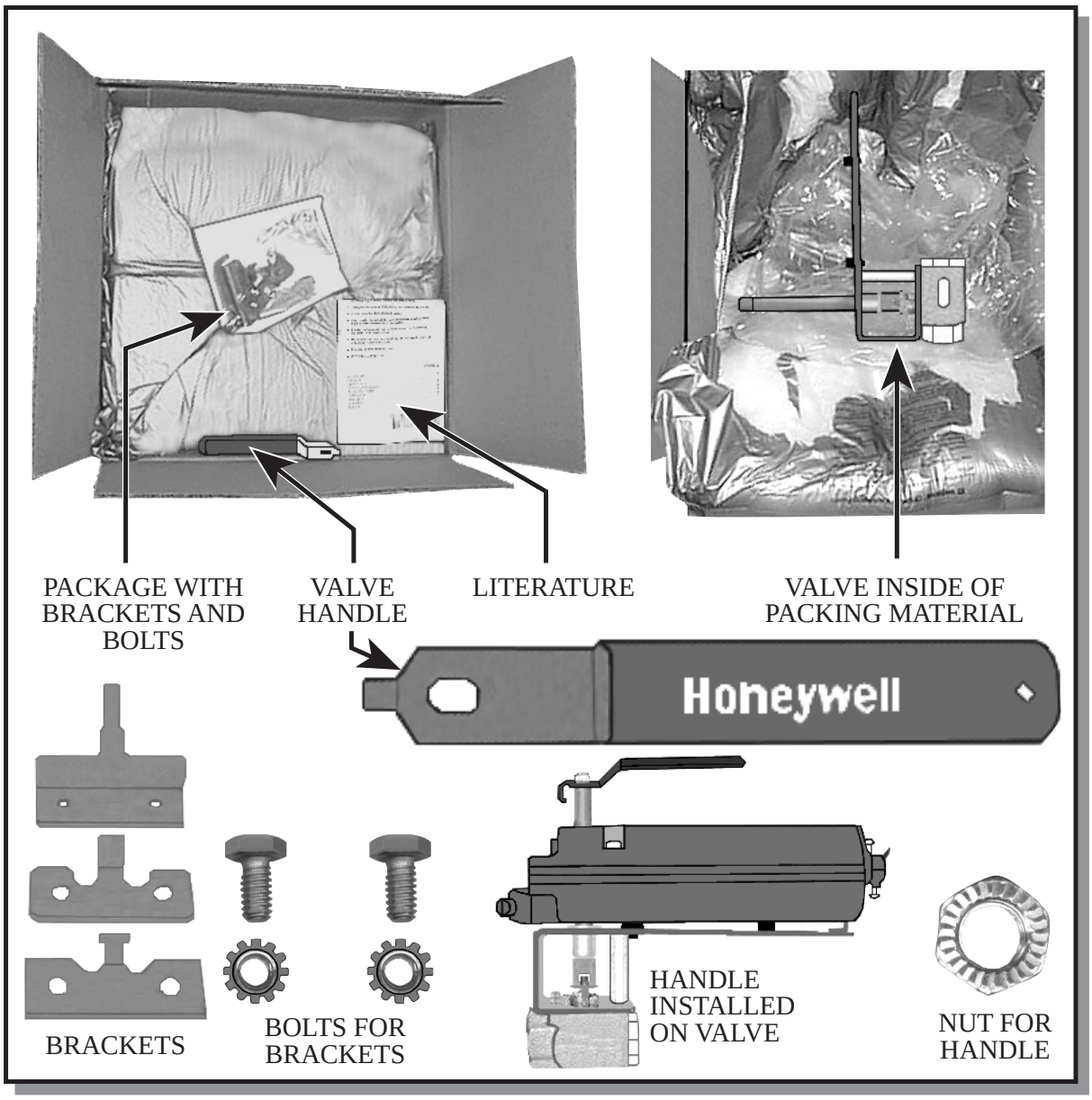
BALL VALVE ROTATION LIMITS



Most ball valve stems are either 1/2 (13 mm) or 1 inch (25 mm). The hub size of the actuator should match the diameter of the stem. This is important since most of the direct coupled actuators are available with various hub sizes. Similar to most globe valves the stem should always be one degree or more above horizontal. Direct contact of moisture or condensation can cause damage to most direct coupled actuators.

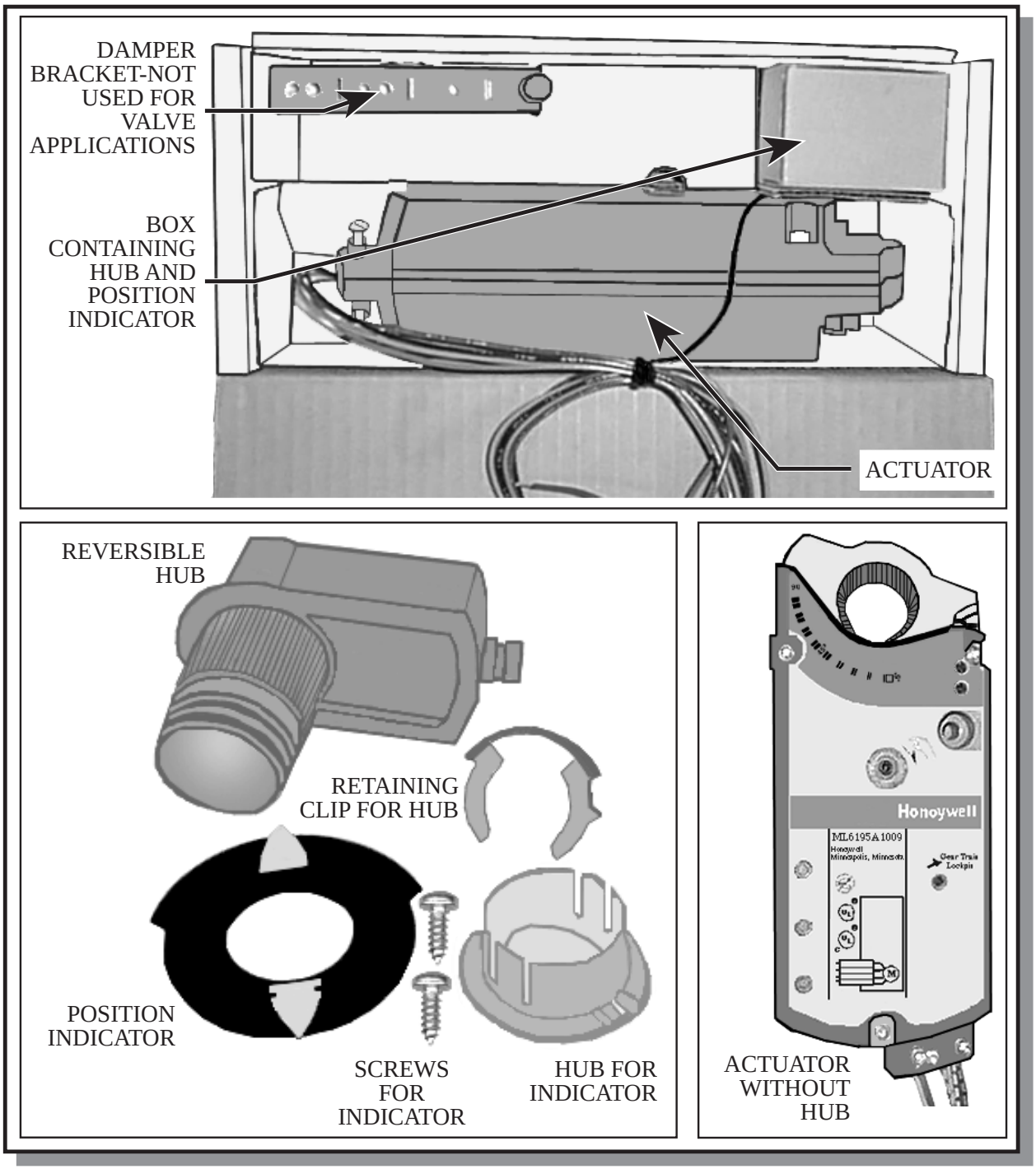
Honeywell ball valves are designed with a rotation of approximately 90 degrees. If this limit is substantially exceeded the position indicator will be bent with no other damage to the valve. The indicator is repairable by bending it back to the correct position. Most Honeywell direct coupled actuators are 90 or 95 degrees of rotation so no adjustments are required. It is important however to install the actuator correctly so that the startpoint of the actuator aligns correctly with the startpoint of the valve rotation. Many ball valves are sold as preset assemblies which require no adjustment. Installation of a new actuator or replacement of a defective unit however will require alignment of the startpoints of the valve and the actuator. This is discussed on the next pages.

BALL VALVE SPRING RETURN ACTUATOR INSTALLATION PROCEDURE PAGE 1



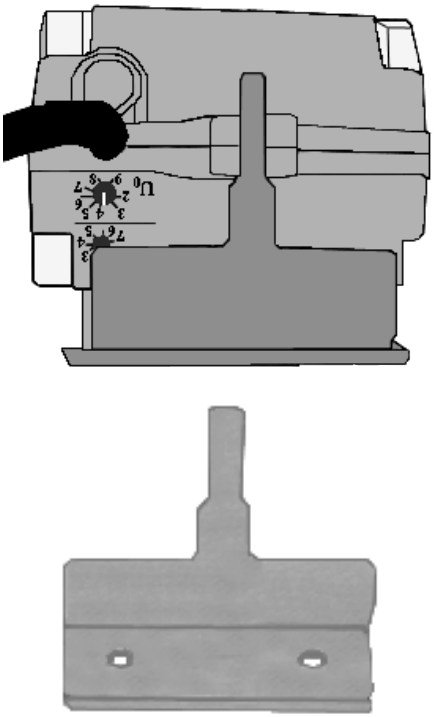
Ball valves are available either as a complete assembly or as a separate item without an actuator. Illustrated on this page is the valve without an actuator. This can facilitate installation since the valve body can be installed in the piping while construction work that might damage the actuator continues around the device. On the next pages certain procedures required to install the actuator onto the valve are illustrated.

The valve linkage is pre-installed on the valve. There are different linkages for different actuators though one linkage can be used with more than one type of actuator. The diameter and height of the stem varies also.

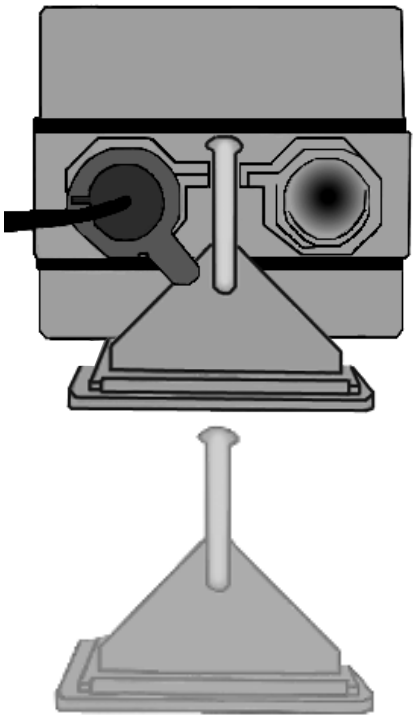


This is the components of a 142 lb-in (17 N-m) actuator. Other torque ranges will be slightly different so refer to the literature for instructions. This actuator is supplied in a box with all of the components necessary for a damper installation. The bracket and position indicator will probably not be used. The reversible hub is contained in a box. In most applications it should be installed with the hub closest to the valve. Reversing the hub does not reverse the direction of the actuator.

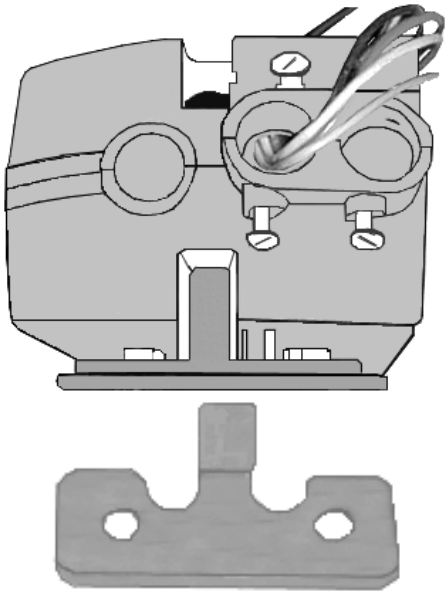
BALL VALVE SPRING RETURN ACTUATOR INSTALLATION PROCEDURE PAGE 3



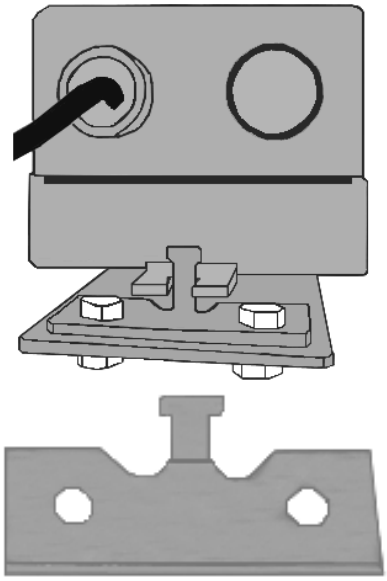
USE WITH 105 LB-IN (12 N-M) SPRING RETURN ACTUATORS



USE WITH 50 LB-IN (6 N-M) SPRING RETURN ACTUATORS



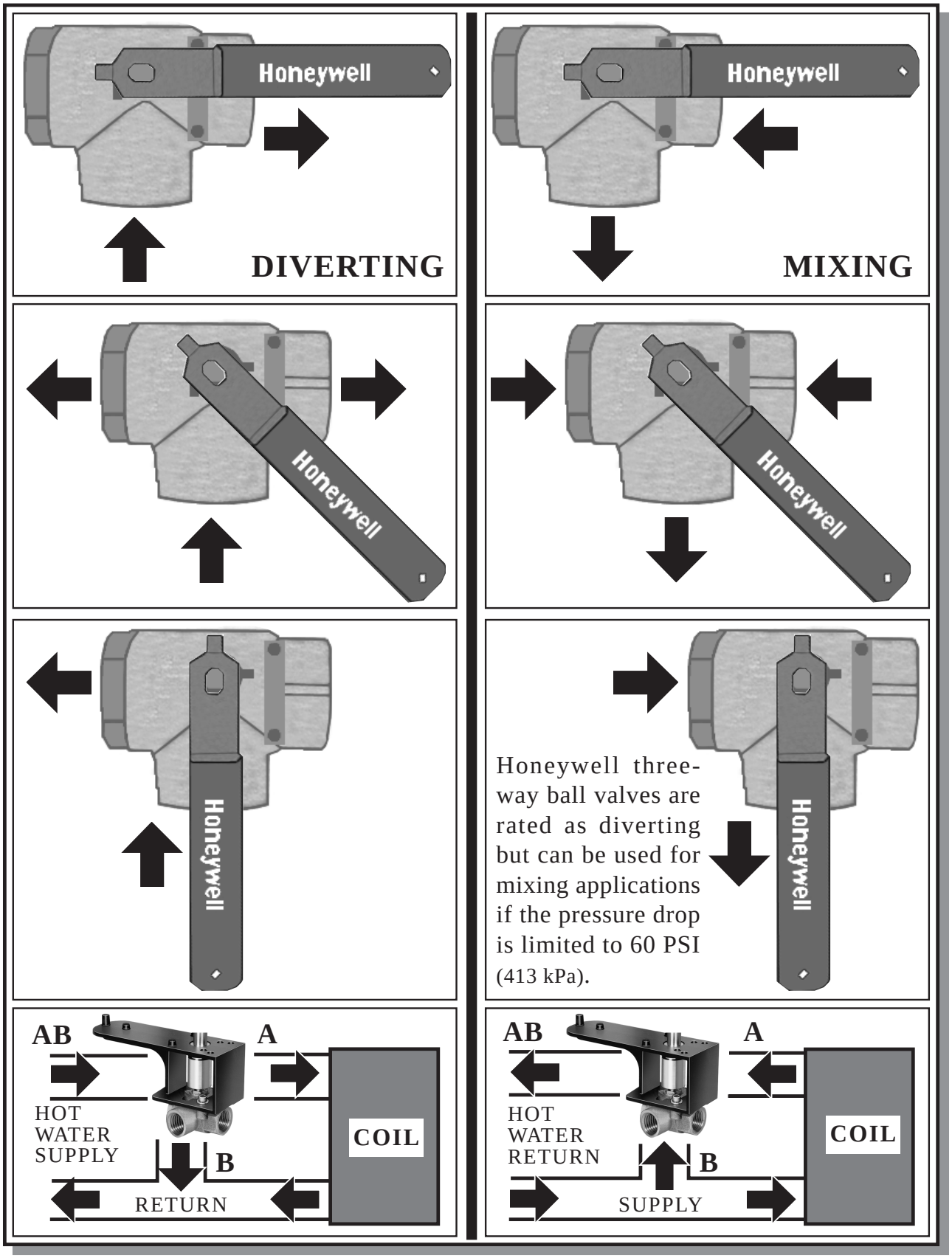
USE WITH 142 LB-IN (16 N-M) SPRING RETURN ACTUATORS



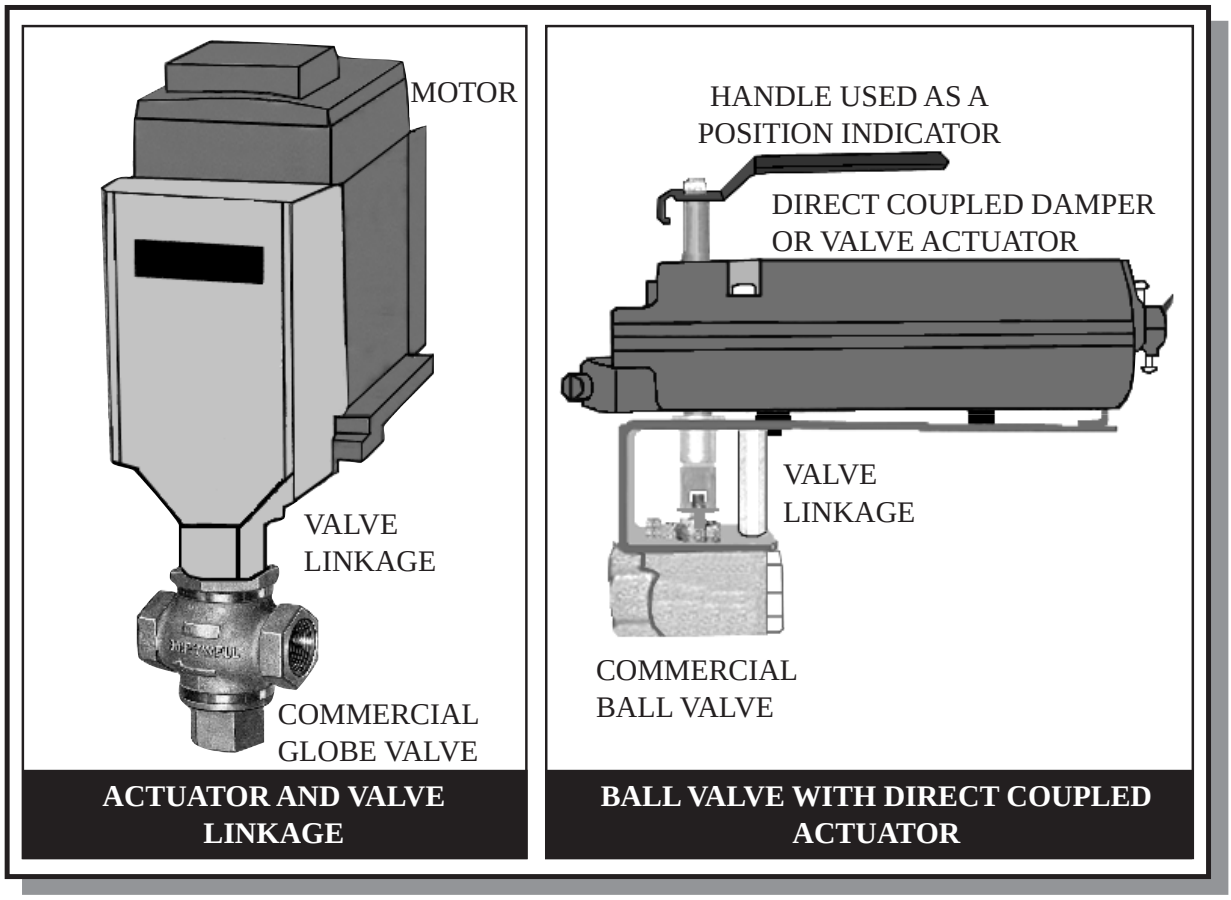
USE WITH 150 OR 300 LB-IN (17 OR 34 N-M) NON-SPRING RETURN ACTUATORS

There are many ball valve and actuator combinations available. There are four anti-rotation brackets available for the medium and large direct coupled actuators. Only one of them is used for any single valve. Bolts are included in the package.

