# **SpaceLogic** PIBCV DN10-250 Pressure and Flow Verification

## About this document and **SpaceLogic** PIBCV Operation

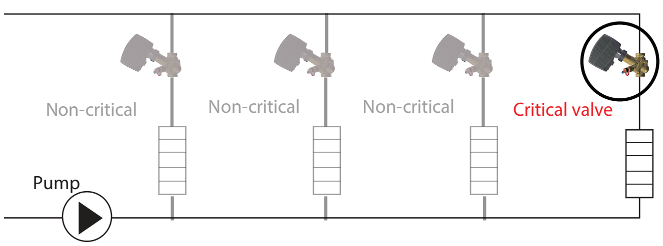
This document covers how to measure the pressure and verify the flow through the complete program of **SpaceLogic** PIBCV valves.

There are two differing styles of operation covering the complete PIBCV family. Two alternative methods of pressure measurement and flow verification exist, depending on whether the situation calls for two test points as on the DN10-32 valve sizes or the three test points on the DN40-250 sizes.

To fully appreciate the how PIBCV provides a steady and measurable flow rate within the operating range of the valve, and how the pressure and flow tables detailed within apply, it is suggested to read the Theory and Design section (page 8 of this document F-28105).

## Pressure and Flow Verification

Flow verification is based on the measurement and check that valves are operating within the design range of the working pressure differential. Verification should start with the most critical valve(s): those furthest from the pump with the highest flow resistance of pipe length, pipe direction turns, and reductions in pipe size. The most critical valve circuit is called the "index circuit"- commonly the valve furthest from the pump.




PIBCV valves provide accurate constant flow regardless of system pressures when they are operated between their normal differential pressure ranges as detailed in Table 1.

The PIBCV maintains a constant differential pressure across its internal control valve and any excess pressure is automatically reduced. If there is not enough minimum differential pressure the PIBCV will not be able to reach its set flow level. Min. Pres. at Qnom (kPa) is the minimum pressure across valve inlet and outlet Points to operate and deliver the stated flow rate through a valve at 100%.

Valves set below a flow setting of 100% will have a slightly lower minimum pressure differential and valve(s) capable of settings over 100% (Up to $Q_{max}$) will have a higher minimum pressure differential.

After confirming there is sufficient minimum pressure at the critical valves, valves closer to the pump with less resistance may not need to be checked that they are operating above the minimum pressure needed as inherently they will be subject to a higher differential pressure from the system.

### System Requirements for Flow testing

To verify system pressure and flow rates within the full network of valves, make sure all the units are operating with all valve actuators commanded fully open, which is the worse case condition in respect to the minimum pressure in the index valve, especially the most critical valve(s). Testing worse-case scenarios assures valves will function well when the PIBCVs are operating under normal conditions with higher pressures present.





Document Number: F-28105-4

December, 2020 tc

## Pressure and Flow Verification Requirements

The following must be completed:

| | |
|---|---|
| PIBCV Valves | Valve actuators input signals commanded fully open. |
| Pump Operation | Per manufacturers and project specification requirements and verified. |
| Piping system | PT test points installed at appropriate locations as required to measure the key pressure values in the main circuits, shutoff valves open, bypass valves closed, strainers clear, manual balancing valves (if installed) full open, system cleanliness in accordance to BSRIA Application Guide, AG 1/2001.1 Pre-Commissioning Cleaning of Pipework systems or equivalent. |
| Coils | Fans in working order with clean coils and filters. |
| Water/glycol | Proper mix of water/glycol and normal operating temperature, air purged, normal system pressure. |
| Procedures/ installation | In compliance with project specifications and local codes, balancing, procedures, and for Testing, Adjusting, and Balancing of Environmental Systems |

# Pump Head Optimization

## How to Ensure Sufficient Flow at the Most Critical Valve: Saving Energy

If all of the most critical valves(s) have a pressure differential more than double their minimum required values, energy can be saved by reducing the pump head pressure.

1. Decrease the pump head until no more than minimal required pressure plus a 20% margin is available on the worse case most critical valve(s).
2. Verification can be done with electronic or gauge manometers.
3. The pump head should also be checked not to exceed the maximum differential pressure across any valve. This is usually verified at the least critical valve(s): those closest to the pump with the lowest flow resistance of least pipe length, fewest pipe directions turns, and fewest reductions in pipe size.

# DN10 to DN32 PIBCV Pressure Verification

## Measuring Pressure Across the Valve Inlet and Outlet

1. After completing the Pressure and Flow Verification Requirements, the minimum pressure(s) for the critical valve(s) to operate typically are checked by measuring the differential pressure across the valves' inlets and outlets using PT Points, which would be between Port A and Port B as shown in Figure 1.

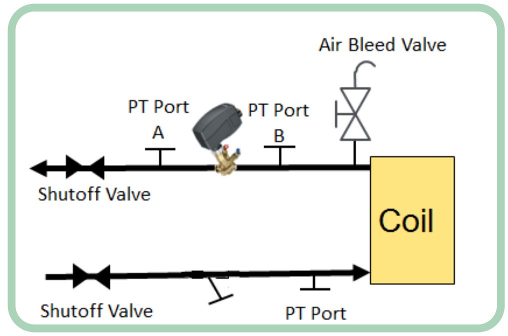



**Figure 1. Typical Valve Installation with Field Installed PT Points**
**ΔP Port B-A must be > Min. Pres. at Qnom (Table 1) for the Critical Valve(s)**

2. These pressures should be compared to Table 1 to confirm they are equal to or higher than the Min. Pres. at $Q_{nom}$ (kPa).
3. If a particular valve is capable of a $Q_{max}$ setting so is set above $Q_{nom}$ at 100% the pressure differential across the valve should be compared to the Min. Pres. at $Q_{max}$ (kPa) value.
4. For example, the VP228E-20BQSNT valve body should have a minimum differential pressure of 16 kPa for typical flow setting of up to 100% and should have a minimum differential pressure of 18 kPa for flow setting of 120%.
5. If a DN15 to DN32 valve, such as the VP228E-20BQS, is equipped with two integrated PT Points, the blue Port P3 on the valve can be used instead of a field installed Port A as shown in Figure 2 (pressure measured between PT Port P3 {blue} and PT Port B).

