DENISON HYDRAULICS
Pressure Relief Valve R4V
Proportional Pressure Relief Valve R4V…P2

Publ. 3–EN 2400–A, replaces 3–EN 240–D
 FEATURES

- **High Performance**: R4 valves are designed for a maximum pressure of 350 bar and a flow capacity ranging from 90 l/min (\(\frac{3}{8}\)") to 600 l/min (1\(\frac{1}{4}\)").

- **Sensitive Control**: The DENISON poppet design delivers the minimum possible friction, superior hysteresis and optimum response to changes in operating conditions.

- **Wide Selection**: In addition to the various mounting options for the main valve body, or as cartridge for manifold applications, the ordering code offers a range of control options for valves and accessories. A solenoid vent valve is available (VV01).

- **Standardized Mounting**: Mounting configurations for R4 Pressure Controls are in accordance with international standards, and conform to ISO 6264. Vent valve option allows for remote pressure control.

 SYMBOL

[Diagram of R4V03 pilot valve and R4V06/10 pilot valve]
DENISON Pressure Valves are pilot operated controls consisting of two or three sections; either a high flow, poppet type seat valve section controlled by the low flow, adjustable pilot mounted on top or in the case of the Proportional Pressure Relief Valve, the proportional section P2 sandwiched between the pilot stage and the main body.

R4V Relief Valves are used to limit the system pressure of a hydraulic circuit. Pressure is set by the control knob on the pilot, or according to the current input on the R4V...P2.

The R4V can be vented electrically by means of an optional vent valve, VV01. This valve is mounted between the pilot valve and the main body.

With the DENISON combined Seat Valve and Pilot design, and the range of springs available, it is possible to achieve extremely precise pressure setting.

All valve components are subject to rigorous quality control, based on international standards, thus permitting worldwide operation and interchangeable spare parts.

The system pressure in Port A is applied, via an orifice in X, to the pilot valve, the proportional valve (where present), and to the top surface of the main poppet. The hydraulically balanced main poppet is held against the seat by the main spring. In this state there is no flow through the valve.

The adjusted spring force acting on the pilot cone determines the relief pressure. If the pressure in Port A exceeds the set point, the pilot cone is lifted from its seat, releasing a small pilot flow to tank.\(^1\)

The flow through the control orifice in X creates a pressure drop which limits the pressure at the top of the main poppet to the set point.

The higher system pressure in Port A now lifts the main poppet off its seat and allows flow to Port B.

In the resulting float position only enough flow is passed from Port A to Port B to maintain the inlet pressure in Port A at the set point.

When the pressure in Port A falls below the set point, the hydraulic balance on the main poppet is restored. The main spring then forces the main poppet to close.

\(^1\) The proportional valve P2 varies the pressure applied to the top of the main poppet, in proportion to the current input to the solenoid.

The manual setting of the pilot stage determines the maximum pressure and should be approximately 10% higher than the max. adjustable pressure of the proportional section (see also page 13).

The pilot drain chamber/proportional drain chamber is normally connected to Port B. Alternative external drain option through Port Y or Port Y1 available.
**TECHNICAL DATA**

**GENERAL**
- **Type of unit**: Pilot operated pressure relief
- **Design**: Poppet type
- **Type of mounting**: Threaded body
  - Subplate mounting
  - Cartridge
- **Port sizes**: 3/8", 1/2", 1 1/4" nominal
- **Mounting position**: Optional
- **Direction of flow**: A→B
- **Ambient temperature range**: –20 . . . + 60°C
- **Suitability for special working conditions**: Consult DENISON