THREE-WAY BALL VALVES



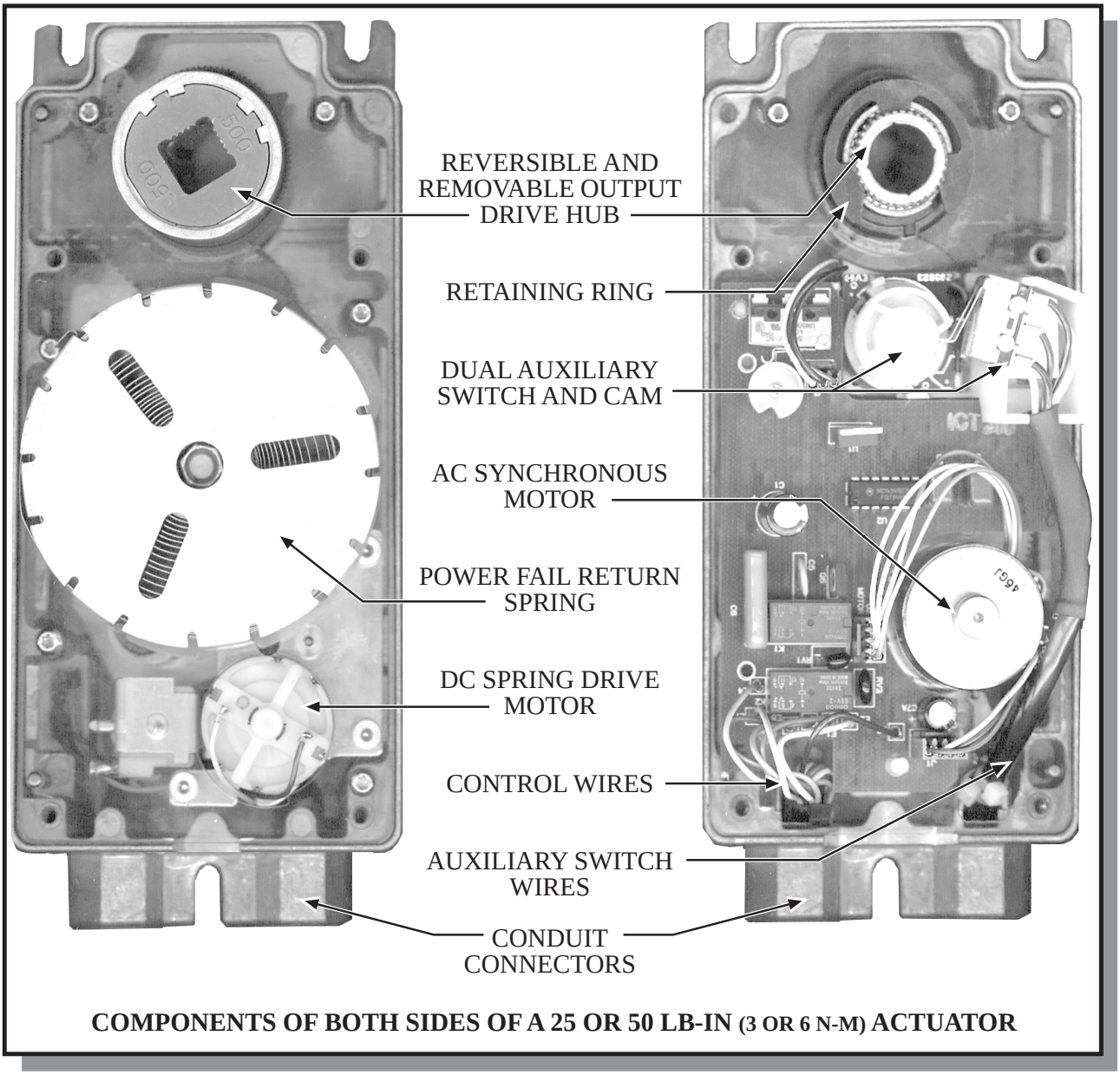
DIRECT COUPLED ACTUATORS



For many years the primary method of controlling a commercial valve with an electric actuator was to use a three piece assembly. It consisted of a valve body, a valve linkage and an electric or electronic actuator.

A recent product development is Direct Coupled Actuators (DCA). These are compact, economical and available for small to medium sized applications. DCA's are widely used on damper applications. New products for ball valves and commercial globe valves permit the use of these same actuators on valves. This is a benefit to both the service person and the building owner in that one actuator can be stocked for replacement of both valve and damper actuators. There is also a standardization of wiring connections between between actuators regardless of the application. The torque rating of these direct coupled actuators is generally not as high as pneumatic actuators so they will primarily be limited to small and medium size valves. The higher flow capacities of ball valves though will generally result in many applications of direct coupled actuators on valves.

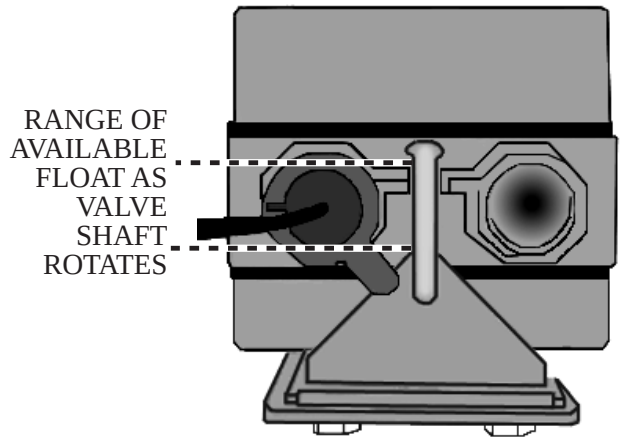
COMPONENTS OF A SPRING RETURN DIRECT COUPLED ACTUATOR

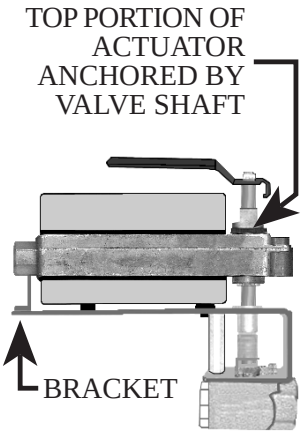


COMPONENTS OF BOTH SIDES OF A 25 OR 50 LB-IN (3 OR 6 N-M) ACTUATOR

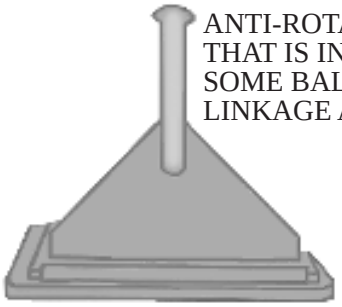
Direct coupled actuators are widely used on damper applications today. The same devices can now be used on ball valves. They are available in a wide range or torque outputs and in most control series configurations. Besides being more economical than conventional actuators there are other benefits associated with using these devices. Installation is typically quicker with fewer linkages and adjustments. The weight of the actuator is substantially less. The same actuator can be used for the dampers in addition to the valves thereby reducing inventory.

50 POUND (6 N-M) SPRING RETURN ACTUATORS ON BALL VALVES





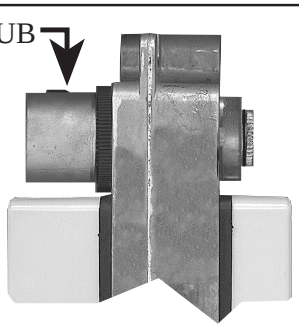
THE KNOB OR TIP OF THE BRACKET SHOULD BE LOCATED IN THE SLOT OF THE ACTUATOR SO THAT THE ACTUATOR CAN FLOAT SLIGHTLY UP AND DOWN AS THE VALVE SHAFT ROTATES. IF THE ACTUATOR WERE TO BE FASTENED TIGHTLY TO THE ANTI-ROTATION BRACKET THE LACK OF THIS FLOAT COULD HAVE A DETRIMENTAL EFFECT OF THE ACTUATOR HUB BEARING ASSEMBLY.



ANTI-ROTATION BRACKET THAT IS INCLUDED WITH SOME BALL VALVE LINKAGE ASSEMBLIES.

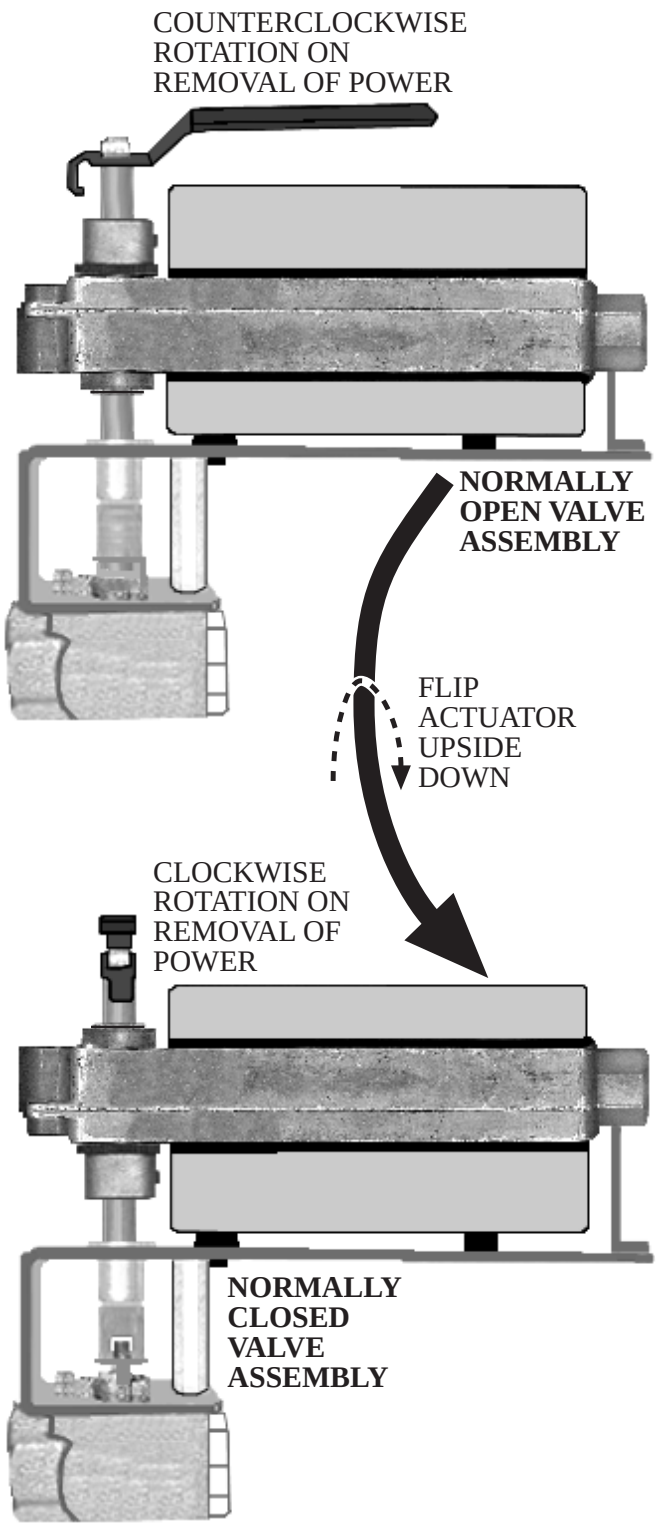
ONLY USE WITH THIS TYPE OF 50 POUND (6 N-m) SPRING RETURN ACTUATOR. A DIFFERENT BRACKET IS USED WITH NON-SPRING RETURN ACTUATORS AND OTHER TORQUE RANGES OF SPRING RETURN ACTUATORS.

There are several ball valve linkages and each is designed to be used only with certain actuators. One or more anti-rotation brackets are included with the ball valve. These are designed to anchor the back of the actuator so it does not spin. It must be a loose connection so that there is some float as the actuator is turned. Never firmly attach a direct coupled actuator to the anti-rotation bracket as this will cause side forces on the valve stem.

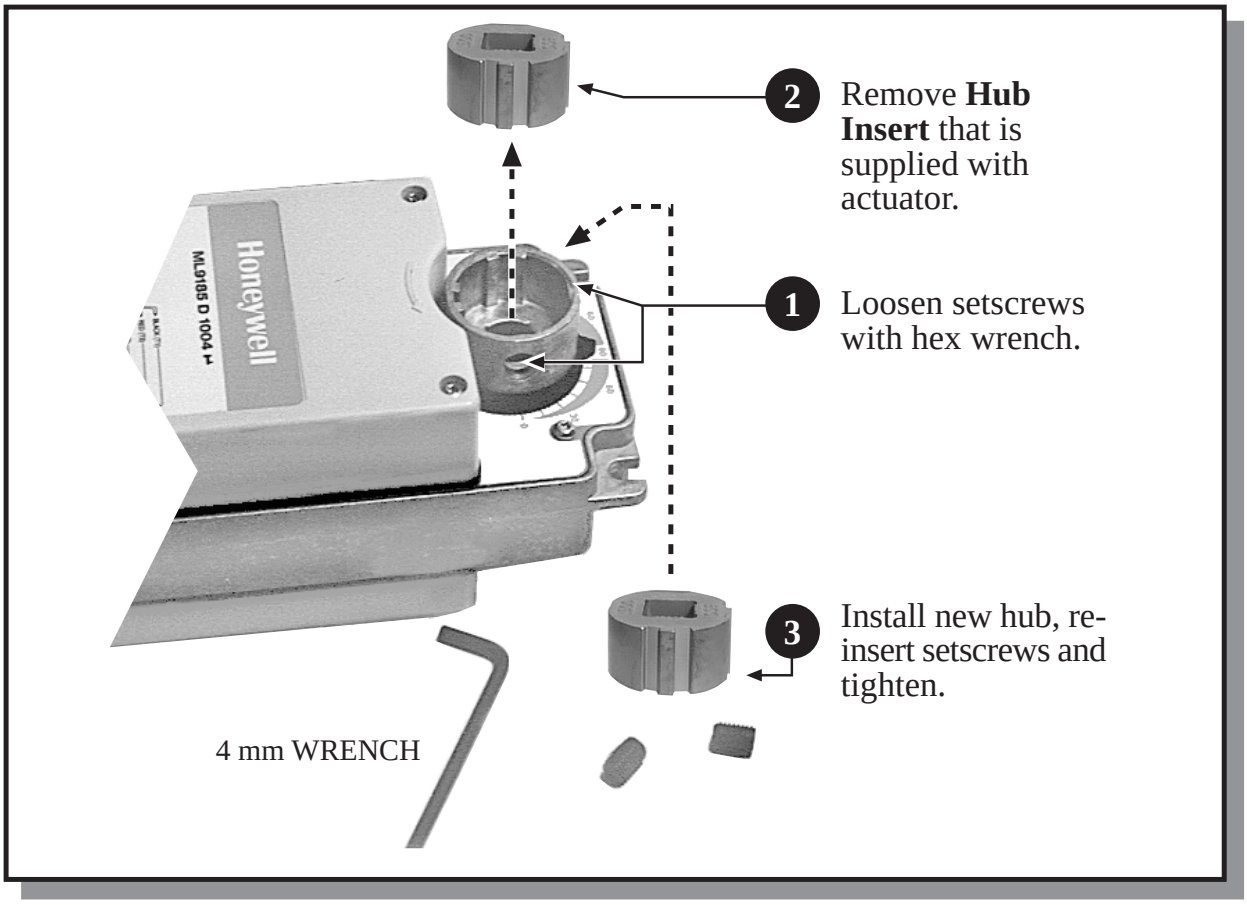


The hub can be on either side of the actuator though it is best to have it on the side away from the valve if the actuator is set for a normally open valve. Its position does not affect the direction of spring return or the control output.

The 50 pound spring return (6 N-m) actuators can be flipped over during installation. This reverses the direction of the spring return and the opening of the actuator. The arrow on the cover denotes the direction of spring return. The rotation of these actuators is 90 degrees. The startpoint of the valve must be aligned as indicated by the position of the handle. When the actuator is installed for clockwise spring return the valve assembly is normally closed. Counterclockwise spring return is for normally open valve assemblies.



HUB INSERTS FOR 50 LB-IN (6 N-M) ACTUATORS



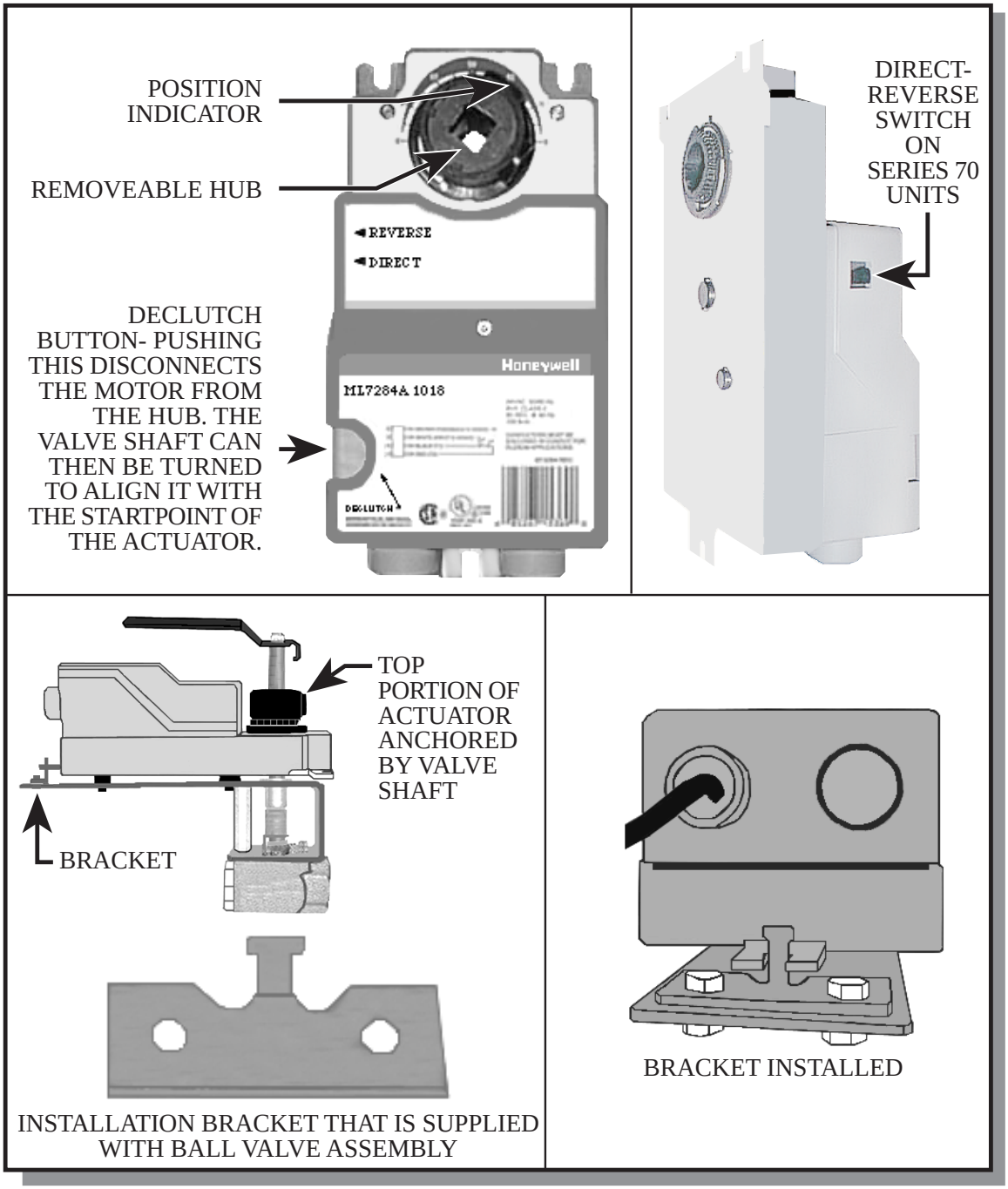
The hub insert is replaceable on the 50 lb-in (6 N-m) line of actuators. They are typically supplied with a 1/2 inch (13 mm) insert. There are three replacement hub inserts available. These are primarily for use with damper shafts and will probably not be used with ball valves since most ball valves linkages from Honeywell are either 1/2 or 1 inch (13 or 25 mm) in diameter. It important to use the correct hub insert when applying them to ball valves. The hub insert should always be the same size as the valve stem. The 50 lb-in (6 N-m) line of actuators does not have sufficient torque to be used with the ball valves with a 1 inch stem (25 mm).

DEVICE	PART NUMBER
3/8 inch (10 mm)	205753
5/8 inch (16 mm)	205758
3/4 inch (19 mm)	205617

The 150 lb-in (17 N-m) non-spring return actuators use the same hub inserts.

The same setscrew fastens the insert to the hub and the insert to the damper shaft.

