aalberts integrated piping systems

# “Apollo” PICV technical manual

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# content

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# “Apollo” 1600 Pressure Independent Control Valve (PICV) with Flash-Flush™ feature

## product overview and features

The Apollo® 1600 Pressure Independent Control Valve (PICV) series is designed for the automatic balancing of sections of pipe work and equipment in Hydronic and potable water applications. By incorporating a combined pressure-independent flow limiter and control valve, the valve operates independently of changes in system pressure in water-based HVAC systems.

## key features

- built in, full bore bypass
- built in, line isolation function
- clear setting indication, with or without an actuator fitted
- manufactured from DZR brass
- NSF/ANSI/CAN 61 water quality
- NSF/ANSI/CAN 372 lead free
- 250 CWP pressure rating

| component | material |
|---|---|
| valve housing | DZR lead free brass (CW511L) |
| cartridge | polyphenylene sulphide (PPS) |
| shuttle | polyphthalamide (PPA) |
| sleeve | polyphthalamide (PPA) |
| cap | DZR lead free brass (CW511L) |
| clamp | DZR lead free brass (CW511L) |
| seals | EPDM |
| measuring P/T plug | brass |
| screws | stainless steel (AISI 304) |
| pins | steel (alloy steel) |
| indicator | stainless steel (AISI 304) |
| locking peg | polyoxymethylene (POM) |
| tailpiece | DZR lead free brass (C27451) |

## tube compatibility

| valve type | size range | end connection specification |
|---|---|---|
| thread NPT | ½” - 1” NPS | ANSI/ASME B1.20.1 |
| solder | ½” - 1” NPS | ANSI/ASME B16.22 |

*all models are double-union connection

## specification

The Pressure Independent Control Valve (PICV) for line-sizes ½” - 1” shall be a DZR (dezincification-resistant) brass, 250 psi CWP rated, “Dynamic” valve. The PICV shall incorporate an M30 x 1.5mm actuator mount with 100% BMS valve override authority. The PICV shall incorporate a built-in “Fast-Flush™” full-flow integrated flushing bypass and an integral in-line isolation feature that are separate from the dynamic PICV cartridge. The bypass & dynamic functions shall be individually selectable and independently lockable via a rotating quarter turn action. The selected function shall be visible on the rotation sleeve. The PICV set point shall be permanently visible with the actuator mounted. The PICV shall be available with numerous connection options for heat-free pipework installation when required.

# technical characteristics

## Apollo 1600 PICV

The valve is suitable for automatic pressure independent balancing, modulating control, measurement and flow shut off. The body of the Apollo 1600 PICV is made of dezincification resistant lead-free brass CW511L. The valve internals are made of polyphenylene sulphide (PPS). The valve is suitable for actuation. The valve has an adjustable a position indication with 10 setpoints. The valve is equipped with two self-sealing test points for flow measurement, which are provided with color coded caps.

## markings

| | |
|---|---|
| marking on valve body: | pressure rating (PN) and size (DN), setpoint indicator, flow |
| marking on shuttle: | direction symbols for ‘flush’, ‘shut-off’ and ‘dynamic operation’ |

## connections

The Apollo 1600 PICV valve is a double-union design. Each valve ships with 2 each, FNPT and 2 each, solder tailpieces.

# applications

## heating installations

Apollo Valves are used in heating applications and are suitable for water and other neutral liquids. For media other than water, measuring corrections must be applied

Apollo 1600 PICV (pressure independent control valve)

| | |
|---|---|
| connection | female NPT / solder |
| operating temperature | 14°F to 200°F |
| max. operating pressure | 250 psi CWP |

## cooling installations

Apollo Valves are used for cooling applications and suitable for water and other neutral liquids or water with glycol. For media other than water, measuring corrections must be applied

Apollo 1600 PICV (pressure independent control valve)

| | |
|---|---|
| connection | female NPT / solder |
| operating temperature | 14°F to 200°F |
| max. operating pressure | 250 psi CWP |

## pressure independant control valve (PICV)

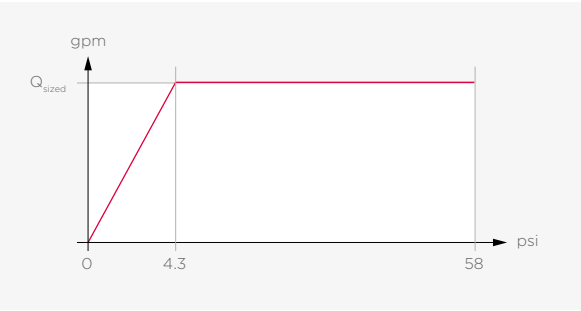
The Apollo 1600 PICV valve is a combined pressure independent flow limiter and control valve which maintains a constant flow independently of pressure changes in heating or cooling systems. When Installed with an actuator the Apollo 1600 PICV combines an automatic flow limiter and a two-way control valve. Having full control authority, the valve reacts instantly and adjusts the flow according to the Building Management System (BMS) or the room thermostat signal. Without actuator, the Apollo 1600 PICV works as an automatic flow limiter. In this way the valve ensures the design flow in terminal units and prevents overflows in the systems at any time.

The Apollo 1600 has 3 functions: differential control, temperature control, and flow regulation with manual and motorized isolation.

## flow control accuracy on dynamic (PICV) technology

When set to a given flow, all valves based on the principle of dynamic balancing have certain sources of error. Within the valve operating pressure range the real flow can deviate from the set design flow within a given tolerance, due to pressure fluctuations within the system. This is typically due to hysteresis and from the desire to have a low starting pressure in order for the differential pressure regulator in the valve to stabilize the flow. The starting pressure of the index valve contributes to the total system pressure loss and therefore influences the decision on pump dimensioning.

The built-in differential pressure regulator stabilizes the flow across the Apollo 1600 PICV valve when the pressure loss across the valve is within 4.3 to 58 psi. When the pressure loss decreases below 4.3 psi, the dynamic operation becomes inactive.

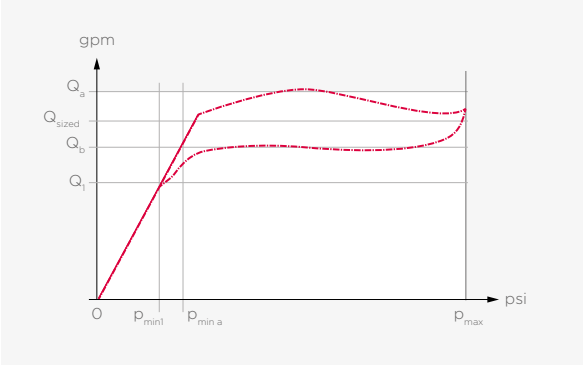



A differential drop between 4.3 psi and maximum 58 psi across the complete valve is required to ensure proper operation of the regulator ensuring constant differential pressure across the flow pre-setting unit and the two-way valve unit. Within this pressure loss range the valve will maintain a constant flow ($Q_{sized}$).

The required starting differential pressure of 4.3 psi across the Apollo 1600 PICV ensures an overall average setting accuracy of ±7%. The differential pressure working range is defined in the chart below: from $p_{minA}$ to $p_{max}$. The flow tolerance, the same as the deviation from the $Q_{-sized}$, is within $Q_a$-$Q_b$ (±7%).

The Apollo 1600 PICV minimum operating differential pressure in reference to the flow control accuracy.

A common phenomenon for pressure independent control valves is that a decrease in the differential pressure affects the accuracy of the valve. Therefore, the starting differential pressure of the Apollo 1600 PICV has for the above reason been specifically set at 4.3 psi. Although a reduction of this value from $p_{minA}$ to $p_{min1}$ would result in lower pump head, which in theory is desirable, the flow control accuracy would deteriorate accordingly: $Q_a$-$Q_b$ < $Q_a$-$Q_1$. The higher flow control accuracy will therefore achieve a better overall system energy efficiency compared to a pressure independent flow control valve with an excessively low starting differential pressure.



