Pilot-controlled differential pressure reducer (PN 16, 25, 40)
PCVD - flow and return mounting, adjustable setting

**Description**

Pilot-controlled pressure reducer is a self-acting differential pressure controller primarily for use in district heating, district cooling or in industrial systems as well. It can be flow mounted in applications with and without heat exchanger like large substations and distribution stations.

The controller consist of main controller, installed in main pipe, and pilot controller and with a throttling element, both installed in bypass.

Setting is done on pilot controller.

Throttle valve data can be found on page 9.

**Main data**:
- DN 50-250\(^{\text{1}}\)
- \(k_{\text{VS}}\) 32-630 m\(^3\)/h
- PN 16, 25, 40\(^{\text{6}}\)
- Temperature:
  - Circulation water/glycolic water up to 30%: 2 … 200°C
- Connections:
  - Pilot controller: ext. thread (weld-on tailpieces) or flange
  - Main valve: flange

\(^{1}\) for details see Technical data and Ordering sections
\(^{6}\) smaller DN on request
\(^{6}\) PN 40 on special request

**Features**:
- Pressure reducer
- Extremely high control ratio (see Tab.1) as a result of low pilot controller min. flow rate \((k_{\text{VS}}\text{ value})\) and high flow rate \((k_{\text{VS}})\) of the main valve
- Small overall dimensions comparing to standard design (especially height)
- Higher valve capacities for DN 150-250 comparing to standard design
- High control stability
- Smooth operation differential pressure controller

**Tab. 1**

<table>
<thead>
<tr>
<th>DN</th>
<th>Min. control ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>100 : 1</td>
</tr>
<tr>
<td>65</td>
<td>140 : 1</td>
</tr>
<tr>
<td>80</td>
<td>220 : 1</td>
</tr>
<tr>
<td>100</td>
<td>300 : 1</td>
</tr>
<tr>
<td>125</td>
<td>400 : 1</td>
</tr>
<tr>
<td>150</td>
<td>400 : 1</td>
</tr>
<tr>
<td>200</td>
<td>550 : 1</td>
</tr>
<tr>
<td>250</td>
<td>750 : 1</td>
</tr>
</tbody>
</table>
### Technical Data

#### Main valve

<table>
<thead>
<tr>
<th>Nominal diameter</th>
<th>DN 50</th>
<th>65</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>200</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>kₜ value</td>
<td>32</td>
<td>50</td>
<td>80</td>
<td>125</td>
<td>160</td>
<td>320</td>
<td>450</td>
<td>630</td>
</tr>
<tr>
<td>Cavitation factor z</td>
<td>0.5</td>
<td>0.5</td>
<td>0.45</td>
<td>0.4</td>
<td>0.35</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Leakage acc. to standard IEC 534</td>
<td>≤ 0.05% of kₜ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal pressure</td>
<td>PN 16, 25, 40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. differential pressure (PN 16)</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. differential pressure (PN 25, 40)</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. differential pressure</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. static pressure</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium VFG 2(1)</td>
<td>Circulation water/glycolic water up to 30%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium pH</td>
<td>Min. 7, max. 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium temperature</td>
<td>2 to 150°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connections</td>
<td>Flange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For PN 16/25</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For PN 40</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Materials

- **Valve body**
  - PN 16: Grey cast iron EN-GJL-250 (GG-25)
  - PN 25: Ductile cast iron EN-GJS-400-18-LT (GGG-40.3)
  - PN 40: Cast steel EN-GP-240-GH (GS-C 25)
- **Valve seat**: Stainless steel M. No. 1.4021
- **Valve cone**: Stainless steel M. No. 1.4404
- **Sealing**: EPDM
- **Pressure relieve system**: Bellows⁴
- **Main actuator**
  - Actuator size: cm²
  - For main valve DN 50 - 125: 250
  - For main valve DN 150 - 250: 630
- **Trottling element**
  - Size of throttling element: DN
  - For main valve DN 50 - 125: 25
  - For main valve DN 150 - 250: 6.6