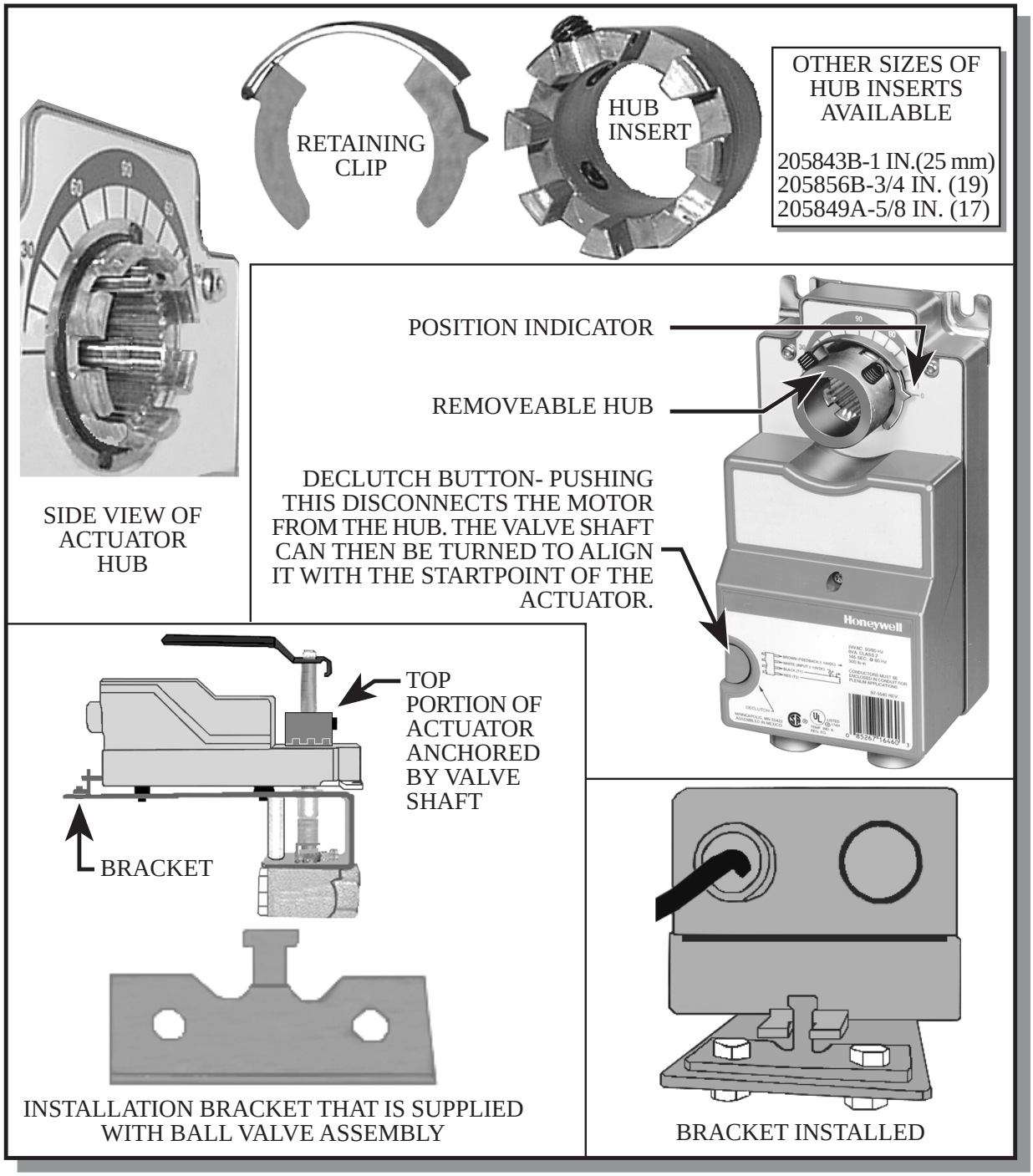
150 LB-IN (17 N-M) NON-SPRING RETURN ACTUATOR COMPONENTS



The non-spring return actuators are installed on the flat back side only. Direct-reverse adjustments are done on series 70 units with a switch on the side. The mounting hub is reversible but will portrude substantially when installed from the back. Hub inserts are available for various shaft sizes but only the 1/2 inch (13 mm) that is typically supplied with the actuator should be used.

The declutch button is used to adjust the startpoint of the shaft rotation after the actuator is attached to the valve shaft.

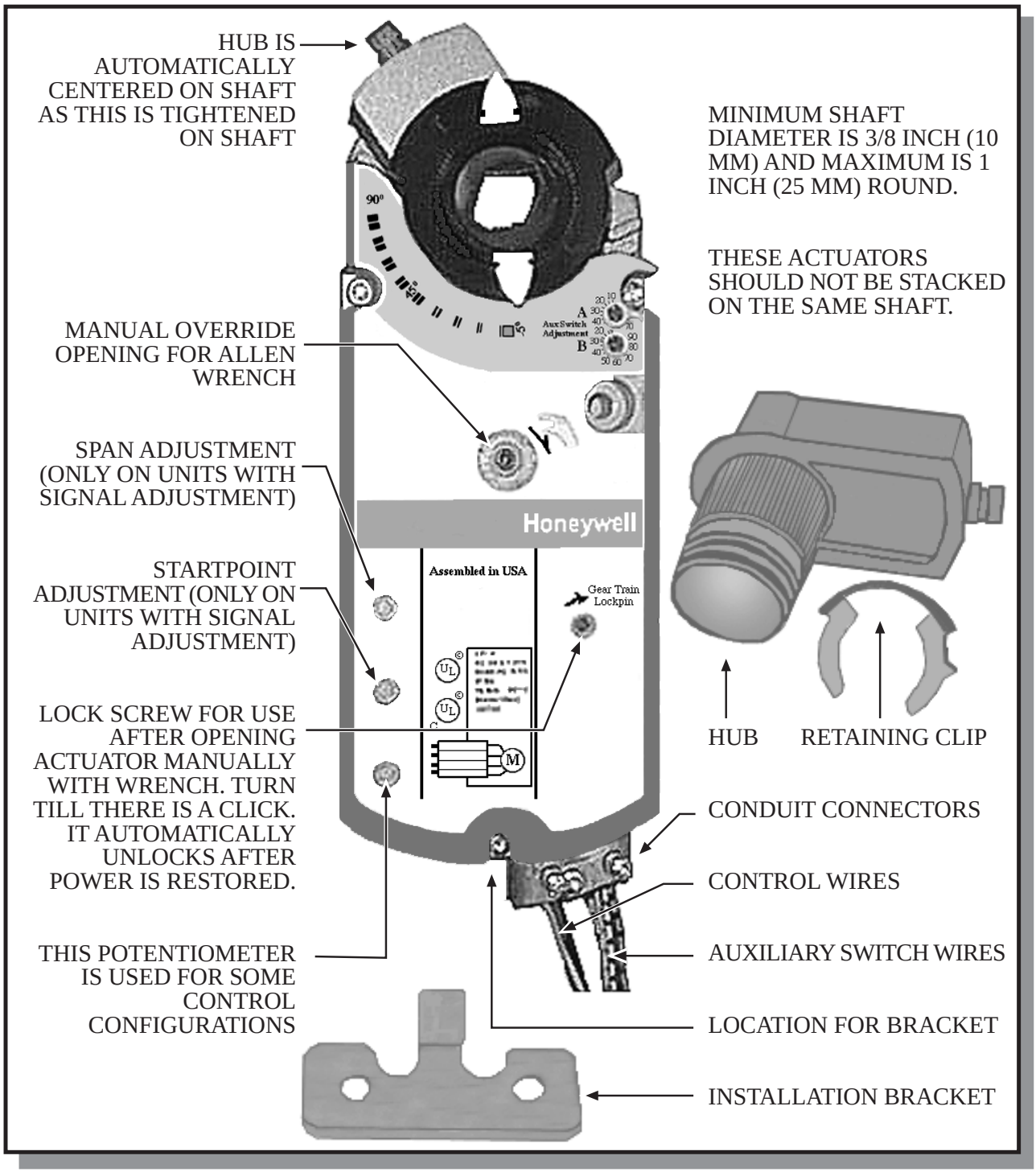
300 LB-IN (34 N-M) NON-SPRING RETURN ACTUATOR COMPONENTS



The 300 lb-in (34 N-m) non-spring return actuators are installed on the flat back side only. Direct-reverse adjustments are done on series 70 units with a switch on the side. Hub inserts are available for various shaft sizes but only the 1/2 or 1 inch inch (13 or 25 mm) that is typically supplied with the actuator should be used.

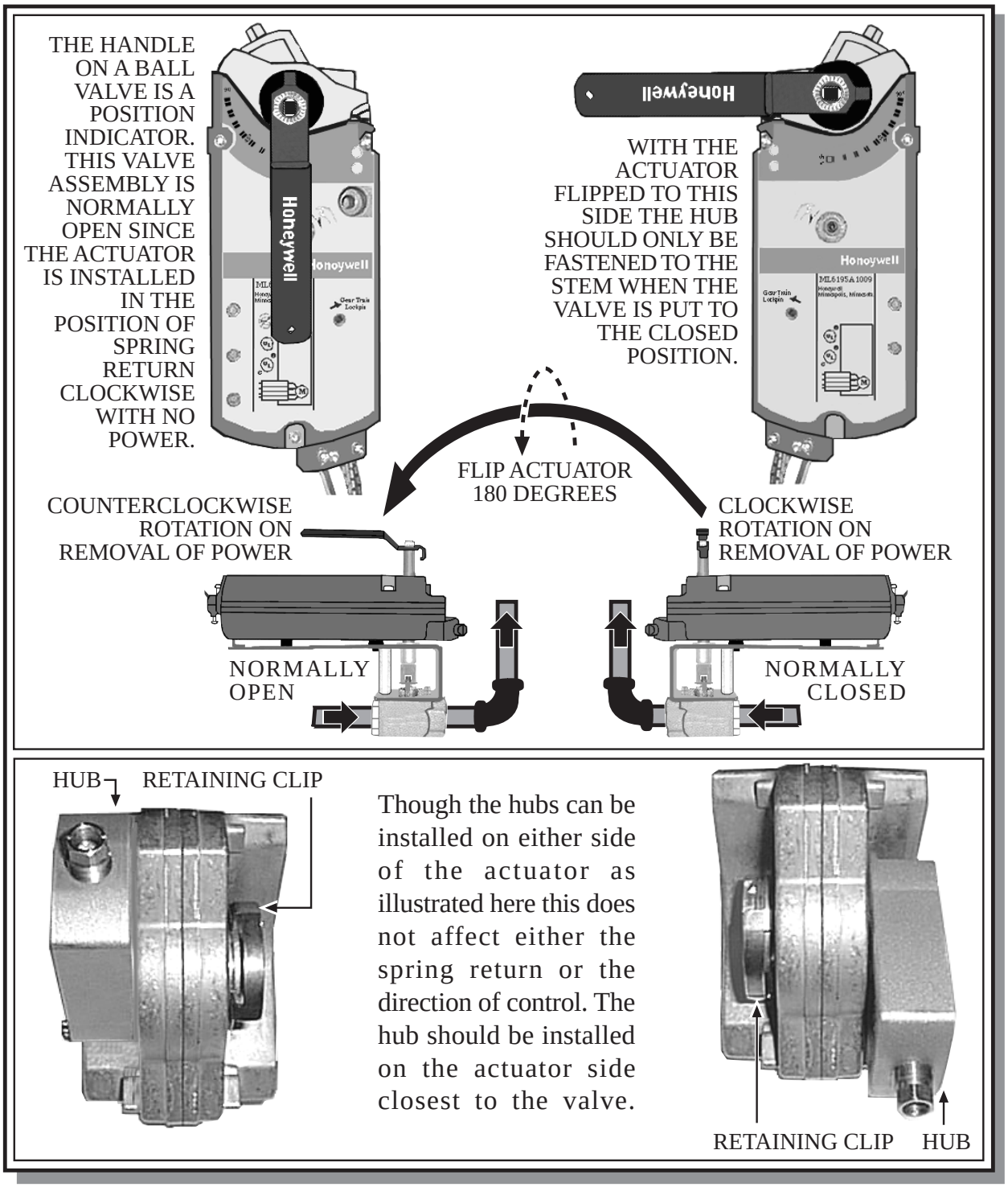
The declutch button is used to adjust the startpoint of the shaft rotation after the actuator is attached to the valve shaft.

142 LB (16N-M) SPRING RETURN ACTUATOR COMPONENTS



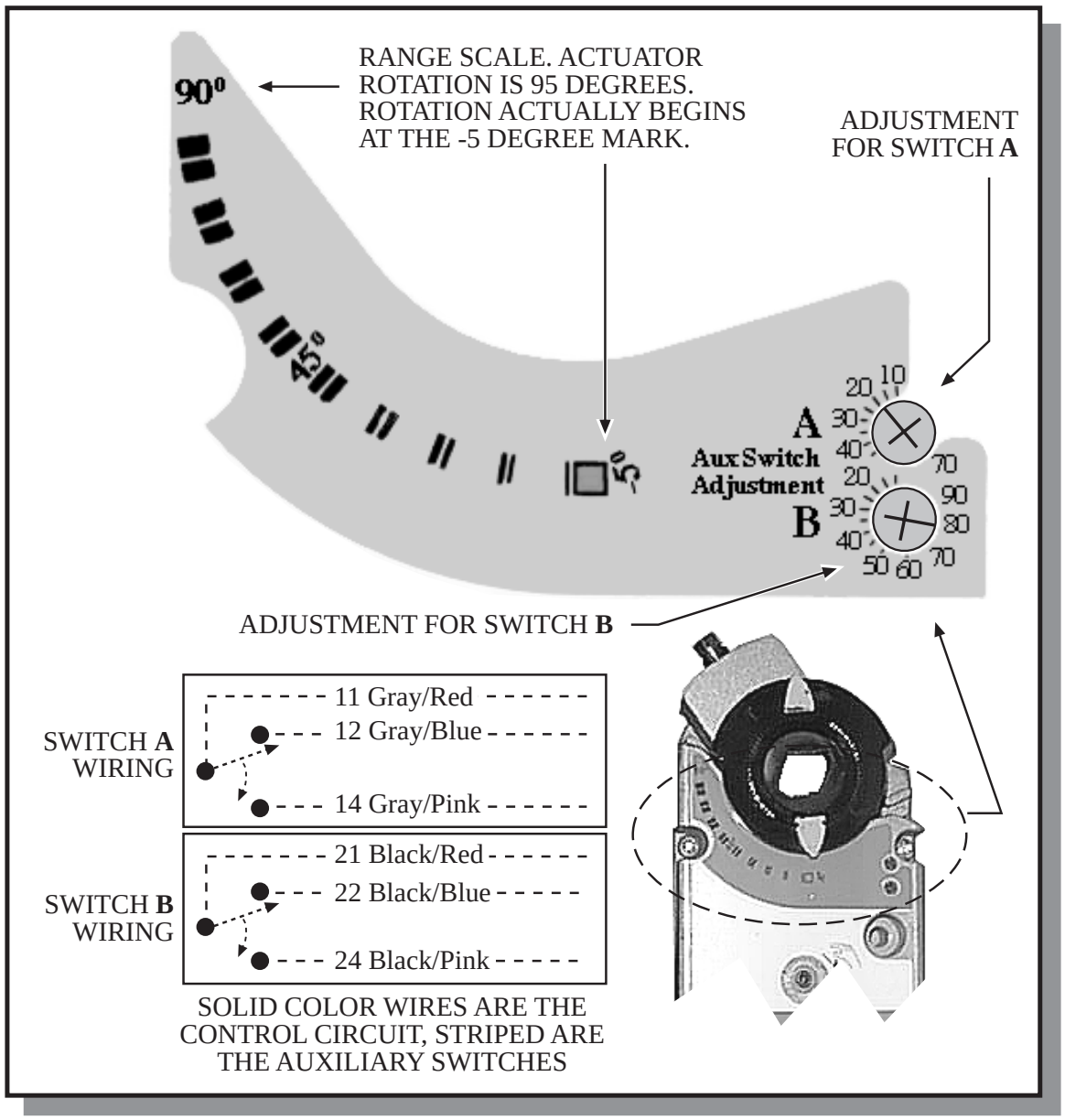
This is a 142 lb (16 N-m) actuator with a self-centering hub. High torque spring return actuators are among the most widely used type in heating, ventilating and air conditioning applications. Spring return is required to prevent coil freeze-up. They are most widely applied on the three-way and larger two-way ball valves. Honeywell has these available in most control series.

142 LB (16N-M) SPRING RETURN ACTUATOR ROTATION AND HUB REVERSAL



This actuator is reversed by flipping it 180 degrees. This reverses not only the direction of opening and closing but also the spring return. Since the actuator on the right spring returns in a different direction the hub must be fastened to the stem while the valve is in the closed position. Otherwise the position indicator will be bent. The control of the valve assembly will also not be correct.

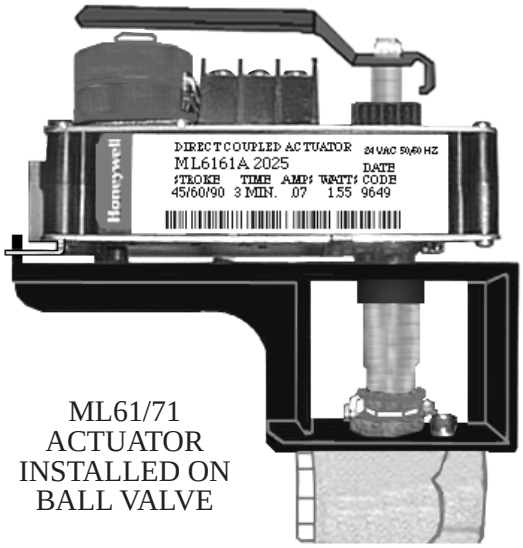
142 LB (16N-M) SPRING RETURN ACTUATOR AUXILIARY SWITCH ADJUSTMENTS



This line of actuators is available with and without auxiliary switches. If there are no switches there will be no dials inside the scaleplate. It is recommended to set the **A** switch to a lower value, such as between 0 and 45 degrees rotation and the **B** switch to a higher value, such as 45 to 90 degrees. The switch differential is 5 degrees for each switch.

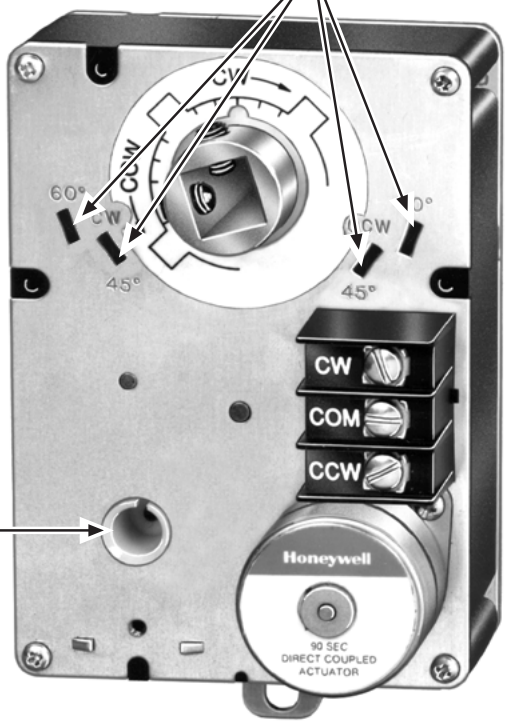
The switches should only be adjusted when the actuator is at the 0 degree mark on the range scale. The scaleplate for the switches is only correct when the actuator is at that position. If the actuator is at a different point on the scale, it should be set close to zero by removing power and having it spring return closed.

ML61/71 ACTUATORS



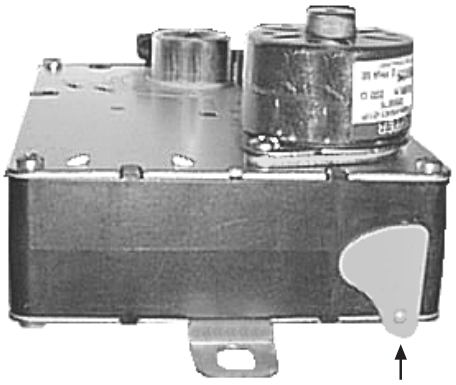
ML61/71 ACTUATOR INSTALLED ON BALL VALVE

RANGE STOP INSERTION LOCATIONS. THESE WILL PRIMARILY BE FOR DAMPER APPLICATIONS. ON MOST BALL VALVES THEY WILL NOT BE USED AND LEFT OPEN.



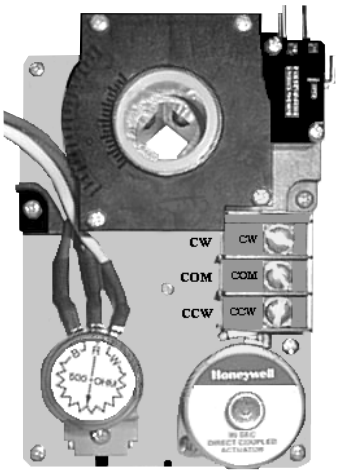
WIRING TERMINALS. THIS UNIT IS SERIES 60.

INSERTION LOCATION FOR AUXILIARY POTENTIOMETERS. ONLY AVAILABLE ON CERTAIN MODELS.



ACTUATORS SUPPLIED WITH BALL VALVES ARE EQUIPPED WITH DECLUTCH LEVERS TO ALLOW VALVE STEM ADJUSTMENTS WITHOUT POWERING ACTUATOR.

ML6161A WITH AUXILIARY SWITCHES AND AUXILIARY POTENTIOMETER INSTALLED. THE BALL VALVE HANDLE CANNOT BE USED IF THE AUXILIARY SWITCHES ARE INSTALLED.