## pressure ratings

Valves must be installed in a piping system where the normal pressure and temperature does not exceed the stated rating of the valve. The maximum allowable pressure in valves as specified in the standards is for non-shock conditions. Water hammer and impact should also be avoided. If system testing will subject the valve to pressures in excess of the working pressure, this should be within the “shell test pressure for the body” to a maximum of 1.5 times the pressure rating of the valve and conducted with the valve fully opened. It may be hazardous to use these valves outside of their specified pressure and temperature limitations and for applications for which they have not been designed.

| type | temperature range | pressure at min working temperature | pressure at max working temperature |
|---|---|---|---|
| threaded/solder | 14°F to 200°F | 250 psig | 250 psig |

## operating pressure differential range

- 4.3 - 58 psi ½” LF / ½” SF / ½” HF / ¾” SF / ¾” HF / 1” SF

## isolation function

- maximum static pressure 60 psi

This feature is designed for temporary isolation and maintenance purposes only. It is recommended that a maximum differential pressure of 60 psi is not exceeded between the inlet and outlet of the valve when transitioning between functions.

## installation

The Apollo 1600 PICV balancing valve is directional, and must be installed in the piping system with the arrows on the body (under the pressure ports) oriented in the direction of flow.

note: Valves must be installed in piping systems that comply with the applicable portions of the ASME B31 standards. Special considerations must be taken with respect to pipe line support, expansions and contractions, and the media expansion and contractions within the piping system.

## electrical continuity

All metallic pipework should comply with the equipotential bonding requirements of the current edition of the NEC (National Electrical Code). After all plumbing work has been completed, continuity checks are to be conducted by a qualified electrician in accordance with the regulations.

## heat free

When heat-free joining is required, the PICV dynamic 1600 Series offers Heat free joining across its whole range with threaded connection technology.

## insulation

For all PICV dynamic 1600 Series valves, it is recommended that you adhere to the insulation requirements as specified by the local plumbing code, ensuring at all times that access for valve operation is taken into consideration.

## valve selection

- Valves must be properly selected for their intended services condition. Provided it is installed correctly and receives adequate preventative maintenance, it should give years of trouble-free service.
- They must be compatible with the system design, pressure and temperature requirements and must be suitable for the fluids that they are intended to carry. Interactions between metals in the pipe system must be considered as part of the valve selection.

## location / end of line service

- To ensure ease of operation, adjustment, maintenance and repair, valve placement should be decided during the system design phase.
- 1600 PICV dynamic valves are not suitable for end-of-line isolation service.
- Use suitable hangers close to both ends of the valve in order to remove stresses transmitted by the pipe.

## factory testing

- Each valve is 100% factory pressure tested at 90 psi (6 bar) for 5 seconds. There shall be no signs of visible leakage from the body / cap joint, surfaces or seals.
- After testing, the valves shall be left in the fully open / “bypass” position.

## storage

- Valves should be stored off the ground in a clean, dry, indoor area. Where desiccant bags are included, these should be changed after a period of six months.
- “Apollo” Valves are supplied in appropriate packaging to give adequate protection from damage.
- When “Apollo” Valves are fitted to pressure equipment or assemblies, suitable protective devices may be required.
- “Apollo” valves with adapted ends for thread or solder connectors are packed in plastic bags to protect the connection ends. The valves should not be removed until the time of assembly in order to protect the connections and avoid contamination or loss of the tailpiece seals.

# operation

### bypass

The valve is supplied in the bypass position to ensure that a system flush can be performed (after installation) in accordance with UPC/IPC guidelines. Due to the unique built-in bypass feature, the system can be flushed and back flushed without any risk to the product.

It is important to ensure that the valve is not moved from the bypass position before the system flush has been completed.

### isolation

Due to the built-in isolation feature, there is no requirement for an additional isolation valve to be installed with this product to provide means of service/maintenance.

### dynamic

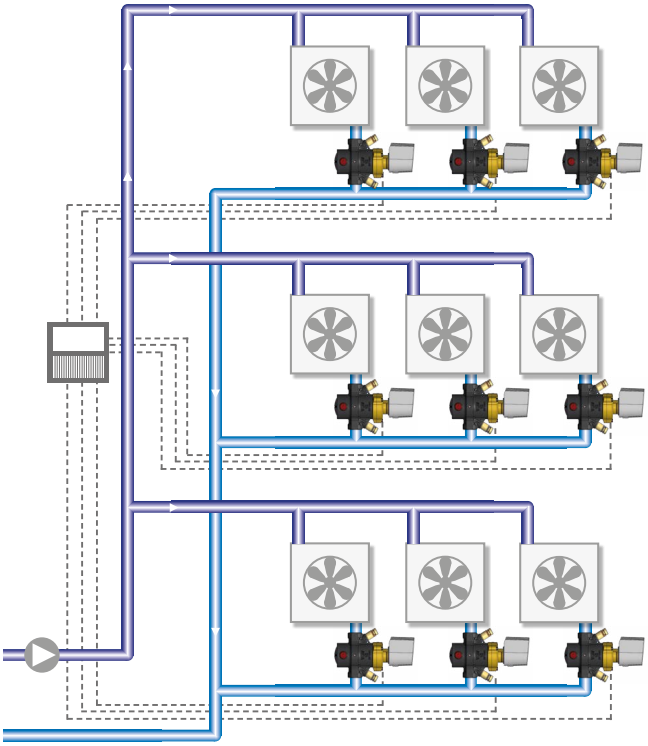
As the valve is supplied in the bypass mode to support full-port flushing/backflushing, it is important to ensure that the dynamic mode of the product is engaged prior to commencing commissioning.

This can be done by removing the pin and rotating the head through the isolation setting into the dynamic position.

# dynamic applications

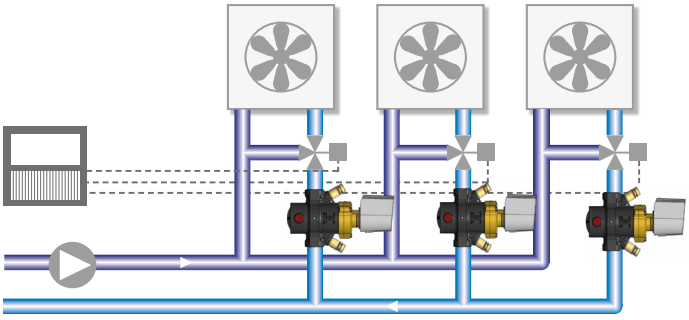
### fan coil system with variable flow

The Apollo 1600 PICV provides hydronic balancing in variable flow systems in order to ensure the optimum flow is achieved at all load conditions, in the terminal units. The actuator controlling the two-way valve inside the Apollo 1600 PICV is connected to a room thermostat or a BMS system. By opening or closing the two-way valve in reference to the room temperature, the required temperature is achieved.



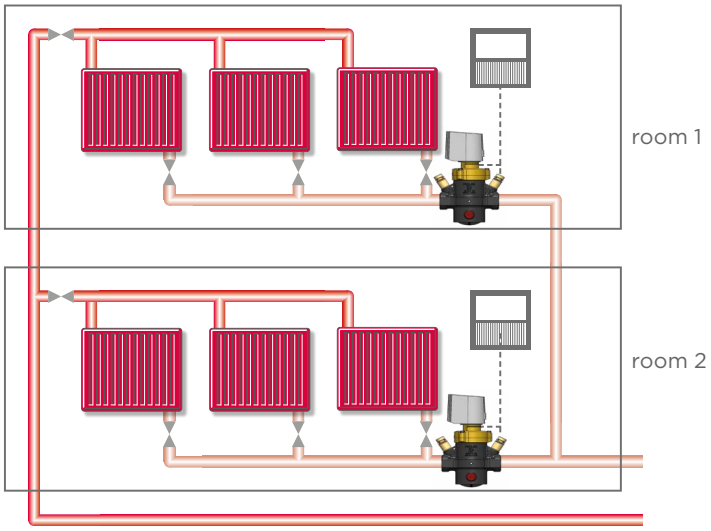
### fan coil system with constant flow

The Apollo 1600 PICV  provides hydronic balancing in a constant flow system, equipped with a three-way motorized valve, in order to ensure the optimum flow is achieved at all load conditions, in a fan coil or other terminal unit. In this application temperature control is achieved by the operation of the motorized valve, rather than an actuator, which is connected to a thermostat or BMS system. By the opening or closing of this valve in reference to the room temperature, the required temperature is achieved.