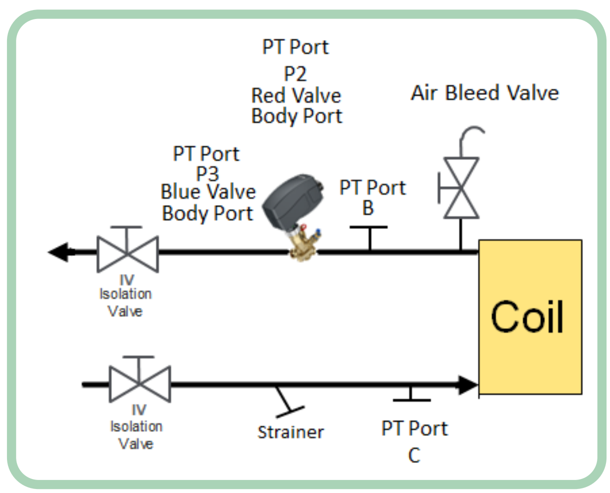



**Figure 2. Typical Valve Installation with Field Installed PT Points and DN10 to DN32 PIBCV with PT Points**
ΔP Port B-P3 must be > Min. Pres. at Qnom (Table 1) for the Critical Valve(s)
Or alternately
ΔP Port P2-P3 ($\Delta P_{cv}$) must be > Valve Body Setting High Value (Table 2) for the Critical valve(s)

The red (balance) P2 Port on the valve provides the internal pressure between the valve's pressure regulator and control valve such that P2 (red) to P3 (blue) is the differential pressure across the PIBCV's control valve or $\Delta P_{cv}$. Figure 3 shows the Typical DN10 to DN32 Valve PT test point operation. Refer to the following page on how to use the valve's integrated flow Points for verification.



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# Table 1. DN10 to DN32 **SpaceLogic** PIBCV Operating Pressure and Flow Rate

| Size | Part Number | Differential Pressure (P1 to P3) | | | P2 Test Point (Valve Balance Port) | P3 Test Point (Valve Outlet) | ΔPcv Differential Pressure over Control Valve (P2 to P3) | $Q_{min}$ Flow Rate (l/s) | $Q_{nom}$ Flow Rate (100%) (l/s) | $Q_{max}$ Flow Rate (l/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min. ΔP at $Q_{nom}$ (kPa) | Min. ΔP at $Q_{max}$ (kPa) | Max. (kPa)* | | | | | | |
| DN10 | VP228E-10BQLNT | 16 | 18 | 600 | | | | 0.01 | 0.04 | 0.05 |
| DN10 | VP228E-10BQSNT | 16 | 18 | | | | | 0.02 | 0.08 | 0.09 |
| DN15 | VP228E-15BQLNT | 16 | 18 | | | | | 0.02 | 0.08 | 0.09 |
| DN15 | VP228E-15BQSNT | 16 | 18 | | | | | 0.03 | 0.13 | 0.15 |
| DN15 | VP229E-15BQHNT | 35 | 40 | | | | | 0.06 | 0.32 | 0.35 |
| DN20 | VP228E-20BQSNT | 16 | 18 | | | | | 0.05 | 0.25 | 0.30 |
| DN20 | VP229E-20BQHNT | 35 | 40 | | | | | 0.09 | 0.47 | 0.52 |
| DN25 | VP229E-25BQSNT | 20 | 25 | | | | | 0.09 | 0.47 | 0.52 |
| DN25 | VP229E-25BQHNT | 35 | 40 | | | | | 0.15 | 0.76 | 0.83 |
| DN32 | VP229E-32BQSNT | 20 | 25 | | | | | 0.18 | 0.89 | 0.98 |
| DN32 | VP229E-32BQHNT | 35 | 40 | | | | | 0.22 | 1.10 | 1.21 |
| DN10 | VP228E-10BQL | 16 | 18 | | | | | 0.01 | 0.04 | 0.05 |
| DN10 | VP228E-10BQS | 16 | 18 | | | | | 0.02 | 0.08 | 0.09 |
| DN15 | VP228E-15BQL | 16 | 18 | | | | | 0.02 | 0.08 | 0.09 |
| DN15 | VP228E-15BQS | 16 | 18 | | Red | Blue | P2-P3 | 0.03 | 0.13 | 0.15 |
| DN20 | VP228E-20BQS | 16 | 18 | | | | | 0.05 | 0.25 | 0.30 |
| DN25 | VP229E-25BQS | 20 | 25 | | | | | 0.09 | 0.47 | 0.52 |
| DN32 | VP229E-32BQS | 20 | 25 | | | | | 0.18 | 0.89 | 0.98 |

* 400 kPa is recommended for normal duty. Operation between 400 and 600 kPa is possible if consideration has been made to the flow velocity, cavitation and noise. For application usage, please consult product support.

Note: Valves ending with Part Numbers ‘NT’ have no test points for differential pressure measurement

## DN10 to DN32 PIBCV Pressure Verification Using Integrated P2-P3 Test Points (Table 1).

As shown in Table 1 some of the DN10 to DN32 valve bodies are equipped with two PT test points P2 (red) - P3 (blue) across the control valve portion of the PIBCV ($\Delta P_{cv}$). These PT test points are used to verify there is adequate differential pressure to reach their set flow levels, especially for the index circuit valve.

