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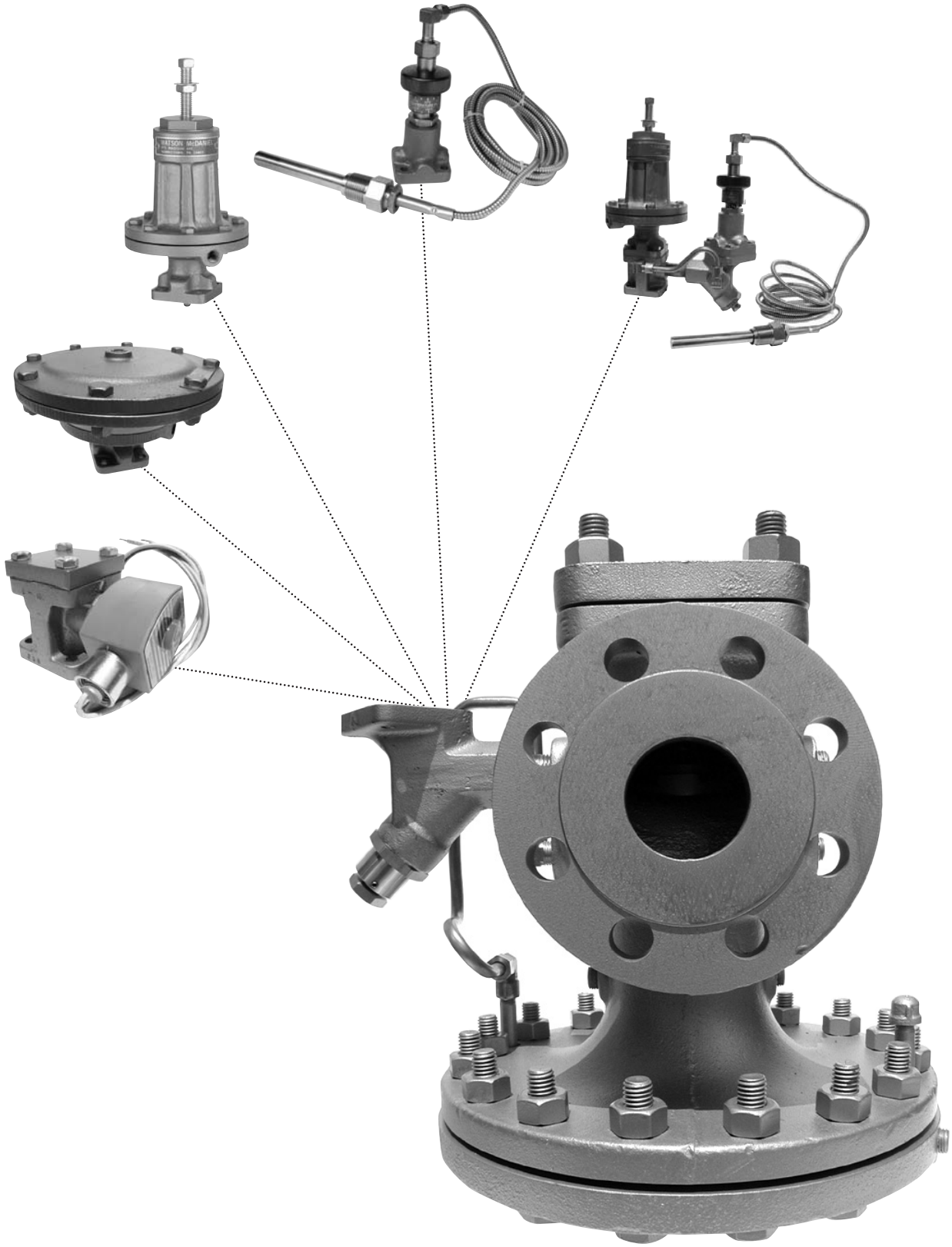
Watson McDaniel

Pilot-Operated Regulating Valves

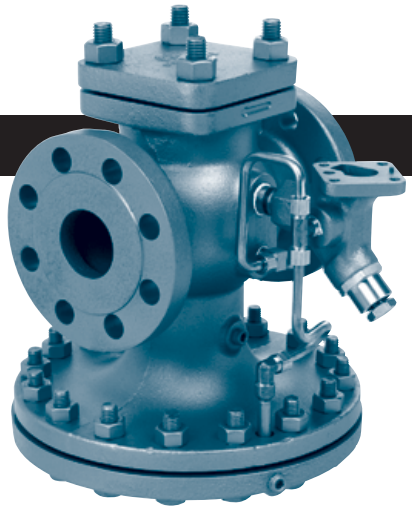


HD Series Pilot-Operated Regulators

PILOT-OPERATED REGULATORS

Pilot-Operated Regulators are more accurate and offer higher capacities than standard direct-operated regulators. They will maintain constant set outlet pressure even when inlet pressure fluctuates or variations in flow occur. With the proper selection of pilots, these regulators will accurately control temperature, pressure, or a combination of both.

HD-Series Steam Service The HD-Series Regulator features **Ductile Iron** construction for increased pressure & temperature rating, a large full-port strainer with blow-down valve on pilot adapter which keeps dirt from entering control pilots, and field reversible pilot-mounting for versatile and easy installation.



DUCTILE IRON BODY

HD Regulators are used in conjunction with the appropriate Pilot(s) to control Steam Pressure or Process Temperature

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HD Series Regulators (with commonly used Pilots) 136-143

HDP Pressure Regulator **136-137**

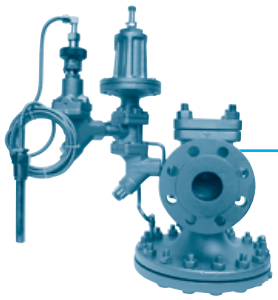
(HD Regulator with "P" Pressure Pilot)

HDT Temperature Regulator **138-139**

(HD Regulator with "T" Temperature Pilot)

HDA Air Controlled Pressure Regulator **140-141**

(HD Regulator with "A" Air Pilot)



HDPT Pressure & Temperature Regulator

(HD Regulator with "P" Pressure & "T" Temperature Pilot) **142-143**

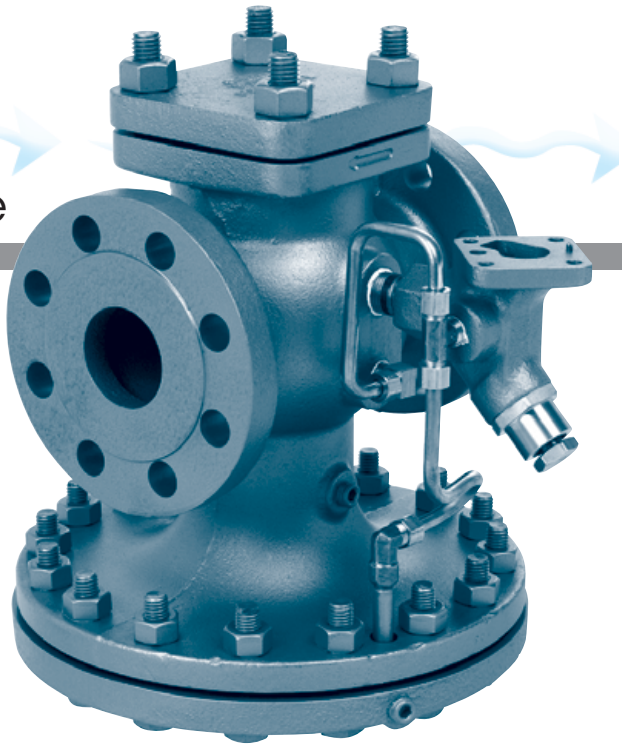
HSP Series Pilot-Operated Pressure Regulating Valve

CAST STEEL BODY **144-145**

The Watson McDaniel HSP Pilot-operated Regulating Valve is constructed of Cast Carbon Steel for higher pressure & temperature ratings.

HD Series

Pilot-Operated Regulating Valve



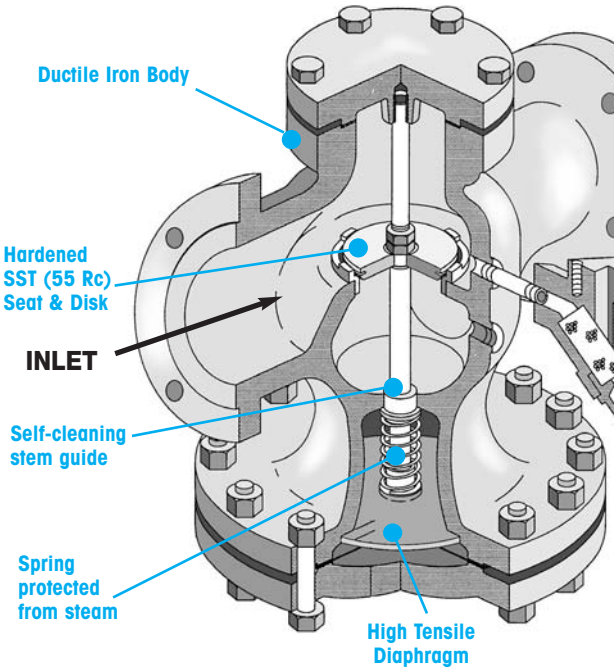
Ductile Iron

Model	**HD-Series**
Sizes	**1/2" – 6"**
Connections	**Threaded 1/2" - 2"** **Flanged 150# 1" - 6"** **Flanged 300# 1" - 6"**
Body Material	**Ductile Iron**
PMO Max. Operating Pressure	**300 PSIG**
Design Pressure/ Temperature Ratings TMA/PMA	NPT **450 PSIG @ 650° F** 150# FLG **150 PSIG @ 566° F** 300# FLG **450 PSIG @ 650° F**

TYPICAL APPLICATIONS

The Watson McDaniel **HD-Series** pilot operated regulators were designed for **extremely accurate control** of **temperature** and **pressure** in steam service applications. The **HD-Series** is made of **Ductile-iron** for extended pressure and temperature ratings. These regulators use several different control pilots, which can be attached to the valve to control pressure, temperature, or a combination of both. The different control pilots can be added or removed from the regulator body. This modular design adds to the versatility of this product. The most common options include the **P**-Pilot for pressure reducing, and the **T**-Pilot for temperature control.

- Ductile Iron body for higher pressures
- Full port strainer & blowdown valve on pilot adapter for ultimate protection from dirt & scale
- Hardened stainless steel trim for extended life
- Pre-mounted tubing & field reversible pilot adapter
- Optional reduced port trim
- Low differential pressure option
- Low inlet pressure option



* Standard pilot mounting is on the right side of the regulator when looking into the outlet port. Pilot mounting on HD regulators are field reversible.

FEATURES

- **No external power source is required. This simplifies the valve and minimizes installation and maintenance costs.**
- **Pressure and temperature pilots can be used in combination eliminating the need for a separate pressure and temperature regulator**
- **Ductile iron for higher pressure ranges and increased safety. Ductile Iron is a better choice than cast iron for steam applications.**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection against dirt and scale**
- **Hardened stainless steel trim (55 Rc) for extended life even in the most demanding applications**
- **The innovative design allows the pilot to be mounted on either side of the regulator and is easily field reversible**
- **Comes fully assembled with tubing and pilot adapter. The control pilot requires only four bolts to complete the installation.**

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Watson McDaniel

HD Series

Pilot-Operated Regulating Valve

TYPICAL PILOTS


PRESSURE Pilot


AIR Pilot


TEMPERATURE Pilot


SOLENOID Pilot

TYPICAL APPLICATIONS

- Pressure Regulating
- Temperature Regulating
- Pressure-Temperature Control
- Back Pressure Control
- Differential Pressure Control

CONTROL PILOTS

Pilot Mounting

Standard pilot mounting is on the right side of the regulator when looking into the outlet port (see diagrams on next page which are all right mounted). For opposite mounting, please specify when ordering. Pilot mounting on HD regulators are field reversible.

Pressure

When controlling pressure there are several options you can use for a pilot. The **P**-Pilot and the **P5**-Pilot are both **spring adjusted** pressure pilots. The **P**-Pilot is used on typical general-purpose pressure reducing applications. The **P5**-Pilot is used when higher accuracy is required and is capable of maintaining a control pressure window of less then 1 PSI. The **A**-Pilot is air controlled and generally used when adjustment of the regulator and pressure reducing station is done remotely.

Temperature

The **T**-Pilot is used to control temperature. The **T**-Pilot is filled with a temperature sensitive liquid, which expands when heated. The expansion of this liquid actuates a bellows that controls the temperature-regulating valve. The **T**-Pilot is equipped with an overheat bellows that protects the pilot in case of an over temperature condition. The **T**-Pilot controls temperature through a range of **60-260˚F.** Spec: ANSI/FCI 70-2 Class IV shut-off.

On-Off

On-off control of the regulator is possible by using the **S**-Solenoid Pilot. The **S**-Pilot allows the regulator to be shut off or turned on **electrically**. Normally the regulator is equipped with either a **P**-Pressure Pilot or **T**-Temperature Pilot in addition to the **S**-Solenoid Pilot.

Pressure-Temperature

The **PT**-Pilot combination is used when it is desirable to control both the **pressure** and **temperature** of a system with only one regulating valve. The unique features of this modular valve allow this to be accomplished quite easily. When the **PT**-Pilot combination is used, the downstream pressure is limited to a maximum setting by the pressure pilot, while the temperature pilot maintains the correct temperature.

Back Pressure

When controlling the back pressure in a steam system, the **BP**-Pilot is used in conjunction with the **HD-Series** Regulator. This controls the pressure on the upstream side of the regulator.

Differential Pressure

The **DP**-Pilot is used when trying to balance two different media sources that are being blended.

COMBINATION PILOTS

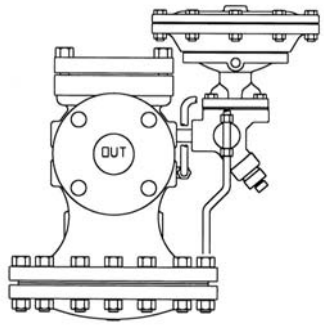
One of the advantages of the **HD-Series** regulating valve is that it can be used with many different variations of control pilots. Up to three pilots can be used simultaneously to control the operation of these valves. The most common is the "PT" Pressure-Temperature combination pilots. In addition to these pilots being used together the **S**-Solenoid Pilot can be used for turning the system on and off. (See next page for combination examples.)