### Main actuator

<table>
<thead>
<tr>
<th>For main valve</th>
<th>DN 50 - 125</th>
<th>150 - 250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator size</td>
<td>cm²</td>
<td></td>
</tr>
<tr>
<td>Max. operational pressure</td>
<td>bar</td>
<td>25</td>
</tr>
<tr>
<td>Flow restrictor differential pressure Δpᵣ</td>
<td>bar</td>
<td>0.2/0.5</td>
</tr>
<tr>
<td>Diff. pressure setting ranges</td>
<td>0.2-1.0/0.3-2.0/1-5/3-12</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td>11</td>
</tr>
</tbody>
</table>

### Trottling element

<table>
<thead>
<tr>
<th>For main valve</th>
<th>DN 50 - 125</th>
<th>150 - 250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of throttling element</td>
<td>DN</td>
<td>25</td>
</tr>
<tr>
<td>Connections</td>
<td>Welded end</td>
<td>Flange</td>
</tr>
<tr>
<td>Max. operational pressure</td>
<td>bar</td>
<td>25</td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td>3.2</td>
</tr>
</tbody>
</table>

### Materials

- **Housing**: Stainless steel M. No. 1.0338
- **Control diaphragm**: EPDM
- **Impulse tube**: Stainless steel tube Ø10 x 0.8 mm
- **Nr. of throttle valves (mounted on impulse tubes)**: 1

### Note:
- For pilot controllers technical data please see relevant Data Sheet
- Defined by pilot controller

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### Ordering

**Example 1:**
Pilot-controlled differential pressure reducer; DN 100; \( k_{VS} \); 125; PN 16; setting range 1-5 bar; \( T_{\text{max}} \) 150 °C; Flange;
- 1x PCV-VFG 21 DN 100 Code No.: **003G1573**
- 1x AVD DN 25 Code No.: **003H6646**
- 1x Weld-on tailpieces DN 25 Code No.: **003H6910**
- 1x Mounting set for impulse tube Code No.: **003G1599**

**Example 2:**
Pilot-controlled differential pressure reducer; DN 150; \( k_{VS} \); 320; PN 16; setting range 3-12 bar; \( T_{\text{max}} \) 150 °C; Flange;
- 1x PCV-VFG 21 DN 150 Code No.: **003G1505**
- 1x AVD DN 40 Code No.: **003H6663**
- 1x Mounting set for impulse tube Code No.: **003G1599**

1) Contains accessories for remounting the impulse tube on the pilot controller from internal connection (factory delivered) to external connection.

2) For PN 40 pilot controller instead of AVD controller use AFD VFG 2 PN 40 DN 40 and one seal pots V3

3) For temperatures \( T_{\text{max}} = 140 \ldots 200 °C \) instead of AVD controller use AFD VFG 2 PN 16/25/40 DN 40, stem extension ZF4 or ZF5 and one seal pot V3

4) Contains accessories for remounting the impulse tube on the pilot controller from internal connection (factory delivered) to external connection.

### DN 50-125

<table>
<thead>
<tr>
<th>DN 50-125</th>
<th>PCV-VFG 21</th>
<th>Main controller, throttling element, throttle valve, impulse tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN (mm)</td>
<td>( k_{VS} ) (m³/h)</td>
<td>( T_{\text{max}} ) (°C)</td>
</tr>
<tr>
<td>50</td>
<td>32</td>
<td>150</td>
</tr>
<tr>
<td>65</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
<td>125</td>
</tr>
<tr>
<td>100</td>
<td>125</td>
<td>160</td>
</tr>
<tr>
<td>125</td>
<td>160</td>
<td>150</td>
</tr>
<tr>
<td>50</td>
<td>32</td>
<td>150</td>
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<tr>
<td>65</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
<td>125</td>
</tr>
<tr>
<td>100</td>
<td>125</td>
<td>160</td>
</tr>
<tr>
<td>125</td>
<td>160</td>
<td>150</td>
</tr>
</tbody>
</table>