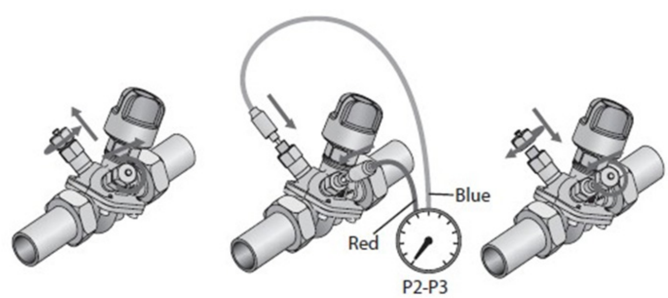



**Figure 3. Typical DN10 to DN32 Valve PT test point operation**

## Confirm Minimum Pressure Differential DN10 to DN32 PIBCV (Flow set in field) (Table 2).

1. Measure the ΔPcv pressure across the P2 and P3 test points and compare to the low and high values for the subject valve in Table 2.
2. If the measured pressure across the $\Delta P_{cv}$ is **above** the high value there is enough pressure for the PIBCV to regulate at the proper flow rate.
3. If the measured pressure across the $\Delta P_{cv}$ is **between** the Low and the High values, the flow through the flow regulator portion of the valve is operating, but there may be a reduced accuracy in the flow rate.
4. If the measured pressure across $\Delta P_{cv}$ is **below** the Low Value there is not enough differential pressure for the PIBCV to regulate flow.
   For example, a VP228E-20BQS valve body with a flow rate setting of 50% and a $\Delta P_{cv}$ measurement across P2-P3 pressure of **greater than** 16.89 kPa is working with its normal flow accuracy.

# Table 2. DN10 to DN32 Valve Body P2-P3 Flow Verification $\Delta P_{cv}$ (kPa)

| Flow Setting % | DN10/15 | | | | | | DN20 | | DN25 | | DN32 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VP228E-10BQL | | VP228E-10BSQ/-15BQL | | VP228E-15BQS | | VP228E-20BQS | | VP229E-25BQS | | VP229E-32BQS | |
| | Low | High | Low | High | Low | High | Low | High | Low | High | Low | High |
| 20 | 18.5 | 21.79 | 19.37 | 21.65 | 17.03 | 17.03 | 16.62 | 17.51 | 17.03 | 18.00 | 15.03 | 16.00 |
| 22.5 | 18.5 | 21.79 | 19.17 | 21.44 | 16.89 | 16.96 | 16.48 | 17.44 | 16.75 | 17.72 | 14.75 | 15.72 |
| 25 | 18.5 | 21.72 | 19.03 | 21.24 | 16.75 | 16.89 | 16.41 | 17.37 | 16.48 | 17.51 | 14.48 | 15.51 |
| 27.5 | 18.5 | 21.72 | 18.89 | 21.03 | 16.62 | 16.82 | 16.27 | 17.31 | 16.27 | 17.24 | 14.27 | 15.24 |
| 30 | 18.4 | 21.65 | 18.75 | 20.82 | 16.48 | 16.75 | 16.13 | 17.24 | 16.00 | 17.03 | 14.00 | 15.03 |
| 32.5 | 18.4 | 21.65 | 18.55 | 20.68 | 16.41 | 16.69 | 16.00 | 17.17 | 15.72 | 16.75 | 13.72 | 14.75 |
| 35 | 18.4 | 21.58 | 18.41 | 20.41 | 16.27 | 16.62 | 15.86 | 17.10 | 15.51 | 16.48 | 13.51 | 14.48 |
| 37.5 | 18.3 | 21.58 | 18.27 | 20.27 | 16.13 | 16.55 | 15.72 | 17.03 | 15.24 | 16.27 | 13.24 | 14.27 |
| 40 | 18.3 | 21.51 | 18.13 | 20.06 | 16.00 | 16.48 | 15.72 | 17.17 | 15.03 | 16.00 | 13.03 | 14.00 |
| 42.5 | 18.3 | 21.44 | 18.06 | 19.99 | 15.72 | 16.41 | 15.44 | 17.10 | 14.75 | 15.86 | 12.76 | 13.86 |
| 45 | 18.2 | 21.44 | 18.06 | 19.93 | 15.51 | 16.41 | 15.17 | 17.03 | 14.48 | 15.72 | 12.48 | 13.72 |
| 47.5 | 18.1 | 21.37 | 18.00 | 19.86 | 15.24 | 16.34 | 14.96 | 16.96 | 14.27 | 15.65 | 12.27 | 13.65 |
| 50 | 18.1 | 21.30 | 17.93 | 19.79 | 15.03 | 16.27 | 14.69 | 16.89 | 14.00 | 15.51 | 12.00 | 13.51 |
| 52.5 | 18.0 | 21.24 | 17.93 | 19.72 | 14.75 | 16.20 | 14.41 | 16.82 | 13.72 | 15.38 | 11.72 | 13.38 |
| 55 | 17.9 | 21.17 | 17.86 | 19.65 | 14.48 | 16.13 | 14.20 | 16.75 | 13.51 | 15.24 | 11.51 | 13.24 |
| 57.5 | 17.9 | 21.17 | 17.79 | 19.58 | 14.27 | 16.06 | 13.93 | 16.69 | 13.24 | 15.10 | 11.24 | 13.10 |
| 60 | 17.8 | 21.10 | 17.79 | 19.51 | 14.00 | 16.00 | 14.20 | 16.82 | 13.03 | 15.03 | 11.03 | 13.03 |
| 62.5 | 17.6 | 20.96 | 17.72 | 19.37 | 13.72 | 15.72 | 13.93 | 16.55 | 12.62 | 14.62 | 10.48 | 12.48 |
| 65 | 17.4 | 20.82 | 17.65 | 19.31 | 13.51 | 15.51 | 13.72 | 16.34 | 12.27 | 14.27 | 10.00 | 12.00 |
| 67.5 | 17.2 | 20.68 | 17.65 | 19.17 | 13.24 | 15.24 | 13.44 | 16.06 | 11.86 | 13.86 | 9.51 | 11.51 |
| 70 | 17.0 | 20.48 | 17.58 | 19.03 | 13.03 | 15.03 | 13.17 | 15.79 | 11.51 | 13.51 | 9.03 | 11.03 |
| 72.5 | 16.8 | 20.34 | 17.51 | 18.96 | 12.76 | 14.75 | 12.96 | 15.58 | 11.10 | 13.10 | 8.48 | 10.48 |
| 75 | 16.6 | 20.20 | 17.44 | 18.82 | 12.48 | 14.48 | 12.69 | 15.31 | 10.76 | 12.76 | 8.00 | 10.00 |
| 77.5 | 16.5 | 20.06 | 17.37 | 18.68 | 12.27 | 14.27 | 12.41 | 15.10 | 10.41 | 12.41 | 7.52 | 9.51 |
| 80 | 16.3 | 19.93 | 17.37 | 18.62 | 12.00 | 14.00 | 12.27 | 14.48 | 10.00 | 12.00 | 7.03 | 9.03 |
| 82.5 | 16.1 | 19.72 | 17.17 | 18.48 | 11.72 | 13.72 | 12.00 | 14.20 | 9.65 | 11.65 | 6.76 | 8.76 |
| 85 | 15.9 | 19.58 | 16.96 | 18.34 | 11.51 | 13.51 | 11.79 | 13.93 | 9.24 | 11.24 | 6.48 | 8.48 |
| 87.5 | 15.7 | 19.44 | 16.82 | 18.20 | 11.24 | 13.24 | 11.51 | 13.72 | 8.89 | 10.89 | 6.27 | 8.27 |
| 90 | 15.5 | 19.24 | 16.62 | 18.13 | 11.03 | 13.03 | 11.24 | 13.44 | 8.48 | 10.48 | 6.00 | 8.00 |
| 92.5 | 15.3 | 19.10 | 16.48 | 18.00 | 10.76 | 12.76 | 11.03 | 13.17 | 8.14 | 10.14 | 5.72 | 7.72 |
| 95 | 15.1 | 18.89 | 16.27 | 17.86 | 10.48 | 12.48 | 10.76 | 12.96 | 7.72 | 9.72 | 5.52 | 7.52 |
| 97.5 | 15.0 | 18.75 | 16.13 | 17.79 | 10.27 | 12.27 | 10.55 | 12.69 | 7.38 | 9.38 | 5.24 | 7.24 |
| 100 | 14.8 | 18.55 | 15.93 | 17.65 | 10.00 | 12.00 | 10.62 | 12.55 | 7.03 | 9.03 | 5.03 | 7.03 |