HD Series

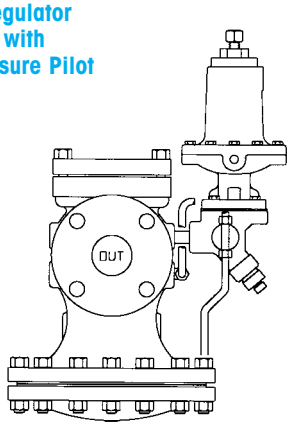
Pilot-Operated Regulating Valve

TYPICAL REGULATOR & PILOT COMBINATIONS

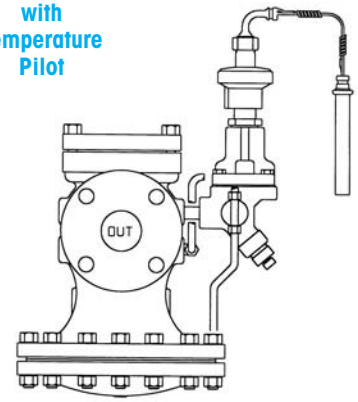
HDA
Regulator with Air Pilot



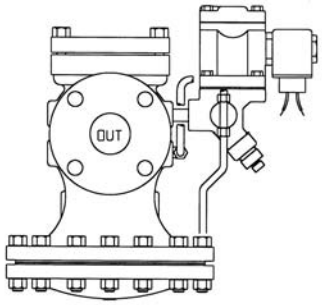
HDP
Regulator with Pressure Pilot



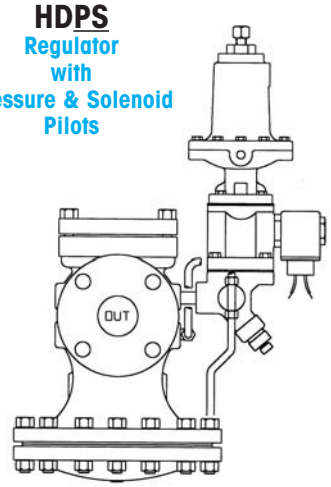
HDT
Regulator with Temperature Pilot



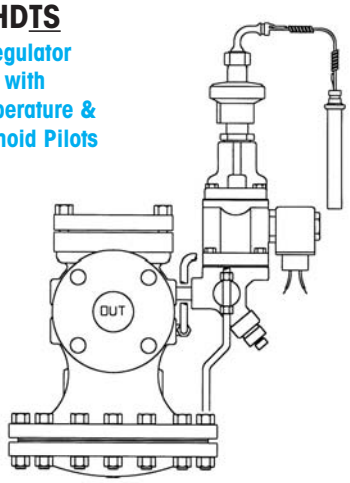
HDS
Regulator with Solenoid Pilot



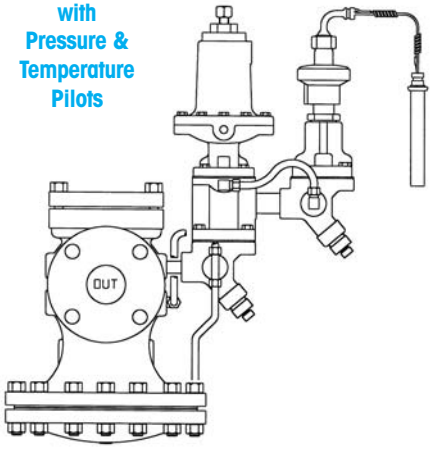
HDPS
Regulator with Pressure & Solenoid Pilots



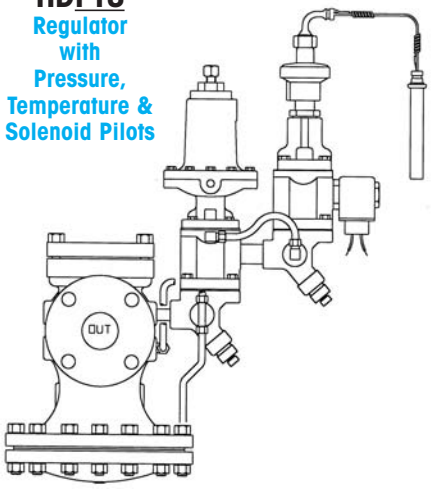
HDTS
Regulator with Temperature & Solenoid Pilots



HDPT
Regulator with Pressure & Temperature Pilots



HDPTS
Regulator with Pressure, Temperature & Solenoid Pilots



OTHER PILOT CONFIGURATIONS USED WITH HD REGULATOR

- Air / Solenoid
- Air / Pneumatic Temperature Controller
- Air / Solenoid / Pneumatic Temperature Controller
- Back Pressure
- Back Pressure / Solenoid
- Differential Pressure

Watson McDaniel's Pilots will fit other Manufacturers' Regulators.

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HD Series

Pilot-Operated Regulating Valves

HD-Series DIMENSIONS – *inches / pounds*

	(A) Face-To-Face						Weight (lbs)		
Size	**NPT**	**150#**	**300#**	**B**	**C**	**D**	**NPT**	**150#**	**300#**
1/2"	4 3/8			5 1/2	3 3/8	6 1/2	18		
3/4"	4 3/8			5 1/2	3 3/8	6 1/2	18		
1"	5 3/8	5 1/2	6	6 1/4	3 1/2	7	23	40	45
1 1/4"	6 1/2			7 3/8	4 7/8	8 3/4	43		
1 1/2"	7 1/4	6 7/8	7 3/8	7 3/8	4 7/8	8 3/4	43	55	60
2"	7 1/2	8 1/2	9	8 1/4	5 3/8	10 7/8	65	75	85
2 1/2"		9 3/8	10	9	5 3/4	11 3/4		100	105
3"		10	10 3/4	8 7/8	6 3/4	13 1/4		130	145
4"		11 7/8	12 1/2	10 7/8	7 1/2	14 3/4		215	235
6"		15 1/8	16	14 1/8	10	19 3/4		420	470

Option: Stainless diaphragms and external tubing - consult factory

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure (for Valve):
15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve)

Minimum Differential Pressure (for Valve):*
10 PSI (Standard Main Valve)
3 PSI (Low Pressure Main Valve)

** Not required for Temperature Pilot applications*

MATERIALS

Body	**Ductile Iron**
Cover	**Ductile Iron**
Gasket	Grafoil
Cover Screws	Steel
Pilot Adapter	**Ductile Iron/Cast Steel**
Screen	Stainless Steel
Tubing	Copper
Valve Seat	Hardened SST (55Rc)
Valve Disc	Hardened SST (55Rc)
Diaphragm	Phosphor Bronze

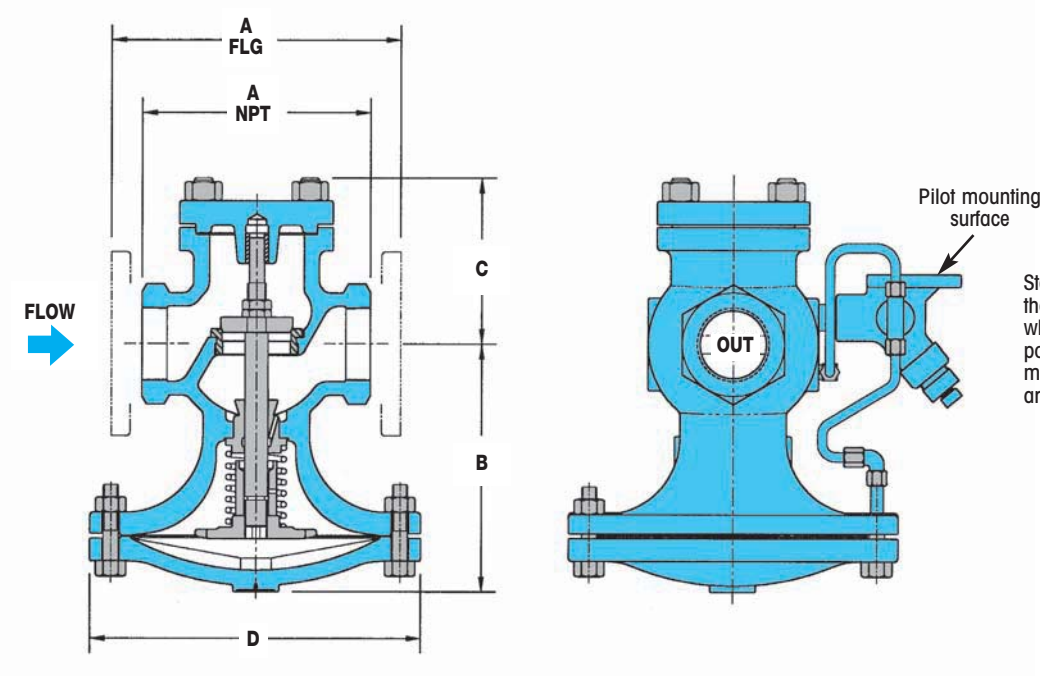
HOW TO ORDER

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity of steam required
- End connections (threaded, 150/300# flanged)

PILOT REQUIRED TO OPERATE THIS VALVE

Note: See **"How to Order"** in specific Pilot Section
- **T** Temperature Pilot
- **P** Pressure Pilot
- **A** Air Pilot
- **S** Solenoid Pilot
- **BP** Back Pressure Pilot
- **PD** Differential Pressure



Standard pilot mounting is on the right side of the regulator when looking into the outlet port (as shown). Pilot mounting on HD regulators are field reversible.

"P" & "P5" Pilot

Pressure Pilot for HD Regulating Valves

Pressure Pilot

- **Max Inlet Pressure: 300 PSIG**
- **Reduced Outlet Pressure Range: 3-200 PSIG**
- **Minimum Inlet Pressures:**
  15 PSIG when used with standard main valve
  5 PSIG when used with low pressure main valve
- **P-Pilot** (Standard) ± 1 PSIG accuracy
- **P5-Pilot** (Special) ± 0.5 PSIG accuracy

PRESSURE-ADJUSTING SPRING RANGES

"P" Pressure Range	"P5" Pressure Range	Identifying Colors
3-25 PSIG	1-10 PSIG	yellow
20-100 PSIG	10-25 PSIG	blue
80-200 PSIG	–	red

MATERIALS

Pilot Body & Cover	**Ductile Iron or Cast Steel**
Gasket	Grafoil
Diaphragm	Phosphor Bronze
Head & Seat Assembly	Hardened SST (55 Rc)

TYPICAL APPLICATIONS

The **"P" & "P5" Pressure Pilots** are used with the **HD** Regulator to control steam pressure in steam mains or for process equipment. Pilot operated regulators will maintain constant downstream pressure even when the inlet pressure to the valve fluctuates or steam usage varies.

FEATURES

- **The "P" Pilot can maintain downstream pressure to ±1 PSIG**
- **"P5" Pilot can maintain downstream pressure to ±0.5 PSIG**
- **Choices of three overlapping pressure ranges**
- **Pressure control spring can be changed in line**
- **Pilot is easily installed using only four bolts**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**
- **Can be used with temperature and solenoid control pilot**
- **Solid floating diaphragm is more failure resistant**
- **Watson McDaniel's pilots can be used with other manufacturers' regulators**

OPTIONS

- Pressure pilot can be used with temperature pilot to eliminate the need for two separate regulators
- Solenoid pilot can be added for remote on/off control of regulator
- "P5" Pilot will maintain ± 0.5 PSIG accuracy

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:
15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve)

Minimum Differential Pressure:
10 PSI (Standard Main Valve)
3 PSI (Low Pressure Main Valve)

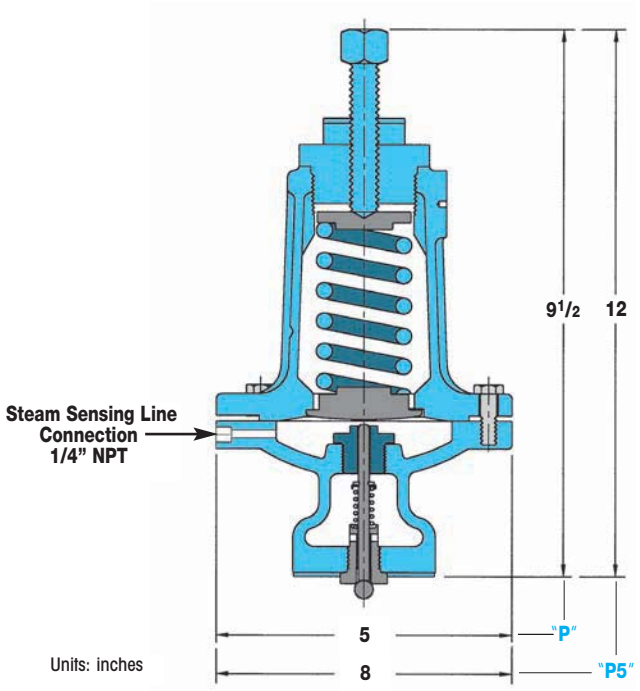
HOW TO ORDER

"P", "P5" PRESSURE PILOT

Specify: • Reduced pressure range –
Example: **"P" Pilot at 3-25 PSIG, yellow**

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity
- End connections (threaded, 150/300# flanged)



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"BP" Pilot

Back Pressure Pilot for HD Regulating Valves

Back Pressure Pilot

- Max Inlet Pressure: 300 PSIG
- Back Pressure Range: 10-200 PSIG
- Minimum Inlet Pressures:
  - **15 PSIG** when used with standard main valve
  - **5 PSIG** when used with low pressure main valve

PRESSURE-ADJUSTING SPRING RANGES

Pressure Range	Identifying Colors
10-25 PSIG	yellow
20-100 PSIG	blue
80-200 PSIG	red

MATERIALS

Pilot Body & Cover	**Ductile Iron**
Gasket	Grafoil
Diaphragm	Phosphor Bronze
Head & Seat Assembly	Hardened SST (55 Rc)

TYPICAL APPLICATIONS

The **"BP" Back-Pressure Pilot** used with the **HD** regulator, maintains upstream pressure in steam systems. These regulators are commonly used to supply flash steam to low pressure mains.

FEATURES

- **The "BP" Pilot can maintain upstream pressure to ±1 PSIG**
- **Choices of three overlapping pressure ranges**
- **Pressure adjusting spring can be changed with regulator in line**
- **Pilot is easily installed using only four bolts**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**
- **Solid floating diaphragm is more failure resistant**
- **Watson McDaniel's pilots can be used with other manufacturers' regulators**

OPTIONS

- Can be used with solenoid pilot for on/off control

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:

15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve)

Minimum Differential Pressure:

10 PSI (Standard Main Valve)
3 PSI (Low Pressure Main Valve)

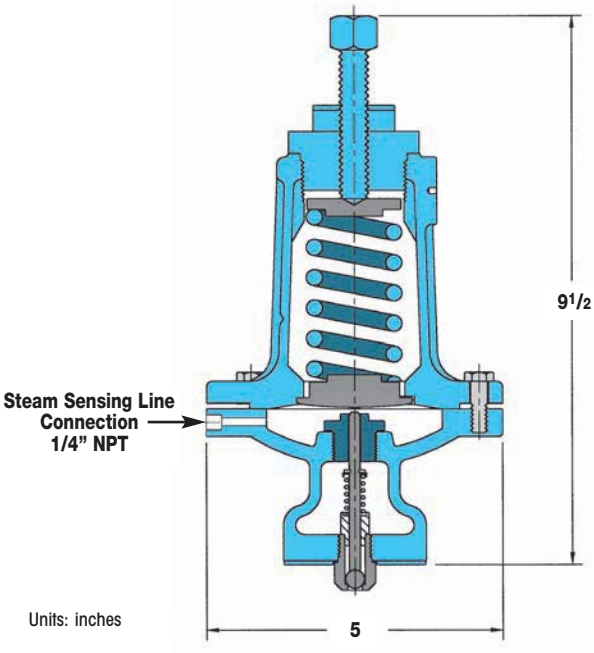
HOW TO ORDER

"BP" BACK PRESSURE PILOT

Specify: • Reduced pressure range –
Example: **"BP" Pilot at 20-100 PSIG, blue**

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity
- End connections (threaded, 150/300# flanged)



"T" Pilot

Temperature Pilot for HD Regulating Valves

Temperature Pilot

- **Max Inlet Pressure: 300 PSIG**
- **Temperature Control Range: 60-260 °F**
- **Minimum Inlet Pressures:**
  - **15 PSIG** when used with standard main valve
  - **5 PSIG** when low pressure temperature pilot is used with low pressure main valve

Low Pressure Temperature Pilot must be used in conjunction with a low pressure main valve for applications where inlet steam pressure is less than 15 PSIG. SPECIFY WHEN ORDERING.

TYPICAL APPLICATIONS

The **"T" Temperature Pilot** is used with the **HD** regulator to control temperature in various processes and systems. Some examples are:

- Oil heaters
- Process heaters
- Dryers
- Ovens
- Vats
- Jacketed Kettles

FEATURES

- **Temperature adjustment made simple and easy by rotating an adjustment knob to the desired temperature setting**
- **Thermostatic sensing bulb comes with an 8-ft. or 15-ft. length capillary**
- **Capillary is armor-protected to resist damage**
- **Overheat protection bellows is incorporated into sensing bulb; 200°F overheat protection up to 350°F**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**

OPTIONS

- Temperature Pilot can be combined with Pressure and Solenoid pilots
- Additional capillary lengths can be ordered in 5-ft. increments; up to 25-ft. maximum length
- Wells* for isolating sensing bulb from process liquid are available in 316 stainless steel or brass
- Extended length wells are available
- 316 Stainless Steel Sensing Bulb
- Other options available; consult factory

*** Thermowells:**
Wells isolate sensing bulb from the process liquid and are available in Brass or Stainless Steel. When placed on the side of a tank or vessel, the sensing bulb can be removed without having to drain the process fluid.

