Piston Accumulators

A Series 250 and 350 bar
Benefits

1, 2 & 3. Shell and Caps

Effective heat dissipation is vital for long seal life. Compact, rugged steel shell and end caps allow heat to dissipate efficiently, while the bore of the accumulator is micro-finished to maximise seal life. Downtime is minimised by the use of threaded caps to simplify maintenance of the accumulator, permitting quick and easy installation of seals.

4. Piston

Rapid response in high cycling applications is assured by Parker’s lightweight piston design. The dished profile of the aluminium piston gives extra gas capacity while maintaining stability in the bore, and permits a greater usable volume of fluid. Piston position sensors, available as an optional feature, enable the condition of the accumulator’s precharge to be monitored.

5. Piston Sealing

Long service intervals are made possible by total separation of oil and gas, even under the most severe operating conditions. Parker’s A Series accumulators feature a wide piston seal assembly comprising a unique five-bladed V-profile O-ring with back-up washers, which eliminates seal roll-over even in high speed applications. The V-O-ring holds full pressure throughout long idle periods between cycles, providing dependable, full pressure storage of hydraulic energy.

6. PTFE Bearing Rings

To reduce wear and extend service life, carbon-filled PTFE bearing rings are fitted, eliminating metal-to-metal contact between the piston and bore.

7. Safety Bleed Grooves

A bleed groove in the gas cap progressively releases unrelieved gas pressure in the accumulator as the gas cap is unscrewed. Note: to avoid the risk of damage or injury, an accumulator must always be discharged before disassembly.

8. Gas Valve

To avoid the risk of damage or injury, an accumulator must be discharged before disassembling. For added safety, the gas valves fitted by Parker vent progressively as they are unscrewed. A robust, cored-type gas valve rated at 350 bar is fitted as standard to all A Series piston accumulators. A mechanically opened and closed poppet-type gas valve cartridge, also rated at 350 bar, is available as an option.

9. Gas Valve Protector

To prevent accidental – and potentially hazardous – damage to the gas valve, the steel gas valve protector reduces the risk to the valve from external impact.

10. Ports

To provide the required flow rate and simplify system design, a wide range of port types and sizes is available. BSPP ports are supplied as standard; ISO, metric and SAE threaded and metric flanged ports to ISO 6162 are available to special order.
Applications

- Industrial Hydraulic Power Units
- Machine Tools
- Automotive
- Marine & Offshore
- Oil & Gas
- Renewable & Wind Energy
- Power Generation
- Mining
- Transport Rail & Truck
- Mobile Construction & Agriculture

Functions

- Dampen Pulsation and Pressure Spikes
- Supply in Emergency - power loss
- Compensate Thermal Changes
- Supplement Flow Requirement - Energy saving
- Compensate External actuator shock

Main Features

Actual Bore Sizes & Maximum Flow Rates

<table>
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<tr>
<th>Model</th>
<th>Pressure</th>
<th>Nominal Bore Ø</th>
<th>Actual Bore Ø</th>
<th>Max. Recommended Flow Rate*</th>
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*Note: Based on 4m/sec maximum piston speed, port & fitting size will become limiting factors for most applications.

Bore Size, Pressures & Temperature Range

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<th>Bore Size (mm)</th>
<th>Max. Working Pressure (bar)</th>
<th>Volume (Litres)</th>
<th>Material Working Temperature Range °C</th>
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Materials

- Shell – high strength steel
- End caps – steel
- Pistons – lightweight aluminium alloy
- Cast iron low temperature Arctic piston available upon request
- Piston and end cap seals – NBR (standard); other compounds to suit application
- Piston seal backup washers – PTFE
- Piston bearing rings – PTFE
- Gas valve assembly – stainless steel
- Gas valve protector – steel
- Paint finish – black primer (standard – others on request)

Custom Designs

For unique applications and hostile environments, different designs, materials and coatings can be supplied. Please contact our engineering department to discuss custom solutions to individual application requirements.
250 and 350 Bar Pressure Ranges
A Series accumulators are available to suit maximum working pressures of 250 and 350 bar. The same premium quality design and technical features guarantee optimum performance and service life from every model, while differing wall thicknesses to suit 250 or 350 bar working pressures allow the designer to specify precisely the right performance envelope for the application.