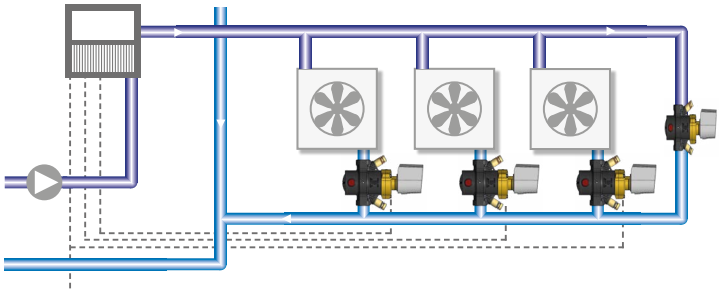
### central heating system

The Apollo 1600 PICV can be installed in a branch of a central heating system with radiators or other terminal units. This ensures that pressure fluctuations from the remaining part of the system will be isolated from the controlled branch, maintaining constant flow. The actuator controlling the two-way valve of the Apollo 1600 PICV is connected to a thermostat or BMS system. By opening or closing the two-way valve in reference to the room temperature, the required temperature is achieved.




### end of line system

The Apollo 1600 PICV can be used as an end of line valve without the use of an actuator. The Apollo 1600 PICV can act as a constant flow device to maintain a minimal flow when there is no demand.



# installation instructions

## Apollo 1600 PICV

Unpack the valve and check that the flow paths and valve threads are clean and free from debris. Check the body markings and nameplate, where fitted, to ensure that the correct valve has been selected for installation.

Before valve installation the pipe work to which the valve is to be connected should be inspected for cleanliness and freedom from debris. The valve is marked with a directional flow arrow on the body. The valve will function correctly providing
it is fitted so that the fluid transported follows the indicated flow direction.

Apollo 1600 PICV valves are manufactured to exacting standards and, therefore, should not be subjected to misuse.
The following should be avoided:

- careless handling of the valve
- dirt and debris entering the valve through the end ports
- excessive force or application of heat during installation or operation

Use suitable hangers close to both ends of the valve in order to remove stresses transmitted by the pipe. Confirm that the pipe threading length is correct to avoid excessive penetration of the pipe into the valve that would otherwise cause damage.
Care should be taken to apply jointing compound to the pipe only and not in the valve threads. Surplus compound will then be forced outwards and will not enter the valve. Overuse of compound can lead to valve failure on the body ends.

## threaded end valves

Mating pipe connections should be accurately threaded, clean and free of foreign material or metal shavings. Two to four wraps of PTFE pipe tape (or pipe dope, but not both) should be applied to the male threads. Two wrenches must be used when mating up pipe joints to these valves. Apply one flat-faced wrench on the valve body wrenching flats hex closest to the pipe joint being tightened and use a pipe wrench on the pipe to prevent transmitting torque through the valve body joint. Typical wrench make-up is 1-1/2 turns after inserting the pipe hand-tight. Do not overtighten the valve onto the pipe, as this can damage or distort the valve. Do not reverse-rotate after tightening.

## solder end valves

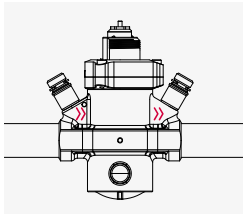
caution: Use only soft solders with melt points below 500°F.
an Apollo soldering video with helpful suggestions can be viewed here: https://www.youtube.com/watch?v=A3cuXXQTk2o

Prior to soldering, any electric actuators should be removed to prevent heat damage. Depending upon the fuel selected and the orientation of the installation, it may be necessary to wrap the valve body and pressure test ports with wet rags or employ other heat absorbing techniques. Select a torch tip size appropriate for the tube size being soldered.

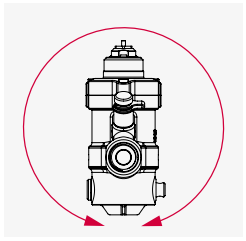
Preheat for soldering by concentrating the heat on the tube first, then the solder cup tailpiece, always directing the flame away from the valve body. The extent of this preheating depends upon the size of the tube. The cup should be heated evenly. Allow heated joints to cool naturally. Quenching with water will cause unnecessary stress on the joint.

warning: Excessive heat input may damage the union connection resulting in leaks at the body joint. In extreme cases, the pressure test ports and cartidge may also be damaged.

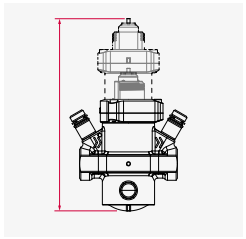
## mounting



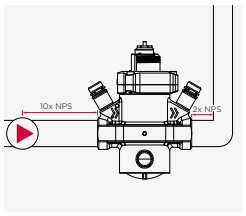
**1.** an arrow on the Apollo 1600 PICV housing indicates the flow direction to be respected.



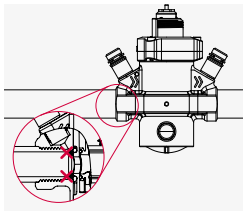
**2.** the Apollo 1600 PICV can be orientated 360° around the pipe axis.



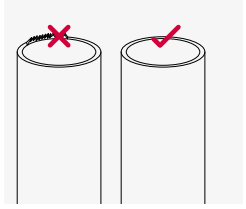
**3.** additional space is required for the isolate and bypass modes and to allow installation of an actuator following commissioning.




**4.** 10 x NPS straight piping is required when the valve is mounted directly after the system pump and 2 x NPS is required after the valve and before any bend.

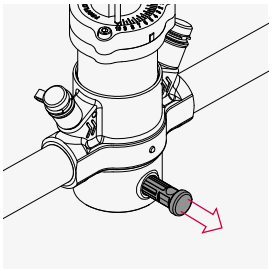


**5.** loose thread sealant must not hang into the pipe.

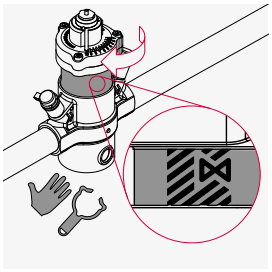


**6.** deburring of pipe ends is required to prevent system clogging.

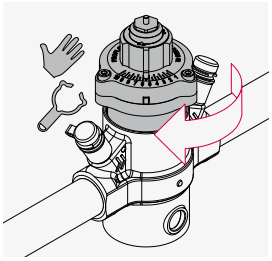
## operation



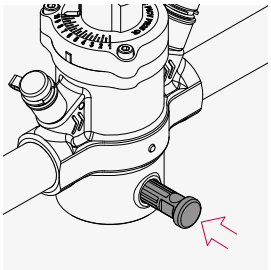
**1.** system flushing
the Apollo 1600 PICV valve is supplied in bypass position. After installation it should remain in this position until all system flushing operations are completed. Then follow the steps detailed below to enable the dynamic balancing mode, commission and verify the valve.



**2.** to activate the operational mode remove the locking pin. By turning the head clockwise the exposed shuttle markings will demonstrate the isolation mode, the isolation function is active when the isolation symbol is fully visible and the bypass symbol is hidden.



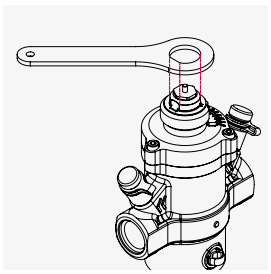
**3.** continue the clockwise motion until the head goes no further, at this point the Apollo 1600 PICV will activate into the operational mode. This can be completed by hand or with the use of an operational tool (see accessories).



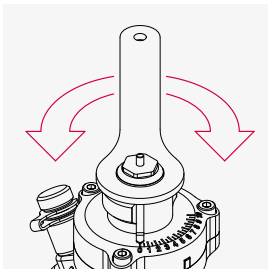
**4** important note. The locking pin must be re inserted to ensure anti tamper and security.

caution. Suitable hand protection should be worn when operating valves used in extreme temperature applications.