**HYDRAULIC CHARACTERISTICS**
- **Operating pressure range**
  - inlet (port A) 0 . . . 350 bar
  - outlet (port B) 0 . . . 30 bar
  - port X 0 . . . 350 bar
  - port Y, Y1 0 . . . 30 bar
- **Pressure setting range**: 7 . . . 350 bar
- **Nominal flow**: 60 l/min  200 l/min  450 l/min
- **Max. flow**: 90 l/min  300 l/min  600 l/min
- **Fluid**: Petroleum base anti-wear fluids (covered by DENISON HF-0 and HF-2 specification). Such as mineral oil according to DIN 51524/25. Maximum catalogue ratings and performance data are based on operation with these fluids.
- **Fluid temperature range**: –18°C . . . + 80°C
- **Viscosity range**: 10 . . . 650 cSt
- **Recommended operating viscosity**: 30 cSt
- **Contamination level**: Max. permissible contamination level according to NAS 1638 Class 8 (Class 9 for 15 micron and smaller) or ISO 17/14

**TYPE OF ADJUSTMENT**
- **Manual**: Handwheel
  - Rotation: 3.75 rev.
- **Electric (Vent valve VV01)**: by solenoid
  - Nominal voltage: Refer to ordering code page 5
  - Permissible voltage difference: +5% . . . −10%
  - Max. coil temperature: +180°C (temperature class H)
  - Type of current: Alternating current (AC)
    - Direct current (DC)
  - Input power: 31 W
  - Holding: 78 VA
  - Inrush: 264 VA
  - Relative operating period: 100%
  - Type of protection: IP 65
  - **Electric proportional**
    - (pilot stage P2)
      - Refer to publication 3–EN 220

If the performance characteristics outlined above do not meet your requirements, please consult your local DENISON Office.
**ORDERING CODE**

<table>
<thead>
<tr>
<th>Model Number:</th>
<th>R4V</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Series</strong></td>
<td>R4V = Pressure Relief Valve</td>
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<tr>
<td><strong>Size</strong></td>
<td>03 = 3/8”</td>
<td>06 = 3/4”, 1”</td>
<td>10 = 1 1/4”</td>
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<tr>
<td><strong>Max. pressure</strong></td>
<td>0 = for cartridges only</td>
<td>5 = for body valves only</td>
<td>350 bar</td>
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<tr>
<td><strong>Body mounting</strong></td>
<td>Cartridge with pilot valve:</td>
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<tr>
<td></td>
<td>0 = without Y1 port</td>
<td>G = Y1 port = G 1/4”</td>
<td>E = Y1 port = SAE-4 (7/16”–20 UNF)</td>
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<tr>
<td></td>
<td>Subplate mounting:</td>
<td>3 = without Y1 port</td>
<td>9 = Y1 port = G 1/4”</td>
<td>7 = Y1 port = SAE-4 (7/16”–20 UNF)</td>
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<td></td>
<td>Threaded body:</td>
<td>6 = R4V03 = G 1/2” T-body</td>
<td>4 = R4V03 = SAE-8 T-body</td>
<td>B = R4V06 = SAE-12 L-body</td>
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<tr>
<td></td>
<td>3 = R4V06 = G 1/4” T-body</td>
<td>4 = R4V10 = G 1 1/4” L-body</td>
<td>X, Y1 ports¹</td>
<td>7 = R4V10 = SAE-20 L-body</td>
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<tr>
<td></td>
<td>1 = R4V06 = SAE-16 T-body</td>
<td>X, Y1 ports¹ = SAE-4</td>
<td>(7/16”–20 UNF)</td>
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<tr>
<td></td>
<td>¹ Port Y1 is only available at Drain line (code 2) external from the pilot head</td>
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<tr>
<td><strong>Pressure setting range</strong></td>
<td>1 = 7...105 bar</td>
<td>5 = 7...350 bar</td>
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<tr>
<td><strong>Type of control</strong></td>
<td>1 = Hand knob 32 mm dia.</td>
<td>3 = Acorn nut with lead seal</td>
<td>4 = Adjusting device with key lock, key order no. 700–70619–8</td>
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<tr>
<td><strong>Drain line</strong></td>
<td>0 = internal (not for cartridges)</td>
<td>1 = external from the subplate or manifold (Y).</td>
<td>2 = external from the pilot head (Y1); (not for Body Mounting codes 0 or 3)</td>
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<tr>
<td><strong>3-way vent valve VV01</strong></td>
<td>09 = with manual override</td>
<td>Solenoid de-energized: open to tank</td>
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<td>10 = without manual override</td>
<td>Solenoid energized: vent line blocked</td>
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<td>11 = with manual override</td>
<td>Solenoid de-energized: vent line blocked</td>
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<td>12 = without manual override</td>
<td>Solenoid energized: open to tank</td>
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<td><strong>P2 = Electric proportional pressure control</strong> (12 V DC only) (not with internal drain code 0)</td>
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<tr>
<td><strong>Solenoid voltage and current</strong></td>
<td>W01 = 115 V / 60 Hz</td>
<td>AC</td>
<td>¹) G0R = 12 V</td>
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<td></td>
<td>W02 = 230 V / 60 Hz</td>
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<td>G0Q = 24 V</td>
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<td>W06 = 115 V / 50 Hz</td>
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<td>G0H = 48 V</td>
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<td></td>
<td>W07 = 230 V / 50 Hz</td>
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<td>¹) R4V with P2 = P2–G0R only</td>
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<td><strong>Design letter</strong></td>
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<tr>
<td><strong>Seal class</strong></td>
<td>1 = N.B.R. (Buna N) Standard</td>
<td>4 = E.P.R.</td>
<td>5 = VITON</td>
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<tr>
<td><strong>Modifications</strong></td>
<td>Please Note: R4V03 – Pilot heads are not interchangeability with R4V06 respectively R4V10 pilot heads.</td>
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</tbody>
</table>
min. pressure setting $\geq$ 3 bar (depending on flow and viscosity).