Available Options
A wide variety of options are available for A Series accumulators, including:
- Threaded and manifold port styles and sizes
- Seal compounds
- Metric and inch mounting styles
- High flow gas ports for use with remote gas storage bottles
- Water service versions
- Gas valves
- Safety fuses
- Accumulator mounting systems
- Precharge monitors and piston position sensors
- Certifications to suit different market requirements

Water Service
A Series piston accumulators are available for use with water as the fluid medium. Modifications include plating of all working surfaces. Please consult Parker for details.

Operating Temperatures, Seals and Fluids
A Series piston accumulators are fitted as standard with nitrile (NBR) seals. A range of alternative seal materials is available for use at higher or lower temperatures, or with synthetic or high water content fluids, as shown in the table. Other seals are also available for use in exceptional conditions – please consult the factory with details of the application. The shells of Parker’s A series accumulators are CE approved for operation at temperatures between -40°C and +150°C.

Seals, Fluids and Temperature Ranges

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<th>Code</th>
<th>Seal Type</th>
<th>&quot;Min Temp&quot;</th>
<th>&quot;Max Temp&quot;</th>
<th>&quot;Fluid Classification&quot;</th>
<th>&quot;Fluid Type&quot;</th>
<th>Maximum Velocity (m/s)</th>
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Filtration
For maximum component life, the system should be protected from contamination by effective filtration. Fluid cleanliness should be in accordance with ISO 4406. The quality of filters should be in accordance with the appropriate ISO standards. The rating of the filter media depends on the system components and the application. The minimum required for hydraulic systems should be class 19/15 to ISO 4406, which equates to 25μ (ß10≥75) to ISO 4572.

Safety
Charging must be carried out by qualified personnel. Before taking any readings or pressurizing with nitrogen, the accumulator must be isolated from the hydraulic system and the fluid side discharged in order to depressurize it. Use only nitrogen (N₂) to pressurize the accumulator.

Danger of Explosion – Never Charge with Oxygen
The types of nitrogen permitted are: type S (99.8% pure); type R (99.99% pure); type U (99.993% pure).

Approvals

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| Other approvals available upon request.

Mounting
The optimum mounting orientation is vertical however angled and horizontal mountings are permissible if the hydraulic fluid is kept clean; high levels of contaminants in the fluid can result in uneven or accelerated seal wear.
### Dimensions

#### 250 and 350 Bar Models, Capacities and Dimensions

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</table>

1 Where the optional poppet-type gas valve is fitted (see page 6), dimension C should be increased by 13mm.

2 A Series piston accumulators are supplied as standard with the metric threaded mounting holes shown in the table. They are also available with inch pattern mounting holes, indicated by the Design Number in the model code – see page 9.
Piston Accumulators

A Series

Gas Valves
The standard gas charging valve fitted to A Series 250 and 350 bar piston accumulators is a cored-type gas valve, rated at 350 bar. A mechanically opened and closed poppet-type gas valve cartridge, also rated at 350 bar, is available as an option.

Optional Features and Spares

Safety Fuses (Burst Discs)
Safety fuses are available on A Series accumulators to prevent over-pressurization of gas due to external heat or excess hydraulic pressure. They comprise a housing incorporating a disc which is calibrated to rupture at a predetermined pressure, to be specific by the customer at the time of ordering. Please contact the factory for further information.

Available Options
If your application requires a piston accumulator, gas bottle, or special option that falls outside of Parker’s broad offering, consult your local distributor, Parker representative, or the factory with your specific requirements. Parker has the manufacturing and engineering expertise to design and build piston accumulators to your exacting requirements, from simple modifications of standard units to complete designs.

Some example of Parker’s past special designs include:
- High Pressures
- Special and Stainless Steel Materials
- Piston Position and Velocity Sensors and Switches
- Water Service
- Non-Standard Capacities
- Extreme Temperatures

Seal Kit Numbers
The seal kits listed contain items 4 (including 5, 6 & 7) and 11.

