PRESSURE INDEPENDENT CONTROL VALVE (PICV)

D991 DN40–50

GENERAL NOTES
The Crane D991 PICV;
• can be used in variable volume heating and chilled water systems
• provides modulating control for terminal units when installed with a modulating actuator
• offers flow rate pre-setting
• has settable linear or equal percentage control characteristics at all pre-set flow rates
• has built in Differential Pressure Control
• has an operating temperature: -10 to 100˚C
• has a maximum working DP = 4.0 bar
• has a maximum operating pressure: 16 bar
• has built in pressure test points to verify operational differential pressures

These instructions apply to the D991 when installed as a ‘standalone’ valve or when supplied as part of the Crane Fluid Systems Dominator range.

LIMITS OF USE
These valves have been categorised in accordance with the Pressure Equipment Directive • PED.
The fluid to be transported is limited to Group 2 liquids i.e. non-hazardous.
On no account must these valves be used on any Group 1 liquids, Group 1 gases or Group 2 gases.
**INSTALLATION**

These instructions are issued as guidelines only and do not cover all installed conditions. If unsure please contact our Technical Helpline before installation.

- Crane Fluid Systems products are designed for installation and use within suitably designed systems reflecting CIBSE, BSRIA and BE&S Guidelines. Particular care should be taken with regards to;
  - accessibility to valve for setting/adjustment
  - tube cutting
  - jointing
  - bracketing/supports

- orientation: whilst the PICV can operate correctly in different orientations, there are recommendations regarding the orientation of actuators - see diagram on page 5

- would normally be installed on return pipework, i.e. after the equipment it is controlling, but can be installed in flow if required

- ensure direction of flow is correct - indicated by cast arrow on body

- D991 operates between a minimum and maximum pressure drop across the valve - see commissioning

- PICV’s are not designed as isolation valves. Dedicated isolation valves should be installed to isolate against system pressure, i.e. for maintenance etc., when disconnecting/draining pipework

- systems should be installed with strainers to protect the PICV and other installed items

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**FLUSHING**

Control valves, like the PICV, are sized to give good control over the system water, therefore, have been designed with small convoluted flow path. These water ways may not allow adequate water velocities for flushing of the coil, even when fully open. Therefore, in line with BSRIA recommendations, it is recommended that a flushing point be located between the coil and the PICV. This allows the coil to be flushed without the water passing through the PICV.
COMMISSIONING

The D991 controls the flow rate depending on its set position, therefore, removing the need to measure the flow rate.

The D991 maintains a constant differential pressure across its internal seat, any excess pressure being removed by the internal differential pressure controller. To ensure that sufficient pressure is available for the differential pressure controller to control the flow rate correctly, a differential pressure reading should be taken using the test points provided.

When taking differential pressure readings, it is important that the system is running at full load, i.e. with all PICVs open. This ensures that differential pressure readings are carried out in the most unfavourable conditions, guaranteeing optimum performance in normal running conditions.

To ensure that all PICVs are working at the required differential pressure, it is necessary to check the least favoured / index PICV. By verifying the least favoured PICV is set to the required differential pressure, all other PICVs must have a higher differential pressure. However, we would also recommend that a selection of other PICVs are tested along the circuit to verify this.

SETTING FLOW

Reference setting table on page 4.

- Identify installed valve from ID plate on bottom of the valve.
- Check flow rate required (page 4).
- Read across chart:
  - Valve = DN40
  - Required flow rate = 1.1 l/s
  - Set position = 60 (i.e. 60% open)
- Flow rates can be extrapolated between settings.

Valve can be set as follows:

1. Loosen Locking Nut as shown. Valve is supplied set at 100 i.e. max setting
2. Hold the Locking Nut to prevent it from turning and tightening too soon.
3. With the Locknut held in position, turn the Adjusting Nut clockwise to close the valve until the desired setting is visible at upper face of locknut.
4. With the desired setting visible, hold the Adjusting Nut still and tighten the Locknut (recommended torque is 7 to 10 Nm).
DIFFERENTIAL PRESSURE REQUIREMENTS

Each valve size (DN40-DN50) at each % setting option requires a specific constant $\Delta P$ (Differential Pressure) to ensure the PICV is within its working range;