TEMPERATURE-ADJUSTING RANGES

Temperature Ranges*	Identifying Colors
60 - 120 °F (16 - 49 °C)	yellow
100 - 160 °F (38 - 71 °C)	black
120 - 180 °F (49 - 82 °C)	blue
160 - 220 °F (71 - 104 °C)	red
200 - 260°F (93 - 127 °C)	green

* Other ranges available; consult factory.

MATERIALS

Body	**Ductile Iron/Cast Steel**
Head & Guide	Stainless Steel
Seat	Stainless Steel
Sensing Bulb:	
T	Copper Bulb
TU	Copper Bulb w/Brass Union Hub
TUBW	Copper Bulb w/Brass Well
TUSW	Copper Bulb w/Stainless Steel Well
TBW	Copper Bulb w/Brass Well & Grommet
TSW	Copper Bulb w/Stainless Steel Well & Grommet

Pressure & Temperature Pilot combination

Controls downstream pressure and process temperature, eliminating the need for a separate pressure regulator

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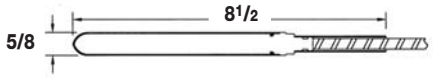
"T" Pilot

Temperature Pilot for HD Regulating Valves

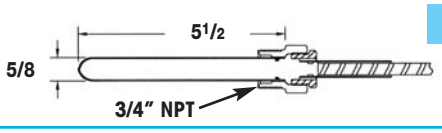
SENSING BULBS AVAILABLE

Units: inches

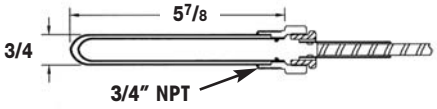
T



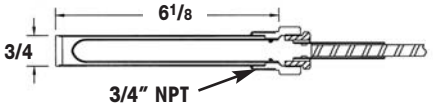
TU *Most common



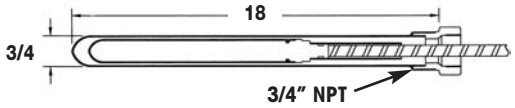
TUBW



TUSW



TBW



TSW

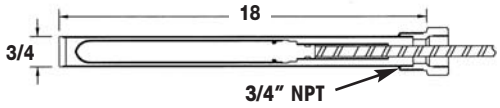
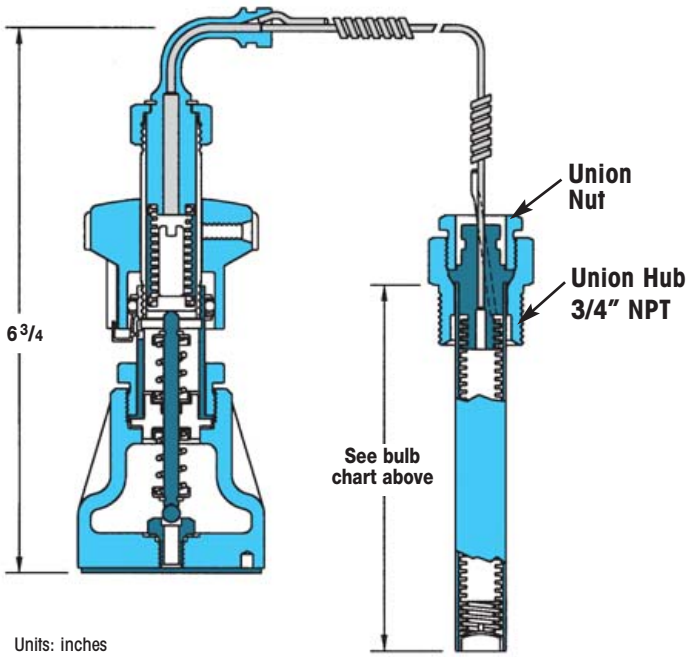


Diagram below shows "T" Pilot TU Option for Bulb



Units: inches

T	**Plain copper** bulb
TU	**Union connected copper** bulb that can be screwed into the side of tank * most common selection
TUBW	Type **TU** bulb with a **brass well**. The well, which isolates bulb from process fluid, can be placed in the side of a tank allowing the sensing bulb to be removed without having to drain the tank of liquid
TUSW	Type **TU** bulb with a corrosion resistant **stainless steel well**. The well, which isolates bulb from process fluid, can be placed in the side of a tank allowing the sensing bulb to be removed without having to drain the tank of liquid
TBW	Type **T** bulb with an **extended length brass well**. The extended well allows deeper insertion of sensing bulb into tanks.
TSW	Type **T** bulb with **extended length stainless steel well**. The extended well allows deeper insertion of sensing bulb into tanks.

Other options available; consult factory.

HOW TO ORDER

"T" TEMPERATURE PILOT

Specify:

- Temperature range from the chart or indicate the temperature of the process you wish to control
- The length of capillary required; 8-ft. is standard
- Bulb type needed:
  T, TU, TUBW, TUSW, TBW & TSW

Example: **TU, 8 FT CAP, 60-120˚F, yellow**

REGULATOR BODY

Specify:

- **HD** regulator body
- Regulator size or capacity of steam required
- End connections (threaded, 150/300# flanged)

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:

15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve with Low Pressure Temperature Pilot)

Low Pressure Temperature Pilot must be used in conjunction with a Low Pressure Main Valve for applications where inlet steam pressure is below 15 PSIG. SPECIFY WHEN ORDERING.

"A" Pilot

Air Pilot for HD Regulating Valves

Controls Pressure & Temperature

Air Pilot

- **Max Inlet Pressure: 300 PSIG**
- **Reduced Outlet Pressure Range: 3-200 PSIG**
- **Minimum Inlet Pressures:**
  15 PSIG when used with standard main valve
  5 PSIG when used with low pressure main valve

Note: Temperature Range: 0-350˚F when used with PTL & PTR temperature controllers

TYPICAL APPLICATIONS

The **"A" Air Pilot** is used with the **HD** Regulator to control steam pressure on steam mains and process equipment. The **"A" Air Pilot** can also be used in conjunction with the **PTL** or **PTR** pneumatic temperature controllers for controlling temperature in process applications. The principal advantage the **"A" Air Pilot** over standard spring loaded pilots is that pressure adjustments to the regulator can be made from a remote location. A regulator that is placed in a difficult to reach or inaccessible location can be adjusted by a remote control panel board placed in an accessible location.

HOW IT WORKS

When air pressure is applied to the upper chamber of the air pilot it exerts a downward force on the air pilot's diaphragm. This force controls the outlet pressure of the steam through the regulating valve. The control process is similar to a spring loaded pressure pilot except that the air pressure takes the place of the spring. There are three separate models of air pilots that make up the complete range depending on the steam pressure that needs to be controlled and the control air pressure available. See Pressure Adjusting Ranges chart.

FEATURES

- **Pressure adjustments to the regulator can be done from a remote location using an air signal**
- **Air-operated pilot ensures instant response and extremely accurate control**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**
- **Controls pressure settings within ±1 PSIG**

DIMENSIONS – *inches*

Model	A	B
A1	5 1/4	5
A4	5 1/4	7 7/8
A6	5 1/4	9 1/2

MAXIMUM CONTROL AIR PRESSURE ON AIR PILOT IS 125 PSIG

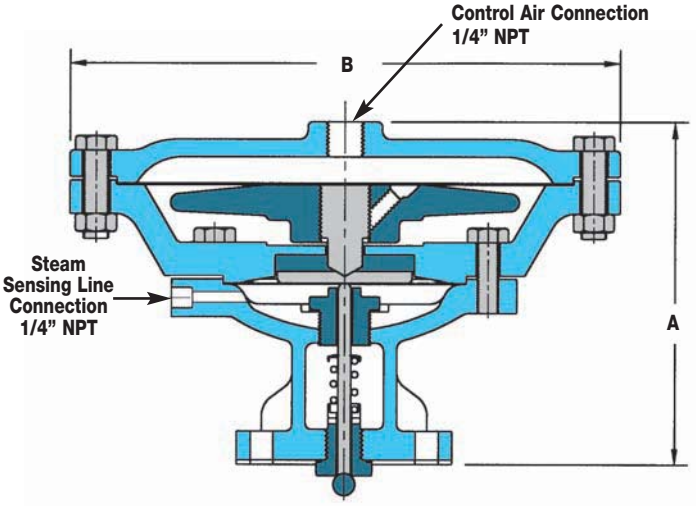
PRESSURE ADJUSTING RANGES

Model	Pressure Ranges	Description
A1	3-125 PSIG	1:1 ratio of steam pressure to control air pressure
A4	3-200 PSIG	4:1 ratio of steam pressure to control air pressure
A6	20-200 PSIG	6:1 ratio of steam pressure to control air pressure

The larger Diaphragm area of the "**A4**" & "**A6**" Air Pilots allow the use of lower control air pressure to regulate higher pressure steam.

MATERIALS

Pilot Body & Cover	**Ductile Iron**
Gasket	Grafoil
Cover Screws	Steel, GR5
Head & Seat Assembly	Hardened SST (55 Rc)



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"A" Pilot

Controls Pressure & Temperature — Air Pilot for HD Regulating Valves

REMOTE CONTROL PANEL BOARDS

Three different options of remote control panel boards can be used along with the **"A" Air Pilots**. Supply air is fed directly through the control panel board to the air pilot. You can choose one of the three options of control panel boards when using the air piloted regulators. Minimum 5 PSIG air supply pressure is required.

PL1

PL2

PL3

PL1

The **PL1** is made up of an air pressure regulator with adjustment knob and pressure gauge that measures the amount of air pressure going to the pilot (air signal). Steam pressure of the system is controlled by adjusting the air pressure regulator.

PL2

The **PL2** is the same as the PL1 with the addition of an extra air pressure gauge for measuring the air supply pressure to the control panel board.

PL3

The **PL3** is the same as the PL2 with the addition of a Steam Pressure Gauge for measuring steam pressure on the outlet side of the regulating valve.

HOW TO ORDER

"A" AIR PILOT

Specify:
- Air Pilot **A1**, **A4** or **A6**
- Remote Control Panel Board **PL1**, **PL2** or **PL3**

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity and pressure range of steam required
- End connections (threaded, 150/300# flanged)

MINIMUM OPERATING PRESSURES

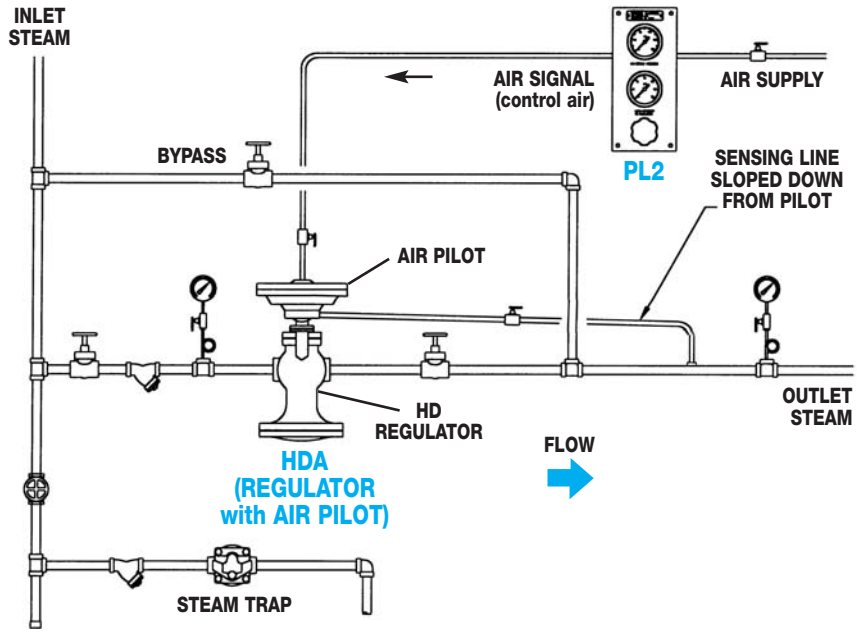
Minimum Inlet Pressure:
- **15 PSIG** (Standard Main Valve)
- **5 PSIG** (Low Pressure Main Valve)

Minimum Differential Pressure:
- **10 PSI** (Standard Main Valve)
- **3 PSI** (Low Pressure Main Valve)

CONTROL AIR PRESSURE RANGE

A-Pilot Control Pressure:
- **3-125 PSIG** (depending on pilot selected and desired outlet pressure)

Pressure Reducing Station Using HD Regulator with an Air Pilot



DESCRIPTION OF OPERATION

The **"A" Air Pilot** is being used in conjunction with the **PL2 Control Panel Board** to regulate steam pressure. A small air regulator on the panel board can be adjusted to control the air pressure to the pilot. One gauge on the panel board measures air line pressure to the panel board and the other gauge shows the air pressure being sent to the pilot. Steam pressure at the outlet of the regulator is controlled by the air pressure signal to the pilot. Depending on the air pilot model chosen (**A1**, **A4**, **A6**), there will be a 1:1, 4:1, or 6:1 ratio of outlet steam pressure to air pressure.

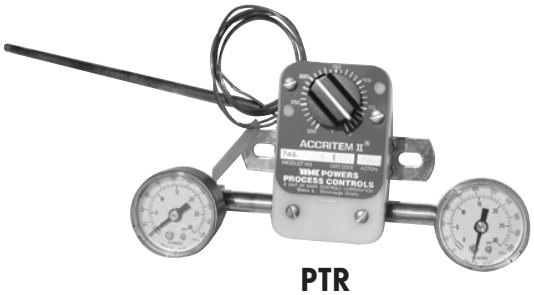
PTL & PTR Controller

Pneumatic Temperature Controller **(used with Air Pilot)**

Pneumatic Temperature Controller

- **Max Inlet Pressure: 300 PSIG**
- **Temperature Range: PTR: 0-300˚F**
  PTL: 50-350˚F
- **Minimum Inlet Pressures:**
  15 PSIG when used with standard main valve
  5 PSIG when used with low pressure main valve

PTL
(mounts directly on tank or vessel)



PTR
(mounts remotely with 4-ft. Capillary)

TYPICAL APPLICATIONS

The **PTL** and **PTR Pneumatic Temperature Controllers** operate over a wider temperature range than our standard "**T**" temperature pilot. These temperature controllers also react quicker to temperature change which make them an excellent choice for instantaneous hot water applications.

HOW IT WORKS

The **PTL** and **PTR Pneumatic Temperature Controllers** are used in conjunction with an **"A" Air Pilot** to control the operation of the **HD** Regulator. The **PTL** uses a bimetallic element to sense temperature and the **PTR** uses a hydraulically filled bulb with a 4-ft. capillary to sense temperature. The air supply is connected to the inlet of the controller and the air output signal is fed directly to an Air Pilot, which controls the opening and closing of the steam regulating valve.

FEATURES

- **Accurate and rapid response to temperature changes**
- **Covers control temperature range of 0-350 ˚F**

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:
15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve)

Model	PTL	PTR
Temperature Adjustment Range	50 - 350 ˚F	0 - 300 ˚F
Maximum Air Supply Pressure	35 PSIG	35 PSIG
Sensing Bulb	Bi-Metallic	Hydraulic Fill
Max. Pressure	250 PSIG	250 PSIG
Max. Temperature	400˚F	350˚F
Material	Copper	Copper
Optional Material	Stainless Steel	Stainless Steel
Capillary Length	N/A	4-ft.