Parts List
1. Shell
2. Hydraulic cap
3. Gas cap
4. Piston
5. V-O-ring
6. V-O-ring back-up washers
7. PTFE bearing ring (piston)
8. O-ring
9. O-ring back-up washer

Seal Kits
Seal Kit Part Numbers with piston seals assembled (remove the P for a Seal Kit without piston seal assembled)

<table>
<thead>
<tr>
<th>Model</th>
<th>Nitrile NBR</th>
<th>Fluorocarbon Elastomer NBR</th>
<th>Ethylene Propylene NBR</th>
<th>Hydrogenated Nitrile NBR</th>
<th>Carboxilated Nitrile NBR</th>
<th>Low Temp. Nitrile NBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>RK0200K000P</td>
<td>RK0200E000P</td>
<td>RK0200D000P</td>
<td>RK0200H000P</td>
<td>RK0200J000P</td>
<td>RK0200Q000P</td>
</tr>
<tr>
<td>A3</td>
<td>RK0300K000P</td>
<td>RK0300E000P</td>
<td>RK0300D000P</td>
<td>RK0300H000P</td>
<td>RK0300J000P</td>
<td>RK0300Q000P</td>
</tr>
<tr>
<td>A4</td>
<td>RK0400K000P</td>
<td>RK0400E000P</td>
<td>RK0400D000P</td>
<td>RK0400H000P</td>
<td>RK0400J000P</td>
<td>RK0400Q000P</td>
</tr>
<tr>
<td>A5</td>
<td>RK0500K000P</td>
<td>RK0500E000P</td>
<td>RK0500D000P</td>
<td>RK0500H000P</td>
<td>RK0500J000P</td>
<td>RK0500Q000P</td>
</tr>
<tr>
<td>A6</td>
<td>RK0600K000P</td>
<td>RK0600E000P</td>
<td>RK0600D000P</td>
<td>RK0600H000P</td>
<td>RK0600J000P</td>
<td>RK0600Q000P</td>
</tr>
<tr>
<td>A8</td>
<td>RK0800K000P</td>
<td>RK0800E000P</td>
<td>RK0800D000P</td>
<td>RK0800H000P</td>
<td>RK0800J000P</td>
<td>RK0800Q000P</td>
</tr>
</tbody>
</table>
'U' Bolts for Piston Accumulators

<table>
<thead>
<tr>
<th>Model</th>
<th>Part No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>PE1093-4</td>
<td>M6</td>
<td>62</td>
<td>68</td>
<td>70</td>
<td>45</td>
<td>10</td>
</tr>
<tr>
<td>A3</td>
<td>PE1093-1</td>
<td>M8</td>
<td>96</td>
<td>104</td>
<td>92</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td>A4</td>
<td>PE1093-2</td>
<td>M12</td>
<td>128</td>
<td>140</td>
<td>114</td>
<td>76</td>
<td>10</td>
</tr>
<tr>
<td>A5</td>
<td>PE1093-12</td>
<td>M12</td>
<td>158</td>
<td>170</td>
<td>140</td>
<td>76</td>
<td>15</td>
</tr>
<tr>
<td>A6</td>
<td>PE1093-3</td>
<td>M16</td>
<td>180</td>
<td>196</td>
<td>155</td>
<td>95</td>
<td>20</td>
</tr>
<tr>
<td>A8</td>
<td>PE1093-13</td>
<td>M16</td>
<td>234</td>
<td>250</td>
<td>200</td>
<td>95</td>
<td>20</td>
</tr>
</tbody>
</table>

Note: 'U' bolts should be mounted within the distances shown from the end of the accumulator, to avoid deformation of the shell.

Charging and Gauging
The charging and gauging assemblies listed in the table are suitable for use with both the standard cored-type gas valve and the optional poppet type. Each kit contains a UCA assembly incorporating a gas valve, bleed valve and gas chuck, and a 3m long charging hose with standard nitrogen bottle fittings. The kit includes 25 bar and 250 bar pressure gauges, to permit easy monitoring of the gas precharge.