N.B. Valves ending with Part Numbers ‘NT’ have no test points for differential pressure measurement.

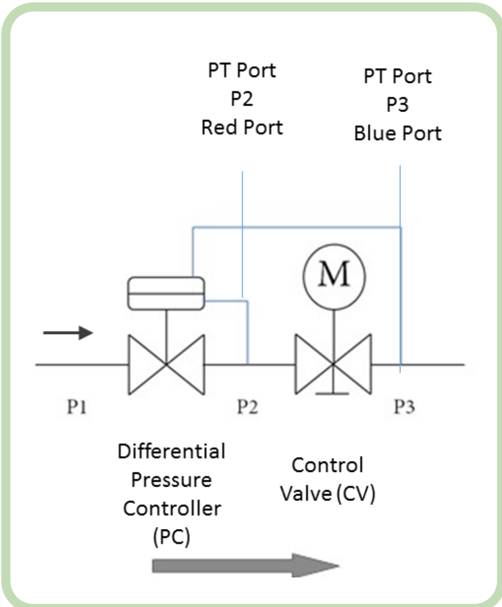



Figure 4. DN10 to DN32 PIBCV Valves with PT Points

## Table 3. DN40 to DN250 **SpaceLogic** PIBCV Valve Operating Pressures and Flow rates

<table>
<tr><th rowspan="2">Size</th><th rowspan="2">Part Number</th><th colspan="3">Differential Pressure (P1 to P3)</th><th rowspan="2">P1 Valve Inlet Port</th><th rowspan="2">P2 Valve Balance Port</th><th rowspan="2">P3 Valve Outlet Port</th><th colspan="2">Control Valve Differential Measurement Across Valve Ports</th><th rowspan="2">$Q_{min}$ Flow Rate (l/s)</th><th rowspan="2">$Q_{nom}$ Flow Rate (at 100% flow setting) (l/s)</th></tr>
<tr><th>Min. ΔP at $Q_{nom}$ (kPa)</th><th>Min. ΔP at $Q_{max}$ (kPa)</th><th>Max. ΔP. (kPa)</th><th>$\Delta P_{cv}$</th><th>ΔP</th></tr>
<tr><td>DN40</td><td>VP220E-40CQS</td><td>30</td><td rowspan="9">-</td><td rowspan="17">600</td><td rowspan="17">Red</td><td rowspan="17">Blue</td><td rowspan="17">Blue</td><td rowspan="17">P1-P2</td><td rowspan="17">P1-P3</td><td>0.83</td><td>2.08</td></tr>
<tr><td>DN50</td><td>VP220E-50CQS</td><td>30</td><td>1.39</td><td>3.47</td></tr>
<tr><td>DN50</td><td>VP220F-50CQS</td><td>30</td><td>1.39</td><td>3.47</td></tr>
<tr><td rowspan="2">DN65</td><td>VP220F-65CQS</td><td>30</td><td>2.22</td><td>5.56</td></tr>
<tr><td>VP220F-65CQH</td><td>60</td><td>2.78</td><td>6.94</td></tr>
<tr><td rowspan="2">DN80</td><td>VP220F-80CQS</td><td>30</td><td>3.11</td><td>7.78</td></tr>
<tr><td>VP220F-80CQH</td><td>60</td><td>4.44</td><td>11.11</td></tr>
<tr><td rowspan="2">DN100</td><td>VP220F-100CQS</td><td>30</td><td>4.20</td><td>10.60</td></tr>
<tr><td>VP220F-100CQH</td><td>60</td><td>6.56</td><td>16.39</td></tr>
<tr><td>DN125</td><td>VP221F-125CQS</td><td>40</td><td>60</td><td>9.97</td><td>24.92</td></tr>
<tr><td>DN125</td><td>VP221F-125CQH</td><td>60</td><td>80</td><td>12.24</td><td>30.60</td></tr>
<tr><td>DN150</td><td>VP221F-150CQS</td><td>40</td><td>60</td><td>16.15</td><td>40.38</td></tr>
<tr><td>DN150</td><td>VP221F-150CQH</td><td>60</td><td>80</td><td>20.95</td><td>52.36</td></tr>
<tr><td>DN200</td><td>VP222F-200CQS</td><td>45</td><td>65</td><td>22.21</td><td>55.52</td></tr>
<tr><td>DN200</td><td>VP222F-200CQH</td><td>60</td><td>80</td><td>29.97</td><td>74.95</td></tr>
<tr><td>DN250</td><td>VP222F-250CQS</td><td>45</td><td>65</td><td>33.31</td><td>83.28</td></tr>
<tr><td>DN250</td><td>VP222F-250CQH</td><td>60</td><td>80</td><td>41.13</td><td>102.84</td></tr>
</table>