ML6421/ 6425/ 7421/ 7425 VALVE ACTUATORS

ML6425/ML7425 SPRING RETURN VALVE ACTUATOR

ML6421/ML7421 NON-SPRING RETURN VALVE ACTUATOR

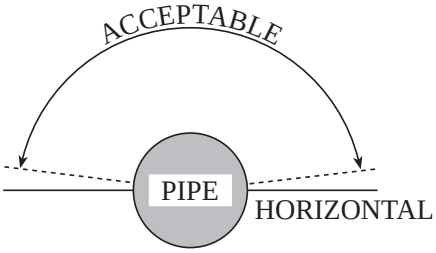
The ML6421/ML6425/ML7421/ ML7425 are a series of direct coupled valve actuators for use with Honeywell V5011 and V5013 valves. The spring return ML6425 and ML7425 are available as stem retracted or stem extended on power outtage. The close-off rating for the non-spring return units makes them usable on valves up to 6 inches (15 cm) in diameter. There are a wide range of control signal options available with 2-10 vdc, 4-20 ma, series 60 SPDT and 135 ohm units available. Through settings and jumper switches on the circuit boards inside the actuator they can be set up for direct/reverse or the actuator position in the event of no control signal input.

The ML6421 and ML7421 are equipped with a manual operator knob to open or close the valve in the event of power failure. Turn off or disconnect the power supply before manually operating the ML7421. To operate push down on the manual operator knob and turn the knob counterclockwise to move the stem downward or turn the knob clockwise to move the stem upward. When the actuator is returned to automatic control the manual operator knob unlocks automatically.

ML6421/ 7421 VALVE ACTUATOR INSTALLATION PROCEDURE

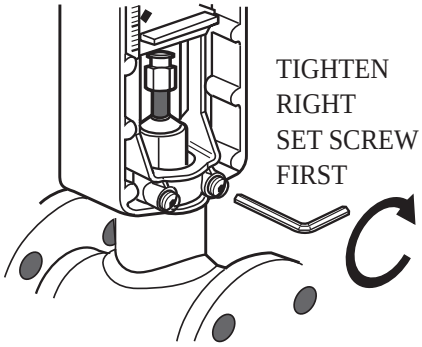
INSTALLING ML6421/ ML7421

NOTE: Check valve body literature for valve stem button adjustment dimension.



CAUTION

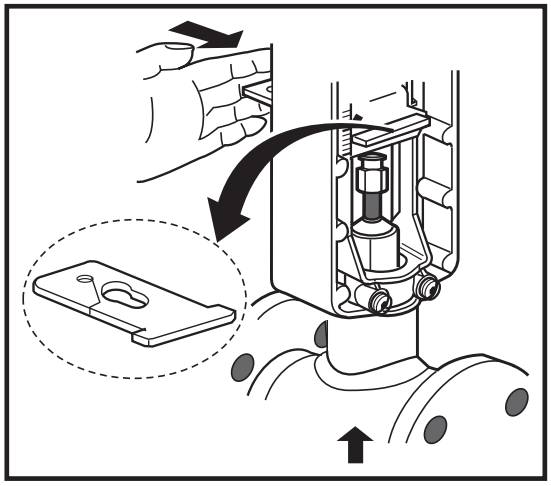
Do not install actuator in a position below horizontal to minimize risk of damage to the actuator in the event of condensation or a valve packing leak.



IMPORTANT

When tightening the set screws, first tighten the right set screw.

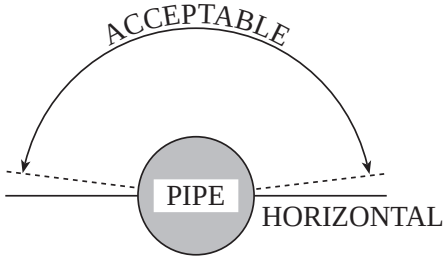
1. Attach the actuator to the valve collar and tighten the set screws with a 5/32 inch (4 mm) hex wrench.



2. Push in the stem button retaining clip and hold.
3. Lift the valve stem until the head of the valve stem button is inside the large slot of the stem button retaining clip on the actuator.
4. Release the stem button retaining clip to secure the stem button.
5. Check to ensure that retaining clip holds the stem button in place.

ML7425 VALVE ACTUATOR INSTALLATION PAGE 1

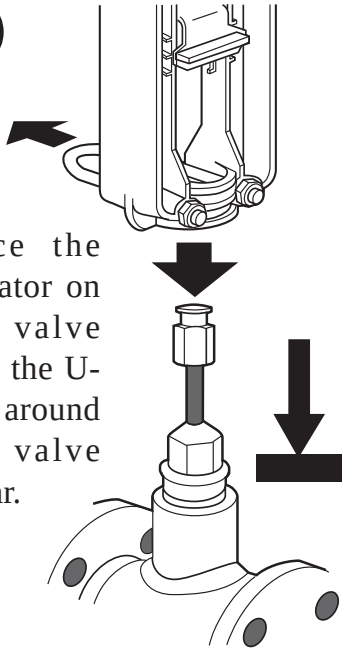
NOTE:
Check valve body literature for valve stem button adjustment dimension.



CAUTION

Do not install actuator in a position below horizontal to minimize risk of damage to the actuator in the event of condensation or a valve packing leak.

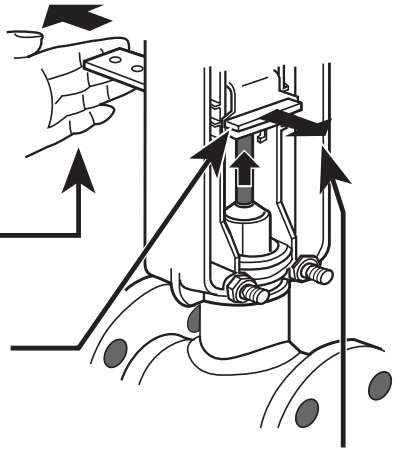
1



Place the actuator on the valve with the U-bolt around the valve collar.

3

Push aside the stem button retaining clip and hold.

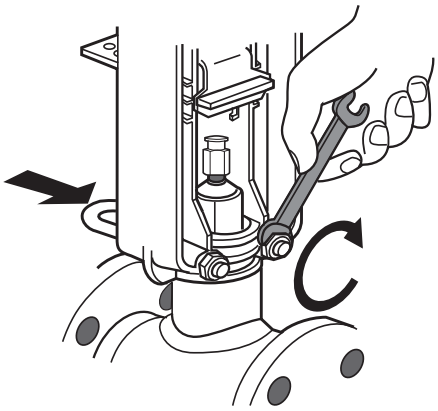


Lift the valve stem until the head of the valve stem button is inside the large slot of the stem button retaining clip on the actuator.

Release the stem button retaining clip to secure the stem button. Check to make certain the stem button is secured by the retaining clip.

2

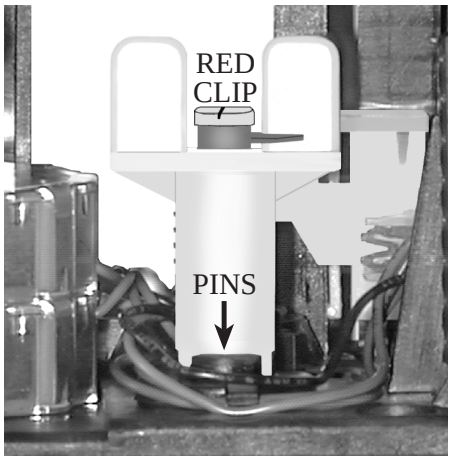
Place the U-bolt against the valve collar and secure the actuator to the valve by turning each U-bolt nut clockwise. To assure of even pressure on the collar, first tighten the nuts finger-tight and then alternate turning each U-bolt nut until both are snug.



Release spring by procedure on next page.

The ML6425 and ML7425 are spring return valves. The spring that either extends or retracts the stem is locked into a fully open position on new actuators. This allows for installation onto the valve and then release of the spring. It is not necessary to have power on the actuator prior to or during installation.

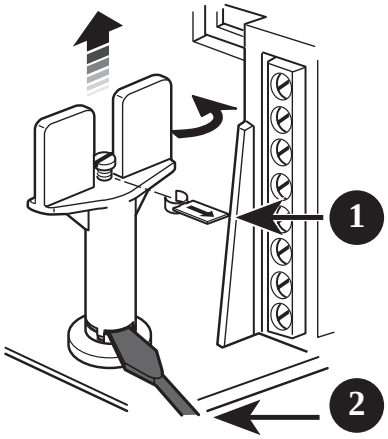
Stem cannot rotate because of being locked into pins at bottom. Red clip at top keeps stem in locked position.



SPRING TEMPORARILY LOCKED

4 UNLOCKING SPRING

A screwdriver is the only tool required to release the spring. Remove the red retaining clip before prying up the handle. **The handle will begin to spin immediately so be certain that your fingers are clear from the top.**



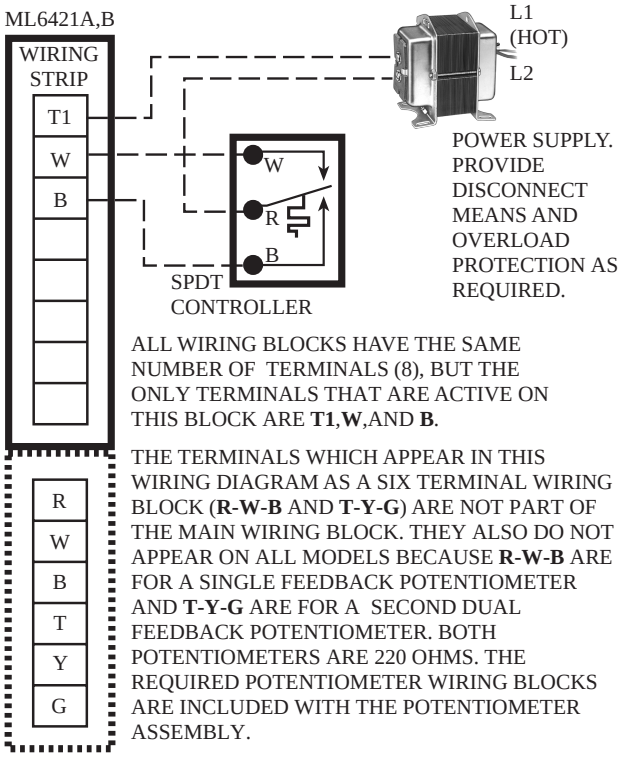
5 SPRING RELEASED

Stem is now above pins and rotates freely. The spring is released and will either retract or extend the stem upon a power outtage to the actuator.

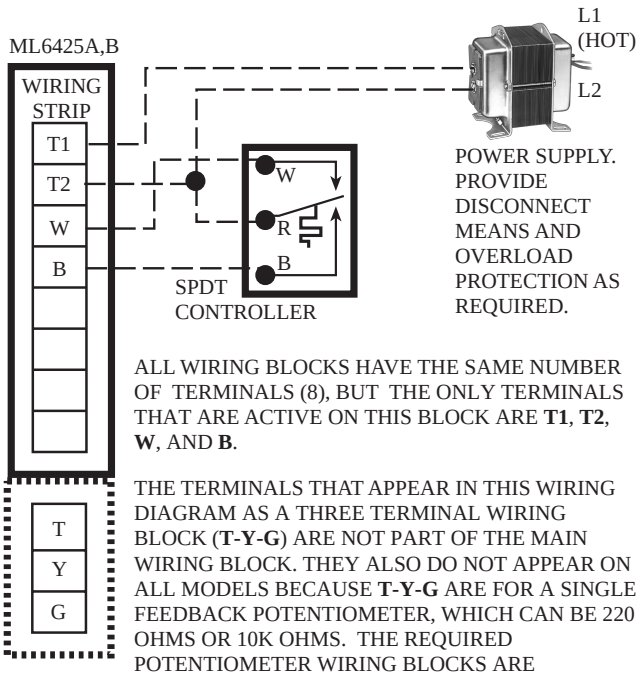
ML6421/ 6425 VALVE ACTUATOR WIRING DIAGRAMS

The ML6421 and ML6425 valve actuators are both controlled by series 60, Single Pole Double Throw, controllers. This can be either a two- position SPDT or a floating SPDT with a center-off position. Applying 24 Vac to T1 and W will power the actuator in one direction. Applying 24 Vac to T1 and B will power the actuator in the other direction.

There are not as many adjustments or wiring configurations for the series 60 actuators as there is for the series 70 ML7421 and ML7425. Since there are auxiliary potentiometers and auxiliary switches available for these devices, there might be variations in the number of terminal connections.



ML6421 WIRING DIAGRAM



ML6425 WIRING DIAGRAM

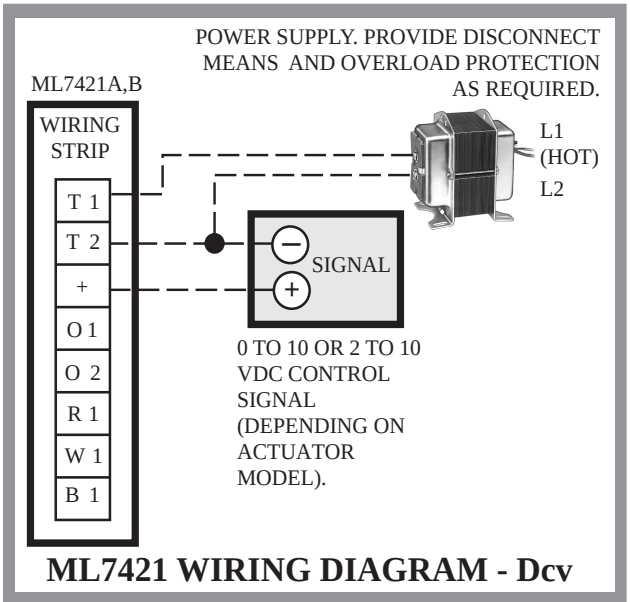
ML7421 VALVE ACTUATOR WIRING DIAGRAMS

The ML7421 valve actuators are controlled by series 70, electronic controllers or series 90 potentiometers. Electronic signal inputs can be either a 0 to 10, 2 to 10 Vdc or a 4 to 20 ma. Since there are auxiliary potentiometers and auxiliary switches available for these devices there might be variations in the number of terminal connections.

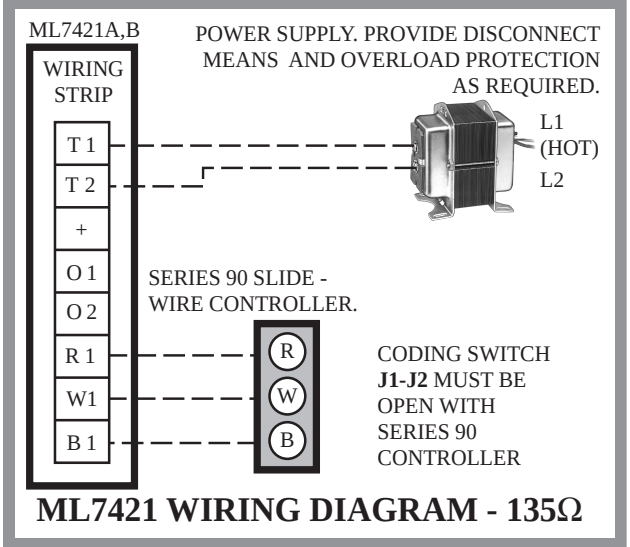
In addition to the wiring connections there are adjustments and settings for:

1. In the event of no control signal input
2. Override of control signal
3. Actuator direction, direct or reverse

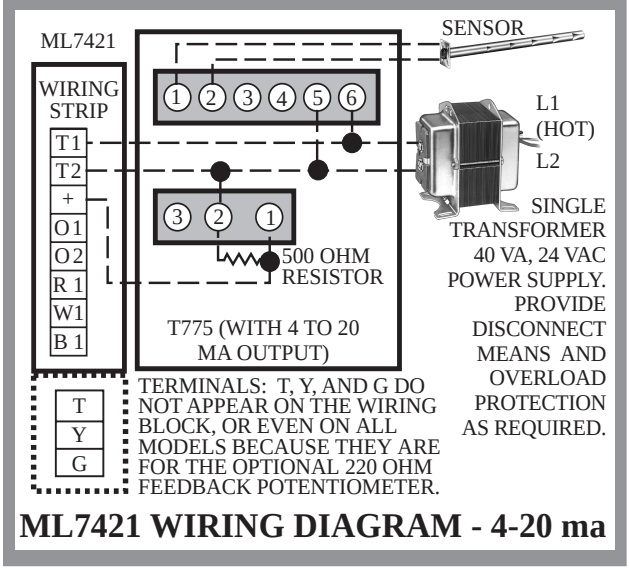
These settings and adjustments change from the spring return to the non-spring return and from series 60 to series 70 actuators so it is necessary to check the literature before making settings. These are illustrated for the ML7421 on the next page.



ML7421 WIRING DIAGRAM - Dcv



ML7421 WIRING DIAGRAM - 135Ω

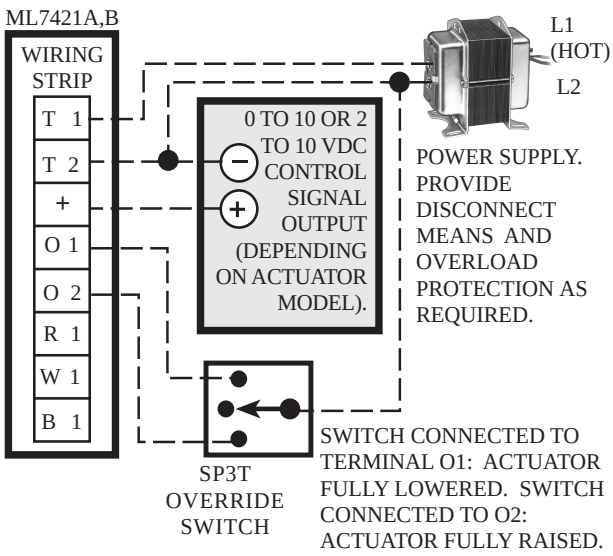


ML7421 WIRING DIAGRAM - 4-20 ma

ML7421 VALVE ACTUATOR CONTROL FUNCTIONS

The ML7421 is equipped with a signal override function. This can be used as a low or high limit or a switchover. The control signal is completely shut out and the actuator is put to either a full open or a full closed position. This is done from a Single Pole Double Throw switch. Some applications might be:

1. Supply air low limit
2. Freeze avoidance
3. Heat/cool switchover
4. Occupied/unoccupied
5. High temperature limit
6. Humidity high limit



SIGNAL OVERRIDE

The S1 switch is only on 0 to 10 VDC actuators. It is used to reverse the output of the actuator to a control signal. The ML7421 is set to extend or push downward on an increasing control voltage signal. It will retract on a decreasing voltage. Adjusting S1 will reverse this. It is on the printed circuit board. On actuators with 2 to 10 vdc circuitry, the action is reversed by switching the control wiring.

SIGNAL REVERSE SWITCH S1

Electric and electronic actuators are frequently designed to be "electrically closed" or "electrically open." This refers to the position the actuator will be in if the control signal is removed. This is not the same though as normally closed or normally open, which is what occurs if the power is taken off the device. On the ML7421 the position of the actuator is adjustable when there is no control signal. The actuator can be put to full open, full closed or 50% open. Note: This only applies to control circuits other than series 90. For series 90 control the switch must be open.

1. Switch open: actuator goes to middle position on no control signal.
2. Switch in J1 position: actuator goes to full lower position if no signal.
3. Switch in J2 position: actuator goes to full upper position if no signal.

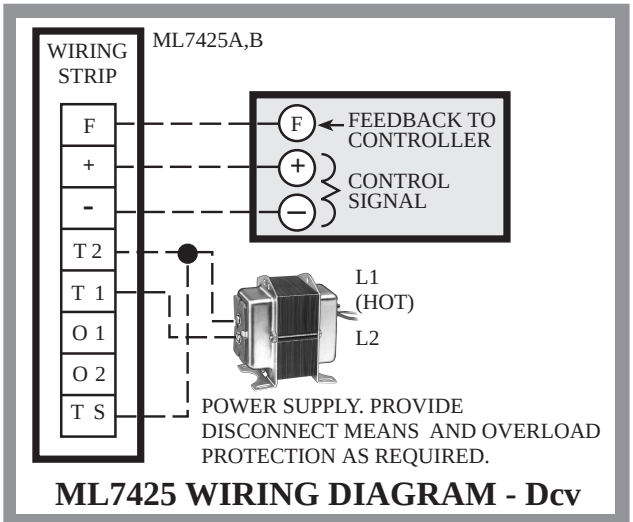
ACTION WITH NO SIGNAL INPUT

ML7425 VALVE ACTUATOR WIRING DIAGRAMS

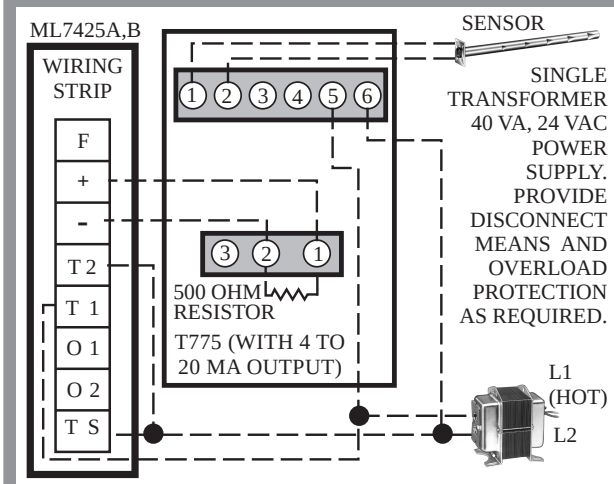
The ML7425 valve actuators are controlled by series 70, electronic controllers. Electronic signal inputs can be either a 0 to 10, 2 to 10 Vdc or a 4-20 ma. Since there are auxiliary potentiometers and auxiliary switches available for these devices there might be variations in the number of terminal connections.