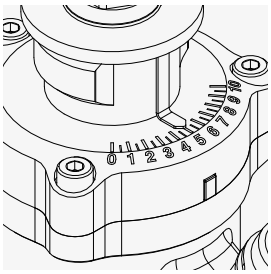
## commissioning steps



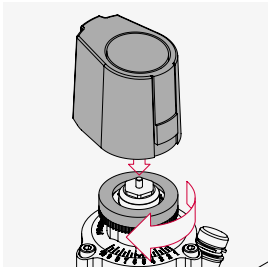
**1.** regulation
Using a setting tool, the spindle can be rotated clockwise and counterclockwise to achieve the desired setting point. (see accessories on page 24 for tool)



**2.** the Apollo 1600 PICV valve has a visible position indicator displayed on the head of the valve, which is visible both with and without an actuator installed.




**3.** the setting indicator allows for accurate positioning from 0 to 10, the clear markings remain in position and preserves the flow setting of the valve even when in isolation or bypass mode, avoiding further costly time on re commissioning and maintenance.

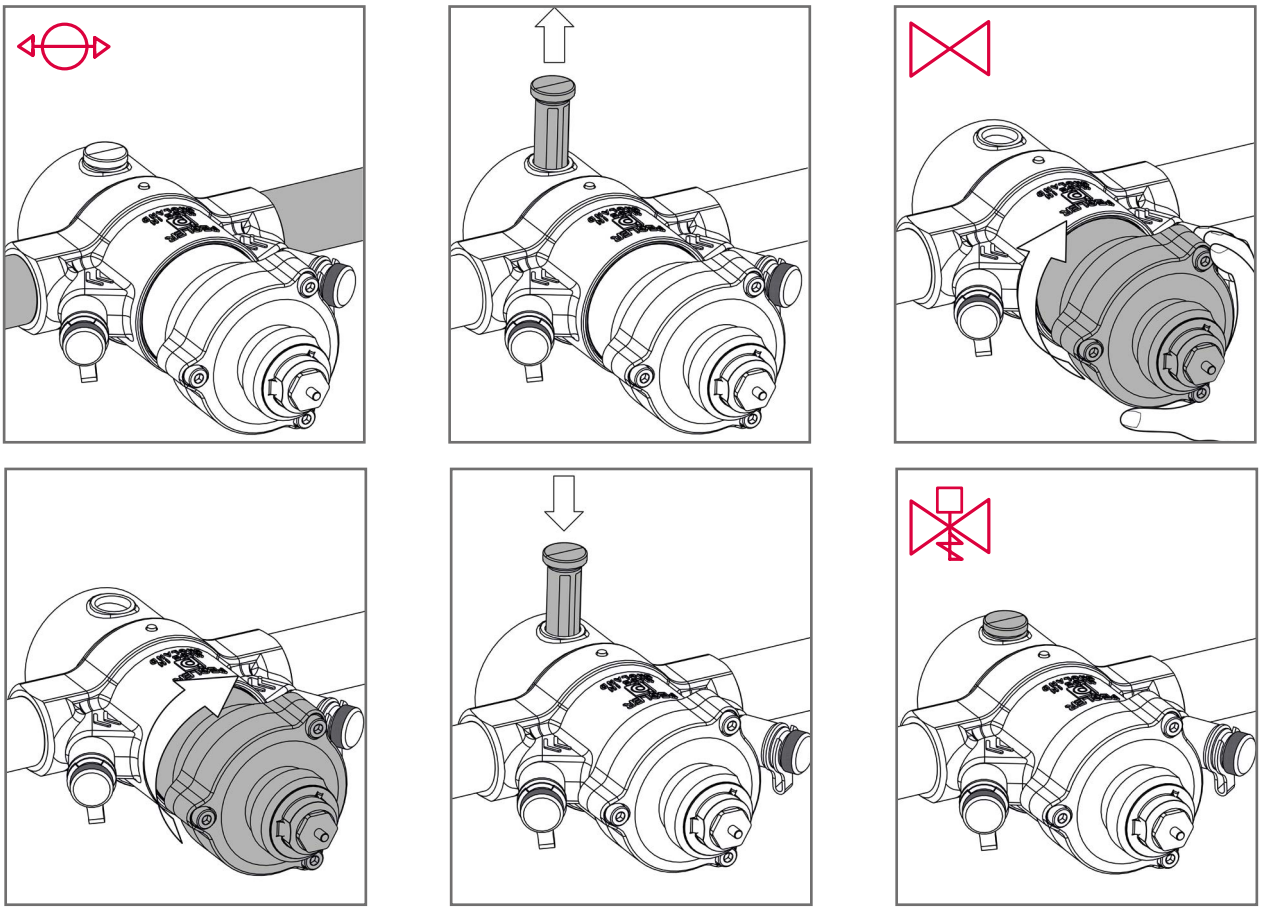


**4.** screw the adapter ring onto the valve and fit the thermal head onto it. Rotate the lower ring until you hear a click.

There is no need for adapters when the valve and actuator match M30 x 1.5 threads.

In order to transition the valve between each of the three modes, the locking pin must be removed, and the valve centre rotated clockwise until the isolation point is reached, as indicated by the symbol on the valve. Further clockwise rotation will then engage the dynamic function of the valve. Ensure that valve is fully rotated, to it’s stop, in either bypass or dynamic mode prior to attempting to insert the locking pin.

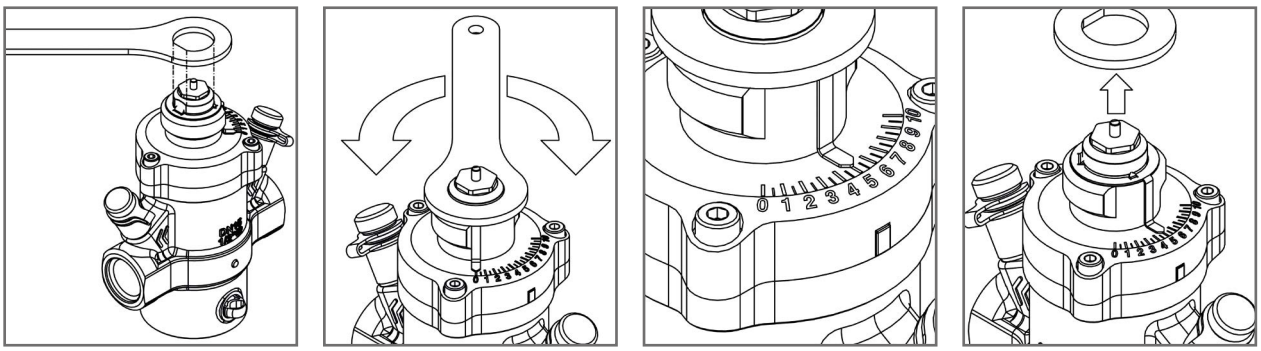
note: for ease of rotating the valve center, a valve operating tool may be used. See page 20 for details.



## setting

- Before setting the maximum flow rates on the valves, ensure that the pump is set to its maximum capacity and all valves in the system are fully opened.
- Make sure that the differential pressure across each valve does not exceed the range specified in the product data.
- The valve is easily adjusted by rotating the plastic spindle head to achieve the desired setting. The indicator on the valve is read against the marking on the brass housing on the valve. Each marking on the scale indicates 10%.

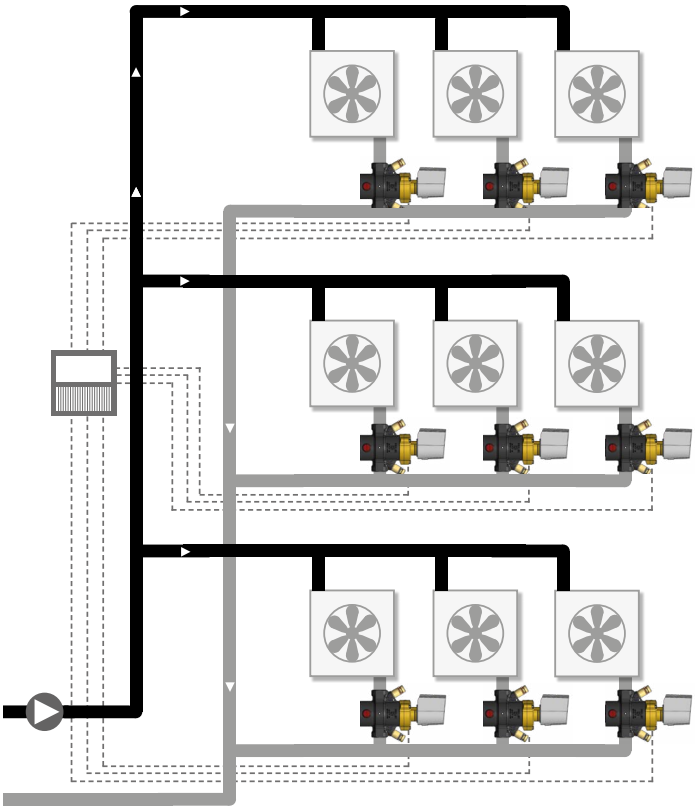
note: for ease of adjustment, a valve setting key may be used. See page 20 for details.