Figure 6 details the P1-P2-P3 test points locations

* 400 kPa is recommended for normal duty. Operation between 400 and 600 kPa is possible if consideration has been made to the flow velocity, cavitation and noise. For application usage, please consult product support.

# Flow Verification and Measurement Using the PT Pressure Test points, PIBCV sizes DN40 to DN250

As shown in Table 3 all of the DN40 and larger valve bodies and assemblies are equipped with two PT test points across the control valve portion of the PIBCV plus a third PT test point to measure the total differential pressure across the PIBCV.

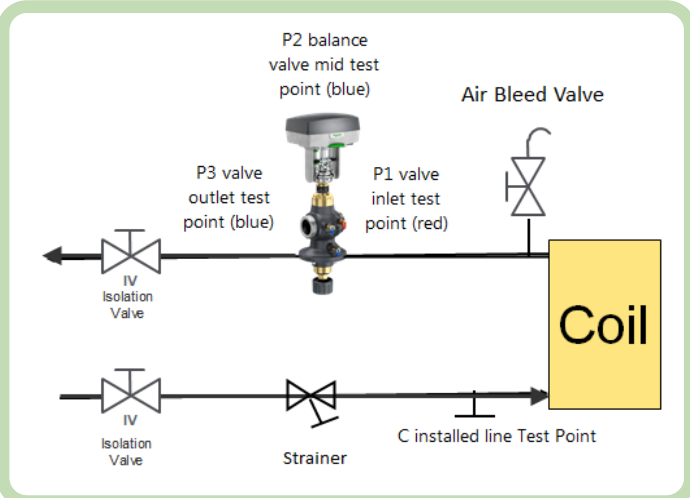



**Figure 5. Typical DN40 and Larger Valve Installation**
ΔP Port P1-P3 must be > Min. Pres. at $Q_{nom}$ (Table 3) for the Critical Valves

The minimum pressures for the DN40 and larger valve bodies to operate are confirmed by measuring the differential pressure across the valves' inlets and outlets using the P1 (red) and P3 (blue outlet) test points as shown in Figures 5 and 7. The pressures should be compared to Table 3 to confirm that they are equal to or greater than the Min. Pres. at $Q_{nom}$ (kPa).

If the Differential pressure across P1 and P3 are within the operating range of the PIBCV as detailed in Table 4, the differential pressure measurement in the control valve portion of the PIBCV ($\Delta P_{cv}$) can be used to calculate the flow rate at any given flow setting utilising P1 and P2 pressure test points in reference to the Kvs Table 4.

Since the measurements across the PT test points are influenced by dynamic turbulences, flow patterns, fluctuations, accuracy of the measuring equipment, measurement tolerances, and other factors, the calculated flows should be used for general reference only, and not be considered to be more accurate than the control accuracy of the PIBCV valve bodies.

Figure 6 shows the Typical DN40 and larger Valve P1-P2 PT Pressure test point.

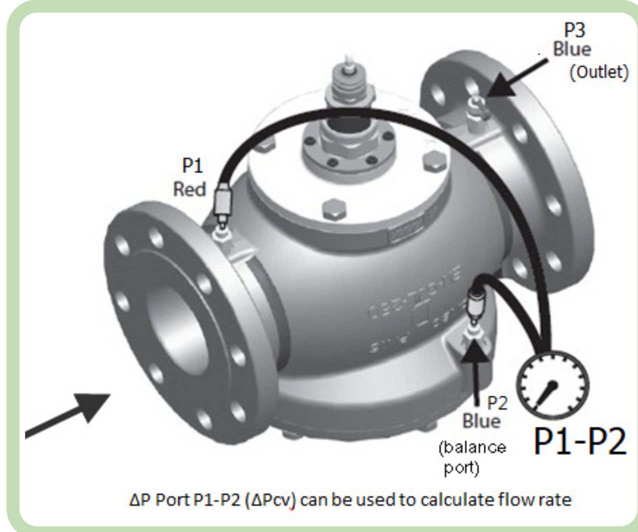



**Figure 6. Typical DN40 and larger Valve P1-P2 PT Port operation.**
ΔP Port P1 (red)-P2 (blue Balance) (ΔPcv as shown above) can be used to calculate flow rate. ΔP Port P1 (red)-P3 (blue outlet) must be > Min. Pres. $Q_{nom}$ (Table 4) for the Critical Valve(s)

## Nominal Check of Flow

To nominally check the flow of a DN40 and larger valve body use the formula below (refer to Table 4):