Fluid 40 cSt at $50^\circ$C $\pm$ 0.5°C.
CARTRIDGES WITH PILOT VALVES

R4V03
0.6 kg

R4V06/10
1.2 kg

Ports | Function
--- | ---
A | Pressure (Inlet)
B* | Tank (Outlet)
X | external control connection
Y, Y1 | drain

* arrangement optional for R4V06 / R4V10

1) Port Y1 is only available at Drain line (code 2) external from the pilot head.

4 Mounting screws

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Order-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3⁄8&quot;-24 UNF-3B or M10 x 18.0 lg.</td>
<td>359–15220–0</td>
</tr>
<tr>
<td>M10 x 45 mm, DIN 912–12.9</td>
<td>700–71602–8</td>
</tr>
</tbody>
</table>

(mounting screws must be ordered separately)
**R4V03 (3⁄8'') SUBPLATE MOUNTING**

**Weight:** 2.7 kg

**Ports Function**

- **A** Pressure (inlet)
- **B** Tank (outlet)
- **X** Remote control or vent connection
- **Y (Y1)** external drain §1

§1 optional from pilot head or subplate. Port Y1 is only available at Drain line (code 2) external from the pilot head.

**Panel opening**

**Block mounting face**

- Flatness 0.01 mm / 100 mm length
- Surface finish CLA 1.27 μm

**Location hole**

**SUBPLATE**

**Weight:** 2 kg

**Port sizes**

- **A + B**
- **X + Y**

**Dimension**

- **M 10 x 35**
- **DIN 912 – 12.9**

**Order No.**

- **700 – 70039 – 8**

**4 Mounting screws**

- at p ≤ 210 bar = 100 daN/mm²
- at p > 210 bar = 120 daN/mm²

*Mounting screws are included in subplate order. For valves ordered without subplate, mounting screws must be ordered separately.

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**Model No.**

- **SS–B–08–G 113**
- **S16–63124–0**

**Order No.**

- **G 1⁄2”**
- **G 1⁄4”**

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**Ordering Code** **Back to Content**
R4V06 (3⁄4") SUBPLATE MOUNTING

Weight: 4.5 kg

Ports Function
A Pressure (inlet)
B Tank (outlet)
X Remote control or vent connection
Y (Y1) external drain \(^1\)

\(^1\) optional from pilot head or subplate. Port Y1 is only available at Drain line (code 2) external from the pilot head.