## dynamic balancing methods

With the Apollo 1600 PICV the valves are simply set to the required flow rate and will compensate for pressure fluctuations in the system. This provides hydronic balancing for the system without requiring a dynamic balancing procedure.

With all valves set to the required calculated flow rate setting, the pump head is minimized to deliver only the pressure the index (worst case) valve needs to operate correctly. Thus ensuring optimal operation whilst avoiding excess energy consumption.



The Apollo 1600 PICV ensures finding the optimal pump setting in a system, which is calculated in a simple manner.

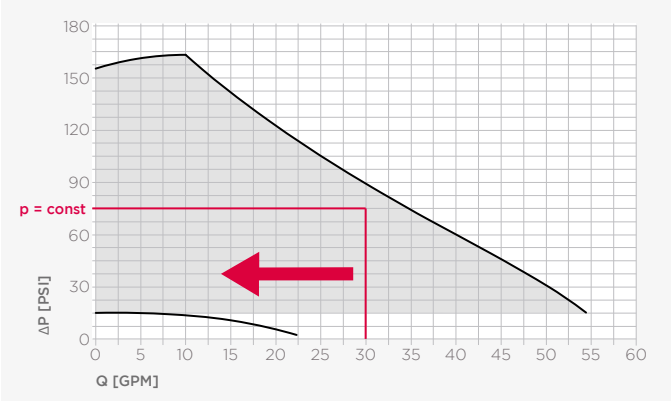
During pre-setting, the pump is set to its maximum capacity. Then, after setting all the valves, a manometer/flow meter is connected to the index valve. The index valve is the system valve with the least differential pressure, which is typically the most remote valve from the pump.

## Apollo 1600 PICV with integrated differential pressure measurement

Connect a manometer to the index valve and confirm that there is at least 4.3 psi differential across it. If it is lower then the pump head must be increased, if it is higher then there is an opportunity to decrease the pump head. If the index valve has at least 4.3 psi then all the other valves in the system will have at least 4.3 psi and will be maintaining the set flow rates.

### differential pressure measurement

pump head chart example



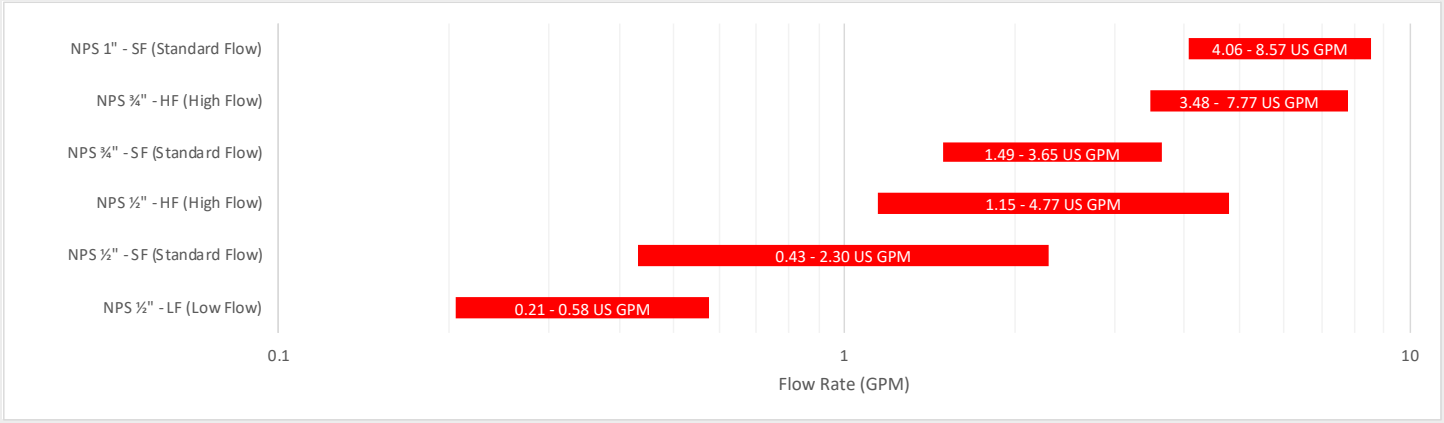

## Apollo 1600 PICV with integrated flow measurement pump head method

The pump head is reduced until the measured flowrate at the index valve begins to decrease significantly, indicating that the minimum required pressure has been reached. The pump head is then increased until the designated flow rate is reached, ensuring hydronic balance is now established and the pump head optimized.

When using a variable speed pump, it is recommended to operate it in a constant differential pressure mode, ensuring that the flow is adjusted according to the current load demand and a constant pressure level is delivered. This provides the correct operating condition for the differential pressure regulator inside the Apollo 1600 PICV.

# selection charts - flow range by size / cartridge

| | | US GPM | | l/s | |
|---|---|---|---|---|---|
| **dimensions** | **item no.** | **min.** | **max.** | **min.** | **max.** |
| NPS ½" - LF (low flow) | 1603LDDB | 0.21 | 0.58 | 0.013 | 0.036 |
| NPS ½" - SF (standard flow) | 1603SDDB | 0.43 | 2.30 | 0.027 | 0.145 |
| NPS ½" - HF (high flow) | 1603HDDB | 1.15 | 4.77 | 0.073 | 0.301 |
| NPS ¾" - SF (standard flow) | 1604SDDB | 1.49 | 3.65 | 0.094 | 0.230 |
| NPS ¾" - HF (high flow) | 1604HDDB | 3.48 | 7.77 | 0.220 | 0.490 |
| NPS 1" - SF (standard flow) | 1605SDDB | 4.06 | 8.57 | 0.256 | 0.541 |

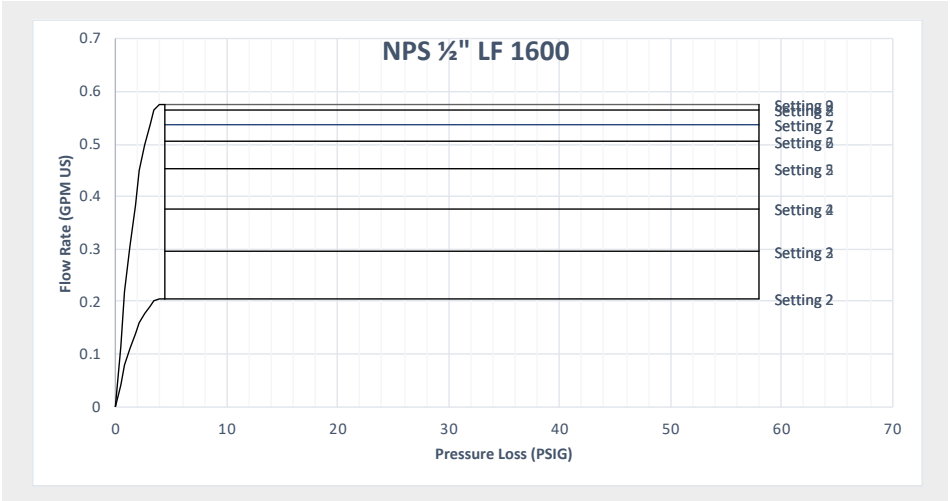



flow rate Apollo 1600 PICV

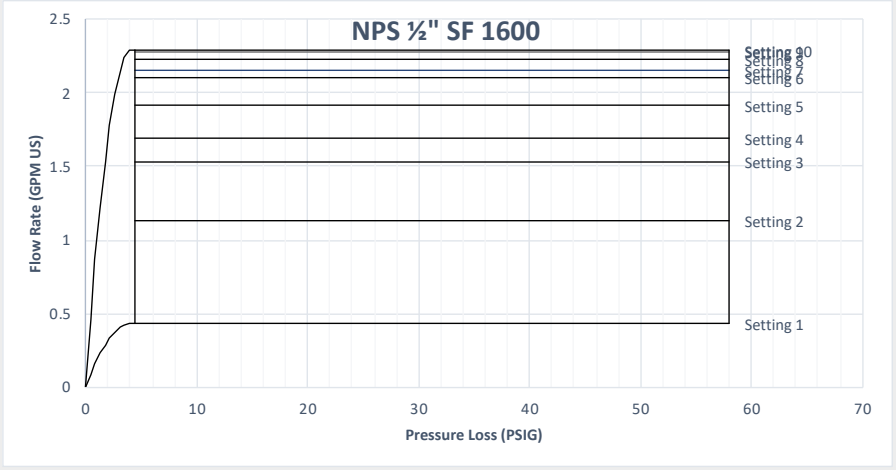
# setting charts

The PICV dynamic 1600 series valves can also be pre-set by referencing the design flow rate against a flow diagram.