<table>
<thead>
<tr>
<th>Territory</th>
<th>Gas Bottle Fitting</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>5/8 BSP (male)</td>
<td>UCA 02</td>
</tr>
<tr>
<td>France</td>
<td>W 21.7 x 1/14&quot; (female)</td>
<td>UCA 04</td>
</tr>
<tr>
<td>Germany</td>
<td>W 24.32 x 1/14&quot; (female)</td>
<td>UCA 01</td>
</tr>
<tr>
<td>Italy</td>
<td>W 21.7 x 1/14&quot; (male)</td>
<td>UCA 05</td>
</tr>
<tr>
<td>US</td>
<td>0.960 x 1/14&quot; (male)</td>
<td>UCA 03</td>
</tr>
<tr>
<td>Universal</td>
<td>All available fittings (includes all fittings above)</td>
<td>UCA UNI</td>
</tr>
</tbody>
</table>

All dimensions are in millimetres unless otherwise stated.

Please note:
Resistant parts cannot be supplied as spares (tubes/end caps)
Fluid Ports - Standard

<table>
<thead>
<tr>
<th>Port Type</th>
<th>Code</th>
<th>A2 250 bar</th>
<th>350 bar</th>
<th>A3 250 bar</th>
<th>350 bar</th>
<th>A4 250 bar</th>
<th>350 bar</th>
<th>A5 250 bar</th>
<th>350 bar</th>
<th>A6 250 bar</th>
<th>350 bar</th>
<th>A8 250 bar</th>
<th>350 bar</th>
<th>250 bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 3/4 BSPP</td>
<td>Leave Blank</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>G 1 BSPP</td>
<td>Leave Blank</td>
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<td></td>
</tr>
<tr>
<td>G 1 1/2 BSPP</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>G 2 BSPP</td>
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<td></td>
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</table>

Optional Threaded Ports

<table>
<thead>
<tr>
<th>Thread Size</th>
<th>From Model</th>
<th>Code</th>
<th>BSPP</th>
<th>Metric to DIN 3852-1</th>
<th>Metric to ISO 6149-1</th>
<th>SAE Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>G 3/4</td>
<td>A2</td>
<td>RC</td>
<td>M14</td>
<td>A2</td>
<td>YA</td>
<td>#5</td>
</tr>
<tr>
<td>G 1</td>
<td>A3</td>
<td>RD</td>
<td>M18</td>
<td>A2</td>
<td>YB</td>
<td>#6</td>
</tr>
<tr>
<td>G 1 1/4</td>
<td>A3</td>
<td>RE</td>
<td>M22</td>
<td>A2</td>
<td>YC</td>
<td>#8</td>
</tr>
<tr>
<td>G 1 1/2</td>
<td>A4</td>
<td>RF</td>
<td>M27</td>
<td>A2, GD</td>
<td>YD</td>
<td>#10</td>
</tr>
<tr>
<td>G 2</td>
<td>A4</td>
<td>RG</td>
<td>M33</td>
<td>A3, GE</td>
<td>YE</td>
<td>#12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optional Flanged Ports

A Series Piston Accumulators are available with metric flange ports to ISO 6162/3000 psi and ISO 6164/6000 psi as shown in the tables. Inch pattern flange ports and flange ports for higher pressure operation are also available, please consult the factory for details.