HOW TO ORDER

PTL & PTR PNEUMATIC TEMPERATURE CONTROLLER

Specify: • **PTL** or **PTR** controller model (air pilot required for operation)

AIR PILOT

Specify: • **A1**, **A4** or **A6** Air Pilot model (refer to Air Pilot section)

REGULATOR BODY

Specify: • **HD** regulator body
• Regulator size or capacity
• End connections (threaded, 150/300# flanged)

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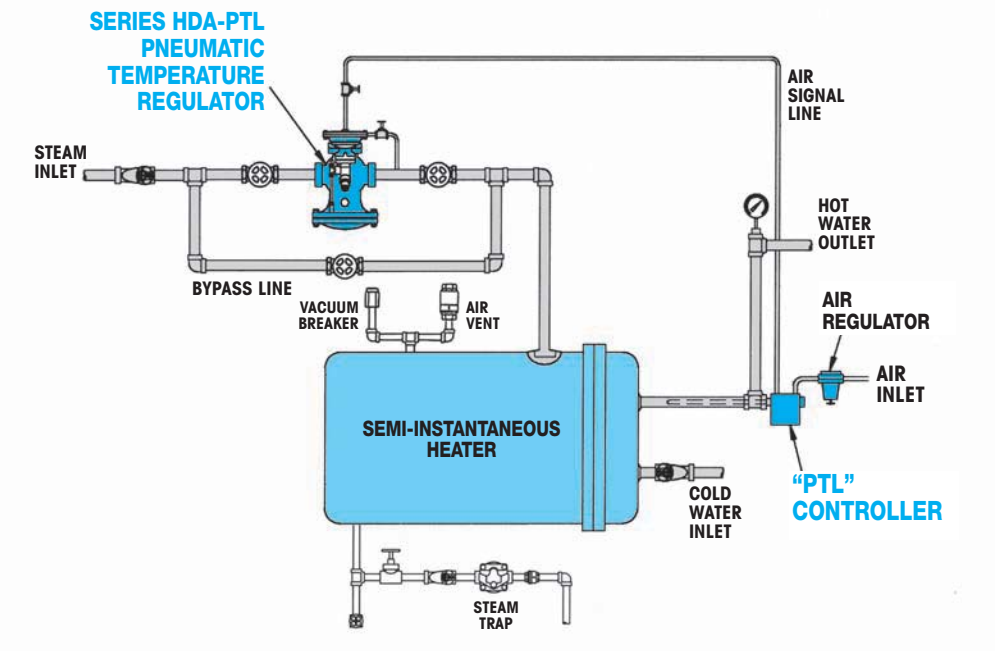
PTL & PTR Controller

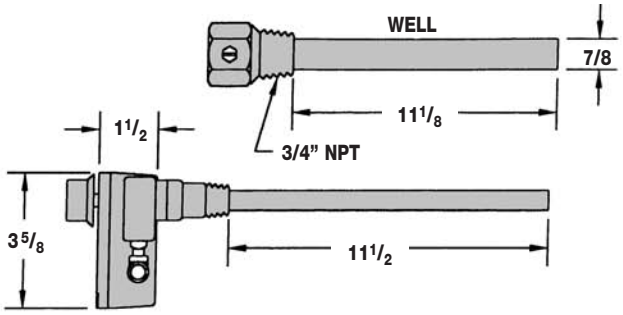
Pneumatic Temperature Controller **(used with Air Pilot)**

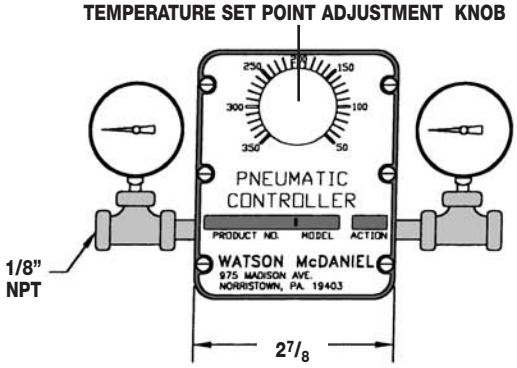


DESCRIPTION OF OPERATION

The **PTL Pneumatic Temperature Controller** senses outlet water temperature on a semi-instantaneous hot water heater. When the outlet water temperature falls below the set point, the PTL pneumatic temperature controller sends an air signal to the **A1 Air Pilot** which opens the regulator, allowing steam to heat the tank. When the water reaches the desired set temperature, the PTL pneumatic temperature controller shuts off the air signal to the **A1 Air Pilot** and the regulator closes, cutting off steam to the heater.

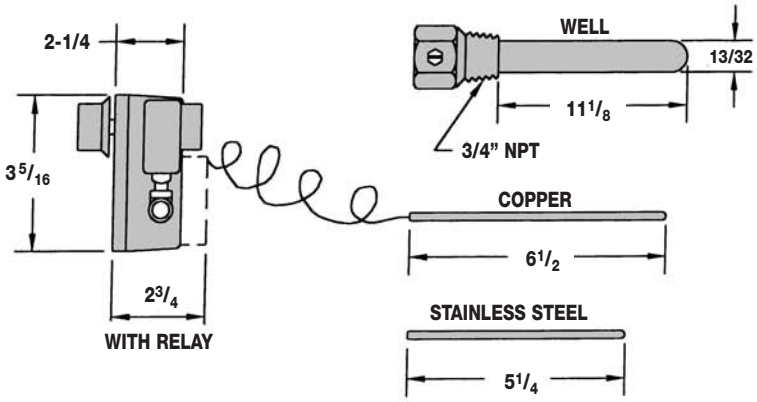
Model PTL (direct mounted)

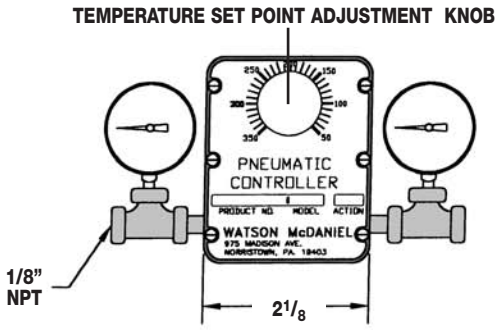




Units: inches

Model PTR (remote mounted)





"TRP" Pilot

Temperature Pilot for HD Regulating Valves

Temperature Pilot

- **Max Inlet Pressure: 300 PSIG**
- **Temperature Control Range: 20-250 ˚F**
- **Min Inlet Pressures: 15 PSIG** standard main valve
  5 PSIG low pressure main valve

TYPICAL APPLICATIONS

The **"TRP" Temperature Pilot** is used with the **HD** Regulator to control temperature in various processes and systems. Some examples are: Oil heaters, Ovens, Process Heaters, Vats, Dryers and Jacketed Kettles.

FEATURES

- **Ductile Iron pilot body**
- **Stainless steel valve and seat**
- **Standard capillary is copper with 316 stainless steel armor in 10 feet length**

OPTIONS

- **Additional Capillary Length:** Available up to 25-ft. in 5-ft. increments.
- **Special Materials:** Sensing bulb, wells, and capillary are available in special corrosion resistant materials.
  - 316 stainless steel capillary
  - 316 stainless steel armor with standard capillary
  - Kynar-covered capillary
- **Finned Bulb:** Special finned sensing bulb for improved temperature sensitivity when controlling air temperature in heating ducts
- **Thermowell or Separable Socket:** Available in stainless steel or copper
- **Temperature Sensing Dial:** Indicates temperature of process being controlled

DIMENSIONS – *inches*

Std. Bulb Range ˚F	Bulb Length A	Bulb Diameter B	Body Height C w/Dial	Body Height C w/o Dial	Thermowell or Separable Socket D	Thermowell or Separable Socket E
40-65°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
65-85°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
85-110°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
110-135°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
135-160°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
160-190°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
190-210°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
210-245°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
245-275°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
275-310°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
305-365°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
365-415°	12 1/4	1.0	11 1/4	16 11/64	13	1.1
415-435°	12 1/4	1.0	11 1/4	16 11/64	13	1.1

The "TRP" will control lower temperatures than the standard "T" Pilot

MATERIALS

Pilot Body	Ductile Iron
Valve and Seat	Stainless steel
Support Bracket	Aluminum
Bulb & Capillary	Copper (optional stainless steel)
All Other Parts	Brass

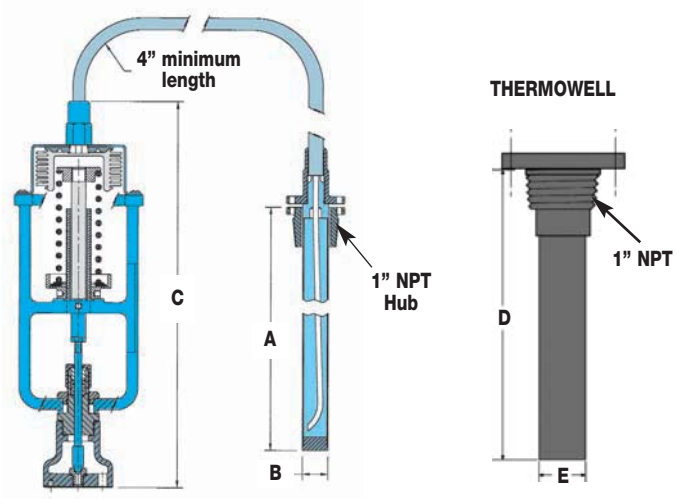
HOW TO ORDER

"TRP" TEMPERATURE PILOT

Specify:
- Temperature range from the chart or indicate the temperature of the process you wish to control
- The length of capillary required

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity of steam required
- End connections (threaded, 150/300# flanged)



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"S" Pilot

Electric Pilot for On/Off Control of HD Regulating Valves

Solenoid Pilot

- For Electrical On-Off Control of Regulating Valves
- Max Inlet Pressure: 250 PSIG

TYPICAL APPLICATIONS

Typically used for automatic operation, remote control, programmed cycling, sequential function interlocks with other equipment, and emergency shut-off in case of power failure.

HOW IT WORKS

The **"S" Solenoid Pilot** can be used in conjunction with Pressure, Temperature, or Air Pilots to electrically control on/off operation of the **HD** Regulator. When the solenoid pilot is used, the regulator can be turned on or off by electrically activating or de-activating the solenoid.

Normally Closed (nc) – Standard
The normally closed Solenoid Pilot remains closed in the non-activated state. The regulating valve will remain closed until an electrical signal is sent to the solenoid pilot. This is known as a fail-safe condition.

Normally Open (no) – Optional
The normally opened Solenoid Pilot remains open in the non-activated state. The regulating valve will function normally unless an electrical signal is used to shut-off the solenoid pilot.

FEATURES

- **Available normally opened (no) or normally closed (nc)**
- **Full-port strainer and blow-down valve on pilot adapter to eliminate failure caused by contaminated steam systems**

OPTIONS

- Normally open solenoid
- NEMA Ratings: NEMA 4 and NEMA 7
- Voltage: 24 VAC, 220 VAC, 240 VAC

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:
15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve)

Minimum Differential Pressure:
10 PSI (Standard Main Valve)
3 PSI (Low Pressure Main Valve)

STANDARD SOLENOID PILOTS AVAILABLE

Steam Inlet Pressure	0-180 PSIG 180-250 PSIG
NEMA Ratings	NEMA 1 – Standard NEMA 4 – Waterproof (optional) NEMA 7 – Explosion-proof (optional)
Voltage	110 Volts AC (standard) 24 Volts AC (optional) 220 Volts AC (optional) 240 Volts AC (optional)

MATERIALS

Pilot Body & Cover	**Ductile Iron**
Gasket	Grafoil
Cover Screws	Steel, GR5
Internals	Stainless Steel

HOW TO ORDER

"S" SOLENOID PILOT

Specify:
- Inlet Steam Pressure range: 0-180 PSIG or 180-250 PSIG
- NEMA rating: NEMA 1, NEMA 4 or NEMA 7 (if not specified NEMA 1 Standard will be supplied)
- Control Voltage: 24, 110, 220 or 240 VAC

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity of steam required
- End connections (threaded, 150/300# flanged)

"DP" Pilot

Differential Pressure Pilot for HD Regulating Valves

Differential Pressure Pilot

- **Max Inlet Pressure: 300 PSIG**
- **Reduced Outlet Pressure Range: 3-200 PSIG**
- **Min Inlet Pressures: 15 PSIG** standard main valve
  5 PSIG low pressure main valve
- **DP-Pilot** ± 2 PSIG accuracy

PRESSURE-ADJUSTING SPRING RANGES

"DP" Pressure Range	Identifying Colors
3-25 PSIG	yellow
20-100 PSIG	blue
80-200 PSIG	red

TYPICAL APPLICATIONS

The **"DP" Differential Pressure Pilot** is used with the **HD Regulator** to maintain steam pressure at a balanced differential pressure above another media source. This is typical on an oil burner where steam used for atomization is injected into the oil burner at a set pressure above the incoming oil supply. Therefore, as oil pressure fluctuates based on demand, the steam pressure will be maintained at a differential pressure above the oil pressure.

FEATURES

- **The "DP" Differential Pressure Pilot is used to maintain downstream steam pressure to a set differential pressure above loading pressure**
- **Accuracy to within ±2 PSIG**
- **3 overlapping spring ranges to choose from**
- **Pilot is installed using only four bolts**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**
- **Solid floating diaphragm**
- **Watson McDaniel's pilots can be used with other manufacturers' regulators**

OPTIONS

- Solenoid pilot can be added for remote on/off control of regulator

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:
15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve)

Minimum Differential Pressure:
10 PSI (Standard Main Valve)
3 PSI (Low Pressure Main Valve)

MATERIALS

Pilot Body & Cover	**Ductile Iron & Cast Steel**
Gasket	Grafoil
Diaphragm	Phosphor Bronze
Head & Seat Assembly	Hardened SST (55 Rc)

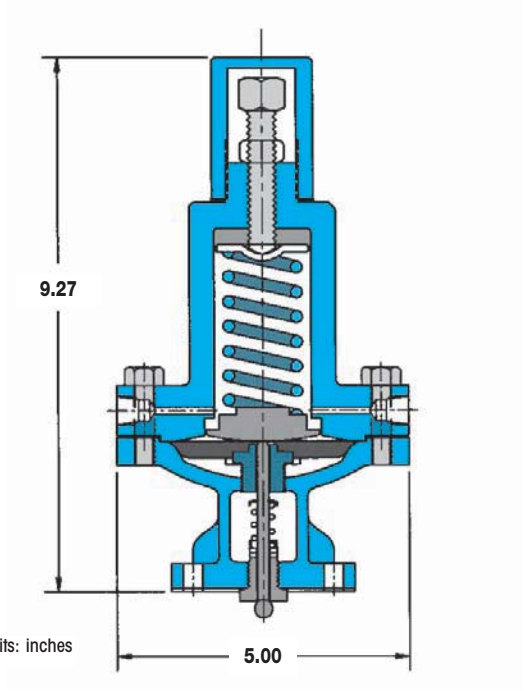
HOW TO ORDER

"DP" DIFFERENTIAL PRESSURE PILOT

Specify: • Reduced pressure range –
Example: **"DP" Pilot at 3-25 PSIG, yellow**

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity
- End connections (threaded, 150/300# flanged)



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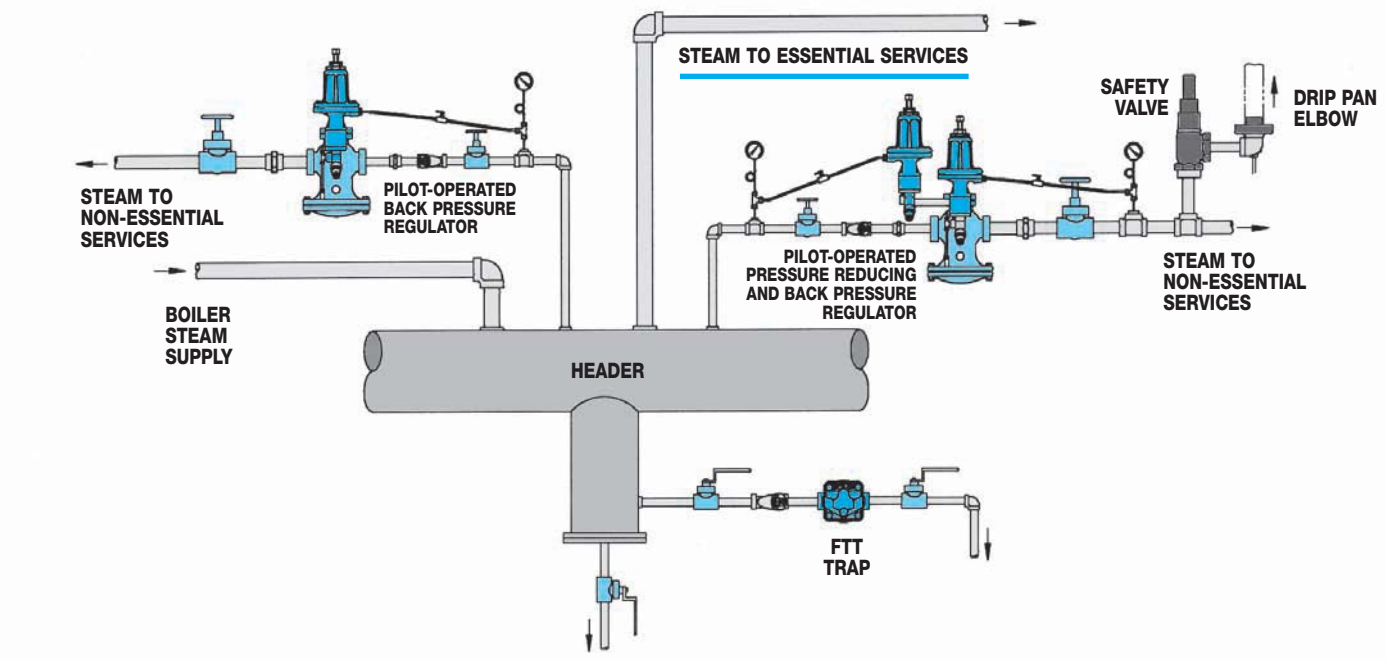
Over Pressure Protection Methods