In addition to the wiring connections, there are adjustments and settings for:

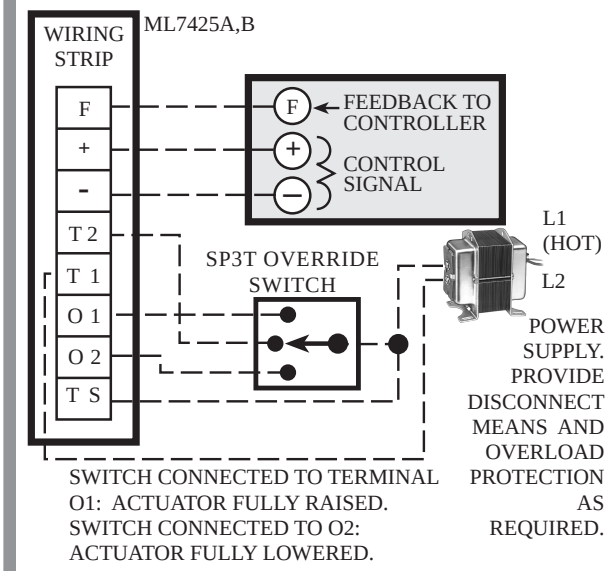
1. In the event of no control signal input
2. Override of control signal
3. Actuator direction, direct or reverse
4. Signal voltage of 0 to 10 Vdc or 2 to 10 Vdc.



ML7425 WIRING DIAGRAM - Dcv

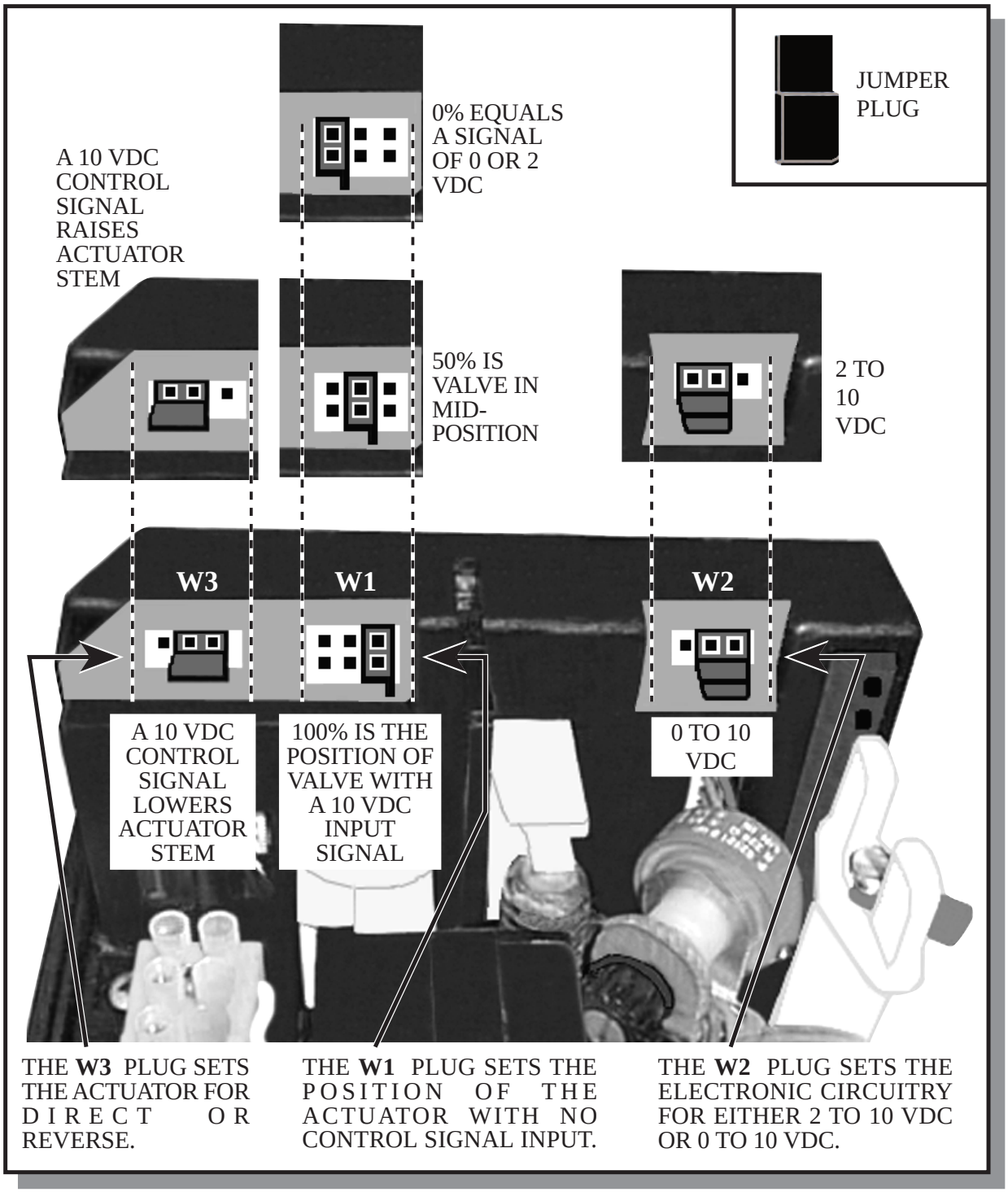


ML7421 WIRING DIAGRAM - 4-20 ma



ML7425 SIGNAL OVERRIDE

ML7425 VALVE ACTUATOR JUMPER PLUG SETTINGS

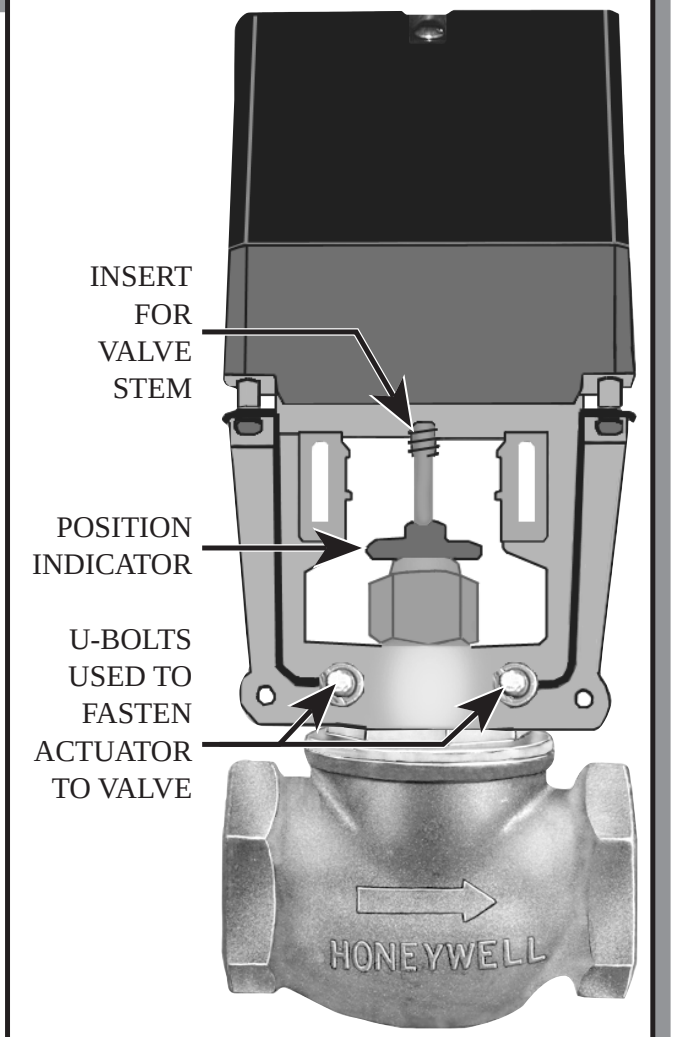


There are 3 jumper plugs on the circuit board of the ML7425 which are used to make 3 separate adjustments. Each adjustment is set by removing a black jumper plug and reinstalling it in the intended position.

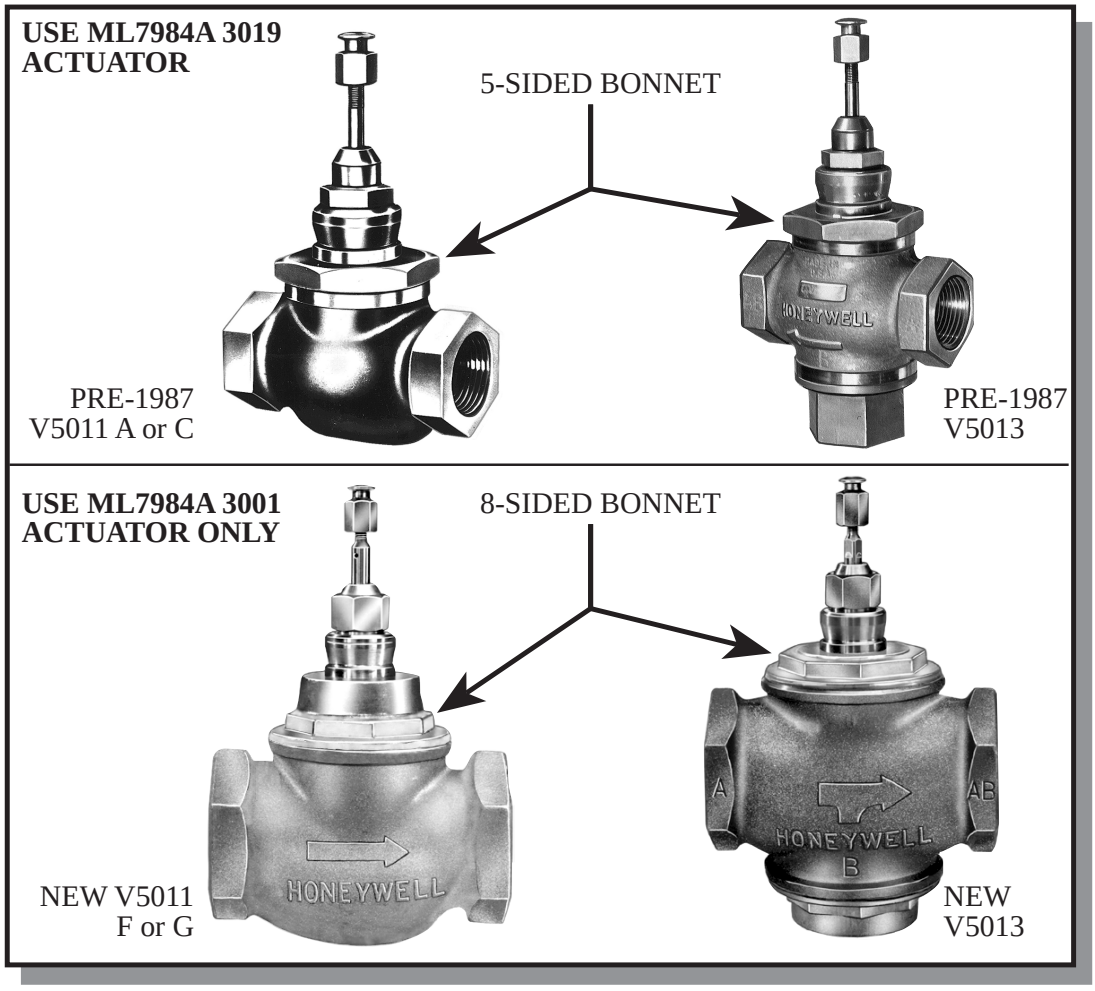
ML7984 VALVE ACTUATOR

MODEL	STEM FORCE	INPUT	TIMING
ML684	150 lbF (665 N)	FLOATING SERIES 60	63 SECONDS
ML784		4-20 mA 2-10 vdc	
ML984		SERIES 90	
ML7984 REPLACES ABOVE EXCEPT ML684	160 lbf (710 N)	4-20 mA, 2-10 vdc, 135 Ohms, Electronic Series 90, Pulse Width Modulation	70 SECONDS

The ML7984 is a combination non-spring return actuator and linkage for one (2.5 cm) to three inch (7.5 cm) commercial globe valves with a 3/4 inch (1.9 cm) stem lift. It replaces several previous Honeywell actuators with a single device that can be used with multiple types of controllers. A separate actuator is available just for pulse width modulation. Dip switches on the circuit board are used to configure the device for various types of control inputs. No adjustments are required to install this actuator other than for the control circuit.



ML7984 VALVE ACTUATOR APPLICATION REQUIREMENTS



Honeywell's commercial globe valves were modified in 1987. In addition to changes in the disc and seat configurations the shape of the bonnet was altered. This affected the use of the ML7984 actuator. The amount of close-off changes from the pre-1987 valves to the newer ones when a ML7984 is used. This is caused by the change in effective stem lift when the actuator is used with the newer valves. To solve this there is a specific actuator ML7984A 3019 made for the V5011 or V5013A and C valves. The ML7984A 3001 is made for the newer V5011 or V5013 F or G valves. This will only be important in retrofit applications since the 5-sided bonnet valves are no longer sold.

ML7984 VALVE ACTUATOR INSTALLATION PROCEDURE PAGE 1

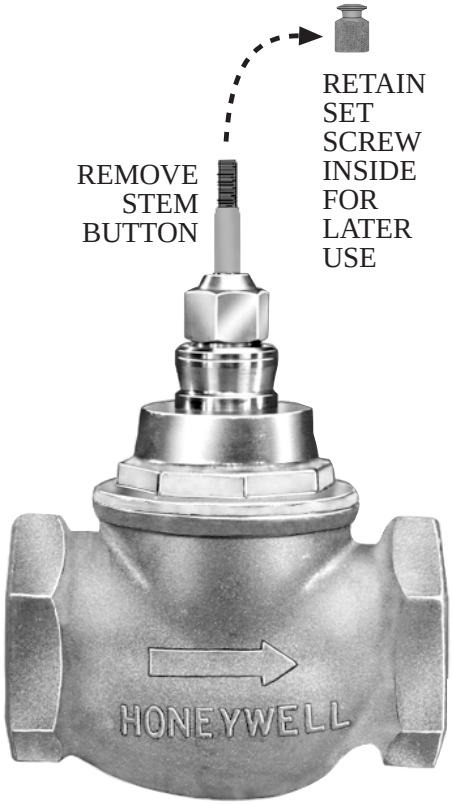
STEP 1

Installing the actuator to the valve is simple but there are a couple of very important steps.

First remove the stem button from the valve. Save the set screw for later installation.

Insure the valve body is installed correctly with the arrow pointing in the direction of flow.

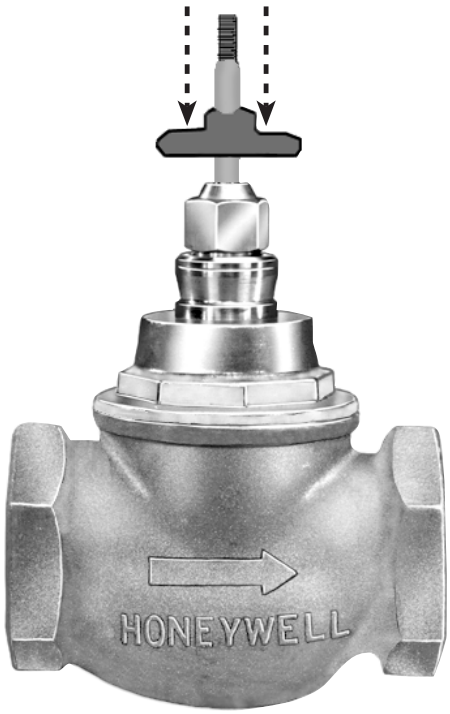
Although the actuator can be mounted in any position it is preferable that the ML7984 is mounted above the valve body. This will minimize risk of damage to the actuator in the event of condensation or a valve gland leak.



STEP 2

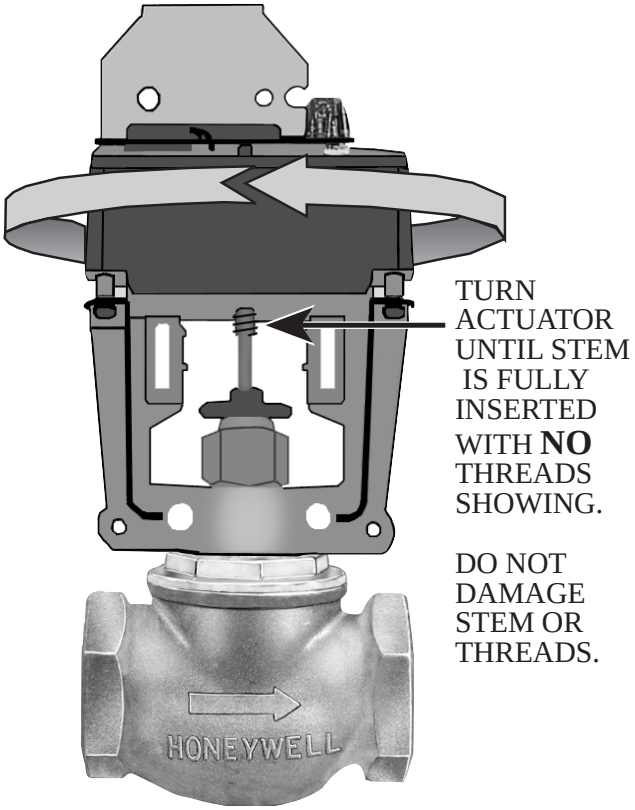
Next slide the red valve position indicator disk on the valve stem.

The indicator disk will self-align to the marking on the yoke after one complete opening and closing cycle.



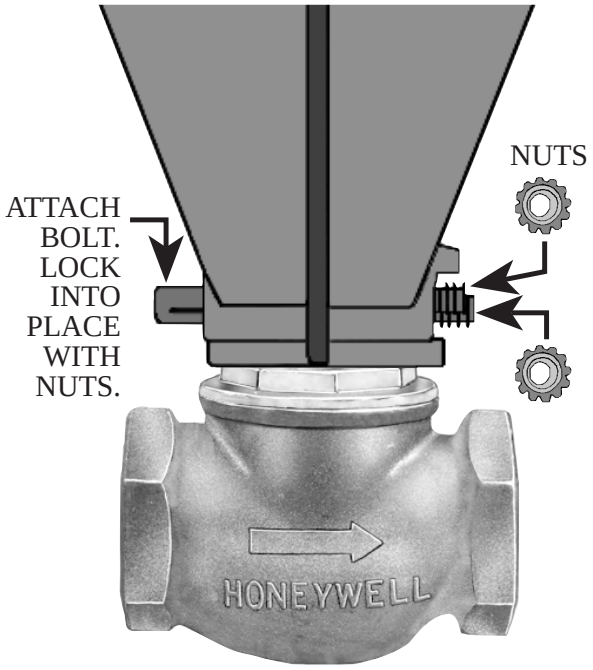
STEP 3

The drive shaft of the ML7984 has a threaded hole to link with the valve stem. Thread the ML7984 drive shaft onto the valve stem **all the way,** until it is **completely attached with NO THREADS SHOWING,** by turning the actuator in a clockwise direction. Use a pin or wrench to keep the valve stem from turning.



STEP 4

Orient the conduit hole to the most desirable direction, then tighten the locknuts on the U bolt.



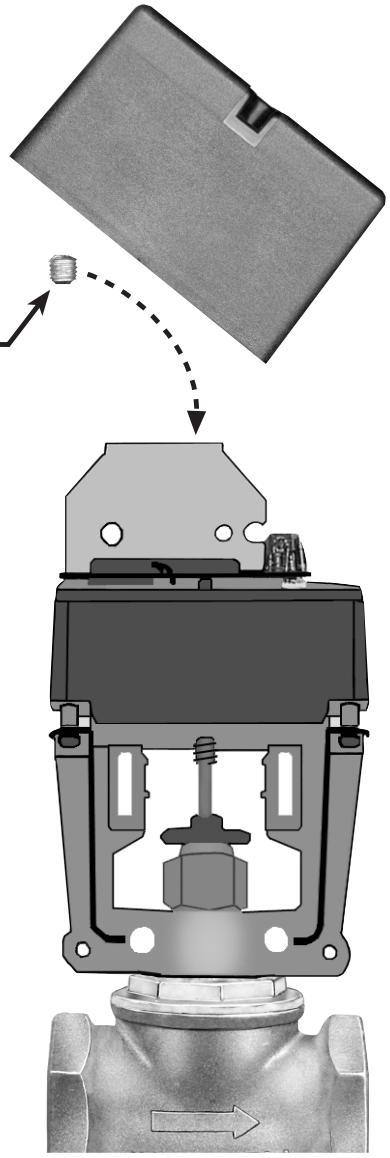
(Continued on Next Page)

ML7984 VALVE ACTUATOR INSTALLATION PROCEDURE PAGE 3

STEP 5

Remove the plastic cover from the ML7984 by loosening the two screws located on the top.