### Pilot controller AVD

<table>
<thead>
<tr>
<th>DN (mm)</th>
<th>( k_{VS} ) (m³/h)</th>
<th>( T_{\text{max}} ) (°C)</th>
<th>PN</th>
<th>Connection</th>
<th>( \Delta p_{\text{max}} ) (bar)</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>8.0</td>
<td>150</td>
<td>25</td>
<td>Cylindr. ext. thread acc. to DIN ISO 228/1</td>
<td>1-5</td>
<td>003H6646</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3-12</td>
<td>003H6652</td>
</tr>
</tbody>
</table>

Weld-on tailpieces DN 25 Code No.: **003H6910**

Mounting set for impulse tube1)

**Code No.:** **003G1599**

### DN 150-250

<table>
<thead>
<tr>
<th>DN 150-250</th>
<th>PCV-VFG 21</th>
<th>Main controller, throttling element, throttle valves, impulse tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN (mm)</td>
<td>( k_{VS} ) (m³/h)</td>
<td>( T_{\text{max}} ) (°C)</td>
</tr>
<tr>
<td>150</td>
<td>320</td>
<td>150</td>
</tr>
<tr>
<td>200</td>
<td>450</td>
<td>150</td>
</tr>
<tr>
<td>250</td>
<td>630</td>
<td>150</td>
</tr>
<tr>
<td>150</td>
<td>320</td>
<td>150</td>
</tr>
<tr>
<td>200</td>
<td>450</td>
<td>150</td>
</tr>
<tr>
<td>250</td>
<td>630</td>
<td>150</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DN (mm)</th>
<th>( k_{VS} ) (m³/h)</th>
<th>( T_{\text{max}} ) (°C)</th>
<th>PN</th>
<th>Connection</th>
<th>( \Delta p_{\text{max}} ) (bar)</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>16</td>
<td>150</td>
<td>25</td>
<td>Flange EN 1092-2</td>
<td>16</td>
<td>003H6660</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3-12</td>
<td>003H6663</td>
</tr>
</tbody>
</table>

Mounting set for Impulse tube2)

**Code No.:** **003G1599**

### Pilot controller AVD2)

<table>
<thead>
<tr>
<th>DN (mm)</th>
<th>( k_{VS} ) (m³/h)</th>
<th>( T_{\text{max}} ) (°C)</th>
<th>PN</th>
<th>Connection</th>
<th>( \Delta p_{\text{max}} ) (bar)</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>16</td>
<td>150</td>
<td>25</td>
<td>Flange EN 1092-2</td>
<td>16</td>
<td>003H6660</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3-12</td>
<td>003H6663</td>
</tr>
</tbody>
</table>

### DN 150-250

<table>
<thead>
<tr>
<th>DN (mm)</th>
<th>( k_{VS} ) (m³/h)</th>
<th>( T_{\text{max}} ) (°C)</th>
<th>PN</th>
<th>Connection</th>
<th>( \Delta p_{\text{max}} ) (bar)</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>320</td>
<td>150</td>
<td>25</td>
<td>Flange EN 1092-2</td>
<td>12</td>
<td>003G1618</td>
</tr>
<tr>
<td>200</td>
<td>450</td>
<td>150</td>
<td>25</td>
<td>Flange EN 1092-2</td>
<td>12</td>
<td>003G1621</td>
</tr>
<tr>
<td>250</td>
<td>630</td>
<td>150</td>
<td>25</td>
<td>Flange EN 1092-2</td>
<td>10</td>
<td>003G1622</td>
</tr>
</tbody>
</table>

**Code No.:** **003G1623**

1) Contains accessories for remounting the impulse tube on the pilot controller from internal connection (factory delivered) to external connection.