Block mounting face
Flatness 0.01 mm / 100 mm length
Surface finish CLA 1.27 μm

Location hole

Model No. Order No. Port sizes 4 Mounting screws*

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Order No.</th>
<th>A + B</th>
<th>X + Y</th>
<th>Dimension</th>
<th>Order No.</th>
<th>min. tensile strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS–B–16–G 115</td>
<td>S16–39168–0</td>
<td>G 1”</td>
<td>G 1⁄4”</td>
<td>M 10 x 45 DIN 912–12.9</td>
<td>700–71602–8</td>
<td>at p ≤ 210 bar = 100 daN/mm(^2) at p &gt; 210 bar = 120 daN/mm(^2)</td>
</tr>
</tbody>
</table>

* Mounting screws are included in subplate order. For valves ordered without subplate, mounting screws must be ordered separately.
R4V10 (1¼") SUBPLATE MOUNTING

Weight: 6 kg

Ports Function
A Pressure (inlet)
B Tank (outlet)
X Remote control or vent connection
Y (Y1) external drain

1) optional from pilot head or subplate. Port Y1 is only available at Drain line (code 2) external from the pilot head.

Panel opening

Block mounting face
Flatness 0.01 mm/100 mm length
Surface finish CLA 1.27 μm

Location hole

Location hole

SUBPLATE

Weight: 8.5 kg

Port sizes 6 Mounting screws*

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Order No.</th>
<th>Port sizes</th>
<th>Dimension</th>
<th>6 Mounting screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS–B–24–G 117</td>
<td>S16–39197–0</td>
<td>A + B G 1⅛&quot;</td>
<td>M 10 x 45</td>
<td>at p ≤ 210 bar = 100 daN/mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X + Y G ⅞&quot;</td>
<td>DIN 912–12.9</td>
<td>at p &gt; 210 bar = 120 daN/mm²</td>
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<tr>
<td></td>
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<td></td>
<td>Order No. 700–71602–8</td>
<td>min. tensile strength</td>
</tr>
</tbody>
</table>

* Mounting screws are included in subplate order.
For valves ordered without subplate, mounting screws must be ordered separately.
R4V03 (3⁄8"") – R4V06 (3⁄4"") THREADED BODY

**R4V03 (3⁄8")**
Weight: 3.2 kg

**R4V06 (3⁄4")**
Weight: 3.3 kg

<table>
<thead>
<tr>
<th>Ports</th>
<th>Function</th>
<th>Port Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (2)</td>
<td>Pressure (inlet)</td>
<td>G ½&quot; or SAE-8 (3⁄4&quot;−16 UNF)</td>
</tr>
<tr>
<td>B</td>
<td>Tank (outlet)</td>
<td>G ½&quot; or SAE-8 (3⁄4&quot;−16 UNF)</td>
</tr>
<tr>
<td>X¹</td>
<td>ext. remote control</td>
<td>G ¼&quot; or SAE-4 (7⁄16&quot;−20 UNF)</td>
</tr>
<tr>
<td></td>
<td>or vent connection</td>
<td></td>
</tr>
<tr>
<td>Y¹ ²</td>
<td>external drain</td>
<td>G ¼&quot; or SAE-4 (7⁄16&quot;−20 UNF)</td>
</tr>
</tbody>
</table>

¹) closed when supplied
²) Port Y1 is only available at drain line (code 2)
   external from the pilot head

<table>
<thead>
<tr>
<th>Ports</th>
<th>Function</th>
<th>Port Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Pressure (inlet)</td>
<td>G ¾&quot; or SAE-12 (1¹⁄₈&quot;−12 UN)</td>
</tr>
<tr>
<td>B</td>
<td>Tank (outlet)</td>
<td>G ¾&quot; or SAE-12 (1¹⁄₈&quot;−12 UN)</td>
</tr>
<tr>
<td>X¹</td>
<td>ext. remote control</td>
<td>G ¼&quot; or SAE-4 (7⁄₁₆&quot;−20 UNF)</td>
</tr>
<tr>
<td></td>
<td>or vent connection</td>
<td></td>
</tr>
<tr>
<td>Y¹ ²</td>
<td>external drain</td>
<td>G ¼&quot; or SAE-4 (7⁄₁₆&quot;−20 UNF)</td>
</tr>
</tbody>
</table>