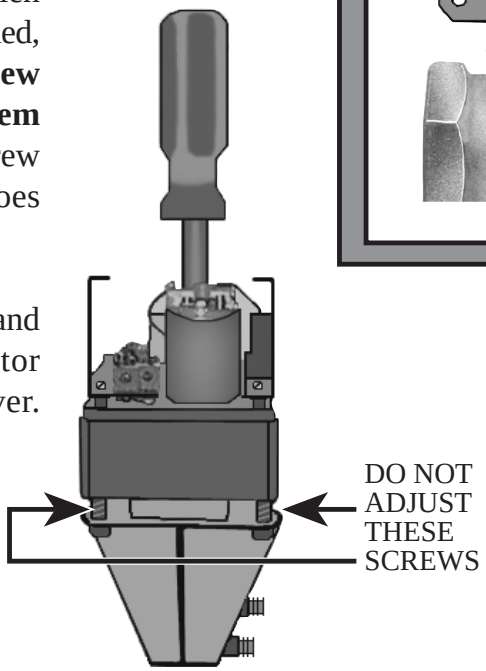
Drop the set screw (From the valve stem or from the plastic bag. It is better to use the set screw from the plastic bag because it has locking threads.) into the top of the shaft slotted side up.



STEP 6

With a 5mm (3/16”) screwdriver or the allen wrench that is provided, **tighten the set screw to lock the valve stem in place.** The set screw is self locking, it does not turn freely.

Wire the controller and power to the actuator and replace the cover.



ML7984A VALVE ACTUATOR SWITCH SETTINGS

Inside the cover of the ML7984A on the printed circuit board there is a 4 position dip switch to the right of the wiring terminal block. This switch is used to configure the actuator to the desired operating mode.

For example if the actuator is to operate with a 10-2 Vdc (reverse acting) signal from the controller the dip switches would be configured as:

Switches 1 and 3: ON
Switches 2 and 4: OFF

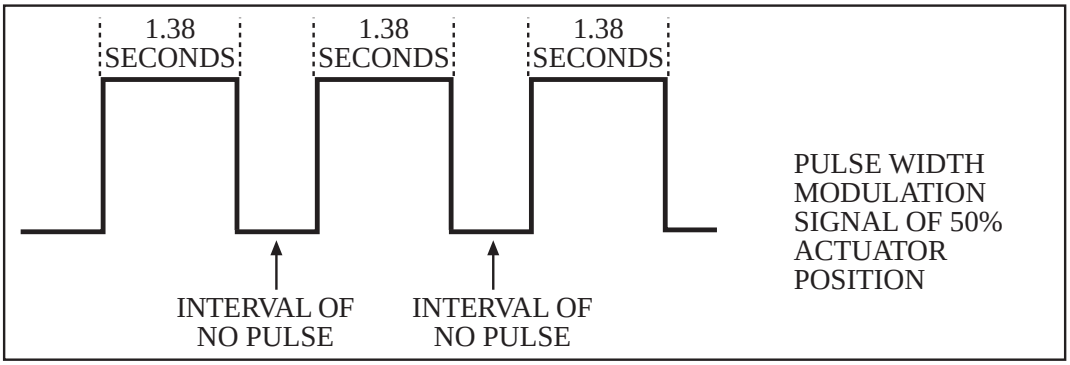
When controlling multiple actuators from a primary in the 4-20 mA or 20-4 mA mode switch 1 on the primary actuator is ON and switch 1 on the controlled actuators is OFF.

To reset the operating mode simply reconfigure the switches, interrupt, then restore power.

APPLICATION	SWITCH NUMBER 1	2	3	4
2 to 10 vdc Direct	ON	OFF	OFF	OFF
2 to 10 vdc Reverse	ON	OFF	ON	OFF
4 to 20 mA Direct Master	ON	OFF	OFF	OFF
4 to 20 mA Direct Slave	OFF	OFF	OFF	OFF
4 to 20 mA Reverse Master	ON	OFF	ON	OFF
4 to 20 mA Reverse Slave	OFF	OFF	ON	OFF
Series 90 135 Ohm	ON	OFF	OFF	ON
Series 90 135 Ohm Reversed	ON	OFF	ON	ON
Electronic Series 90	ON	ON	OFF	ON
Electronic Series 90 Reversed	ON	ON	ON	ON

If Replacing Primary or Controlled ML784 Series, Check Literature

PULSE WIDTH MODULATION



If this control circuit were this type of pulse width modulation:

Minimum signal of 0.1 seconds
0.01 second increments
Maximum duration 2.65 seconds

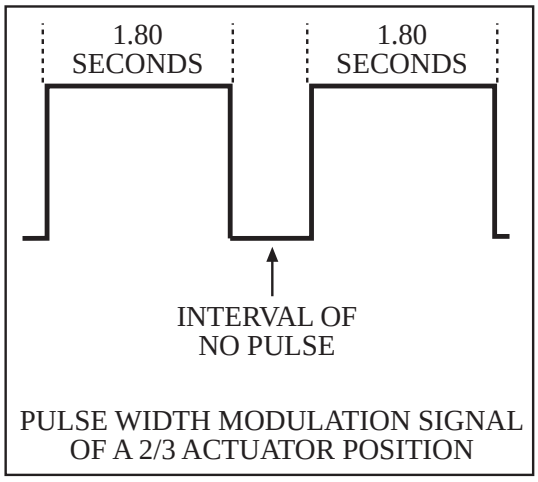
Then the actuator would be at 50% or half open position. This is calculated by subtracting the minimum signal from 2.65 seconds.

2.65 minus 0.1 equals 2.55.

2.55 divided by .01 increments equals 255 increments.

The signal being sent is 1.38 seconds. This is 128 increments more than the minimum of 0.1.

128 is approximately half of 255 putting the actuator at a 50% position.

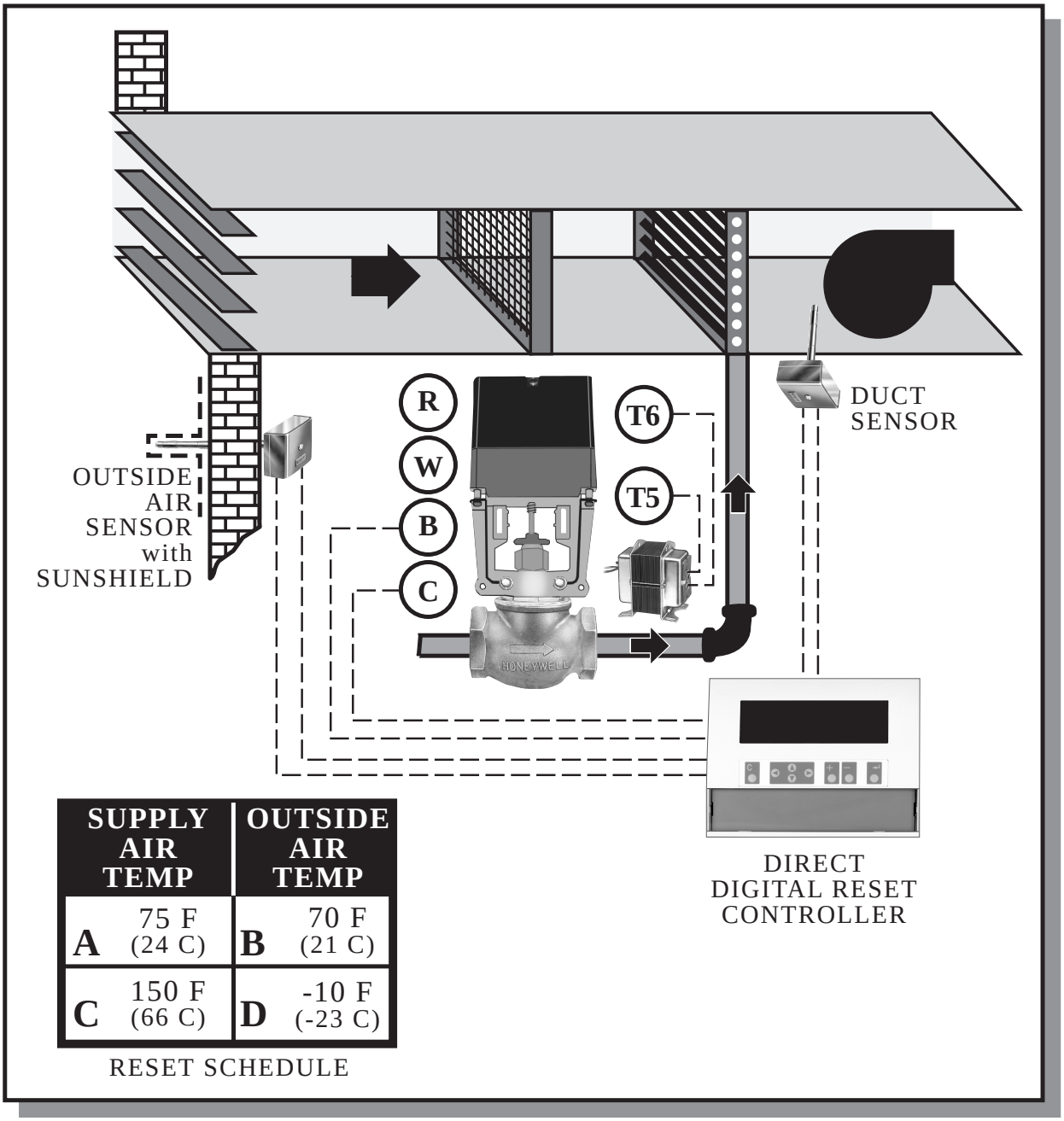


A pulse duration of 1.80 seconds would be 170 increments more than the minimum.

170 is approximately 2/3 of 255 putting the actuator at a 2/3 position.

A newer type of control circuit used with DDC controllers for which Honeywell makes direct coupled actuators is Pulse Width Modulation (PWM). This is a digital modulation control mode which requires a specific actuator. The duration of a defined voltage signal sent from the controller to the actuator is adjusted based upon the need for heating or cooling. If the room is cold a longer signal might be sent to a heating valve to open it more fully. As the room warms the duration of the signal is shortened to close the valve. It can be compared to Morse Code wherein shorter taps have a different significance than longer taps. The time width or interval and the voltage resolution of the signal are not standardized in the control industry. Honeywell PWM actuators are adjustable at installation for many types of PWM modes.

ML7984B PULSE WIDTH MODULATION VALVE ACTUATOR



SUPPLY AIR TEMP		OUTSIDE AIR TEMP	
A	75 F (24 C)	B	70 F (21 C)
C	150 F (66 C)	D	-10 F (-23 C)

RESET SCHEDULE

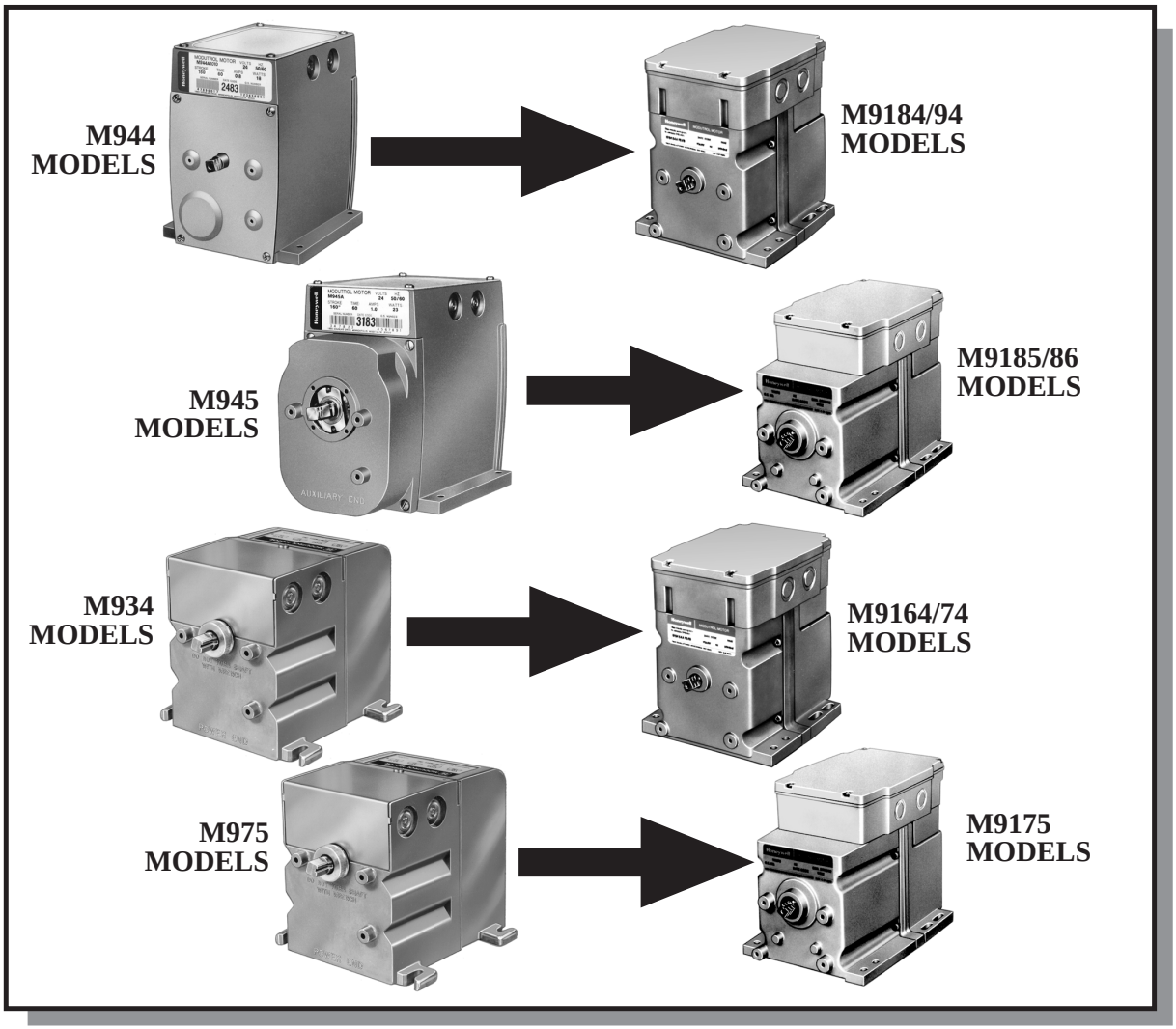
This is supply air reset of a heating coil on an airhandler using pulse width modulation. The actuator is a ML7984B used with a V5011 valve. Steam or hot water is supplied to the coil and the supply air temperature from the coil is varied with the outside air temperature to meet the needs of the conditioned area. Proportional plus integral or proportional plus integral plus derivative control will probably be required to prevent excessive cycling of the valve actuator. The reset timing would have to be adjusted to provide a steady positioning of the valve.

ML7984B VALVE ACTUATOR SWITCH SETTINGS

APPLICATION	SWITCH NUMBER 1	2	3	4
Pulse Width Modulation: minimum 0.1 sec. + 0.01 sec. increments. Maximum 2.65 sec. Direct.	OFF	OFF	OFF	ON
Pulse Width Modulation: minimum 0.1 sec. + 0.01 sec. increments Maximum 2.65 sec. Reverse.	OFF	OFF	OFF	ON
Pulse Width Modulation: minimum 0.1 sec. + 0.02 sec. increments. Maximum 5.20 sec. Direct.	ON	OFF	OFF	OFF
Pulse Width Modulation: minimum 0.1 sec. + 0.02 sec. increments. Maximum 5.20 sec. Reverse.	ON	OFF	OFF	ON
Pulse Width Modulation: minimum 0.1 sec. + 0.05 sec. increments. Maximum 12.85 sec. Direct.	OFF	ON	OFF	OFF
Pulse Width Modulation: minimum 0.1 sec. + 0.05 sec. increments. Maximum 12.85 sec. Reverse.	OFF	ON	OFF	ON
Pulse Width Modulation: minimum 0.1 sec. + 0.10 sec. increments. Maximum 25.6 sec. Direct.	ON	ON	OFF	OFF
Pulse Width Modulation: minimum 0.1 sec. + 0.10 sec. increments. Maximum 25.6 sec. Reverse.	ON	ON	OFF	ON
Pulse Width Modulation: minimum 0.59 sec. + 0.00918 sec. increments. Maximum 2.93 sec. Novar. Direct.	OFF	ON	ON	OFF
Pulse Width Modulation: minimum 0.59 sec. + 0.00918 sec. increments. Maximum 2.93 sec. Novar. Reverse.	OFF	ON	ON	ON
2 to 10 vdc Direct	ON	ON	ON	OFF
2 to 10 vdc Reverse	ON	ON	ON	ON

The ML7984B is designed to work with five of the most frequently used types. Selection of one of the five types is done by dip switches on the top of the actuator. These same switches are also used to select direct and reverse or to use the ML7984B with a 2 to 10 vdc control signal instead of pulse width modulation.

MOD IV VALVE AND DAMPER ACTUATORS

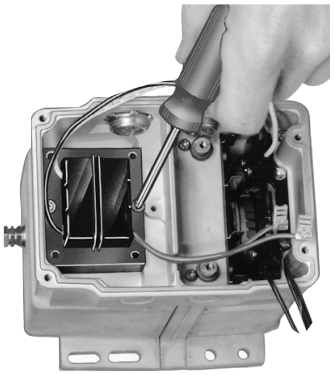


While Honeywell provides a complete line of direct coupled valve actuators there are many retrofit applications where it is preferrable to replace a modutrol motor with a similar motor. This could be due to high torque requirements or inability of removing insulation from the linkage. The Mod IV line of motors is available to replace virtually all previous Honeywell actuators and can be adapted to the existing linkage if necessary. A newer Q5001 valve linkage is also available.

Some of the valve-specific features of the Mod IV line of actuators are:

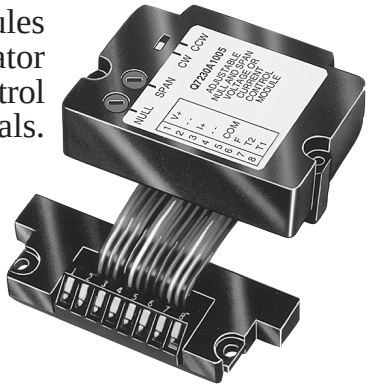
1. 24 Vac input
2. Cams which allow for adding auxiliary switch kits
3. Auxiliary end shaft capable of accepting Q5001 valve linkage
4. Interface Modules can be added to upgrade all Series 90 motors to Series 70 control

ACCESSORIES FOR MOD IV ACTUATORS

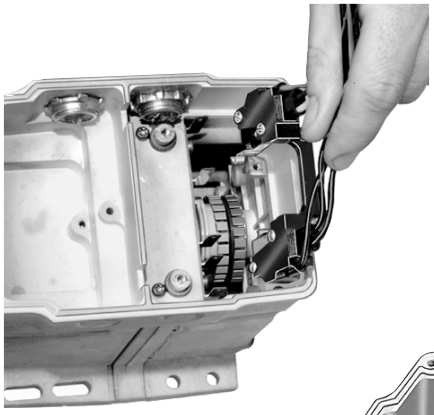


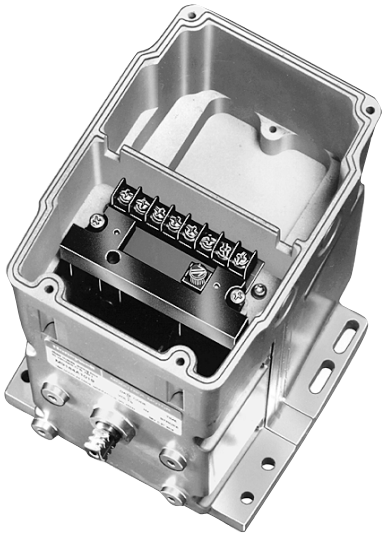
Internal transformers

Interface modules to adapt actuator for various control signals.

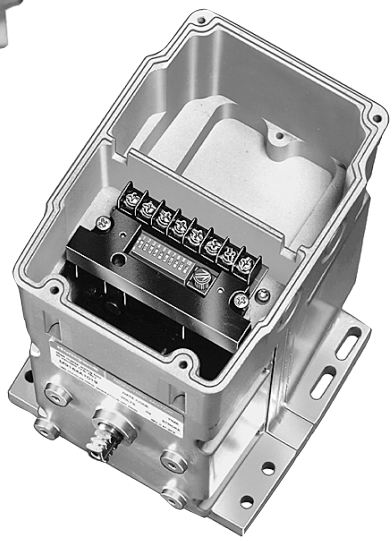


Auxiliary switches for Tradeline actuators. Same functions as factory switches. One and two switch kits available.





The 220741A Screw Terminal Board to adapt various Modutrol IV quick connects to screw terminals. Optional minimum position switch.