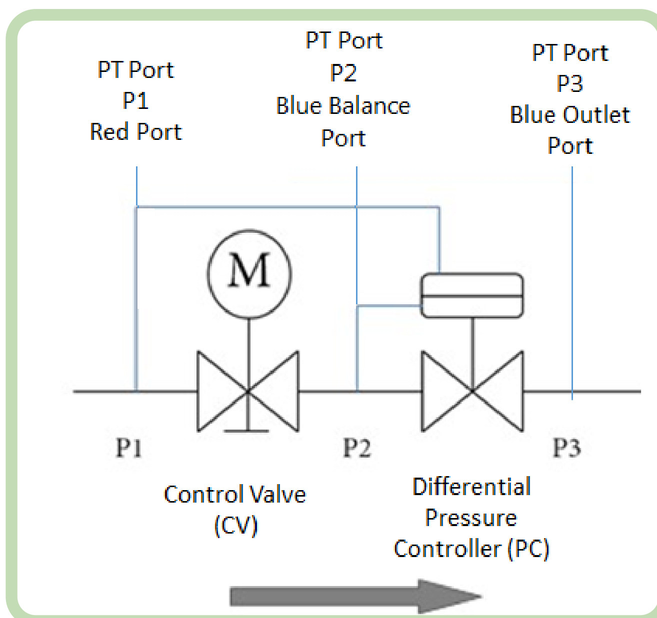
$Q = Kv_{cv} \times \sqrt{\Delta P_{cv}}$

Q = Nominal Valve Flow in m³/h

$Kv_{cv}$ = Effective Kv of the Control Valve in m³/h

$Kv_{cv}$ figures found from Table 4

$\Delta P_{cv}$ = ΔP across PIBCV control valve (ΔP P1-P2) for calculations always use bar and m³/h as a units of measurement



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# Table 4. Effective Kvs ($Kv_{cv}$ in $m^3/h$) Values, DN40 to DN250 (P1 - P2 Control Valve)

| Flow Setting % | Valve Size | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | DN40 | DN50 | DN65 | DN80 | DN100 | DN125 | DN150 | DN200 | DN250 |
| 40 | 8.80 | 12.20 | 14.40 | 29.00 | 39.00 | 73.00 | 108.00 | 132.00 | 189.00 |
| 42.5 | 9.48 | 13.15 | 15.68 | 30.69 | 41.44 | 77.00 | 115.00 | 141.00 | 202.00 |
| 45 | 10.20 | 14.10 | 16.95 | 32.38 | 43.88 | 82.00 | 122.00 | 151.00 | 215.00 |
| 47.5 | 10.83 | 15.05 | 18.23 | 34.06 | 46.31 | 86.00 | 129.00 | 160.00 | 227.00 |
| 50 | 11.50 | 16.00 | 19.50 | 35.75 | 48.75 | 90.00 | 136.00 | 170.00 | 240.00 |
| 52.5 | 12.18 | 16.95 | 20.78 | 37.44 | 51.19 | 94.00 | 143.00 | 179.00 | 253.00 |
| 55 | 12.90 | 17.90 | 22.05 | 39.13 | 53.63 | 98.00 | 150.00 | 188.00 | 266.00 |
| 57.5 | 13.53 | 18.85 | 23.33 | 40.81 | 56.06 | 102.00 | 157.00 | 198.00 | 279.00 |
| 60 | 14.20 | 19.80 | 24.60 | 42.50 | 58.50 | 106.00 | 163.00 | 207.00 | 292.00 |
| 62.5 | 14.88 | 20.75 | 25.88 | 44.19 | 60.94 | 110.00 | 170.00 | 217.00 | 304.00 |
| 65 | 15.55 | 21.70 | 27.15 | 45.88 | 63.38 | 114.00 | 177.00 | 226.00 | 317.00 |
| 67.5 | 16.26 | 22.65 | 28.43 | 47.56 | 65.81 | 119.00 | 184.00 | 235.00 | 330.00 |
| 70 | 16.90 | 23.60 | 29.70 | 49.25 | 68.25 | 123.00 | 191.00 | 245.00 | 343.00 |
| 72.5 | 17.58 | 24.55 | 30.98 | 50.94 | 71.81 | 127.00 | 198.00 | 254.00 | 356.00 |
| 75 | 18.25 | 25.50 | 32.25 | 52.63 | 75.38 | 131.00 | 205.00 | 264.00 | 369.00 |
| 77.5 | 18.93 | 26.45 | 33.53 | 54.31 | 78.94 | 135.00 | 212.00 | 273.00 | 381.00 |
| 80 | 19.60 | 27.40 | 34.80 | 56.00 | 82.50 | 139.00 | 219.00 | 283.00 | 394.00 |
| 82.5 | 20.28 | 28.35 | 36.08 | 57.69 | 86.06 | 143.00 | 225.00 | 292.00 | 407.00 |
| 85 | 20.95 | 29.30 | 37.35 | 59.38 | 89.63 | 147.00 | 232.00 | 301.00 | 420.00 |
| 87.5 | 21.63 | 30.25 | 38.63 | 61.06 | 93.19 | 152.00 | 239.00 | 311.00 | 433.00 |
| 90 | 22.30 | 31.20 | 39.90 | 62.75 | 96.75 | 156.00 | 246.00 | 320.00 | 446.00 |
| 92.5 | 22.98 | 32.15 | 41.18 | 64.44 | 100.31 | 160.00 | 253.00 | 330.00 | 458.00 |
| 95 | 23.65 | 33.10 | 42.45 | 66.13 | 103.88 | 164.00 | 260.00 | 339.00 | 471.00 |
| 97.5 | 24.33 | 34.05 | 43.73 | 67.81 | 107.44 | 168.00 | 267.00 | 348.00 | 484.00 |
| 100 | 25.00 | 35.00 | 45.00 | 69.50 | 111.00 | 172 | 274 | 358 | 497.00 |
| 102.5 | | | | | | 176 | 281 | 367 | 510 |
| 105 | | | | | | 180 | 287 | 377 | 523 |
| 107.5 | | | | | | 184 | 294 | 386 | 535 |
| 110 | | | | | | 189 | 301 | 396 | 548 |

**Figure 7. DN40 to DN250 PIBCV Valves with three PT test points**

For example, the VP220E-50CQS valve body with a flow setting of 80% to establish its maximum flow rate of 10 $m^3/h$ (2.775 l/s) Using Table 4 provides a $Kv_{cv}$ of 27.4 which can be used with the measured differential pressure from P1-P2 to indicate the current flow rate.