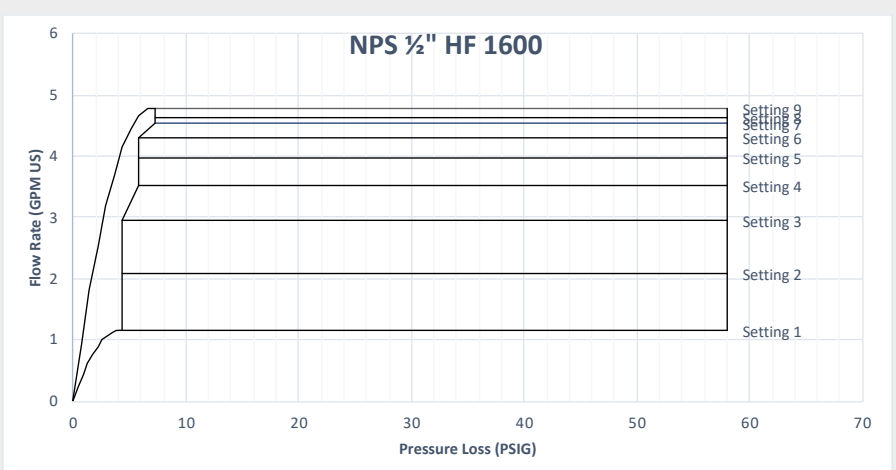
### 1600 PICV - ½” NPS (LF)



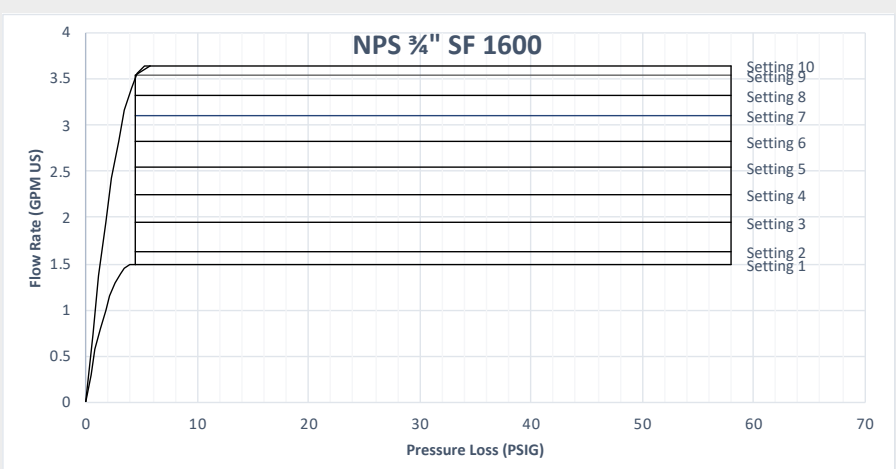
## 1600 PICV - ½” NPS (SF)



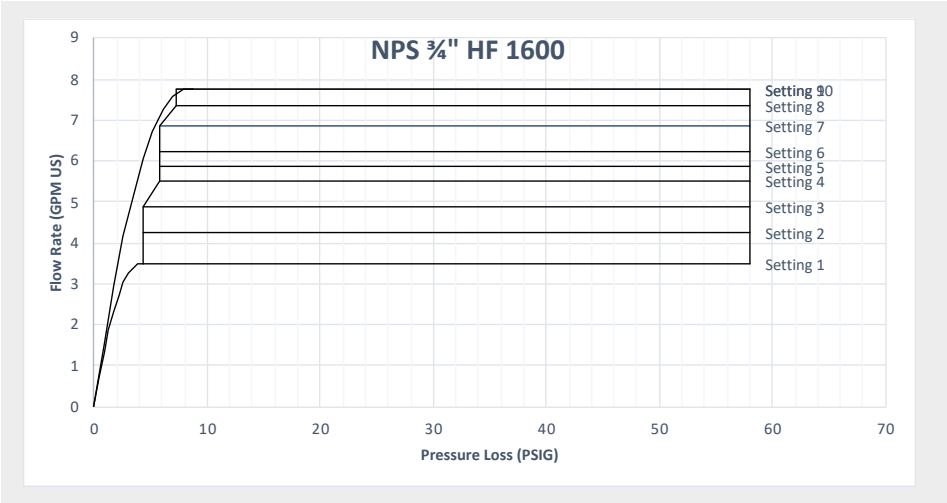

## 1600 PICV - ½” NPS (HF)



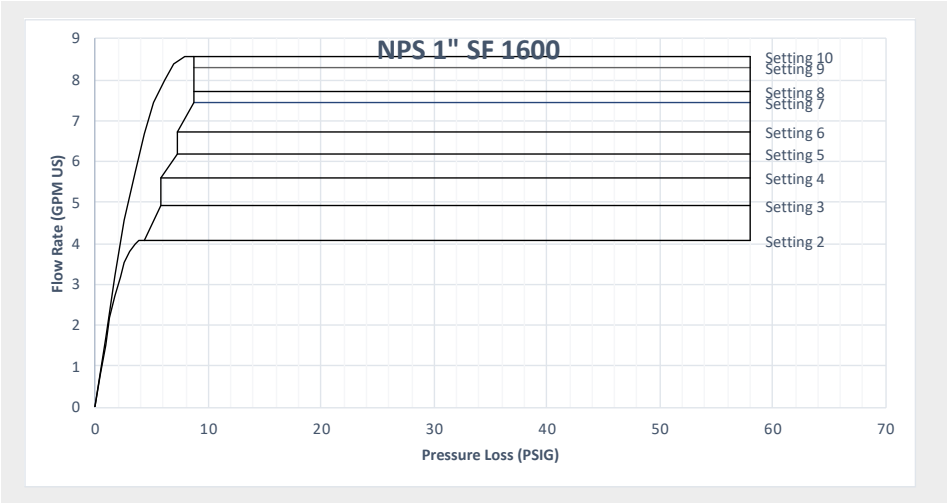

## 1600 PICV - ¾” NPS (SF)



## 1600 PICV - ¾” NPS (HF)




## 1600 PICV - 1” NPS (SF)

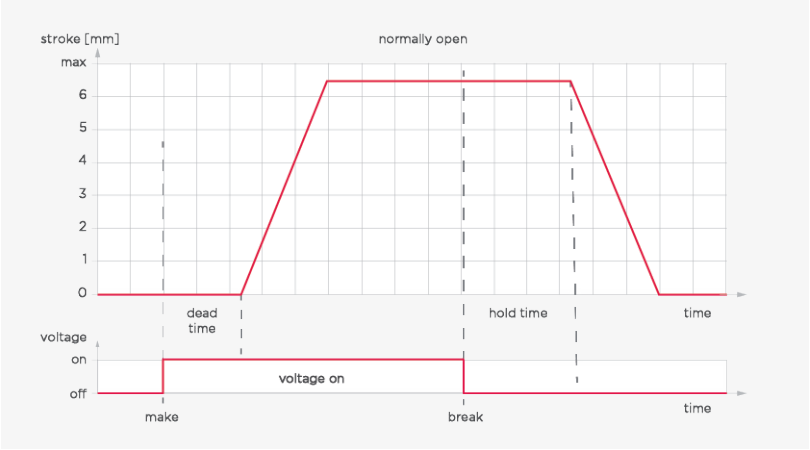



Confirmation of the flow rate can also be verified by connecting an electronic manometer to the built in test ports.