ISO 6162 Flanged Port Dimensions

ISO 6164 Flanged Port Dimensions

Flange Ports to ISO 6162/3000 psi

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>From Model</th>
<th>A</th>
<th>B ± 0.25</th>
<th>C ± 0.25</th>
<th>F</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN13</td>
<td>A3</td>
<td>M8</td>
<td>17.5</td>
<td>38.1</td>
<td>13</td>
<td>MT</td>
</tr>
<tr>
<td>DN19</td>
<td>A3</td>
<td>M10</td>
<td>22.3</td>
<td>47.6</td>
<td>19</td>
<td>MI</td>
</tr>
<tr>
<td>DN25</td>
<td>A3</td>
<td>M10</td>
<td>26.2</td>
<td>52.4</td>
<td>25</td>
<td>MV</td>
</tr>
<tr>
<td>DN32</td>
<td>A3</td>
<td>M10</td>
<td>30.2</td>
<td>58.7</td>
<td>32</td>
<td>MW</td>
</tr>
<tr>
<td>DN38</td>
<td>A4</td>
<td>M12</td>
<td>35.7</td>
<td>69.9</td>
<td>38</td>
<td>MJ</td>
</tr>
<tr>
<td>DN51</td>
<td>A4</td>
<td>M12</td>
<td>42.9</td>
<td>77.8</td>
<td>51</td>
<td>ML</td>
</tr>
<tr>
<td>DN64</td>
<td>A6</td>
<td>M12</td>
<td>50.8</td>
<td>88.9</td>
<td>64</td>
<td>MM</td>
</tr>
<tr>
<td>DN76</td>
<td>A8</td>
<td>M16</td>
<td>61.9</td>
<td>106.4</td>
<td>76</td>
<td>MN</td>
</tr>
</tbody>
</table>

Flange Ports to ISO 6164/6000 psi

<table>
<thead>
<tr>
<th>Flange Size</th>
<th>From Model</th>
<th>A</th>
<th>B ± 0.25</th>
<th>F ±0.0 -1.5</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN10</td>
<td>A2</td>
<td>M6 x 1</td>
<td>24.7</td>
<td>10.0</td>
<td>SD</td>
</tr>
<tr>
<td>DN13</td>
<td>A2</td>
<td>M8 x 1.25</td>
<td>29.7</td>
<td>13.0</td>
<td>SE</td>
</tr>
<tr>
<td>DN19</td>
<td>A3</td>
<td>M8 x 1.25</td>
<td>35.4</td>
<td>19.0</td>
<td>SF</td>
</tr>
<tr>
<td>DN25</td>
<td>A3</td>
<td>M10 x 1.5</td>
<td>43.8</td>
<td>25.0</td>
<td>SG</td>
</tr>
<tr>
<td>DN32</td>
<td>A3</td>
<td>M12 x 1.75</td>
<td>51.6</td>
<td>32.0</td>
<td>SH</td>
</tr>
<tr>
<td>DN38</td>
<td>A4</td>
<td>M16 x 2</td>
<td>68.1</td>
<td>38.0</td>
<td>SP</td>
</tr>
<tr>
<td>DN51</td>
<td>A4</td>
<td>M16 x 2</td>
<td>69.3</td>
<td>51.0</td>
<td>SQ</td>
</tr>
<tr>
<td>DN56</td>
<td>A6</td>
<td>M20 x 2.5</td>
<td>83.4</td>
<td>56.0</td>
<td>SX</td>
</tr>
</tbody>
</table>
How to order

Series | Model | Type of Construction | Options | Volume Capacity | Working Pressure | Design Number | Seal Type | Port Size | Gas Port | Pre-Charge
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
A | 4 | E | S | 0005 | L | 2 | K | RF | S | /010

**A Series Accumulator**

**B Bottle**

- **Code**: Bore Size (nominal)
  - 2: 50 A Series
  - 3: 75 A Series
  - 4: 100 A Series
  - 5: 127 A Series
  - 6: 150 A Series
  - 8: 200 A Series

- **Code**: Approval Type
  - E: CE approved

- **Code**: Valve Options
  - S: Cored-type gas valve (standard)
  - W: Cored-type gas valve + water service
  - F: Cored-type gas valve + safety fuse
  - G: Cored-type gas valve + water service + safety fuse
  - M: Poppet-type gas valve
  - L: Poppet-type gas valve + water service
  - P: Poppet-type gas valve + safety fuse
  - R: Poppet-type gas valve + water service + safety fuse

Please see Dimensions table on page 5

- **Code**: Maximum Working Pressure
  - L: 250 bar (A2, A3, A4, A5, A6 & A8)
  - H: 350 bar (A2, A3, A4, A6)