2) For PN 40 pilot controller instead of AVD controller use AFD VFG 2 PN 40 DN 40 and one seal pots V3

3) For temperatures \( T_{\text{max}} = 140 \ldots 200 °C \) instead of AVD controller use AFD VFG 2 PN 16/25/40 DN 40, stem extension ZF4 or ZF5 and one seal pot V3

4) Contains accessories for remounting the impulse tube on the pilot controller from internal connection (factory delivered) to external connection.
# Data sheet

**PCVD - Pilot-controlled differential pressure reducer (PN 16, 25, 40)**

## Ordering (Continuous)

### VFG 2 Valves (metallic sealing cone)

<table>
<thead>
<tr>
<th>DN (mm)</th>
<th>$k_{vs}$ (m³/h)</th>
<th>$T_{max}$ (°C)</th>
<th>Connections</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>20</td>
<td>150</td>
<td>200(^{1})</td>
<td>065B2392 065B2405 065B2415</td>
</tr>
</tbody>
</table>

### AFD Actuators

<table>
<thead>
<tr>
<th>$\Delta p$ setting range (bar)</th>
<th>For DN</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-12</td>
<td>15-125</td>
<td>003G1001</td>
</tr>
<tr>
<td>1-6</td>
<td></td>
<td>003G1002</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Description</th>
<th>Connections</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulse tube set AF(^{2})</td>
<td>- 1× Copper tube Ø10 × 1 × 1500 mm - 1 × compression fitting for imp. tube connection to pipe (G 1/4) - 2 × socket</td>
<td>-</td>
<td>003G1391</td>
</tr>
<tr>
<td>Seal pot V1(^{1})</td>
<td>Capacity 1 liter; with compression fittings for imp. tube Ø10</td>
<td>-</td>
<td>003G1392</td>
</tr>
<tr>
<td>Compression fitting(^{3})</td>
<td>For impulse tube Ø10 connections to controller</td>
<td>G 1/4</td>
<td>003G1468</td>
</tr>
<tr>
<td>Throttle valve-PCV</td>
<td>Regulating and shut-off device</td>
<td>-</td>
<td>065Z1502</td>
</tr>
</tbody>
</table>

1) Seal pot has to be used on impulse tubes always when $T_{max} \geq 150$ °C

2) Consist of a nipple, compression ring and nut

3) impulse tubes on $T>150$ °C or PN> PN 16 should be of stainless steel

### Service kits AVD

<table>
<thead>
<tr>
<th>Type designation</th>
<th>DN (mm)</th>
<th>$k_{vs}$ (m³/h)</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve insert(^{1})</td>
<td>15</td>
<td>0.4</td>
<td>003H6869</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>1.0</td>
<td>003H6870</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>4.0</td>
<td>003H6873</td>
</tr>
<tr>
<td></td>
<td>32/40/50</td>
<td>6.3</td>
<td>003H6874</td>
</tr>
<tr>
<td></td>
<td>12.5/20/25</td>
<td>8.0</td>
<td>003H6875</td>
</tr>
<tr>
<td></td>
<td>32/40/50</td>
<td>12.5/20/25</td>
<td>003H6876</td>
</tr>
<tr>
<td>Valve body extension with stuffing box(^{2})</td>
<td>15</td>
<td>3.2</td>
<td>003H6877</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>4.5</td>
<td>003H6877</td>
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</tbody>
</table>

### Service kits VFG 2

<table>
<thead>
<tr>
<th>Type designation</th>
<th>DN (mm)</th>
<th>$k_{vs}$ (m³/h)</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve insert</td>
<td>15</td>
<td>4.0</td>
<td>065B2796</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>6.3</td>
<td>065B2797</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>8</td>
<td>065B2798</td>
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<tr>
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<td>280</td>
<td>065B2965</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>400</td>
<td>003G1464</td>
</tr>
</tbody>
</table>

1) for AVD controller only

2) for AVDS controller only

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Function

The pilot valve maintains the pressure in front of selected part of system/application. By this action also flow through a bypass changes and therefore (-p) at the throttling element.