Using "P" and "BP" Pilots

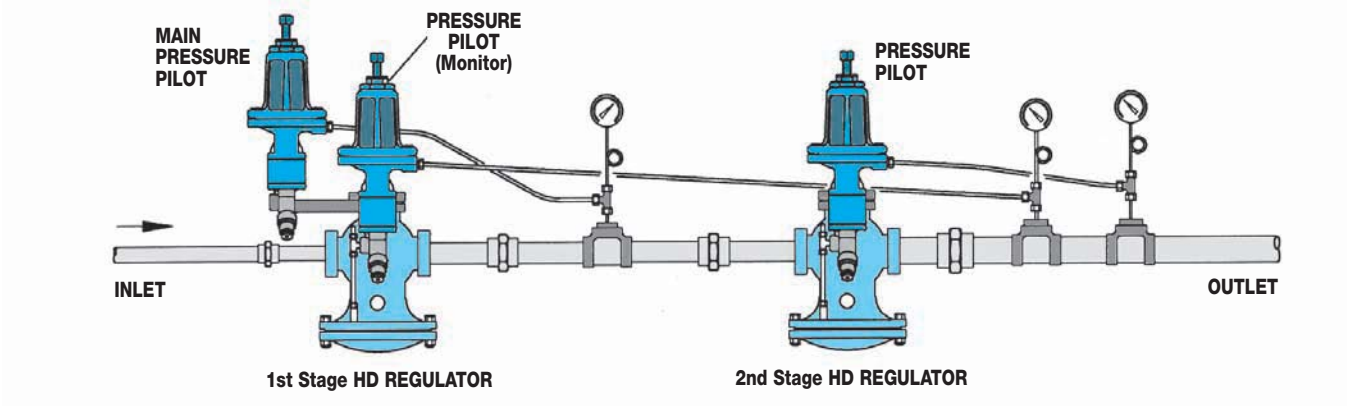
Back Pressure Regulators for Boiler Overload Protection

In steam systems with several applications of varying importance, a back pressure regulator may be used to prevent overloading of the boiler by isolating non-essential loads from critical processes in the event steam demand exceeds boiler output. When steam demand is greater than the capacity the boiler can generate, pressure in the boiler will drop, possibly upsetting the control balance in the boiler resulting in the generation of wet steam. Using back pressure regulators on the non-essential application supply lines allows isolation of these applications at times of peak demand by shutting off steam flow to areas deemed non-essential. This ensures that boiler demand is not exceeded and steam flow is maintained to critical processes until demand subsides and the boiler is able to catch up.



Pressure Override Protection of Regulator Supply Lines

On multi-stage pressure reducing applications where a rise in control pressure due to failure of the final supply regulator could result in equipment damage and/or personnel injury, a secondary pressure pilot may be added to provide override protection of a steam supply line. During normal operation, the main pressure pilot on the 1st stage regulator provides intermediate pressure control while the additional "monitor" pilot senses final control pressure and remains open due to a slightly higher setting than the final control pressure setting. Should the 2nd stage regulator fail for any reason, increasing supply pressure will begin to close the monitor pressure pilot of the 1st stage regulator, thus overriding the main control pilot preventing final supply pressure from increasing. This overpressure protection can similarly be offered on single-stage reducing valves by protecting against failure of the main control pilot.



HDP

Pilot-Operated Pressure Regulating Valve

HD Regulating Valve with "P" Pressure Pilot

- **Max Inlet Pressure: 300 PSIG**
- **Reduced Outlet Pressure Range: 3-200 PSIG**
- **Min Inlet Pressures:**
  15 PSIG standard main valve
  5 PSIG low pressure main valve

TYPICAL APPLICATIONS

The **HD** Regulator with the **"P" Pressure Pilot** is used for reducing steam pressure in piping mains and process applications. Pilot-operated regulators will maintain constant downstream pressure even when the inlet pressure to the regulator fluctuates or steam usage varies.

FEATURES

- **The "P" Pilot can maintain downstream pressure to ±1 PSIG**
- **Optional "P5" pilot can maintain pressure to ±0.5 PSIG**
- **Choices of three overlapping pressure ranges**
- **Pressure adjusting spring can be changed with regulator in line**
- **Pilot is easily installed using only four bolts**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**
- **Watson McDaniel's pilots can be used with other manufacturers' regulators**

OPTIONS

- Pressure and temperature pilots can be combined on the same regulator
- Solenoid pilot can be added for electrical on/off control of the regulator
- Can be used with solenoid and temperature pilots

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:
15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve)

Minimum Differential Pressure:
10 PSI (Standard Main Valve)
3 PSI (Low Pressure Main Valve)

PRESSURE-ADJUSTING SPRING RANGES "P"	
Pressure Ranges	**Identifying Colors**
3-25 PSIG	yellow
20-100 PSIG	blue
80-200 PSIG	red
PRESSURE-ADJUSTING SPRING RANGES "P5"	
1-10 PSIG	yellow
10-25 PSIG	blue

MATERIALS	
Body	**Ductile Iron**
Cover	**Ductile Iron**
Gasket	Grafoil
Cover Screws	Steel
Pilot Adapter	**Ductile Iron/Cast Steel**
Screen	Stainless Steel
Tubing	Copper
Valve Seat	Hardened SST (55 Rc)
Valve Disc	Hardened SST (55 Rc)
Diaphragm	Phosphor Bronze

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HDP

Pilot-Operated Pressure Regulating Valve

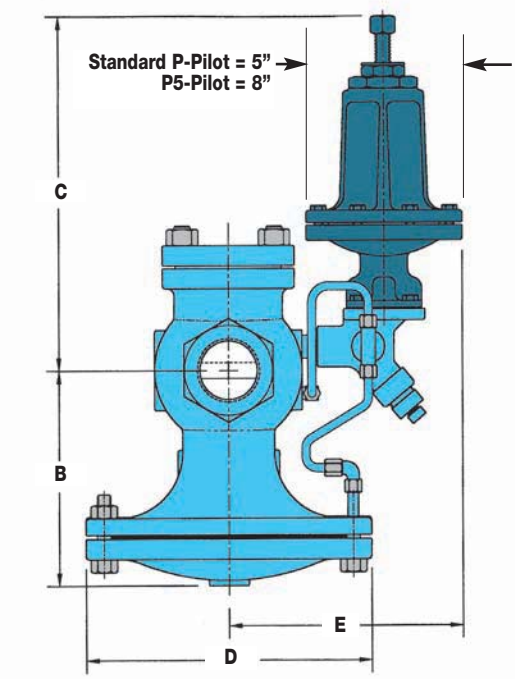
DIMENSIONS HD-Series – *inches / pounds*

Size	Face-To-Face NPT	Face-To-Face 150#	Face-To-Face 300#	B	C*	D	E**	Weight (lbs) NPT	Weight (lbs) FLG
1/2"	4 3/8			5 1/2	11 7/8	6 1/2	7 3/4	18	
3/4"	4 3/8			5 1/2	11 7/8	6 1/2	7 3/4	18	
1"	5 3/8	5 1/2	6	6 1/4	11 7/8	7	7 3/4	23	35
1 1/4"	6 1/2			7 3/8	11 7/8	8 3/4	8 1/4	43	
1 1/2"	7 1/4	6 7/8	7 3/8	7 3/8	11 7/8	8 3/4	8 1/4	43	60
2"	7 1/2	8 1/2	9	8 1/4	11 7/8	10 7/8	8 1/2	65	85
2 1/2"		9 3/8	10	9	11 7/8	11 3/4	8 1/2		105
3"		10	10 3/4	8 7/8	11 7/8	13 1/4	9 1/2		145
4"		11 7/8	12 1/2	10 7/8	11 7/8	14 3/4	10 1/2		235
6"		15 1/8	16	14 1/8	12 1/2	19 3/4	11 3/4		470

For P5 Pilot:

** For sizes 1/2" to 1 1/2" add 2 1/2" to "C" dimension;*
For sizes 2" to 6" add 5" to "C" dimension.

*** Add 1 1/2" to "E" dimension for all sizes.*



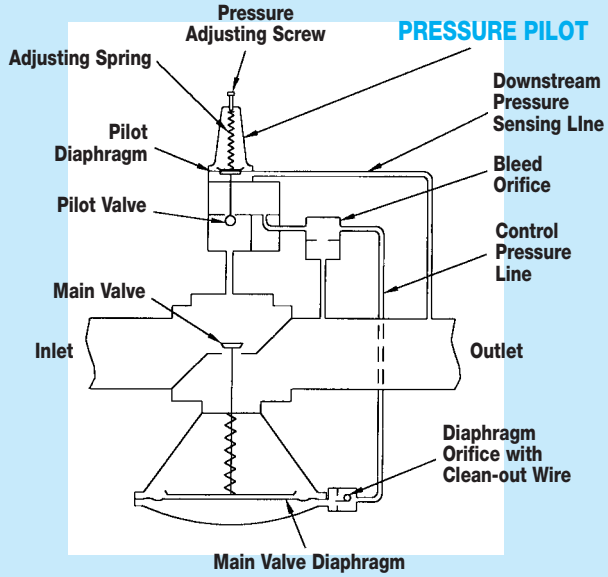
HOW TO ORDER

P or P5 PRESSURE PILOT

Specify: • Reduced pressure range
(P5 Pilot requires a special adapter block on 3" & 4" valves)

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity and pressures of steam required
- End connections (threaded, 150/300# flanged)



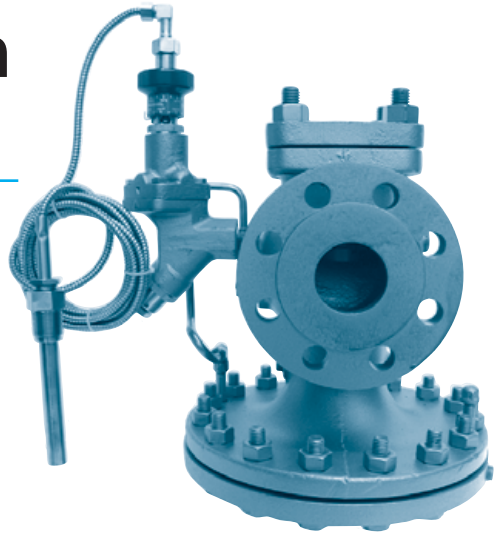
HOW IT WORKS

The purpose of the pressure pilot is to control the operation of the pressure regulating valve. A pressure sensing line connects the pressure pilot to the downstream side of the regulator. The pressure in the sensing line is directed under the diaphragm in the pressure pilot. When the pressure in the system reaches the adjusting spring set point it pushes the diaphragm upwards against the force of the adjusting spring and closes the pilot valve. When the pilot valve is shut, steam can no longer pass through to the underside of the regulator diaphragm and the main valve closes. When the steam pressure falls below its set point, the pilot valve opens allowing steam to lift the main valve diaphragm which opens up the regulating valve.

HDT

Pilot-Operated Temperature Regulating Valve

HD Regulating Valve with "T" Temperature Pilot



- **Inlet Pressure Max: 300 PSIG**
- **Temperature Control Range: 60–260 ˚F**
- **Min Inlet Pressures:**
  - **15 PSIG** standard main valve with standard temperature pilot
  - **5 PSIG** low pressure main valve with low pressure temp. pilot

Low Pressure Temperature Pilot must be used in conjunction with a low pressure main valve for applications where inlet steam pressure is less than 15 PSIG. SPECIFY WHEN ORDERING.

TYPICAL APPLICATIONS

The **HD** Regulator with the **"T" Temperature Pilot** is used for controlling temperature in various processes and systems, such as Oil Heaters, Ovens, Process Heaters, Vats, Dryers and Jacketed Kettles.

FEATURES

- **Temperature adjustment made simple and easy by rotating an adjustment knob to the desired temperature setting**
- **Thermostatic sensing bulb comes with 8-ft. or 15-ft. capillary; optional lengths up to 25-ft. max**
- **Capillary is armor-protected to resist damage**
- **Optional stainless steel sensing bulb and capillary**
- **Overheat protection bellows is incorporated into sensing bulb; 200˚F overheat protection up to 350˚F**
- **Can be used with Pressure Pilot for simultaneous control of pressure and temperature**
- **Hardened stainless steel trim on regulator for extended service life**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**

OPTIONS

- Temperature Pilot can be combined with Pressure and Solenoid pilots
- Additional capillary lengths can be ordered in 5-ft. increments; up to 25-ft. maximum length
- Wells* are available in 316 stainless steel
- Longer wells can be supplied
- Low pressure (under 15 PSIG) temperature pilot
- Consult factory for other options

TEMPERATURE-ADJUSTING RANGES

Temperature Ranges *	Identifying Colors
60 - 120 °F (16 - 49 °C)	yellow
100 - 160 °F (38 - 71 °C)	black
120 - 180 °F (49 - 82 °C)	blue
160 - 220 °F (71 - 104 °C)	red
200 - 260 °F (93 - 127 °C)	green

* Other ranges available; consult Factory.

MATERIALS

Body	**Ductile Iron**
Cover	**Ductile Iron**
Gasket	Grafoil
Cover Screws	Steel
Pilot Adapter	**Ductile Iron/Cast Steel**
Screen	Stainless Steel
Tubing	Copper
Valve Seat	Hardened SST (55 Rc)
Valve Disc	Hardened SST (55 Rc)
Diaphragm	Phosphor Bronze

*** Thermowells:**
Wells isolate sensing bulb from the process liquid and are available in Brass or Stainless Steel. When placed on the side of a tank or vessel, the sensing bulb can be removed without having to drain the process fluid.