$Q = Kv_{cv} \times \sqrt{\Delta P_{cv}}$ (units in $m^3/h$ and Bar)

Rearranged: $\Delta P_{cv} = (Q/Kv_{cv})^2$

$\Delta P_{cv} = (10/27)^2$

$\Delta P_{cv} = (0.3704)^2$

$\Delta P_{cv} = 0.137$ bar = 13.7 kPa

We would therefore expect to be measuring around 13.7 kPa across P1 to P2 for a flow of 10 $m^3/h$ (2.775 l/s)

# Theory and Design

A **SpaceLogic** PIBCV valve consists of two parts:

1. Differential Pressure Controller
2. Control valve

## 1. Differential Pressure Controller ($\Delta P_{cv}$)

The differential pressure controller maintains a constant differential pressure across the control valve. The pressure difference $\Delta P_{cv}$ (P2-P3 for the DN10 to DN32 valves and P1-P2 for the DN40 and larger valves) on the membrane is balanced with the force of the spring. Whenever the differential pressure across the control valve changes (due to a change in available pressure, or movement of the control valve) the hollow cone is displaced to a new position. This brings a new equilibrium and therefore keeps the differential pressure at a constant level.

## 2. Control Valve (CV)

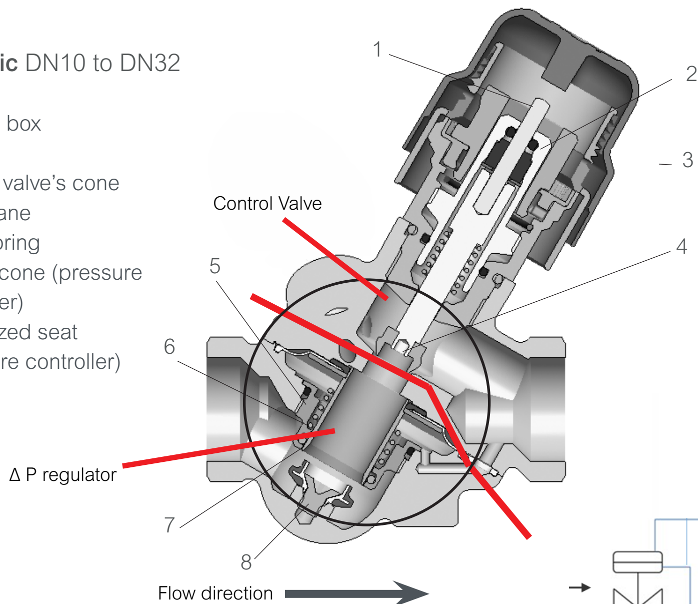
The control valve has a linear characteristic. It features a stroke limitation that allows adjustment of the value. The scale on the valve and the pointer it is set to will be a direct percentage of the valves nominal flow rate which is stated on all valves either on the valve ID plate or the green marker. Changing the stroke limitation is done by adjusting the valve body's maximum flow % setting without the actuator installed.

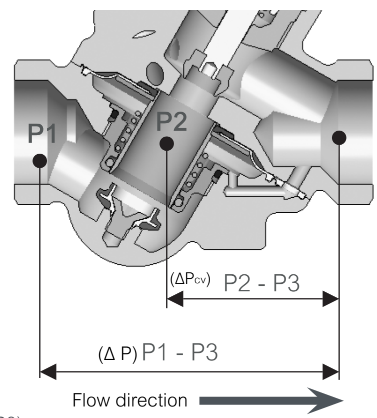
## PT Port Functionality

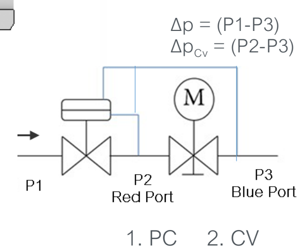
The two optional PT Points available on the DN10 to DN32 PIBCV valves have different functions than the three PT Points than are included as standard on the DN40-DN250 valves. In the DN10 to DN32 PIBCV size valves the Red port serves to measure the Balance port and Blue is the Outlet port. With the DN40 through DN250 size PIBCV valves the Red port serves as the valve inlet pressure, one mid blue port serving as the P2 Balance port and another Blue port serving to measure the Valve outlet pressure (P3).

**SpaceLogic** DN10 to DN32

1. Spindle
2. Stuffing box
3. Pointer
4. Control valve's cone
5. Membrane
6. Main spring
7. Hollow cone (pressure controller)
8. Vulcanized seat (pressure controller)

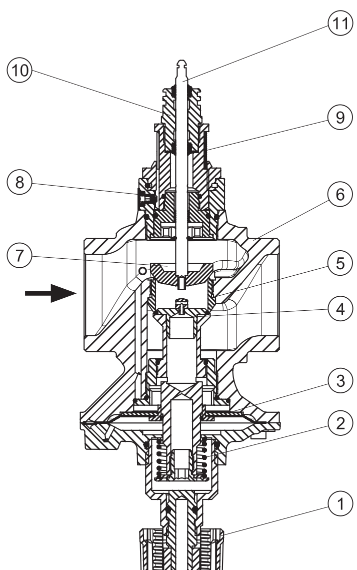


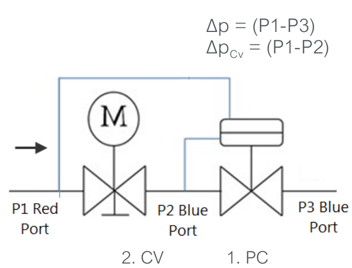



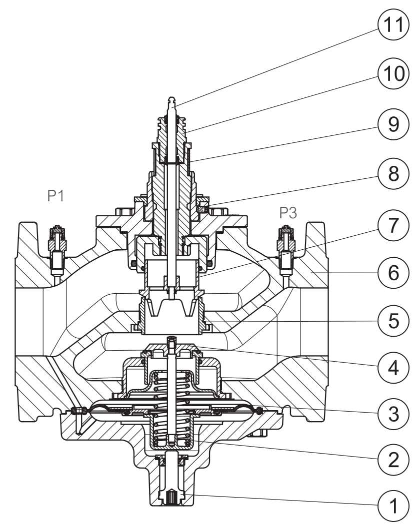

**SpaceLogic** DN40 to DN100

1. Shut off handle
2. Main spring
3. Membrane
4. DP cone
5. Seat
6. Valve body
7. Control valves cone
8. Locking screw
9. Scale
10. Stuffing box
11. Spindle