¹) closed when supplied
²) Port Y1 is only available at drain line (code 2)
   external from the pilot head

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**Ordering Code**

**Back to Content**
R4V06 (1")

Weight: 6.6 kg

R4V10 (1 1/4")

Weight: 5.6 kg

<table>
<thead>
<tr>
<th>Ports</th>
<th>Function</th>
<th>Port Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (2)</td>
<td>Pressure (inlet)</td>
<td>G 1&quot; or SAE-16 (1 1/4&quot;) – 12 UN</td>
</tr>
<tr>
<td>B</td>
<td>Tank (outlet)</td>
<td>G 1&quot; or SAE-16 (1 1/4&quot;) – 12 UN</td>
</tr>
<tr>
<td>X¹</td>
<td>ext. remote control or vent connection</td>
<td>G 1/4&quot; or SAE-4 (5/16&quot;) – 20 UNF</td>
</tr>
<tr>
<td>Y¹²</td>
<td>external drain</td>
<td>G 1/4&quot; or SAE-4 (5/16&quot;) – 20 UNF</td>
</tr>
</tbody>
</table>

¹) closed when supplied
²) Port Y1 is only available at drain line (code 2)
   external from the pilot head

<table>
<thead>
<tr>
<th>Ports</th>
<th>Function</th>
<th>Port Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Pressure (inlet)</td>
<td>G 1 1/4&quot; or SAE-20 (1 1/4&quot;) – 12 UN</td>
</tr>
<tr>
<td>B</td>
<td>Tank (outlet)</td>
<td>G 1 1/4&quot; or SAE-20 (1 1/4&quot;) – 12 UN</td>
</tr>
<tr>
<td>X¹</td>
<td>ext. remote control or vent connection</td>
<td>G 1/4&quot; or SAE-4 (5/16&quot;) – 20 UNF</td>
</tr>
<tr>
<td>Y¹²</td>
<td>external drain</td>
<td>G 1/4&quot; or SAE-4 (5/16&quot;) – 20 UNF</td>
</tr>
</tbody>
</table>

¹) closed when supplied
²) Port Y1 is only available at drain line (code 2)
   external from the pilot head
Screws for additional proportional section installation
4 x \( \frac{3}{8}'' \)-24 UNF x 3 1/2'' lg., order no. 359–15340–0.

Drain Line:
a) only external from the pilot head Y1, to a stable low pressure tank line (for threaded main stage)
b) external from the pilot head Y1, or from the subplate Y to a stable low pressure tank line, (for subplate mounted main stage)

Symbol

Important: On initial start up and after long shut down periods bleed air from this plug.

Note:
See publication 3–EN 220 for information on Electrical Proportional Control Valve. For additional installation with pilot operated control valves please consult DENISON.
**VERSION WITH VENT VALVE VV01**

Weight: (VV01): 1.7 kg

Screws for additional vent valve installation.
4 x 3/8"-24 UNF x 3 1/2" lg., order no. 359–15340–0.

Note:
For full details of the vent valve VV01 refer to bulletin 3–EN 215.

Symbols:
R4V-Relief Valve with Vent Valve VV01

<table>
<thead>
<tr>
<th>Code</th>
<th>Internal Drain</th>
<th>External Drain</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 or 12</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>09 or 10</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
</tr>
</tbody>
</table>

AC ~ 149
DC = 160
**Type of Control-Code 2**
Hand knob 50 mm dia.  
(not for version with vent valve VV01 or P2)

**Type of Control-Code 3**
Acorn nut with lead seal

**Type of Control-Code 4**
Adjusting device with key lock.  
Key must be ordered separately, order-no. 700–70619–8

The product described is subject to continual development and the manufacturer reserves the right to change the specifications without notice.