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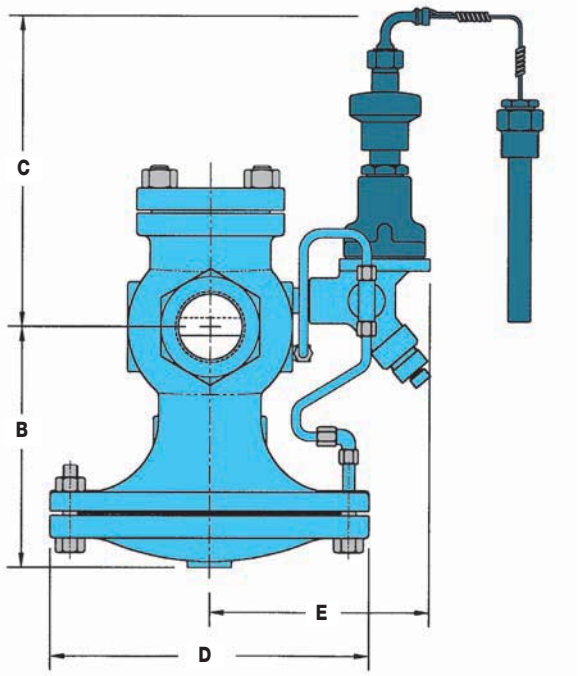
HDT

Pilot-Operated Temperature Regulating Valve

DIMENSIONS HD-Series – *inches / pounds*

Size	Face-To-Face			B	C	D	E	Weight (lbs)	
	NPT	150#	300#					NPT	FLG
1/2"	4 3/8			5 1/2	9 1/4	6 1/2	6 1/2	18	
3/4"	4 3/8			5 1/2	9 1/4	6 1/2	6 1/2	18	
1"	5 3/8	5 1/2	6	6 1/4	9 1/4	7	8 1/4	23	35
1 1/4"	6 1/2			7 3/8	9 1/4	8 3/4	7 1/4	43	
1 1/2"	7 1/4	6 7/8	7 3/8	7 3/8	9 1/4	8 3/4	7 1/4	43	60
2"	7 1/2	8 1/2	9	8 1/4	9 1/4	10 7/8	7 1/2	65	85
2 1/2"		9 3/8	10	9	9 1/4	11 3/4	7 3/4		105
3"		10	10 3/4	8 7/8	9 1/4	13 1/4	8 1/2		145
4"		11 7/8	12 1/2	10 7/8	9 1/4	14 3/4	9 1/2		235
6"		15 1/8	16	14 1/8	9 3/4	19 3/4	10 3/4		470



HOW TO ORDER

"T" TEMPERATURE PILOT

Specify:

- Temperature range from the chart or indicate the set temperature of the process you wish to control
- The length of capillary required. 8-ft. or 15-ft. standard; Maximum length: 25-ft. in 5-ft. increments
- Bulb type needed: T, TU, TUBW, TUSW, TBW & TSW

REGULATOR BODY

Specify:

- **HD** regulator body
- Regulator size or capacity
- End connections (threaded, 150/300# flanged)

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:

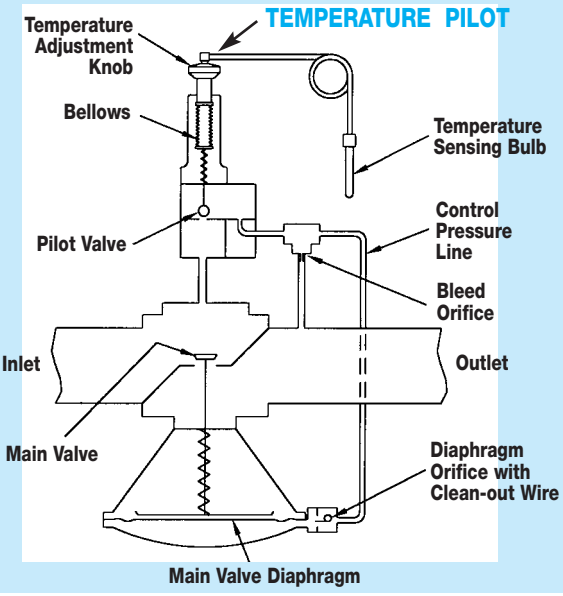
15 PSIG (Standard Main Valve with Standard Temperature Pilot)

5 PSIG (Low Pressure Main Valve with Low Pressure Temperature Pilot)

Low Pressure Temperature Pilot must be used in conjunction with a Low Pressure Main Valve for applications where inlet steam pressure is less than 15 PSIG. SPECIFY WHEN ORDERING.

HOW IT WORKS

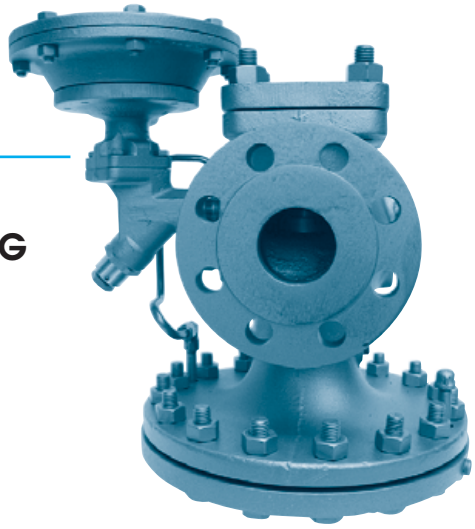
The temperature pilot controls the operation of the temperature regulating valve. The temperature sensing bulb, which is filled with a temperature sensitive liquid, is placed in the process fluid that is being heated. When the temperature of the process fluid reaches its set point, the bellows expands and closes off the pilot valve. When the pilot valve is shut, steam can no longer pass thru to the underside of the regulator diaphragm, and the main valve closes. When the process fluid cools below the set temperature, the main valve reopens.



HDA

Air-Operated Pilot Regulating Valve

HD Regulating Valve with "A" Air Pilot



- **Max Inlet Pressure: 300 PSIG**
- **Reduced Outlet Pressure Range: 3-200 PSIG**
- **Min Inlet Pressures:**
  - **15 PSIG** standard main valve
  - **5 PSIG** low pressure main valve

Note: Temperature Range: 0-350˚F when used with PTL & PTR temperature controllers

TYPICAL APPLICATIONS

The **HD** Regulator with the **"A" Air Pilot** is used for reducing steam pressure on steam mains and process equipment. The **"A" Air Pilot** can also be used in conjunction with the PTL and PTR Pneumatic Temperature Controllers for controlling temperature in process applications. The principal advantage of the **"A" Air Pilot** over standard spring-loaded pilots is that pressure adjustments to the regulator can be made from a remote location. A regulator placed in a difficult to reach or inaccessible location can be adjusted by a remote control panel board placed in an accessible location.

FEATURES

- **Air Pilot can be used with PTL or PTR Pneumatic Temperature Controller**
- **Pressure adjustments of the regulator can be done from a remote location**
- **Air-operated pilot insures instant response and very accurate control**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**
- **Controls pressure settings within ±1 PSIG**

OPTIONS

- **Solenoid Pilot (S-Pilot) can be added for Electrical On/Off Operation of the regulator**

MAXIMUM CONTROL AIR PRESSURE ON AIR PILOT IS 125 PSIG

PRESSURE-ADJUSTING RANGES

Model	Pressure Ranges	Description
A1	**3-125 PSIG**	**1:1** ratio of steam pressure to control air pressure **Example:** *With the A1 air pilot, 10 PSIG of air pressure maintains 10 PSIG of steam pressure*
A4	**3-200 PSIG**	**4:1** ratio of steam pressure to control air pressure **Example:** *With the A4 air pilot, 10 PSIG of air pressure maintains 40 PSIG of steam pressure*
A6	**20-200 PSIG**	**6:1** ratio of steam pressure to control air pressure **Example:** *With the A6 air pilot, 10 PSIG of air pressure maintains 60 PSIG of steam pressure*

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:
15 PSIG (Standard Main Valve)
5 PSIG (Low Pressure Main Valve)

Minimum Differential Pressure:
10 PSI (Standard Main Valve)
3 PSI (Low Pressure Main Valve)

CONTROL AIR PRESSURE RANGE

A-Pilot Control Pressure:
3-125 PSIG (depending on pilot selected and desired outlet pressure)

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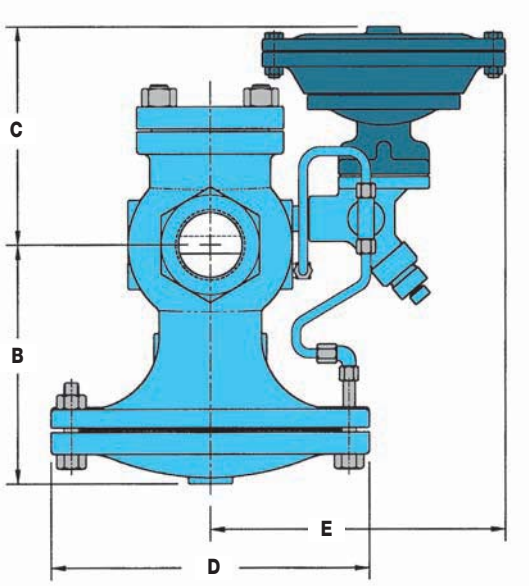
HDA

Air-Operated Pilot Regulating Valve

DIMENSIONS HD-Series – *inches / pounds*

Size	Face-To-Face			B	C*	D	E**	Weight (lbs)	
	NPT	150#	300#					NPT	FLG
1/2"	4 3/8			5 1/2	7 1/2	6 1/2	7 3/4	18	
3/4"	4 3/8			5 1/2	7 1/2	6 1/2	7 3/4	18	
1"	5 3/8	5 1/2	6	6 1/4	7 1/2	7	7 3/4	23	35
1 1/4"	6 1/2			7 3/8	7 1/2	8 3/4	8 3/8	43	
1 1/2"	7 1/4	6 7/8	7 3/8	7 3/8	7 1/2	8 3/4	8 3/8	43	60
2"	7 1/2	8 1/2	9	8 1/4	7 1/2	10 7/8	8 3/4	65	85
2 1/2"		9 3/8	10	9	7 1/2	11 3/4	8 3/4		105
3"		10	10 3/4	8 7/8	7 1/2	13 1/4	9 1/2		145
4"		11 7/8	12 1/2	10 7/8	7 1/2	14 3/4	10 1/2		235
6"		15 1/8	16	14 1/8	8 1/4	19 3/4	11 3/4		470

** Add 2 1/2" to "C" dimension for A4 or A6 Air Pilots on 2" thru 4" valves.*
*** Add 1 1/2" to "E" dimension for A4, and 2 1/4"" for A6.*

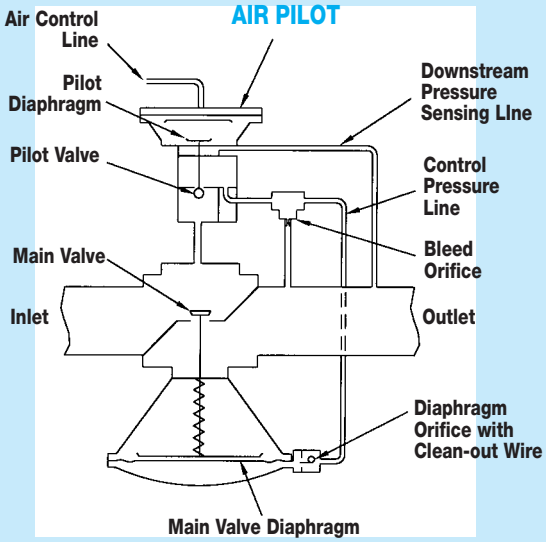


MATERIALS

Body	**Ductile Iron**
Cover	**Ductile Iron**
Gasket	Grafoil
Cover Screws	Steel
Pilot Adapter	**Ductile Iron/Cast Steel**
Screen	Stainless Steel
Tubing	Copper
Valve Seat	Hardened SST (55 Rc)
Valve Disc	Hardened SST (55 Rc)
Diaphragm	Phosphor Bronze

HOW IT WORKS

When air pressure is applied to the upper chamber of the air pilot it exerts a downward force on the air pilot's diaphragm. The lower chamber of the air pilot is connected to the outlet side of the regulator using a sensing line. The purpose of the sensing line is to sense the pressure on the outlet side of the regulator. When the intended set pressure is reached, the pilot valve closes which then closes off the flow path of steam to the underside of the diaphragm chamber in the regulator body. The regulator modulates maintaining the desired downstream pressure regardless of the amount of steam being used.



HOW TO ORDER

"A" AIR PILOT

Specify:
- Air Pilot **A1**, **A4** or **A6**
- Remote Control Panel Board: **PL1**, **PL2** or **PL3**

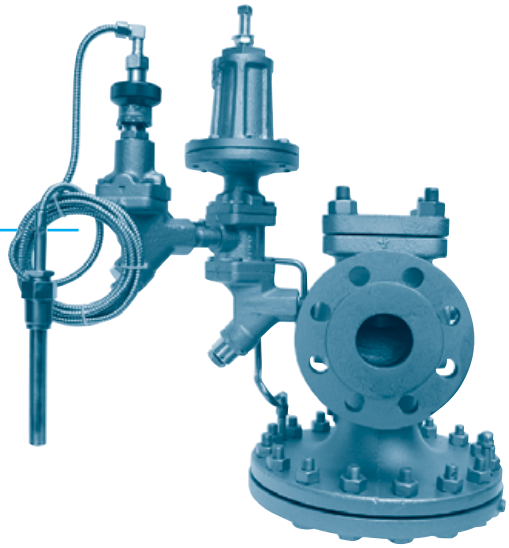
REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity and pressures of steam required
- End connections (threaded, 150/300# flanged)

HDPT

Pilot-Operated Pressure & Temperature Regulating Valve

HD Regulating Valve with "P" Pressure & "T" Temperature Pilots



- Max Inlet Pressure: 300 PSIG
- Reduced Outlet Pressure Range: 3-200 PSIG
- Temperature Control Range: 60-260 °F
- Min Inlet Pressures:
  - **15 PSIG** standard main valve with standard temperature pilot
  - **5 PSIG** low pressure main valve with low pressure temp. pilot

Low Pressure Temperature Pilot must be used in conjunction with a low pressure main valve for applications where inlet steam pressure is less than 15 PSIG. SPECIFY WHEN ORDERING

TYPICAL APPLICATIONS

The **HD** Regulator with both the **"P" Pressure Pilot** and **"T" Temperature Pilot** is used to simultaneously control both pressure and temperature in process applications.

Using both the temperature and pressure pilot on the same regulator eliminates the need for two separate regulators to control temperature and pressure.

FEATURES

- **Pressure and temperature pilot combination eliminates the need for two separate regulators**
- **Choice of three overlapping pressure ranges**
- **Pilot is installed using only four bolts**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**
- **Watson McDaniel's pilots can be used with other manufacturers' valves**

OPTIONS

- **Solenoid Pilot can be added for electrical On/Off control of the regulator**

TEMPERATURE-ADJUSTING RANGES

Temperature Ranges *	Identifying Colors
60 - 120 °F (16 - 49 °C)	yellow
100 - 160 °F (38 - 71 °C)	black
120 - 180 °F (49 - 82 °C)	blue
160 - 220 °F (71 - 104 °C)	red
200 - 260 °F (93 - 127 °C)	green

* Other ranges available; consult Factory.