Pressure changes from inlet pipe (+p) is being transferred through the impulse tube to the main actuator chamber and acts on control diaphragm.

In case of small flow rates the main controller is closed and control is taken by the pilot controller only. With increasing the flow rate, a negative pressure is built in the throttling element. This partial vacuum acts on the main actuator diaphragm and causes the main controller to open.

Installation positions

Both main and pilot controllers have to be installed in horizontal pipes only, with a pressure actuator oriented downwards.
Pressure temperature diagram

Working area is below P-T line and it ends at Tmax for each valve

Maximum allowed operating pressure as a function of medium temperature (according to EN 1092-2)

Maximum allowed operating pressure as a function of medium temperature (according to EN 1092-1)

Dimensions

Impulse tubes (pos.1, 2, 3) are part of the delivery. Their shape depends on the controller type. In case of high temperatures (Tmax > 150) seal pots have to be installed. For details see relevant Instructions.

The components shown with dashed lines are NOT part of the delivery. The pipes (pos. 5) must be welded during mounting.

Tmax 150 DN 50-250

<table>
<thead>
<tr>
<th>DN</th>
<th>50</th>
<th>65</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>200</th>
<th>250</th>
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<tbody>
<tr>
<td>L</td>
<td>230</td>
<td>290</td>
<td>310</td>
<td>350</td>
<td>400</td>
<td>480</td>
<td>600</td>
<td>730</td>
</tr>
<tr>
<td>H1</td>
<td>390</td>
<td>425</td>
<td>425</td>
<td>530</td>
<td>530</td>
<td>619</td>
<td>647</td>
<td>697</td>
</tr>
<tr>
<td>H2</td>
<td>82</td>
<td>95</td>
<td>95</td>
<td>125</td>
<td>125</td>
<td>179</td>
<td>237</td>
<td>257</td>
</tr>
<tr>
<td>D</td>
<td>263</td>
<td>263</td>
<td>263</td>
<td>263</td>
<td>263</td>
<td>380</td>
<td>380</td>
<td>380</td>
</tr>
</tbody>
</table>
Dimensions (Continuous)

$L_{max} 200 DN 150-250$

<table>
<thead>
<tr>
<th>DN</th>
<th>150</th>
<th>200</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>480</td>
<td>600</td>
<td>730</td>
</tr>
<tr>
<td>$H_2$</td>
<td>169</td>
<td>234</td>
<td>254</td>
</tr>
<tr>
<td>$H_1$</td>
<td>916</td>
<td>1162</td>
<td>1494</td>
</tr>
<tr>
<td>D</td>
<td>380</td>
<td>380</td>
<td>380</td>
</tr>
</tbody>
</table>

Impulse tubes $T_{max}$ (200 °C)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cu Ø 6 × 1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SS Ø 10 × 0.8</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cu Ø 10 × 1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SS Ø 6 × 1</td>
<td></td>
</tr>
</tbody>
</table>

Location of connection depends on controller type.
Dimensions (Continuous)

$T_{\text{min}}$, 150 °C DN 50-125

Pipes Pos. 1:
DN 25: Pipes Ø 33.7 × 2.6
DN 40: Pipes 48.3 × 3.2

$T_{\text{max}}$, 150 °C DN 150-250
Throttle valve

Throttle valve is regulating and shut-off device, which is / are installed on the impulse tubes connected to main PCV actuator. Number of used throttle valves can be seen in table for Main actuator in Technical Data section.

Function of throttle valve is to control flow speed through impulse tube and consequently influence on PCV’s reaction time. Influence on reaction time is not completely defined and strongly depends on application conditions and could significantly vary from application to application.

In general:
- by opening of the valve (clockwise) PCV’s reaction time increases
- by valve closing (counterclockwise) PCV’s reaction time decreases

In case valve is completely closed it has function as shut-off valve.

Throttle valve is delivered from factory in completely open position.

Main data:
- DN 4
- used for Ø10 mm impulse tube

Flow diagram

(1 revolution of spindle equals to 1 mm stroke)