<table>
<thead>
<tr>
<th>Position</th>
<th>DN40</th>
<th>DN50</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activation DP Overall (kPa)</td>
<td>Flow Rate (l/s)</td>
</tr>
<tr>
<td>Setting 2 - 20% Open</td>
<td>20</td>
<td>0.30</td>
</tr>
<tr>
<td>Setting 3 - 30% Open</td>
<td>25</td>
<td>0.50</td>
</tr>
<tr>
<td>Setting 4 - 40% Open</td>
<td>25</td>
<td>0.70</td>
</tr>
<tr>
<td>Setting 5 - 50% Open</td>
<td>25</td>
<td>0.90</td>
</tr>
<tr>
<td>Setting 6 - 60% Open</td>
<td>30</td>
<td>1.10</td>
</tr>
<tr>
<td>Setting 7 - 70% Open</td>
<td>30</td>
<td>1.30</td>
</tr>
<tr>
<td>Setting 8 - 80% Open</td>
<td>30</td>
<td>1.70</td>
</tr>
<tr>
<td>Setting 9 - 90% Open</td>
<td>35</td>
<td>2.10</td>
</tr>
<tr>
<td>Setting 10 - 100% Open</td>
<td>35</td>
<td>2.40</td>
</tr>
</tbody>
</table>

For flow rates in between settings, extrapolation of position can be used.

The pump speed should be set to ensure that the required differential pressure is always available. By setting the differential pressure across the least favoured PICV to the value stated in the above table, it ensures that minimum pump energy is used, therefore, reducing system running costs and CO$_2$ emissions.

To set pump speed to achieve this; whilst measuring $\Delta p$, increase pump speed until a value greater than the minimum stated in the above table is achieved. As the measured $\Delta p$ is the total pressure drop across the PICV, the measured value will continue to rise as pump speed is increased. Any value above the minimum requirement will increase running costs, therefore, reducing system efficiency.

The optimum pump speed setting is achieved when there is sufficient, but not excessive, pump pressure available.

Flow rate verification should be carried out using separate Flow Measurement Devices (FMD) where fitted. In line with CIBSE & BSRIA recommendations, we recommend that as a minimum requirement, FMDs are installed in all sub-circuits.

Where flow rate verification is required at terminals, FMDs may also have been installed at each terminal. Where individual flow measurement devices (FMD) have not been installed, terminal flow rates can also be confirmed by measuring sub-circuits flow rates and closing individual terminal PICVs one at a time and measuring the reduction in flow at the branch. Care should be taken to ensure that reduced flow rates are still within the measuring range of the branch FMD, i.e. that the measured ‘signal’ doesn’t drop below 1kPa.
CONSTANT FLOW REGULATOR

Where the PICV is being used as a CFR (Constant Flow Regulator), i.e. with no actuator fitted, a locking clip will need to be fitted.

To set the flow rate to be controlled, follow the setting instructions above (Page 4) –
NOTE: this should be done with the pump turned off, i.e. no flow through the valve. This can also be achieved by isolating the pipework containing the CFR to ensure no flow.

After setting the flow rate, the valve stem should be lifted by hand (1) & (2) and the locking clip put in position (3) & (4) as shown below.

The PICV will now perform as a CFR holding the flow rate constant providing that the minimum pressure requirement is achieved – see ‘Differential Pressure Requirements’.

ACTUATOR OPTIONS

The D991 DN40 – DN50 PICV is designed to work with ACT991M series 500Nm modulating actuator.

For the full Installation, operating and maintenance guidance on the ACT991M 500Nm actuator please see the separate IOM shipped with the actuator.

Crane cannot be held responsible for the control function if alternative actuators are used.
ACT991M (MODULATING) 500NM ACTUATOR:

DIMENSIONS

All dimensions in mm

MOUNTING POSITIONS

90° Max

OK

OK

NO
MOUNTING THE VALVE

1. Ensure that there is a 2 – 4mm gap under the actuator head. Use the manual adjuster on top of the actuator to increase/decrease gap size.

2. Ensure that the stem is in the ‘up’ position on the receiving valve.

3. Place actuator over the top of the valve bonnet and self-locate on the valve neck. Adjust bolt on side to hold actuator in place. NOTE: Do not use excessive force and over tighten.

4. Use the metal clip provided to lock the valve shaft and actuator shaft together. Place one side of the clip around the valve shaft and ensure the metal clip is the right way round. (NOTE: to achieve correct orientation both ends of the shaft locate centrally as per picture 4.)

5. Line up the second half of the metal clip and ensure both halves mate together correctly. Tighten the bolts with an Allen key to lock it in position.
To visit our Video Library go to: www.youtube.com/user/CraneBSU

• Designed and manufactured under quality management systems in accordance with BS EN ISO 9001-2008

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