DN40, DN50

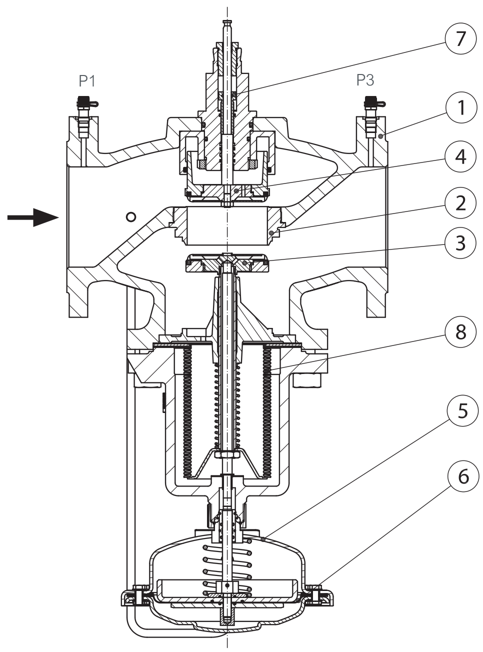


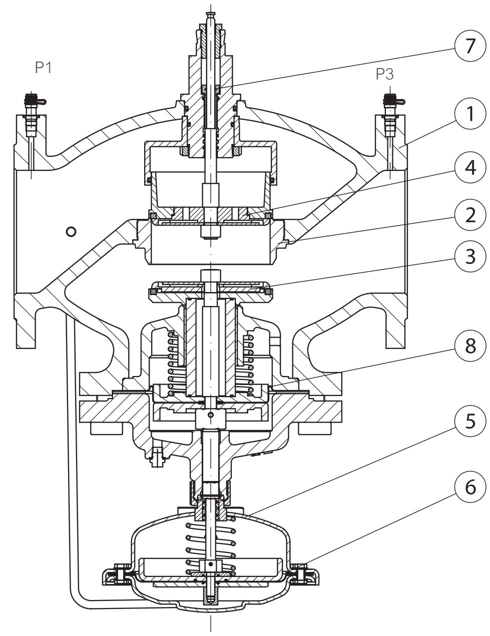

DN65…DN100

**SpaceLogic** DN125…DN150

1. Valve body
2. Valve seat
3. PC cone
4. CV cone
5. Controller casting
6. Rolling diaphragm
7. Adjusting screw
8. Bellow for pressure relief on PC cone



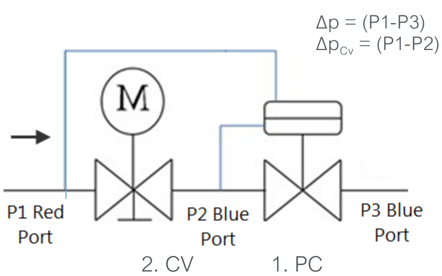

PIBCV DN125

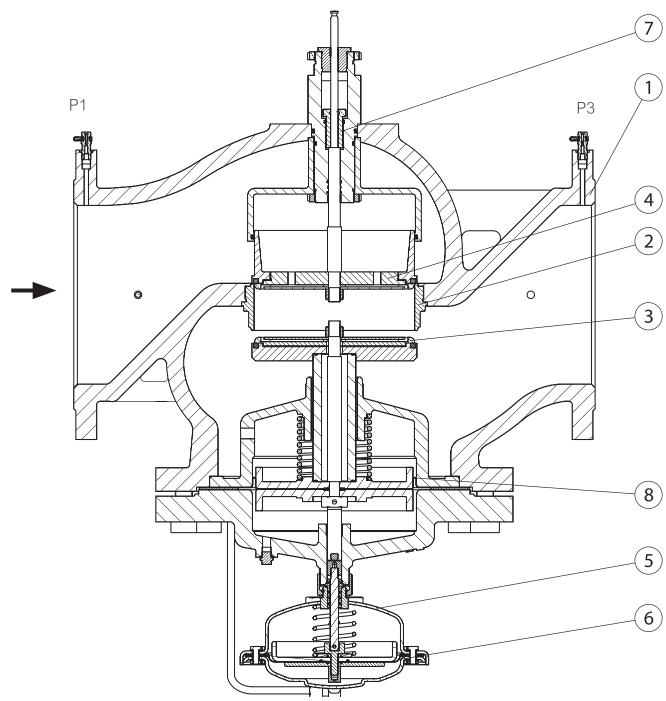



PIBCV DN150

**SpaceLogic** DN200 …DN250

1. Valve body
2. Valve seat
3. PC cone
4. CV cone
5. Controller casting
6. Rolling diaphragm
7. Adjusting screw
8. Bellow for pressure relief on PC cone



# MyExchange Sales Mobile App

Bring more “wow” to your customer meetings! MyExchange mobile app enables sales teams to share the latest marketing and sales content via their iOS or Android tablet or mobile phone – on- or off-line – to make meetings and follow up more productive.

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- Download assets for availability while offline
- Electronically mark up assets (highlight, pen) and save changes
- Manage a personal “channel” with your own presentation content
- Email assets to others (customers, consultants) and manage sharing activities/history
- Receive news and notifications on updates directly on your device
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  - MyExchange Schneider Electric on the App Store on iTunes.
  - For Android devices, access the app in the Google Play store by searching for ‘myexchange Schneider Electric’. See the Play Store for Android system requirements.

You must self-register on The Exchange before using MyExchange. Register at: https://ecobuilding.schneider-electric.com/login-register





Document Number: F-28105-4

December, 2020 tc