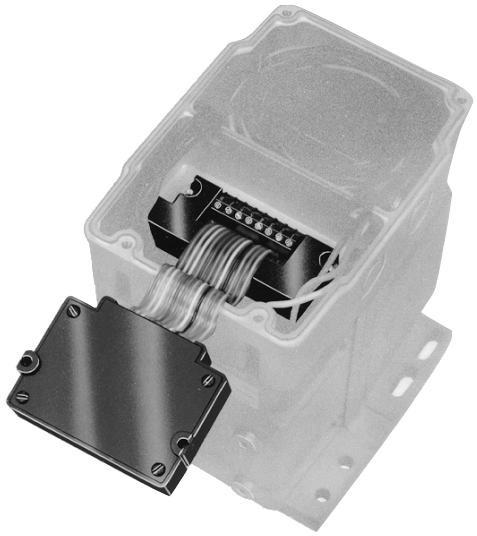


A Modutrol IV Resistor Board that can drive:

- Up to six motors in unison
- One to four motors from a 4-20 mA controller
- Two or three motors from a W973

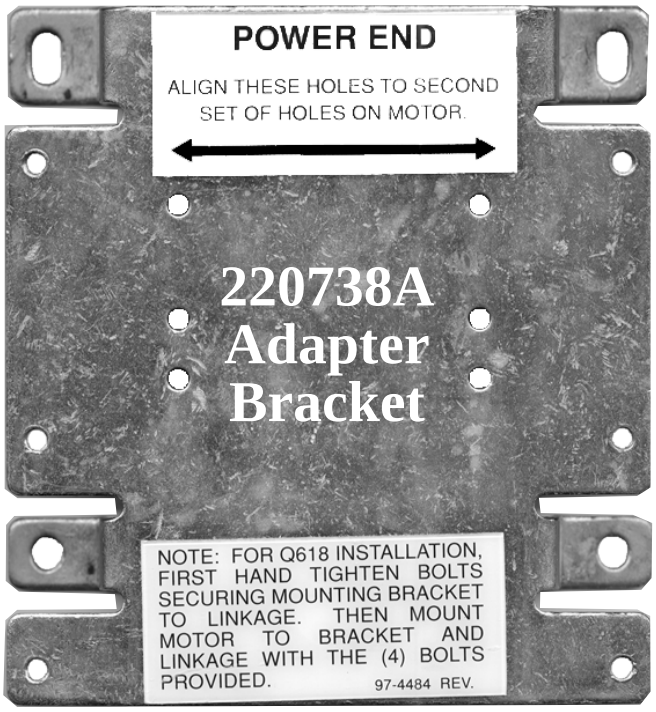
INSTALLATION PROCEDURE Q7130A, Q7230A, Q7330A, Q7630A Modules:

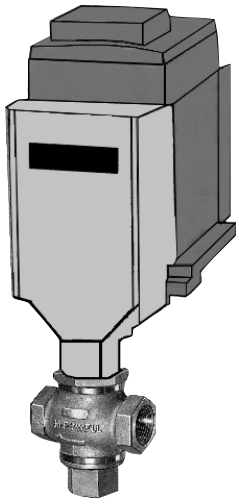
1. Make motor adjustments (stroke and/or auxiliary switches) as needed.
2. Disconnect power to motor.
3. Plug terminal block onto motor's quick-connect terminals.
4. Connect field wiring to terminal block's screw terminals.
5. Check for proper operation of motor stroke and auxiliary switches.
6. Position ribbon cable to loop down inside motor cavity.
7. Place circuit module on terminal block and secure assembly to motor with 2 screws.
8. Make adjustments to interface module (specific adjustments depend on particular module used).



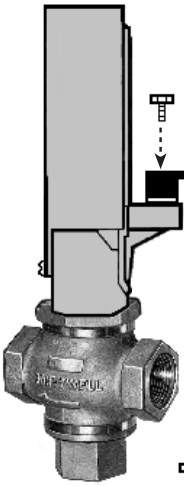
Module	Interface Function	Used in Replacing
Q7130A	Selectable voltage ranges 4-7, 6-9, or 10.5-13.5 Vdc	M734H,J M744D M745G
Q7230A	Adjustable zero and span, current or voltage control. Ranges include 4-20 mA and 2-10 Vdc.	M744S,T,Y M745S,T,Y
Q7330A	Control interface for W936 and W945	M734D M744A M745A
Q7630A	14-17 Vdc control with minimum position capability	M745K M745L

MOD IV ACTUATORS USED WITH A Q618 VALVE LINKAGE

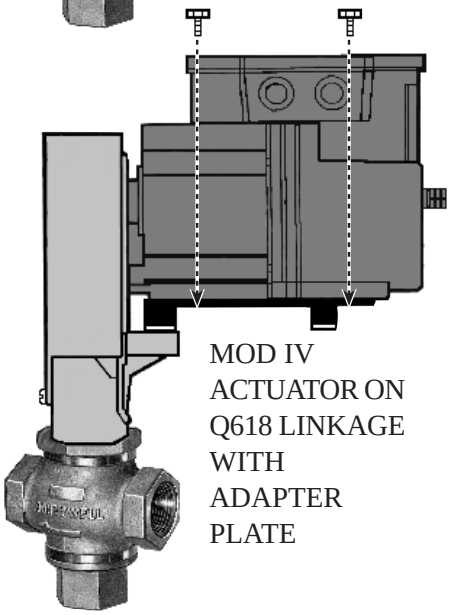




Q618 VALVE LINKAGE INSTALLED ON A VALVE



220738A ADAPTER PLATE INSTALLED ON Q618 LINKAGE



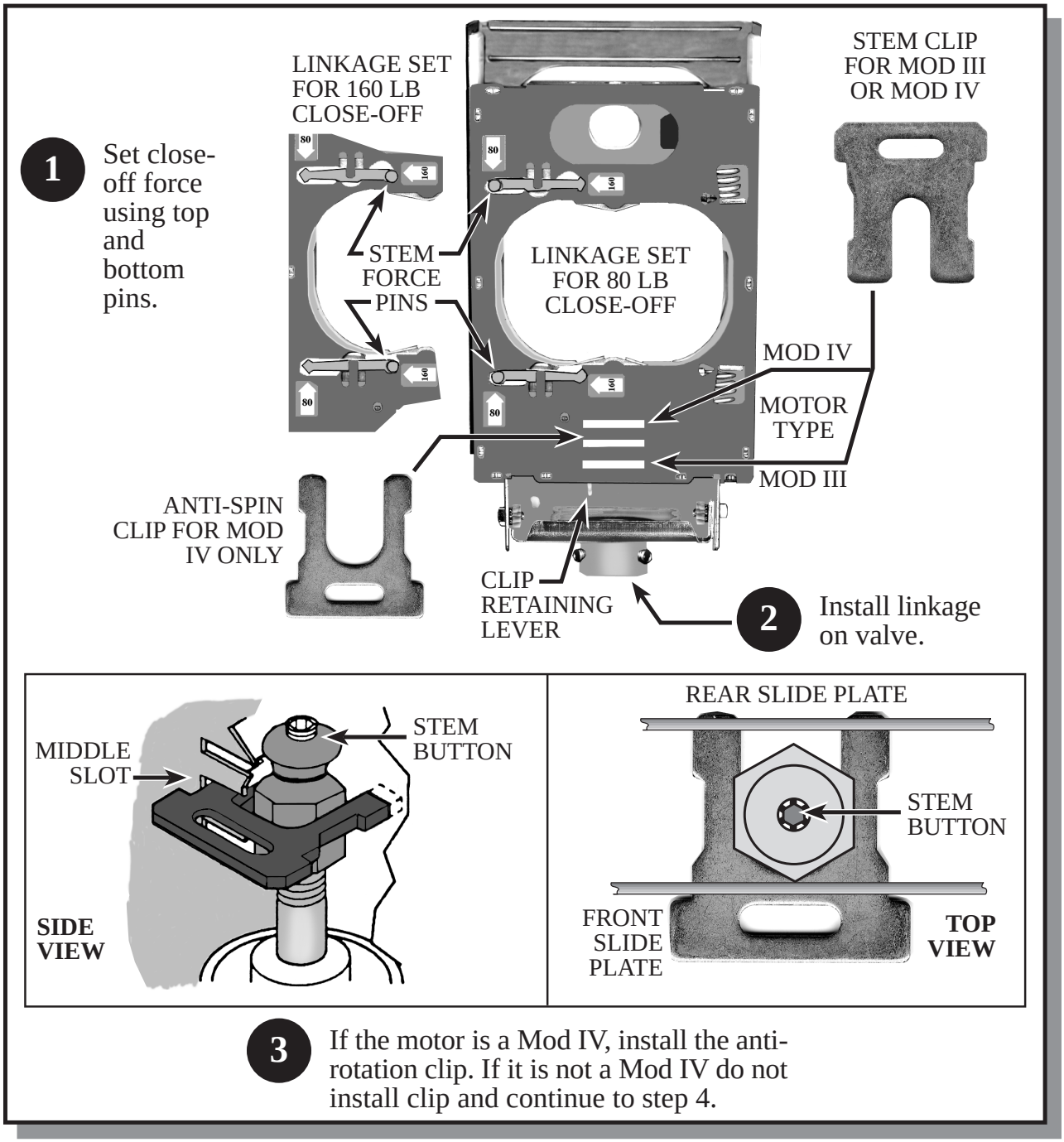
MOD IV ACTUATOR ON Q618 LINKAGE WITH ADAPTER PLATE

The shaft heigth on the Honeywell Mod IV motors is 3/4 inches (2 cm) lower than that of the previous line of motors the Mod III. When replacing Mod III actuators in valve applications without replacing the Q618 linkage, an adapter plate is required. This adapter, which raises the heigth of the shaft 3/4 inches (2 cm) has been included in the box with some motors. This plate is installed on the valve linkage first. The Mod IV actuator is then bolted to the plate.

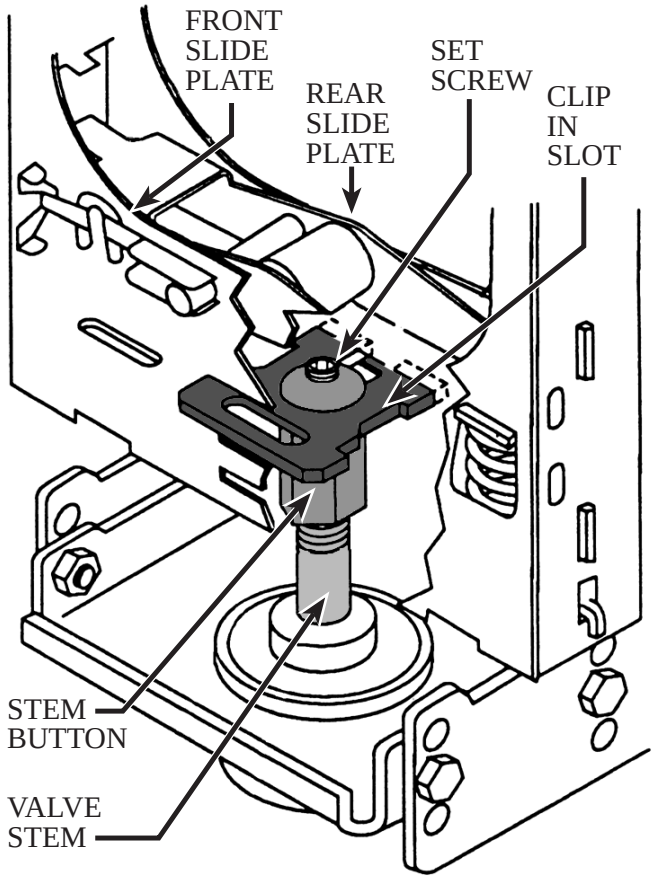
If the Q618 valve linkage is damaged and a new Q5001 linkage is used to replace it the adapter plate is not needed.

The adapter plate can also be used on damper applications if it is necessary to have the shaft height match the previous motor.

Q5001 Valve Linkage for Mod III and IV Actuators Installation Page 1

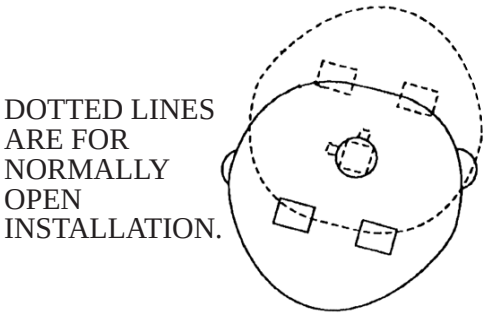


The Q5001 valve linkage is designed for installing Honeywell Mod III and Mod IV actuators on commercial globe valves. Stem force ratings of 80, 160 or 320 pounds are available depending upon the actuator. Stem lifts of 1/4 inch (.625 cm) to 1.5 inches (3.75 cm) are available depending upon the cam selected. Nine separate cams are available. For spring return applications the normal position of the valve assembly can be reversed by reversing the cam. No other adjustments are required.

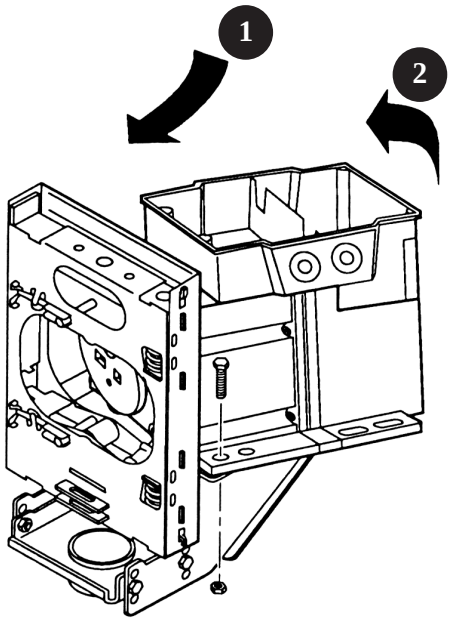


CLIP MUST ENGAGE SLOTS ON STEM BUTTON AND THE REAR SLIDE PLATE

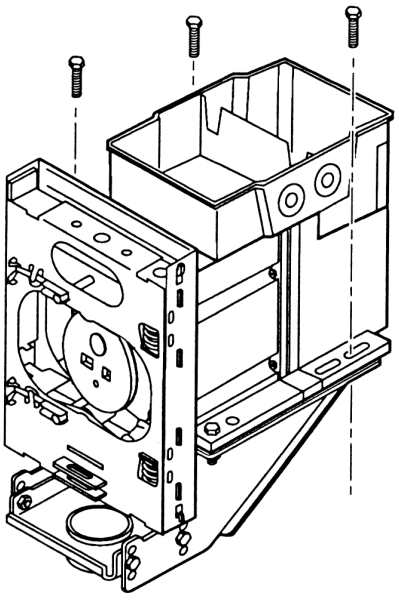
4 Install stem clip.



5 Install cam on motor.

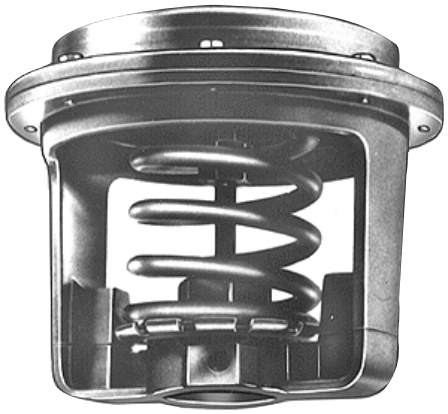


6 Install linkage on motor.



7 Fasten motor to linkage with bolts.

PNEUMATIC ACTUATORS



PNEUMATIC ACTUATOR

UNITARY PNEUMATIC VALVE

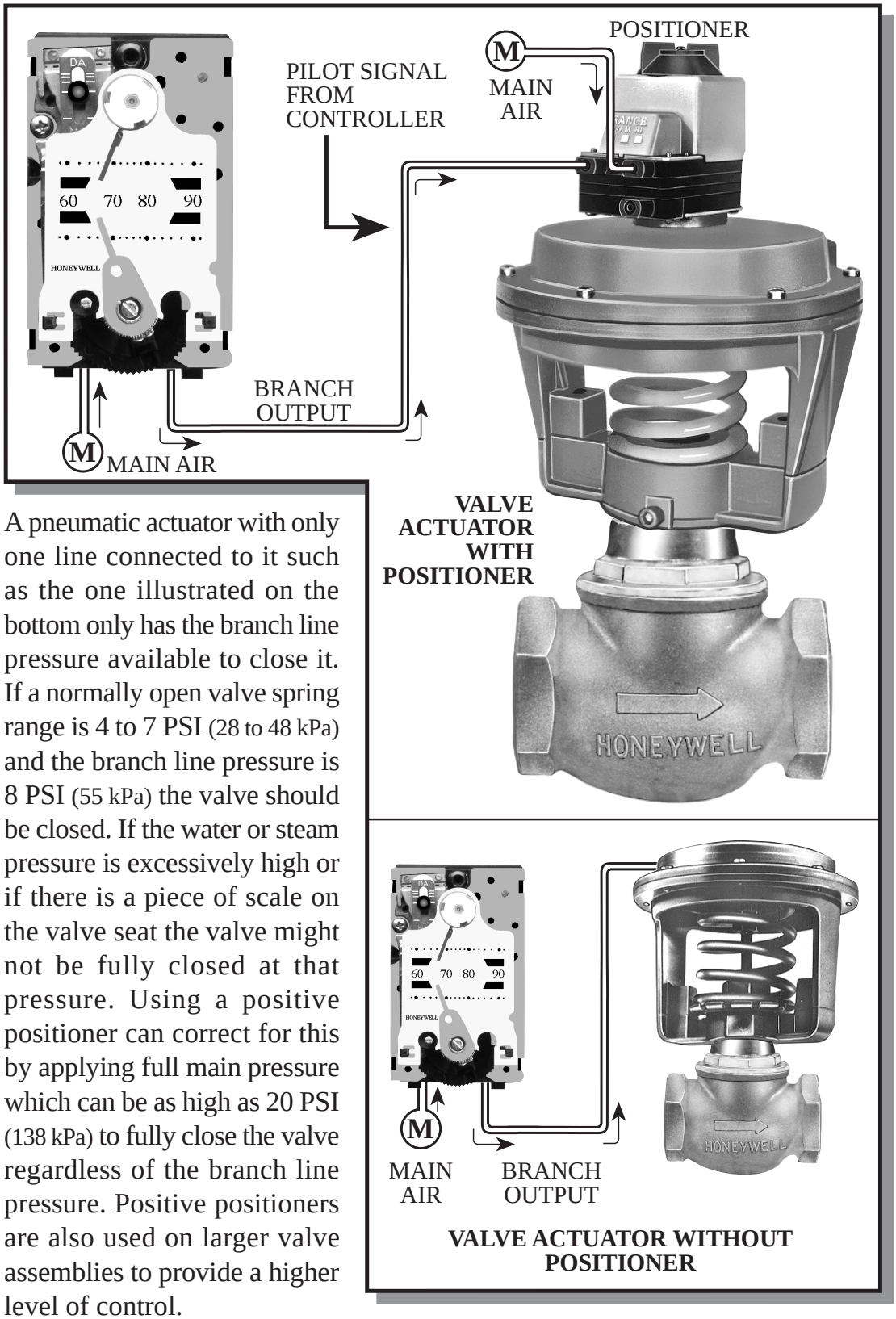
There are applications in which it is preferable to use air-powered or pneumatic actuators on valves. These might be intermixed in a building along with electric or electronic actuators depending upon whether it is new construction or retrofit. There are many purposes for using a pneumatic actuator instead of electric. Most common is the size of the valve. Larger valves require higher torque for acceptable close-off ratings. Pneumatic actuators provide higher torque than most commercial electric actuators.

An equipment room environment that is very humid with excessive amounts of condensation directly onto the actuator will not have a substantial effect on a pneumatic valve actuator. While electric actuators are available with water resistant enclosures the cost is increased and the ambient temperature rating might be lowered.

If the actuator is cycled excessively such as supply air in an airhandler the maximum number of cycles for an electric motor can be reached in an unacceptably short length of time. Replacement of the entire actuator is frequently required instead of repair. A pneumatic actuator is frequently repairable with minimal parts and tools.