PRESSURE-ADJUSTING SPRING RANGES

Pressure Ranges	Identifying Colors
3-25 PSIG	yellow
20-100 PSIG	blue
80-200 PSIG	red

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:

15 PSIG (Standard Main Valve with Standard Temperature Pilot)

5 PSIG (Low Pressure Main Valve with Low Pressure Temperature Pilot)

Minimum Differential Pressure:

10 PSI (Standard Main Valve)

3 PSI (Low Pressure Main Valve)

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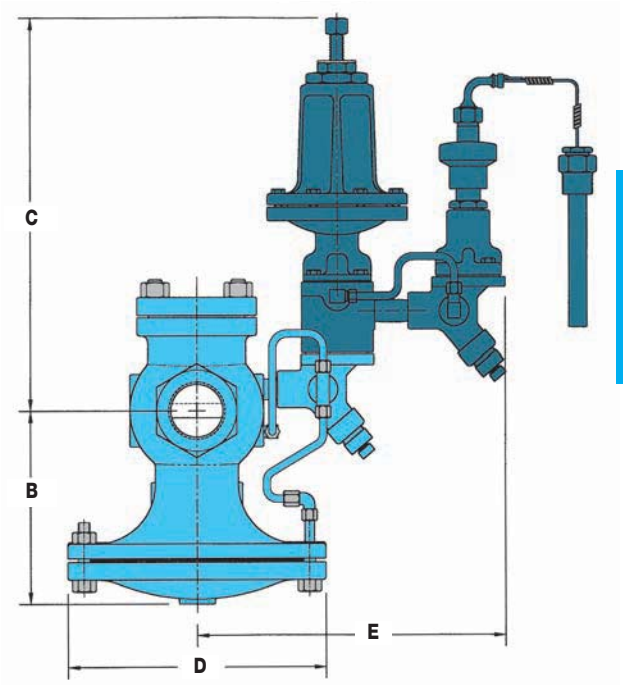
HDPT

Pilot-Operated Pressure & Temperature Regulating Valve

DIMENSIONS HD-Series – *inches / pounds*

Size	Face-To-Face			B	C	D	E	Weight (lbs)	
	NPT	150#	300#					NPT	FLG
1/2"	4 3/8			5 1/2	14 1/2	6 1/2	10 1/4	18	
3/4"	4 3/8			5 1/2	14 1/2	6 1/2	10 1/4	18	
1"	5 3/8	5 1/2	6	6 1/4	14 1/2	7	10 1/4	23	35
1 1/4"	6 1/2			7 3/8	14 1/2	8 3/4	10 3/4	43	
1 1/2"	7 1/4	6 7/8	7 3/8	7 3/8	14 1/2	8 3/4	10 3/4	43	60
2"	7 1/2	8 1/2	9	8 1/4	14 1/2	10 7/8	11 1/4	65	85
2 1/2"		9 3/8	10	9	14 1/2	11 3/4	11 1/4		105
3"		10	10 3/4	8 7/8	14 1/2	13 1/4	12		145
4"		11 7/8	12 1/2	10 7/8	14 1/2	14 3/4	13		235
6"		15 1/8	16	14 1/8	15	19 3/4	14 1/4		470

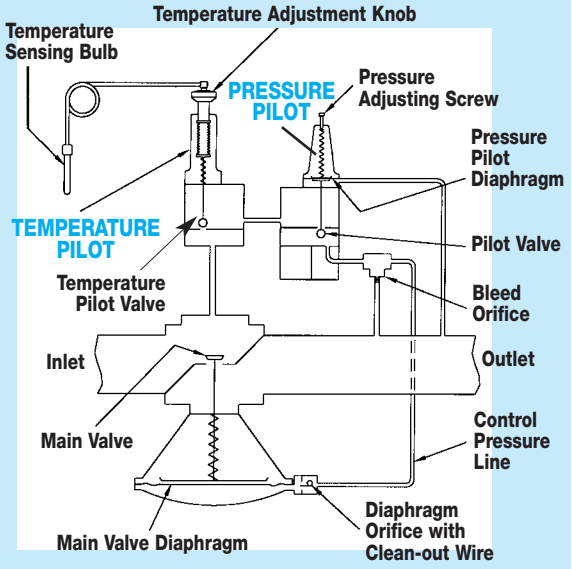


MATERIALS

Body	**Ductile Iron**
Cover	**Ductile Iron**
Gasket	Grafoil
Cover Screws	Steel
Pilot Adapter	**Ductile Iron/Cast Steel**
Screen	Stainless Steel
Tubing	Copper
Valve Seat	Hardened SST (55 Rc)
Valve Disc	Hardened SST (55 Rc)
Diaphragm	Phosphor Bronze

HOW IT WORKS

A pressure pilot and temperature pilot can be used together to control the operation of the regulator. The pressure pilot limits the outlet pressure of the regulator when the temperature pilot calls for steam. The temperature pilot senses the temperature of the process that is being controlled and opens or closes the regulator accordingly. Using a pressure-temperature pilot combination eliminates having to use two separate valves.



HOW TO ORDER

"T" TEMPERATURE PILOT

Specify:
- Temperature range from the chart or indicate the set temperature of the process you wish to control
- The length of capillary required; 8-ft. is standard
- Bulb type needed: T, TU, TUBW, TUSW, TBW & TSW

"P" PRESSURE PILOT

Specify:
- Pressure range from the chart

REGULATOR BODY

Specify:
- **HD** regulator body
- Regulator size or capacity and pressures of steam required
- End connections (threaded, 150/300# flanged)

HSP Series CAST STEEL

Pilot-Operated Pressure Regulating Valve

Model	**HSP Series**
Sizes	**1", 1 1/2", 2", 3", 4"**
Connections	**150#/300# Flange**
Body Material	**Cast Steel**
PMO Max. Operating Pressure	**450 PSIG**
TMO Max. Operating Temperature	**650˚F**
PMA Max. Allowable Pressure	**550 PSIG @ 650˚F**
TMA Max. Allowable Temperature	**650˚F @ 550 PSIG**

PRESSURE-ADJUSTING SPRING RANGES

Pressure Ranges	Identifying Colors
10-40 PSIG	yellow
25-100 PSIG	blue
75-300 PSIG	red

TYPICAL APPLICATIONS

The **HSP-Series** Main Valve with integral Pressure Pilot reduces steam pressure in steam system piping mains and process applications. This pilot-operated regulator is specifically used in applications where the properties and benefits of Cast Steel are desired and/or specified. Using steel as the material of construction for the main valve body extends the temperature ranges of the regulator. A unique two-bolt pilot adapter design and field-reversible tubing offer even greater versatility to this type of regulator, further reducing maintenance downtime. These valves share the same design and proven reliability of the Watson McDaniel HD-Series Regulators, providing extremely accurate control of downstream system pressure even when inlet pressure to the regulator fluctuates or steam usage varies.

FEATURES

- **Cast Steel body for higher pressure and temperature ratings**
- **New, convenient bolt-on pilot design simplifies installation**
- **New diaphragm design improves performance and extends life**
- **Hardened stainless steel trim for extended life**
- **Optional Stellite trim available**
- **Full port strainer and blowdown valve on pilot adapter for ultimate protection from dirt and scale**
- **Maintains downstream pressure + 1.0 PSIG**
- **Choice of three overlapping spring ranges**
- **Pre-mounted pilot & tubing simplifies installation**

CONTROL PILOTS

Pilot Mounting

Standard pilot mounting is on the right side of the regulator when looking into the outlet port (see diagram on opposite page which is right mounted). For opposite mounting, please specify when ordering. Pilot mounting on HSP regulators are field reversible.

Pressure

The spring-adjusted Pilot is used for general purpose pressure reducing applications.

MATERIALS

Body	**ASTM A-216 GR WCB**
Cover	ASTM A-216 GR WCB
Diaphragm Cover	ASTM A-216 GR WCB
Pilot	ASTM A-216 GR WCB
Gaskets	Garlock 3400/grafoil SLS
Seat	420F SS (optional Stellite seat, consult factory)
Disc	420F SS
Diaphragm	300 SS
Mfg. Bolts	SA-193 GR B7
Spring	302 SS
Stem	416 SS

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Watson McDaniel

HSP Series CAST STEEL

Pilot-Operated Pressure Regulating Valve

DIMENSIONS HSP Series – *inches / pounds*

	(A) Face-To-Face						Weight (lbs)		
Size	NPT	150#	300#	B	C	D	NPT	150#	300#
1"	x	5 1/2	6	6 1/4	3 1/2	7	x	40	45
1 1/2"	x	6 7/8	7 3/8	7 3/8	4 7/8	8 3/4	x	55	60
2"	x	8 1/2	9	8 1/4	5 3/8	10 7/8	x	75	85
3"	x	10	10 3/4	8 7/8	6 3/4	13 1/4	x	130	145
4"	x	11 7/8	12 1/2	10 7/8	7 1/2	14 3/4	x	215	235

MINIMUM OPERATING PRESSURES

Minimum Inlet Pressure:
15 PSIG (standard Main Valve)
5 PSIG (low pressure Main Valve)

Minimum Differential Pressure:
10 PSIG (standard Main Valve)
3 PSIG (low pressure Main Valve)

HOW TO ORDER

REGULATOR BODY

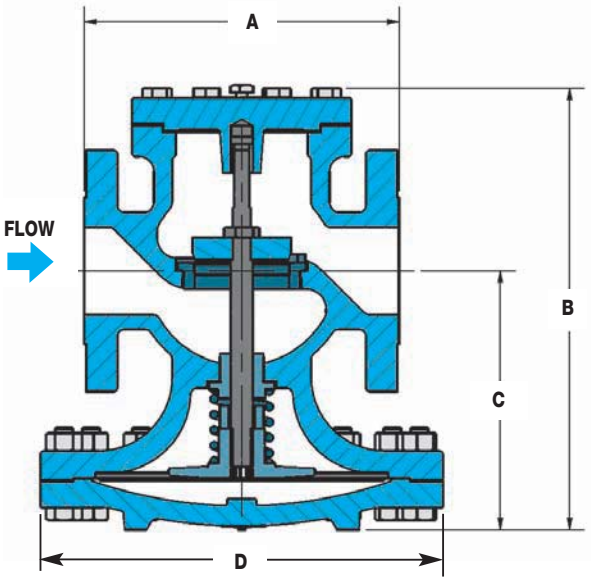
Specify:
- **HSP** regulator body
- Regulator size or capacity of steam required
- End connections (150#/300# flanged)

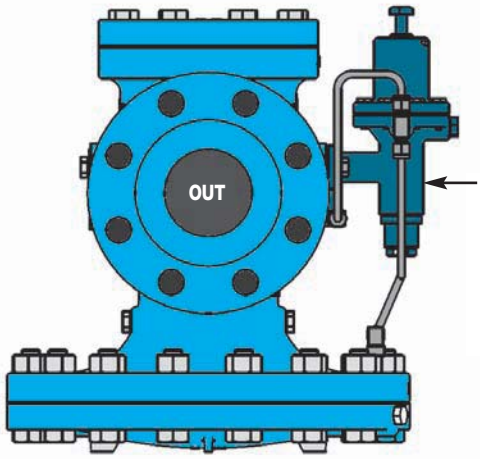
PILOT REQUIRED TO OPERATE THIS VALVE

- Pressure Pilot (Specify Range)

Specify: 10-40 PSIG - Yellow
25-100 PSIG - Blue
75-300 PSIG - Red

Example: 2" **HSP**, 150# FLG, 10-40 PSIG (yellow)





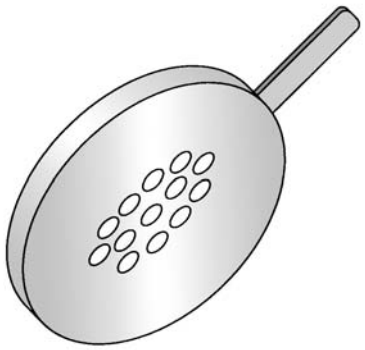
Standard pilot mounting is on the right side of the regulator when looking into the outlet port (as shown). Pilot mounting on HD regulators are field reversible.

Series-A ORIFICE PLATE
for Pressure Regulating Valves

Noise Attenuation Equipment is used to reduce unwanted or excessive noise that commonly occurs in pressure reducing stations.

Series-A ORIFICE PLATE

Noise Reduction Capability: 5-10 dBA



Series-A
Orifice Plate

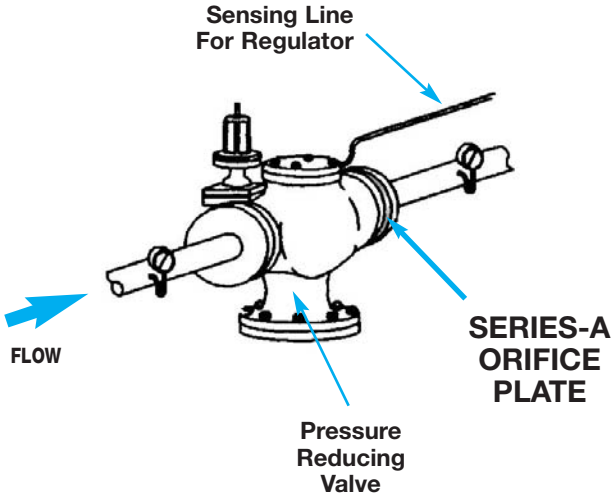
HOW IT WORKS

The **Series-A** Orifice Plate with its drilled orifice pattern is installed after the pressure regulating valve to smooth out turbulence caused by the pressure drop across the regulator. Noise reduction levels of **5-10 dBA** can typically be achieved.

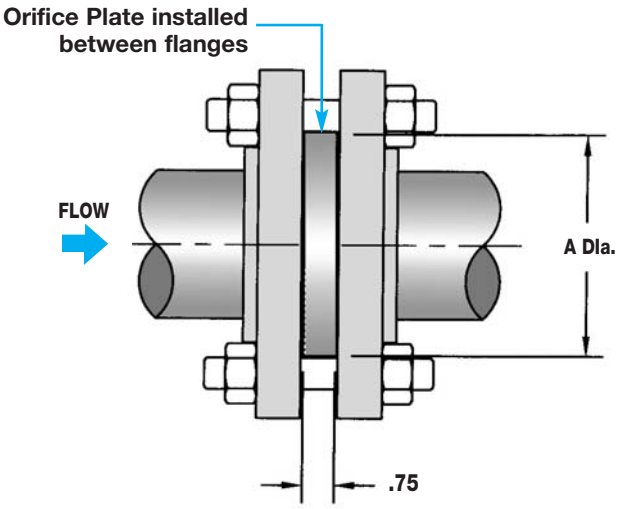
INSTALLATION

The Series-A Orifice Plate is installed between ANSI flanges immediately after the regulator. If the regulator is a flanged unit, the orifice plate is placed at the flange outlet connection.

Series-A Typical Hook-up



Series A Dimensions



Series-A DIMENSION (A) – *inches*

Pipe Size	125# Flange	250# Flange
2″	6	4 3/16
2 1/2″	7	4 15/16
3″	7 1/2	5 11/16
4″	9	6 15/16
6″	11	9 11/16

Note: Other sizes available. Consult factory.

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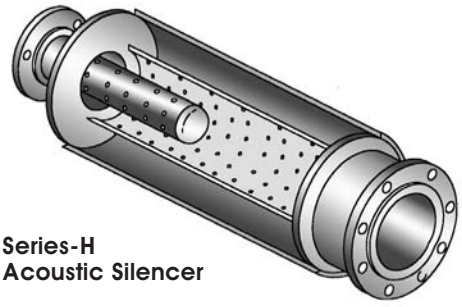
ACOUSTIC SILENCER Series-H

for Pressure Regulating Valves

Noise Attenuation Equipment is used to reduce unwanted or excessive noise that commonly occurs in pressure reducing stations.

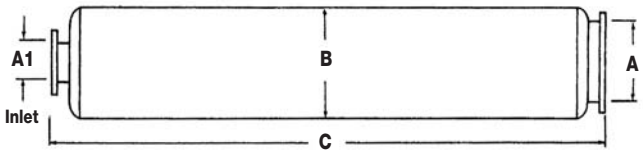
Series-H ACOUSTIC SILENCER

Noise Reduction Capability: 20-30 dBA



Series-H
Acoustic Silencer

Series-H Dimensions



HOW IT WORKS

The **Series-H** Acoustic Silencer incorporates a **Dual Diffuser** tube design. The inner tube has a drilled orifice pattern and the outer tube contains an integral layer of sound absorbing insulation. Noise reduction levels of **20-30 dBA** can typically be achieved.

INSTALLATION

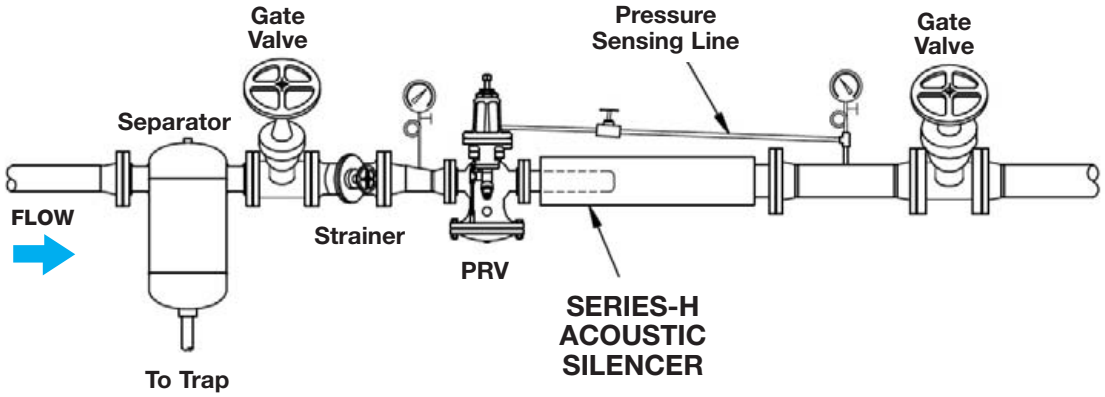
The **Series-H** Diffuser Tube should be installed immediately downstream of the regulator, as shown below.

Series-H DIMENSIONS – *inches*

Model	A1	A	B	C	Weight (lbs)
LCV-8	4	8	14	57	145
LCV-10	6	10	16	71	210
LCV-12	6	12	18	81	295

Note: Other sizes available. Consult factory.