- **Code**: Port
  - 1: Inch mounting + SAE port
  - 2: Metric mounting + BSPP port (standard)
  - 3: Special ports
  - ###: Specials (Parker assigned number)

- **Code**: Service/Fluid
  - K: Nitrile (NBR)
  - E: Fluorocarbon Elastomer (FPM)
  - H: Hydrogenated nitrile (HNBR)
  - D: Ethylene Propylene (EPR)

  - Code: Service/Fluid
    - J: Carboxilated nitrile (XNBR)
    - Q: Low temperature nitrile
    - S: Special - please specify

Please see Fluid Port tables on page 8 (leave blank if standard)

- **Gas Port**
  - Specification (where no valve supplied)
  - Other approvals are available to order - please consult the factory.
  - Where a gas port is specified, no gas valve will be supplied.
  - For other pressure ratings, please consult the factory.

- **Hydraulic and Gas Port Modifications**
  - For accumulators with non-standard ports, specify special gas and/or hydraulic ports and use the appropriate port code from page 8. A typical model number for an accumulator with ISO 6149 hydraulic and gas ports would be: A - 3 - T - M - 0690 - D - 2 - K - YE/YE

- **Gas Port**
  - Pre-Charge (for example)
    - 010: 10 bar
    - 020: 20 bar
Accumulator Sizing Software
Parker Olaer has developed very sophisticated simulation software to optimize accumulator sizing recommendations. The behaviour of accumulators used in applications such as pulsation damping, surge alleviation, thermal expansion and energy storage can be simulated. Our software can be downloaded from our website [www.parker.com/ACDE](http://www.parker.com/ACDE).

You may also contact your local Parker Olaer office for sizing assistance.

Calculating Accumulator Size
Accurate calculation of accumulator size requires many factors to be considered – the working volume of fluid, ambient and maximum operating temperatures, the working pressure range etc. In addition, correction factors must be applied to allow for temperature compensation between the ambient and gas temperatures, and the consequent effect on precharge pressure in the accumulator. Where the working cycle is sufficiently rapid that no heat transfer takes place, the process is termed adiabatic. Conversely, where the process takes place at a constant temperature, it is termed isothermal.

Accumulator Sizing Charts
The charts shown opposite are used to estimate the size of piston accumulator required to provide a given volume of fluid discharge from the accumulator.

The curves are based on the following formula:

\[
\Delta V = 0.855 \frac{V_0 \left( P_2 / P_1 \right)^{1/n} - 1}{\left( P_2 / P_1 \right)^{1/f}}
\]

Where:
- \(\Delta V\) = volume of fluid discharged
- \(V_0\) = Accumulator size
- \(n\) = discharge coefficient
- \(P_2\) = maximum system pressure
- \(P_1\) = minimum system pressure
- \(f\) = charge coefficient

It is assumed that the gas precharge pressure = 0.9 \(P_1\).

Isothermal and Adiabatic Operation
In constructing the curves, the following factors have been assumed.

For isothermal operation eg: slow charge and discharge time, \(f\) and \(n = 1\)

For adiabatic operation, eg: fast charge and discharge time, \(f\) and \(n = 1.8\)

Note: The charts provide an estimate of the volume of accumulator required to store and release a given volume of fluid under specified conditions. In practice, the true charge and discharge coefficients will depend on the application, and may cause significant variations from the chart results. If in doubt, please contact our engineering department for a more detailed calculation.

Where the ratio \(P_2 / P_1\) exceeds 1.9, a fatigue analysis is necessary. Please contact our engineering department for further information.

How to Use the Sizing Chart
These charts are used to find accumulator size \(V_0\) when the required output \(\Delta V\) is known.

Example
Refer to the red lines in the charts opposite.
\(\Delta V = 6\) litres \(P_2 = 170\) bar \(P_1 = 100\) bar

Step 1
As the accumulator output \(\Delta V\) is known, choose the appropriate pair of charts from the two sets shown opposite. For outputs up to 50 litres use charts A and B, and for outputs above 50 litres use charts C and D. In this case, as the required output is 6 litres, charts A and B should be used.