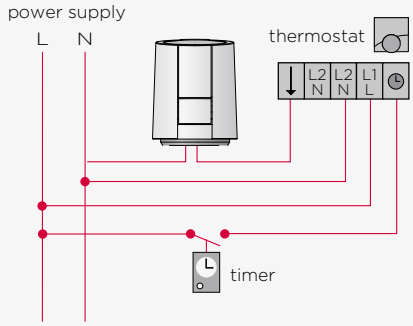
# AT01 electro thermal actuator
(open/closed)

## specifications

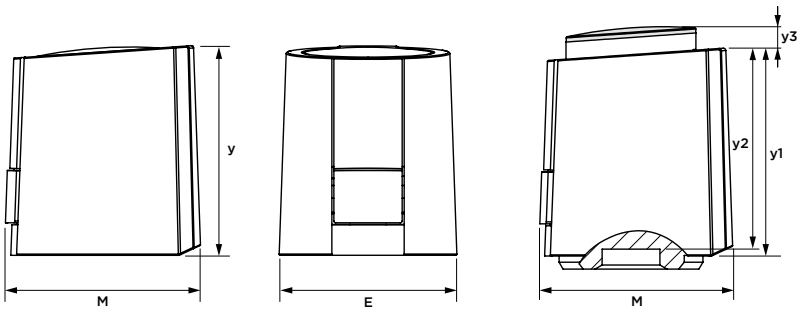
- compact dimensions
- first-open function
- maintenance free
- noiseless
- low power consumption
- 360° installation position
- position indicator




| specifications | On/Off actuator 24V |
|---|---|
| operating voltage | 24VAC/DC<br>-10 % to +20 % |
| operating power | 2.3V A 1W |
| actuator stroke | .16”<br>(4 mm) |
| stroke time | approx. 3.5 min |
| actuating force | 22.5 lbf (100N) |
| ambient temperature<br>- fluid<br>- storage | 32 to 140°F (0 to 60°C)<br>32 to 212°F (0 to 100°C)<br>-13 to 140°F (-25 to 60°C) |
| protection class | IP54 |
| connecting cable | 3.3 ft (1 m) long, 2 core |
| housing | molded plastic |
| CE conformity | EN 60730-1 |


In the example above the actuator is connected to a power supply of 24VAC, 24VDC. In case the thermostat switch is activated and the actuator being in the normally closed version, the valve is opened steadily by the plunger motion. In the normally open version the valve is closed.



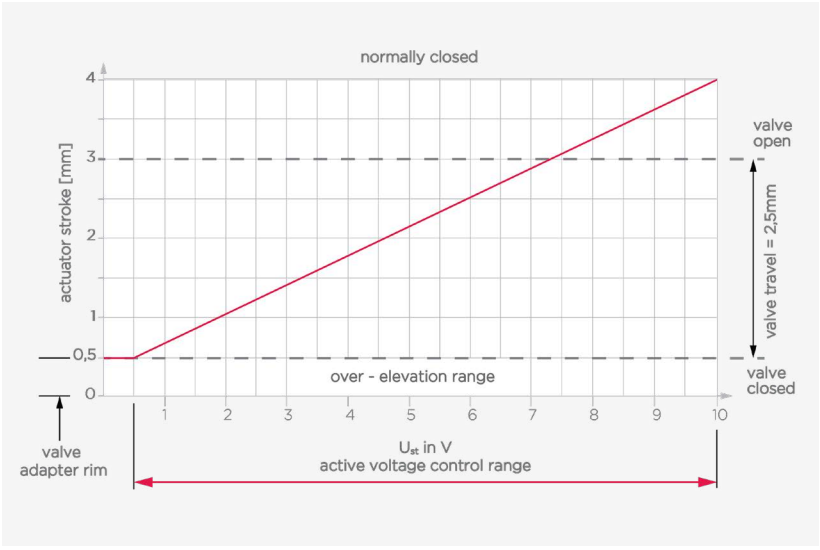

| actuator type | article no. | voltage | weight lb. (kg) | E | M | y1 | y2 | y3 |
|---|---|---|---|---|---|---|---|---|
| DN15 - DN32 (normally closed - NC) | 15202 | 24VAC/DC | 0.31 (0.14) | 1.73” | 1.89” | 2.05” | 1.97” | 0.28” |

# AE01 electro thermal actuator

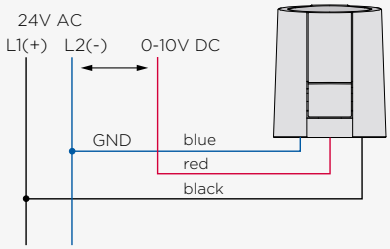
(proportional control, normally closed)

## specifications

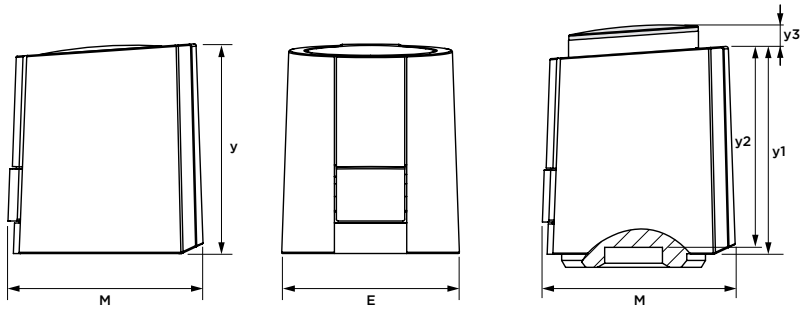
- proportional actuator
- compact dimensions
- first-open function
- maintenance free
- noiseless
- low power consumption
- 360° installation position




| specifications | modulating actuator 24V |
|---|---|
| operating voltage | 24VAC |
| operating power | 3.1V A |
| actuator stroke | .16”<br>(4 mm) |
| stroke time | approx. 3.5 min |
| actuating force | 22.5 lbf (100N) |
| ambient temperature<br>- fluid<br>- storage | 32 to 140°F (0 to 60°C)<br>32 to 212°F (0 to 100°C)<br>-13 to 140°F (-25 to 60°C) |
| protection class | IP54 |
| ambient humidity | 0 - 95% |
| connecting cable | color-coded fly lead,<br>3.3 ft (1 m) long, 3 core |
| housing | moulded plastic |
| CE conformity | EN 60730-1 |




The above example is connected to a 24VAC or 24VDC power supply, with a control voltage from 0-10V-DC. When the control voltage is increased, the electronic control system immediately adapts the heat input to the elastic element and the valve is further opened, with the valve being normally closed (0 Volt).




| actuator type | article no. | voltage | weight lb. (kg) | E | M | y1 | y2 | y3 |
|---|---|---|---|---|---|---|---|---|
| DN15 - 32 (normally closed - NC) | 15281 | 24VAC (10VDC) | 0.31 (0.14) | 1.73” | 1.89” | 2.05” | 1.97” | 0.28” |

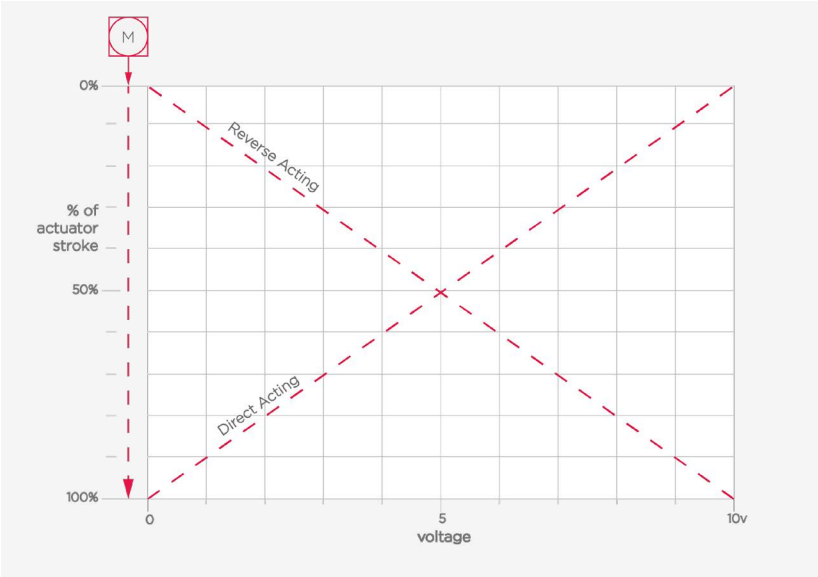
# AP02 electro motoric actuator modulating