Series-H Typical Hook-up

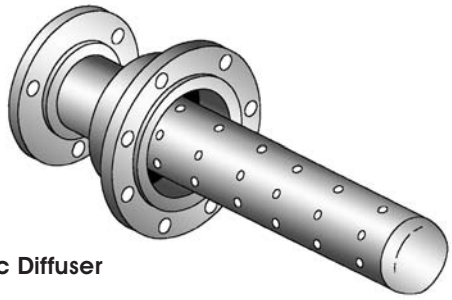


Series-S ACOUSTIC DIFFUSER

for Pressure Regulating Valves

Series-S ACOUSTIC DIFFUSER

Noise Reduction Capability: 10-15 dBA



Series-S
Acoustic Diffuser

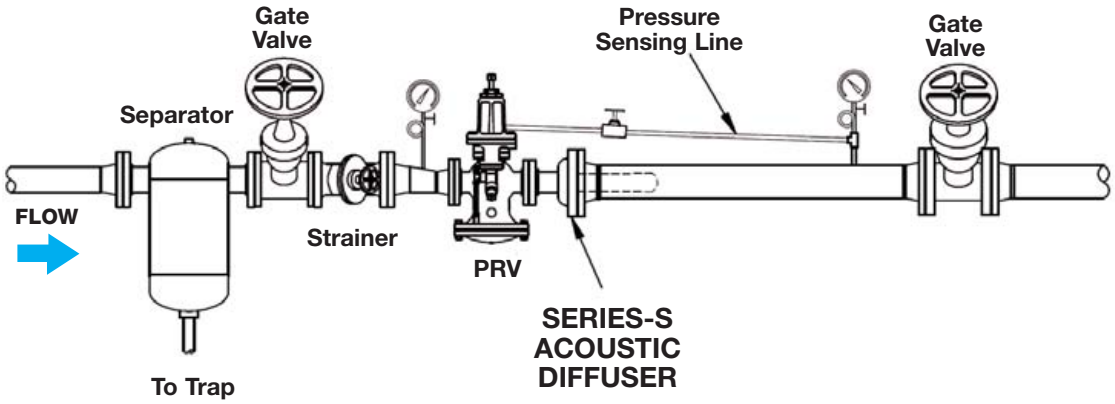
HOW IT WORKS

The **Series-S** Acoustic Diffuser incorporates a single tube with a drilled orifice pattern which reduces downstream turbulence. Noise reduction levels of **10-15 dBA** can typically be achieved.

INSTALLATION

The **Series-S** Diffuser Tube should be installed immediately downstream of the regulator, as shown below.

Series-S Typical Hook-up



Model Selection Chart for Series-S Diffuser

Steam Capacity (lbs/hr)	Valve Inlet Pressure (PSIG)															
	15	20	25	30	40	50	60	75	90	100	125	150	175	200	225	250
1000	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3
1500	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3	S-3
2000	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4	S-4
3000	S-4	S-4	S-4	S-4	S-4	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5
4000	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5	S-5
6000	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6	S-6
8000	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8
10000	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8	S-8

Note: For higher capacity models, S-10 & S-12, consult factory.

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ACOUSTIC DIFFUSER Series-S

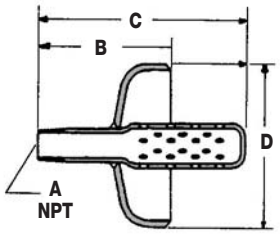
for Pressure Regulating Valves

Series-S Dimensions – *inches*

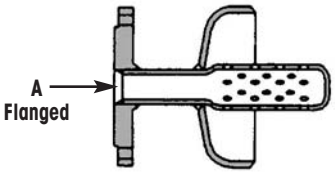
Model	Inlet (A)		Outlet	NPT x Weld Dimensions		
	NPT	FLG	FLG/BW	B	C	D
S-3	3/4		2	5 1/2	13 1/2	2 3/8
	1		2	5 1/2	13 1/2	2 3/8
S-4	3/4		4	6 1/2	13 1/2	4 1/2
	1		4	6 1/2	13 1/2	4 1/2
	1 1/4		4	6 1/2	13 1/2	4 1/2
	1 1/2		4	6 1/2	13 1/2	4 1/2
	2		4	6 1/2	13 1/2	4 1/2
S-5	3/4		4	6 1/2	16 1/2	4 1/2
	1		4	6 1/2	16 1/2	4 1/2
	1 1/4		4	6 1/2	16 1/2	4 1/2
	1 1/2		4	6 1/2	16 1/2	4 1/2
	2		4	6 1/2	16 1/2	4 1/2
	2 1/2	2 1/2	4	6 1/2	16 1/2	4 1/2
S-6	1 1/4		6	8	14	5 5/8
	1 1/2		6	8	14	5 5/8
	2		6	8	14	5 5/8
	2 1/2	2 1/2	6	8	14	5 5/8
	3	3	6	8	14	5 5/8
S-8	1 1/2		8	10	17	8 5/8
	2		8	10	17	8 5/8
	2 1/2	2 1/2	8	10	17	8 5/8
	3	3	8	10	17	8 5/8
	4	4	8	10	17	8 5/8
S-10	2		12	12	14	12 3/4
	2 1/2	2 1/2	12	12	14	12 3/4
	3	3	12	12	14	12 3/4
	4	4	12	12	14	12 3/4
	6	6	12	12	14	12 3/4
S-12	2 1/2	2 1/2	12	12	21	12 3/4
	3	3	12	12	21	12 3/4
	4	4	12	12	21	12 3/4
	6	6	12	12	21	12 3/4

Notes: 1)150# & 300# flanges available.
2) Other sizes available; consult factory.

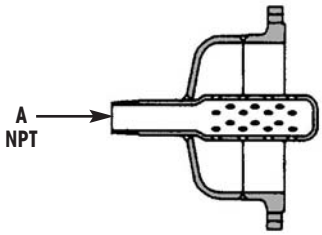
NPT x Weld



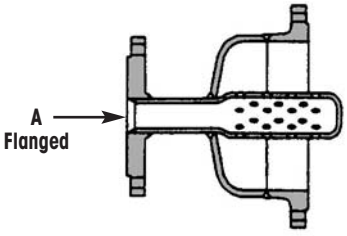
Flanged x Weld



NPT x Flanged



Flanged x Flanged



HD & HSP Series

Full Port Regulating Valves – Capacities

CAPACITIES – *Steam (lbs/hr)* **FULL PORT**

Inlet Pressure (PSIG)	Outlet Pressure (PSIG)	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"
C_V Factors		3.8	6.7	11	15	21	37	55	71	113	241
5	0	85	150	250	350	500	800	1200	1600	2600	5500
	2	80	140	230	310	440	770	1100	1500	2400	5100
7	0	115	200	325	450	600	1100	1650	2100	3600	7800
	2	105	180	300	400	575	1000	1500	2000	3100	6700
	3	90	160	275	375	525	900	1300	1800	2800	6000
10	0	150	260	425	575	850	1500	2200	2800	4600	9900
	2	140	240	400	550	800	1400	2100	2700	4300	9100
	5	100	175	300	400	600	1000	1600	2000	3200	6900
12	0	160	280	475	600	900	1600	2400	3100	4900	10300
	4	140	240	400	550	800	1400	2100	2700	4300	9100
	7	125	200	375	500	700	1200	1900	2400	3800	8200
15	0-3	190	325	550	750	1000	1800	2700	3500	5600	12000
	5	175	300	500	700	900	1700	2500	3200	5200	11100
	8	140	250	400	500	800	1300	2000	2600	4200	8900
20	0-5	210	375	625	850	1200	2100	3100	4000	6400	13700
	10	190	325	550	750	1000	1800	2700	3500	5600	12000
	12	170	300	500	675	950	1600	2500	3200	5100	10800
25	0-7	250	450	775	1050	1500	2600	3800	5000	7900	16900
	10	225	425	700	975	1300	2400	3600	4600	7300	15600
	15	200	350	600	800	1100	2000	3000	3900	6200	13200
30	0-12	275	500	800	1100	1500	2700	4100	5200	8300	17800
	15	250	450	750	1000	1400	2500	3800	4900	7800	16600
	20	225	375	650	850	1200	2100	3200	4100	6500	14000
40	0-18	350	600	1000	1350	1900	3300	5000	6400	10300	21900
	25	300	500	850	1150	1600	2800	4200	5400	8700	18500
	30	250	425	700	1000	1400	2500	3700	4700	7600	16100
50	0-20	400	700	1200	1650	2300	4100	6000	7800	12400	26500
	30	350	650	1100	1500	2000	3600	5400	6900	11000	23600
	40	275	500	800	1100	1500	2700	4100	5200	8300	17800
60	0-30	475	850	1350	1900	2600	4600	6900	8900	14200	30300
	35	425	775	1250	1700	2400	4300	6400	8200	13100	27900
	50	300	525	850	1200	1600	2900	4300	5600	8900	19000
75	0-35	575	1000	1650	2300	3200	5600	8300	10800	17200	36600
	50	475	825	1350	1900	2600	4600	6900	8900	14100	30100
	60	400	700	1150	1600	2200	3900	5800	7400	11800	25200
90	0-45	675	1200	1950	2700	3700	6600	9800	12700	20200	43100
	60	575	1000	1700	2300	3200	5700	8500	10900	17400	37100
	75	425	750	1200	1700	2300	4100	6100	7900	12600	27000
100	0-50	750	1300	2100	3000	4100	7300	10800	14000	22200	47500
	60	700	1200	2000	2700	3800	6700	10000	12900	20500	43800
	80	500	875	1400	1900	2700	4800	7100	9200	14700	31300
125	0-60	925	1650	2700	3700	5200	9100	14000	17500	28000	59500
	75	825	1475	2400	3300	4600	8200	12200	15700	25000	53500
	100	625	1100	1800	2500	3500	6200	9200	11900	19000	40400
150	0-75	1100	1900	3100	4300	6000	10600	15800	20400	32400	69100
	100	925	1600	2700	3600	5100	9000	13400	17400	27700	59000
	125	650	1150	1900	2600	3600	6400	9500	12300	19600	41900
175	0-85	1275	2250	3700	5000	7100	12500	18600	24000	38200	81400
	125	1000	1800	2900	4000	5600	9900	14700	18900	30100	64300
	150	750	1300	2100	2900	4100	7300	10800	14000	22200	47500
200	0-100	1450	2500	4200	5700	8000	14100	21000	27100	43100	92000
	125	1300	2300	3700	5100	7100	12600	18700	24100	38400	81900
	150	1075	1900	3100	4300	6000	10600	15700	20300	32300	68900
225	0-120	1575	2800	4600	6200	8700	15400	22900	29500	47000	100200
	150	1450	2500	4200	5700	8000	14100	21000	27200	43300	92300
	175	1350	2400	3900	5300	7400	13100	19500	25200	40100	85500
250	0-130	1750	3100	5100	6900	9700	17100	25500	32900	53400	111800
	150	1650	2900	4700	6500	9100	16000	23800	30800	49000	104600
	200	1200	2100	3500	4800	6700	11900	17600	22800	36200	77300
300	0-160	2045	3605	5920	8075	11310	19220	29610	38230	60840	129750
	175	1945	3425	5625	7670	10740	18925	28130	36320	57800	123270
	200	1780	3140	5155	7030	9840	17340	25780	33275	52960	112950

Note: For inlet pressures in shaded area, use low pressure main valve and low pressure temperature pilot.

HD & HSP Series

Reduced Port Regulating Valves – Capacities

CAPACITIES – *Steam (lbs/hr)* **REDUCED PORT**

Inlet Pressure (PSIG)	Outlet Pressure (PSIG)	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"
C_V Factors		1.4	3.3	5.6	7.8	13.3	18.8	25.9	41.7	74	163
5	0	15	35	59	82	140	197	272	438	777	1712
	2	13	32	53	75	128	181	249	401	712	1569
7	0	21	48	82	115	195	276	381	613	1088	2396
	2	20	46	79	110	187	265	365	587	1042	2296
	3	19	44	74	104	177	250	344	554	983	2165
10	0	29	70	117	164	279	395	544	876	1554	3423
	2	28	68	115	160	274	387	533	858	1523	3354
	5	25	60	102	142	242	342	471	758	1346	2964
12	0	35	83	141	197	335	473	653	1051	1865	4108
	4	33	78	133	185	316	446	615	990	1758	3873
	7	29	68	115	160	272	385	530	854	1515	3336
15	0-3	43	102	173	241	410	580	800	1287	2284	5031
	5	41	98	166	232	395	558	769	1238	2198	4841
	8	37	88	149	208	354	500	690	1111	1972	4343
20	0-5	57	134	227	317	541	764	1053	1696	3009	6629
	10	51	120	204	284	483	684	942	1517	2692	5929
	12	47	111	188	262	447	632	870	1401	2486	5477
25	0-7	70	166	282	393	670	948	1305	2102	3730	8215
	10	67	158	269	375	640	905	1246	2006	3561	7843
	15	59	139	235	328	559	790	1088	1751	3108	6846
30	0-12	81	190	323	450	768	1085	1495	2408	4273	9411
	15	76	180	305	426	726	1025	1413	2275	4037	8892
	20	66	155	263	366	625	883	1216	1958	3475	7654
40	0-18	105	248	420	585	998	1410	1943	3128	5551	12227
	25	99	199	367	511	872	1232	1698	2734	4852	10688
	30	78	183	311	433	739	1044	1439	2317	4111	9056
50	0-20	135	318	539	751	1280	1809	2492	4013	7121	15686
	30	118	277	470	655	1117	1579	2175	3502	6216	13692
	40	88	208	353	491	838	1184	1632	2627	4662	10269
60	0-30	153	360	611	851	1451	2051	2826	4550	8074	17786
	35	143	338	573	798	1361	1924	2651	4268	7573	16682
	50	98	230	390	543	926	1309	1804	2904	5154	11353
75	0-35	195	460	780	1086	1853	2619	3608	5809	10308	22706
	50	164	387	657	916	1561	2207	3040	4895	8687	19135
	60	132	312	529	737	1257	1777	2448	3941	6993	15404
90	0-45	229	540	916	1277	2177	3077	4239	6825	12112	26680
	60	197	465	789	1100	1874	2648	3649	5874	10425	22962
	75	146	345	585	815	1389	1964	2705	4357	7731	17029
100	0-50	255	600	1018	1419	2419	3419	4710	7584	13458	29644
	60	235	554	940	1310	2234	3158	4351	7006	12432	27384
	80	176	416	706	983	1676	2367	3263	5254	9324	20538
125	0-60	322	760	1290	1796	3063	4329	5964	9603	17041	37536
	75	294	693	1176	1638	2793	3948	5439	8757	15540	34230
	100	221	518	882	1229	2095	2961	4079	6568	11655	25672
150	0-75	381	900	1527	2128	3628	5128	7065	11376	20187	44467
	100	329	775	1315	1831	3123	4414	6081	9791	17374	38270
	125	243	575	975	1385	2316	3274	4510	7261	12885	28382
175	0-85	449	1060	1800	2505	4272	6939	8320	13396	23771	52362
	125	360	849	1440	2006	3421	4835	6661	10725	19032	41923
	150	265	625	1060	1476	2518	3558	5606	7893	14008	30855
200	0-100	509	1200	2037	2837	4838	6838	9420	15168	26916	59288
	125	459	1082	1836	2557	4360	6164	8492	13672	24262	53442
	150	389	917	1556	2167	3695	5223	7195	11584	20557	45232
225	0-120	560	1319	2238	3117	5360	7514	10351	16667	29577	65150
	150	493	1162	1972	2747	4684	6621	9121	14686	26061	57405
	175	416	980	1663	2316	3950	5583	7692	12384	21976	48409
250	0-130	628	1480	2511	3498	5964	8431	11614	18700	33184	73095
	150	588	1386	2352	3276	5586	7896	10878	17514	31080	68460
	200	441	1040	1764	2457	4190	5922	8159	13136	23310	51345
300	0-160	755	1775	3015	4200	7160	10120	13945	22450	39840	87760
	175	715	1690	2865	3990	6800	9615	13250	21330	37850	83370
	200	655	1550	2625	3655	6235	8810	12140	19545	34680	76400

Note: For inlet pressures in shaded area, use low pressure main valve and low pressure temperature pilot.