Step 2
Calculate \(P_2 / P_1\) by dividing the maximum system pressure by the minimum pressure required to make the machine function.
In this case, \(170 / 100 = 1.7\)

Step 3
Using chart A, locate 1.7 on the X-axis and draw a vertical line to the top of the chart.

Step 4
Depending on the cycle time, select the appropriate curve on chart A. For fast cycle times, use the adiabatic curve; for slow cycle times, the isothermal curve should be used. In this case, use the adiabatic curve. \((n = 1.8)\)

Step 5
On chart A, identify the point at which the vertical line drawn in step 3 crosses the chosen curve (in this case adiabatic) and draw a horizontal line across to the right hand end of chart B.

Accumulator Sizing Software
Parker Olaer has developed very sophisticated simulation software to optimize accumulator sizing recommendations. The behaviour of accumulators used in applications such as pulsation damping, surge alleviation, thermal expansion and energy storage can be simulated. Our software can be downloaded from our website [www.parker.com/ACDE](http://www.parker.com/ACDE).

You may also contact your local Parker Olaer office for sizing assistance.

Calculating Accumulator Size
Accurate calculation of accumulator size requires many factors to be considered – the working volume of fluid, ambient and maximum operating temperatures, the working pressure range etc. In addition, correction factors must be applied to allow for temperature compensation between the ambient and gas temperatures, and the consequent effect on precharge pressure in the accumulator. Where the working cycle is sufficiently rapid that no heat transfer takes place, the process is termed adiabatic. Conversely, where the process takes place at a constant temperature, it is termed isothermal.

Accumulator Sizing Charts
The charts shown opposite are used to estimate the size of piston accumulator required to provide a given volume of fluid discharge from the accumulator.

The curves are based on the following formula:

\[
\Delta V = 0.855 \frac{V_0 \left( P_2 / P_1 \right)^{1/n} - 1}{\left( P_2 / P_1 \right)^{1/f}}
\]

Where:
- \(\Delta V\) = volume of fluid discharged
- \(V_0\) = Accumulator size
- \(n\) = discharge coefficient
- \(P_2\) = maximum system pressure
- \(P_1\) = minimum system pressure
- \(f\) = charge coefficient

It is assumed that the gas precharge pressure = 0.9 \(P_1\).
Catalogue HY10-4024/UK

**Sizing an Accumulator**

**Step 6**
Using the lower X-axis on chart B, locate the required accumulator output ($\Delta V$), in this case 6 litres. Draw a vertical line to the top of the chart.

**Step 7**
Locate the point where the vertical line drawn in step 6 crosses the horizontal line drawn in step 5. Locate the first curve to the right of this intersection.

**Piston Accumulators**

**A Series**

**Step 8**
Follow the curve selected in step 7 up to the top X-axis (V0) and read off the required accumulator size, in this case 30 litres. Always round up to the next largest size available; for this example, therefore, a 38 litres accumulator should be selected.

**Summary**
- Pre-charge: 90% of 100 bar = 90 bar
- Adiabatic / Isothermal: Adiabatic
- Accumulator selected: A6ES2310L2K

**Accumulator Sizing Chart $\Delta V = 0.1$ to 50 Litres**

**Chart 1**

**Chart 2**

**Chart 3**

**Chart 4**
AE – UAE, Dubai
Tel: +971 4 8127100
parker.me@parker.com

AR – Argentina, Buenos Aires
Tel: +54 3327 44 4129

AT – Austria, Wiener Neustadt
Tel: +43 (0)2622 23501-0
parker.austria@parker.com

AT – Eastern Europe, Wiener Neustadt
Tel: +43 (0)2622 23501 900
parker.easteurope@parker.com