(proportional control, normally open)

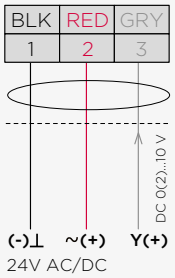
## specifications

- fast acting
- double color LED
- removable cable
- direct acting

| specifications | modulating floating 24VAC |
|---|---|
| operating voltage | 24VAC +/-10% |
| operating power | 2.5V A |
| actuator stroke | .126” (3.2 mm) |
| stroke time | 8 sec/mm |
| actuating force | 27 lbf (120N) |
| ambient temperature | 32 to 140°F (0 - 60°C) |
| -operating | 32 to 200°F (0 - 95°C) |
| -storage | -4 to 149°F (-20 - 65°C) |
| protection class | IP43 |
| ambient humidity | 0 - 95% |
| connecting cable | 5 ft (1.5 m) long (3 x 0.35 mm²) |
| housing | ABS + PC |
| CE conformity | EN 60730-1 |



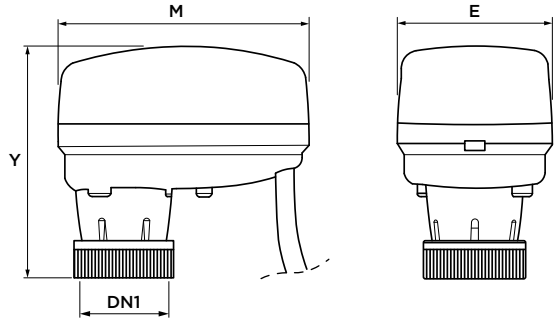

DIP switch 4 is off. When the signal increases the actuator stem extends




When the power is applied, the actuator self-calibrates performing an auto zero detection cycle. The actuator moves the stem down for a complete mechanical valve stroke until no changes are detected. Once the auto-zero is detected the actuator moves the stem accordingly with the input signal, within the value of the electrical stroke as per jumper setting.

When the input signal increases (eg. from 0V to 10V) the actuator stem extends if the actuator is configured as Direct Action (DA).

When the input signal decreases (eg. from 10V to 0V) the actuator stem retracts if the actuator is configures as Direct Action (DA).




| actuator type | article no. | voltage | weight lb. (kg) | DN1 | E | M | Y |
|---|---|---|---|---|---|---|---|
| DN15 - DN25 (normally open - NO) | 18275 | 24VAC (0-10VDC) | 0.44 (0.2) | M30 x 1.5 | 1.93 | 3.15 | 2.91 |



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# accessories

## setting key

for adjusting the desired flow setting on the cartridge

| dimension | item no. |
|---|---|
| ½” - 1” NPS | 16075 |

*see installation guidelines “Apollo” 1600 PICV

## operating tool

easily rotates the cap for selecting dynamic, isolation or Fast-Flush™ bypass modes

| dimension | item no. |
|---|---|
| ½” NPS | 16079 |
| ¾” - 1” NPS | 16080 |

*see installation guidelines “Apollo” 1600 PICV

## locking pin and tether

replacement part for “Apollo” 1600 PICV

| dimension | item no. |
|---|---|
| ½” NPS | 16076 |
| ¾” - 1” NPS | 16077 |

## cartridge

replacement cartridges for “Apollo” 1600 PICV

| dimension | | item no. | color |
|---|---|---|---|
| ½” NPS | low flow | 16070 | white |
| ½” NPS | standard flow | 16071 | red |
| ½” NPS | high flow | 16072 | black |
| ¾” NPS | standard flow | 16073 | white |
| ¾” NPS | high flow / 1” NPS standard flow | 16074 | black |

## cap

protects actuator mounting threads and cartridge head when actuator is not installed

| dimension | item no. |
|---|---|
| ½” - 1” NPS | 16078 |

*see installation guidelines “Apollo” 1600 PICV

## warranty

Aalberts integrated piping systems warrants, to its initial purchaser only, that these balancing valve products which are delivered to this initial purchaser will be of the kind described in the order or price list and will be free of defects in workmanship or material for a period of TWO years from the date of delivery to you, our initial purchaser.
Should any failure to conform to this warranty appear within TWO years after the date of the initial delivery to our initial purchaser, Aalberts integrated piping systems will, upon written notification thereof and substantiation that the goods have been stored, installed, maintained and operated in accordance with Aalberts integrated piping systems’ recommendations and standard industry practice, correct such defects by suitable repair or replacement at Aalberts integrated piping systems’ own expense.

This warranty is exclusive and is in lieu of any implied warranty of merchantability, fitness for a particular purpose or other warranty of quality, whether expressed or implied, except the warranty of title and against patent infringement. Correction of non-conformities, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of Aalberts integrated piping systems to our initial purchaser, with respect to the goods, whether based on contract, negligence, strict tort or otherwise. It is the intention of Aalberts integrated piping systems that no warranty of any kind, whether expressed or implied shall pass through our initial purchaser to any other person or corporation.
Limitation of liability: Aalberts integrated piping systems shall not, under any circumstances, be liable for special or consequential damages such as, but not limited to, damages or to loss of other property or equipment, loss of profits or revenue, cost of capital, cost of purchased or replacement goods, or claims of customers of our initial purchaser. the remedies of our initial purchaser, and all others, set forth herein, are exclusive, and the liability of Aalberts integrated piping systems with respect to same shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based.

*it is the end user’s responsibility to confirm that items intended for use satisfy local codes and standards.

## terms and conditions

Full terms and conditions can be found on the “Apollo” website at aalberts-ips.us

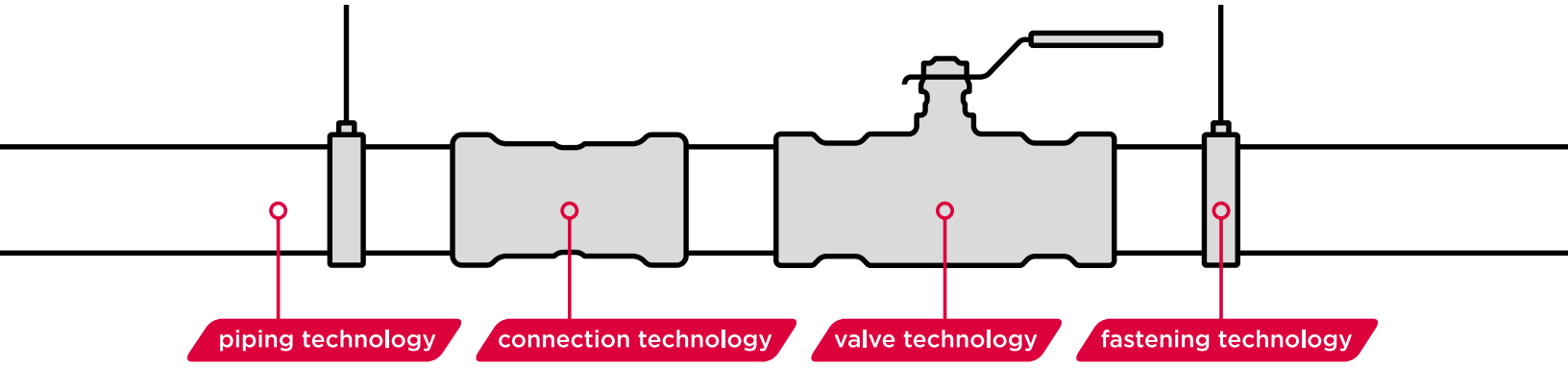
aalberts integrated piping systems

## more information?

For a complete and up-to-date product range and our additional services, visit: www.aalberts-ips.us

Would you like to make an appointment to meet an account manager in your region or receive advice and support from one of our experts?
Please contact:

**Aalberts integrated piping systems customer service**
**704.841.6000(US)**
**905.851.9494(CAN)**

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