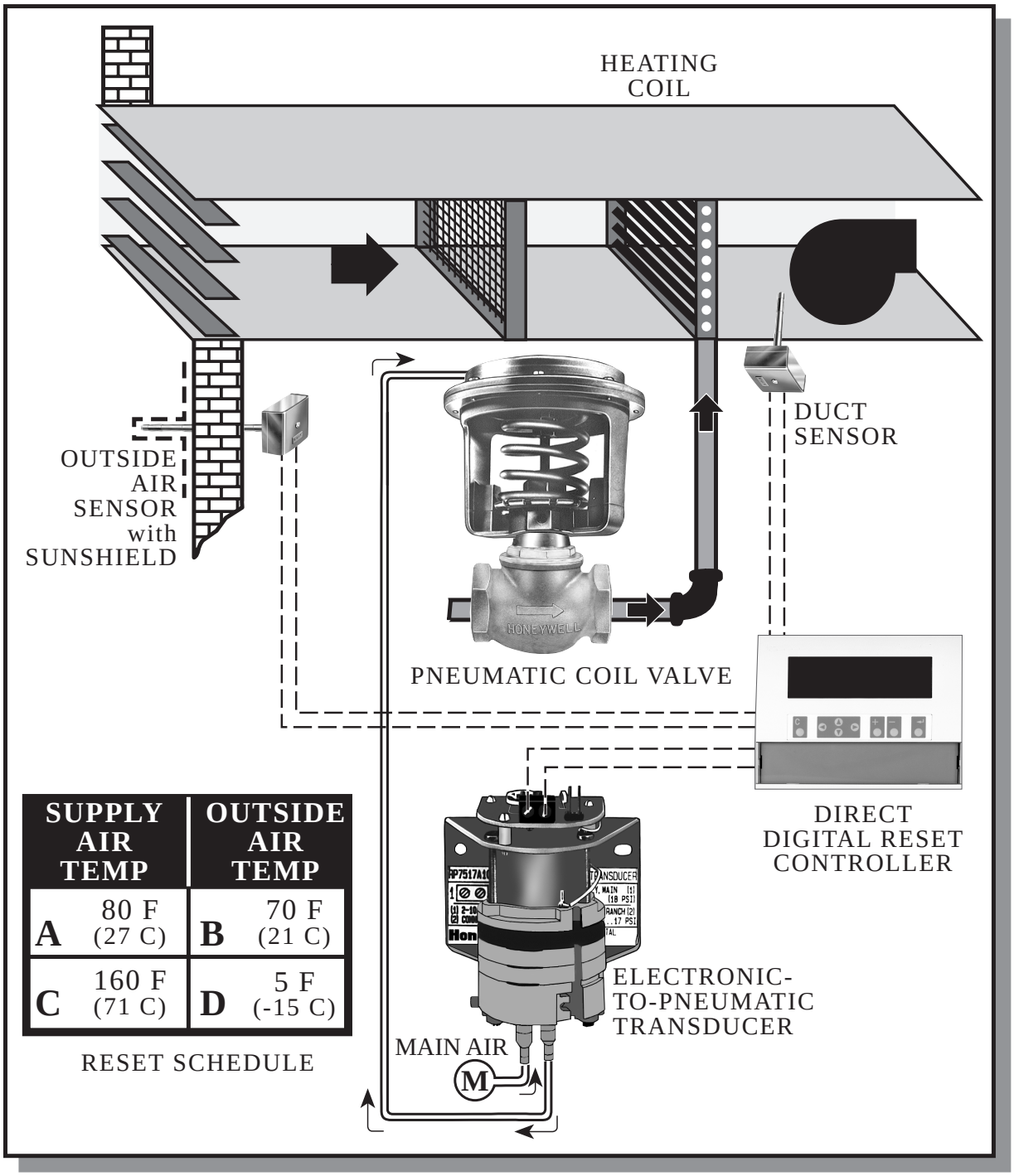
The actuators above illustrate the two types of pneumatic actuators: a pneumatic actuator for a valve assembly on the left and an integral or unitary pneumatic valve on the right. The difference is that the unitary valves are available only as a complete assembly. The actuators on the left are available in different sizes and configurations and can be used with a wide range of valves. Repair parts are available for each. Unitary valves can be adapted for various sequencing applications by installing spring ranges with different pressure ratings.

POSITIVE POSITIONERS



A pneumatic actuator with only one line connected to it such as the one illustrated on the bottom only has the branch line pressure available to close it. If a normally open valve spring range is 4 to 7 PSI (28 to 48 kPa) and the branch line pressure is 8 PSI (55 kPa) the valve should be closed. If the water or steam pressure is excessively high or if there is a piece of scale on the valve seat the valve might not be fully closed at that pressure. Using a positive positioner can correct for this by applying full main pressure which can be as high as 20 PSI (138 kPa) to fully close the valve regardless of the branch line pressure. Positive positioners are also used on larger valve assemblies to provide a higher level of control.

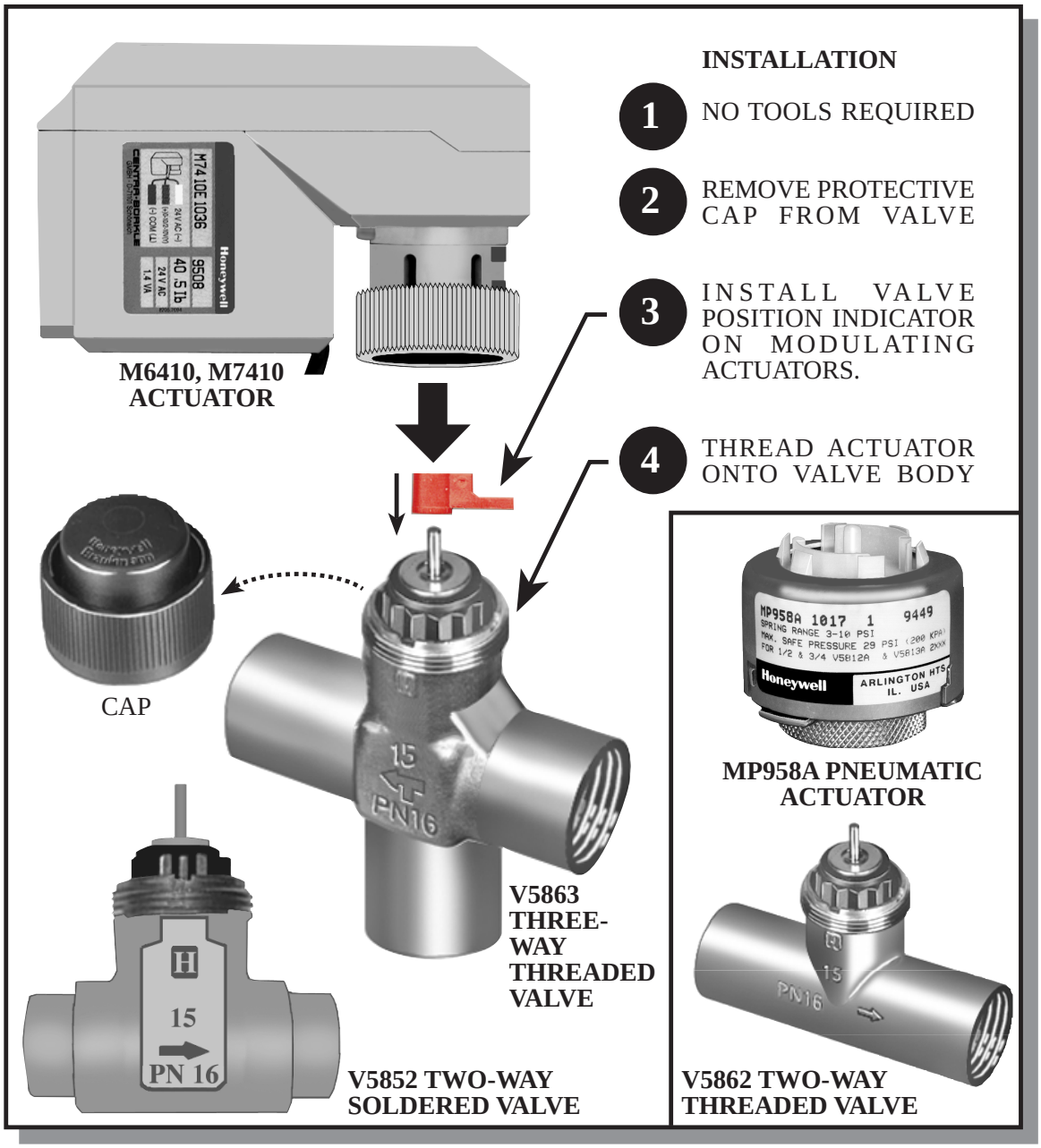
ELECTRONIC-TO-PNEUMATIC TRANSDUCERS



SUPPLY AIR TEMP		OUTSIDE AIR TEMP	
A	80 F (27 C)	**B**	70 F (21 C)
C	160 F (71 C)	**D**	5 F (-15 C)

RESET SCHEDULE

Transducers are used to take an electronic signal from a controller and convert it to a pneumatic signal to modulate a valve or damper actuator. This is frequently on on mixed air dampers since multiple large damper motors can be connected to one transducer. In this application a pneumatic heating coil valve is being controlled with an electronic-to-pneumatic transducer. Multiple transducers can be used for other control loops such as face and bypass dampers, mixed air or a cooling coil.

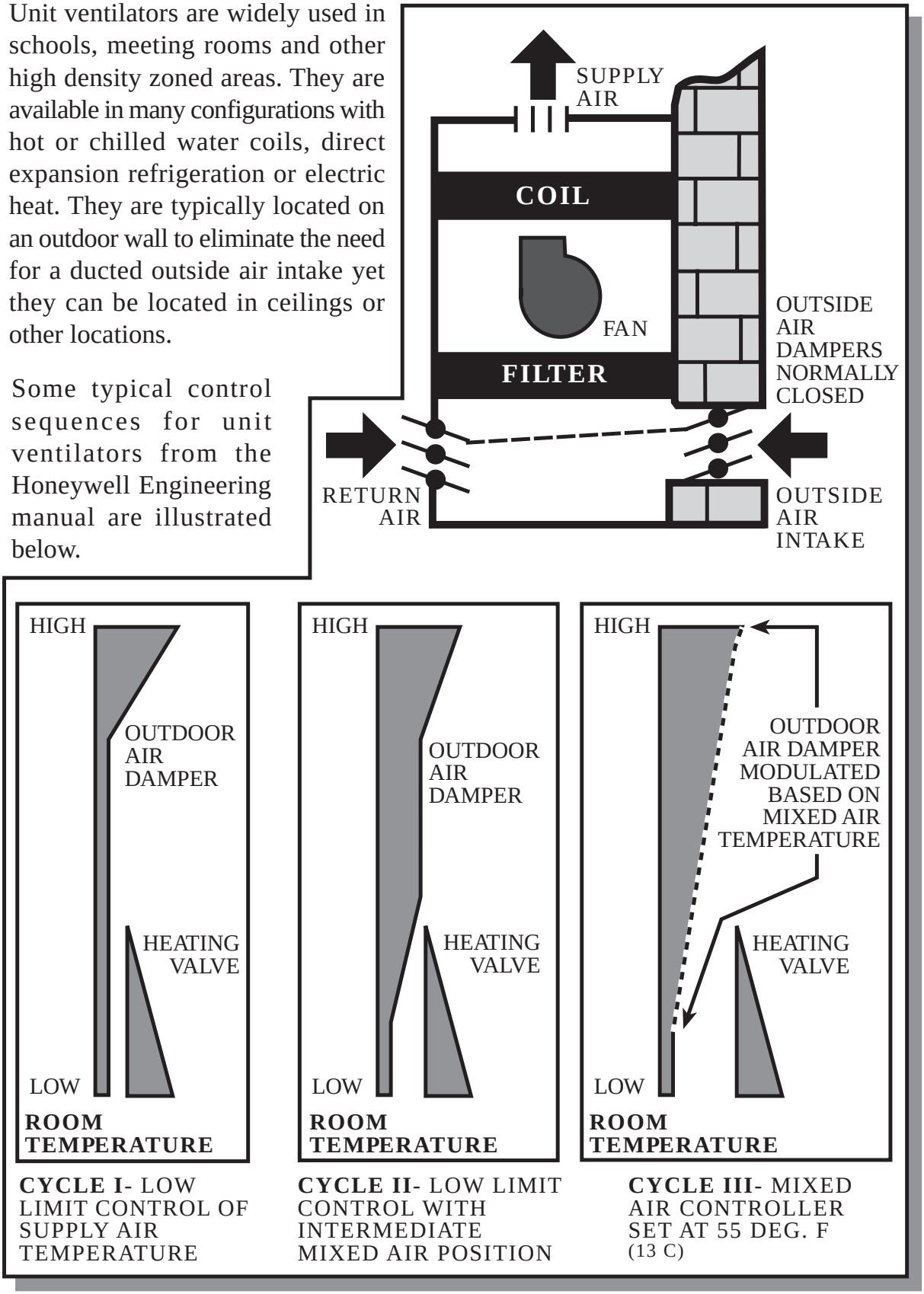


V5852/53 and V5862/63 are two and three-way valves available 1/2 (1.25 cm) and 3/4 inch (1.9 cm) threaded and soldered with a Cv up to 4.9. The three-way valves are mixing. They are widely used on variable air volume box applications since the noise level is very low. A valve assembly that is audible during the opening or closing cycle can be unacceptable in an office environment. Actuators are available floating or proportional in electric or pneumatic. A special tool is available that can be used to install a replacement valve insert without draining the fluid from the piping. The protective cap that is supplied with the valve can also be used to manually open and close the valve.

UNIT VENTILATOR CONTROL SEQUENCES

Unit ventilators are widely used in schools, meeting rooms and other high density zoned areas. They are available in many configurations with hot or chilled water coils, direct expansion refrigeration or electric heat. They are typically located on an outdoor wall to eliminate the need for a ducted outside air intake yet they can be located in ceilings or other locations.

Some typical control sequences for unit ventilators from the Honeywell Engineering manual are illustrated below.

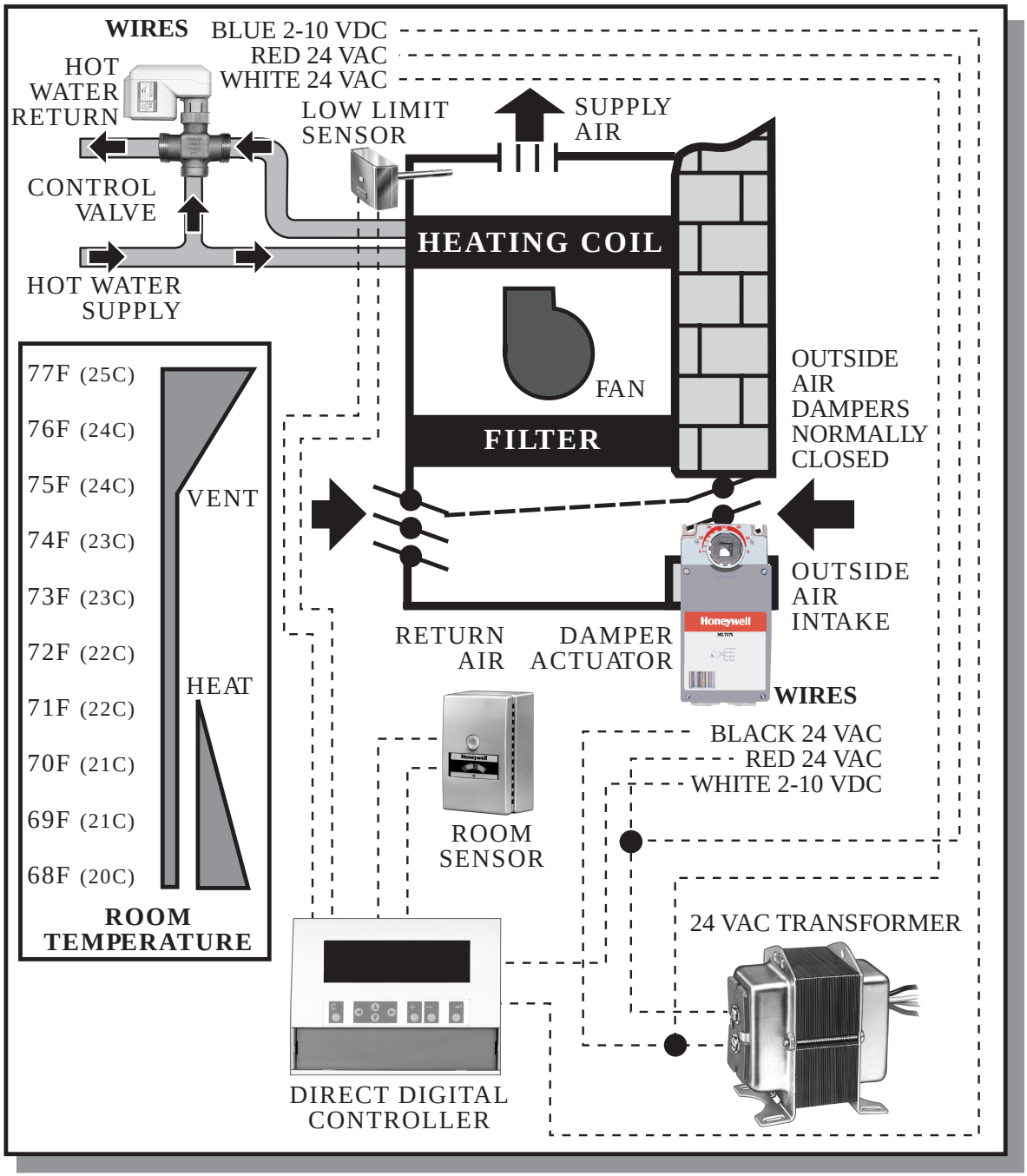


CYCLE I- LOW LIMIT CONTROL OF SUPPLY AIR TEMPERATURE

CYCLE II- LOW LIMIT CONTROL WITH INTERMEDIATE MIXED AIR POSITION

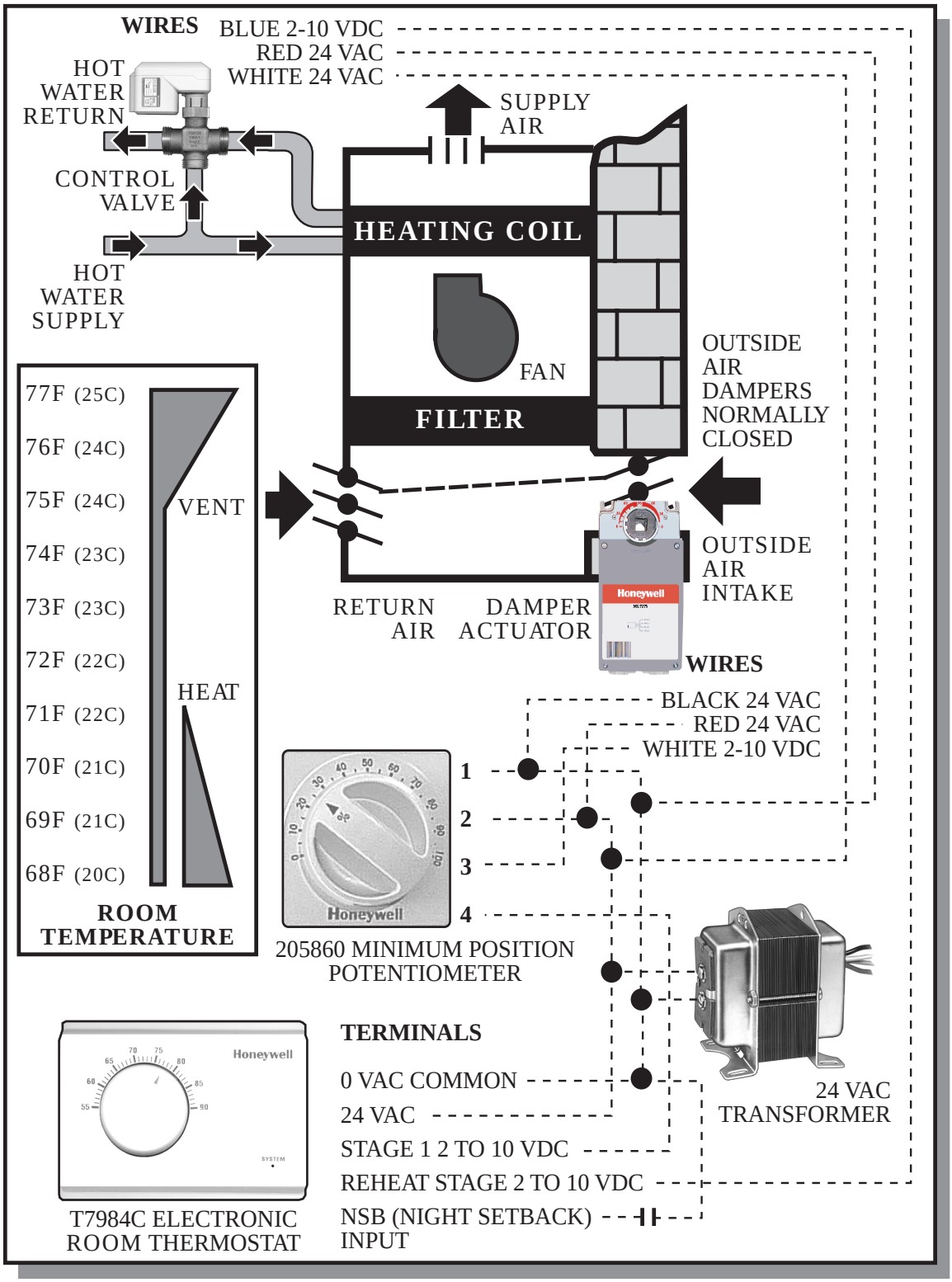
CYCLE III- MIXED AIR CONTROLLER SET AT 55 DEG. F (13 C)

UNIT VENTILATOR DDC APPLICATION WITH V5852/53 AND V5862/63 VALVES



If the room becomes warm and the heating valve closesd the supply air temperature can drop too low and cause cold drafts in the room. A supply air low limit prevents this by opening the heating valve if the supply temperature decreases below 55 or 60 Deg. F (13 or 16 C). Once the supply air temperature rises above the low limit setpoint the control of the heating valve is switched back to the room sensor. The supply air sensor can also be used to modulate the mixed air dampers to provide economizer cooling if there is a outside air sensor connected to the direct digital control panel.

UNIT VENTILATOR APPLICATION WITH V5852/53 AND V5862/63 VALVES



In warmer climates heating is required only for a short interval in the morning. A minimum position switch is used to ensure adequate ventilation at all times.

This control sequence could only be used in a climate where freezing temperatures are not encountered.

Notes

Notes

Notes

Honeywell

Home and Building Control
Honeywell Inc.
Honeywell Plaza
P.O. Box 524
Minneapolis MN 55408-0524

Home and Building Control
Honeywell Limited-Honeywell Limitée
155 Gordon Baker Road
North York, Ontario
M2H 3N7

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