AU – Australia, Castle Hill
Tel: +61 (0)2-9634 7777

AZ – Azerbaijan, Baku
Tel: +994 50 2233 458
parker.azerbaijan@parker.com

BE/LU – Belgium, Nivelles
Tel: +32 (0)67 280 900
parker.belgium@parker.com

BR – Brazil, Cachoeirinha RS
Tel: +55 51 3470 9144

BY – Belarus, Minsk
Tel: +375 17 209 9399
parker.belarus@parker.com

CA – Canada, Milton, Ontario
Tel: +1 905 963 3000

CH – Switzerland, Etoy
Tel: +41 (0)21 821 87 00
parker.switzerland@parker.com

CL – Chile, Santiago
Tel: +56 2 623 1216

CN – China, Shanghai
Tel: +86 21 2899 5000

CZ – Czech Republic, Klecany
Tel: +420 284 083 111
parker.czechrepublic@parker.com

DE – Germany, Kaarst
Tel: +49 (0)2131 4016 0
parker.germany@parker.com

DK – Denmark, Ballerup
Tel: +45 43 56 04 00
parker.denmark@parker.com

ES – Spain, Madrid
Tel: +34 902 330 001
parker.spain@parker.com

FI – Finland, Vantaa
Tel: +358 (0)20 753 2500
parker.finland@parker.com

FR – France, Contamine s’Arve
Tel: +33 (0)4 50 25 80 25
parker.france@parker.com

GR – Greece, Athens
Tel: +30 210 933 6450
parker.greece@parker.com

HK – Hong Kong
Tel: +852 2428 8008
parker.hongkong@parker.com

HU – Hungary, Budapest
Tel: +36 1 220 4155
parker.hu@parker.com

IE – Ireland, Dublin
Tel: +353 (0)1 466 6370
parker.ie@parker.com

IN – India, Mumbai
Tel: +91 22 6513 7081-85
parker.india@parker.com

IT – Italy, Corsico (MI)
Tel: +39 02 45 19 21
parker.italy@parker.com

JP – Japan, Tokyo
Tel: +81 (0)3 6408 3901
parker.japan@parker.com

KR – South Korea, Seoul
Tel: +82 2 559 0400
parker.southkorea@parker.com

KZ – Kazakhstan, Almaty
Tel: +7 7272 505 800
parker.easteurope@parker.com

MX – Mexico, Apodaca
Tel: +52 81 8156 6000

MY – Malaysia, Shah Alam
Tel: +60 3 7849 0800
parker.malaysia@parker.com

NL – The Netherlands, Oldenzaal
Tel: +31 (0)541 585 000
parker.nl@parker.com

NO – Norway, Asker
Tel: +47 66 75 34 00
parker.norway@parker.com

NZ – New Zealand, Mt Wellington
Tel: +64 9 574 1744
parker.nz@parker.com

PL – Poland, Warsaw
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

PT – Portugal, Leca da Palmeira
Tel: +351 22 999 7360
parker.portugal@parker.com

RO – Romania, Bucharest
Tel: +40 21 252 1382
parker.romania@parker.com

RU – Russia, Moscow
Tel: +7 495 645-2156
parker.russia@parker.com

SE – Sweden, Spånga
Tel: +46 (0)8 59 79 50 00
parker.sweden@parker.com

SG – Singapore
Tel: +65 6887 6300

SK – Slovakia, Banská Bystrica
Tel: +421 448 162 520
parker.slovakia@parker.com

SL – Slovenia, Kranj
Tel: +386 5 800 6450
parker.slovenia@parker.com

TH – Thailand, Bangkok
Tel: +66 2 717 8140

TR – Turkey, Istanbul
Tel: +90 216 499 7081
parker.turkey@parker.com

TW – Taiwan, Taipei
Tel: +886 2 2298 9057
parker.taiwan@parker.com

UK – United Kingdom, Warwick
Tel: +44 (0)1926 317 878
parker.uk@parker.com

US – USA, Cleveland
Tel: +1 216 896 3000
parker.us@parker.com

VE – Venezuela, Caracas
Tel: +58 212 238 5422
parker.venezuela@parker.com

ZA – South Africa, Kempton Park
Tel: +27 (0)11 961 0700
parker.southafrica@parker.com

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European Product Information Centre
Free phone: 00 800 27 27 5374
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