Flow Rates of up to 168 l/m at 155 bar and 46 l/m at 636 bar

Established XW and XWH Pumps Developed for use with Potentially Hazardous Chemicals

Chemically Inert, Low Friction Ceramic Pistons

Chemical Injection Motor Pump Unit (CIMPU)

- Flow Rates of up to 168 l/m at 155 bar and 46 l/m at 636 bar
- Established XW and XWH Pumps Developed for use with Potentially Hazardous Chemicals
- Chemically Inert, Low Friction Ceramic Pistons
- Worldwide Approvals
- In Accordance with API 674
- Compact Multi-Piston Pumps Provide Minimal Pressure Pulsation
- Hermetically Tight, Environmentally Friendly Product

Innovative and Reliable Pump Solutions  www.bifold.co.uk
The Bifold Group of companies have provided peace of mind to contractors, installers and end users for over a century. Our innovative range of products, specifically designed with the customer in mind, have gained worldwide approval and credibility for the onerous conditions as found in hazardous (classified) locations, hostile and subsea environments.

The customer requirements for sustained safety and reliability under extreme operating conditions are Bifold Marshalsea’s primary objectives.

Our state of the art production facilities based in the UK, allows our superior and innovative designs to be manufactured to rigorous manufacturing and quality standards. The policy and overall business objective of Bifold Marshalsea, is to provide system packages of the highest quality and in compliance with customer requirements. We guarantee ease of installation and low lifetime cost of ownership - due to superior design, long-life materials, precision manufacturing and testing facilities.

Located in Taunton, UK, Bifold Marshalsea has subsidiary locations in Houston, USA, Singapore and Manchester, UK. The Bifold Group of Companies are supported worldwide with our engineers and a global network of agents and distributors.

The Group have invested in state of the art machining centres ensuring accuracy of close tolerances, and a rapid turnaround capability together with state of the art assembly and testing facilities. The customer can be confident that Bifold Marshalsea has the product portfolio and the technical and production capability to provide the correct solution for their system requirements, and provide support during and after installation.

Bifold Marshalsea provide pumps for use with fluids which include a variety of water-based, fire resistant and other media types. The properties of these fluids include a combination of high or low viscosity with either high or low lubricity.

Various pump models are available for use with water glycol and other calibration fluids.
Overview

The CIMPU is designed for chemical injection and transfer applications using chemical fluids such as methanol or other toxic or inflammable substances. The unit incorporates the XWC or the XWHC pump, developed from the well established Bifold Marshalsea XW and XWH pumps. The positive displacement axial piston XW and XWH pumps feature a double sealing system to prevent the ingress of oil into the process fluid. Bypass from the pistons is collected in an isolated cavity and returned to the inlet side of the pump. The XWC and XWHC versions can have additional galleries and seals designed to prevent high pressure fugitive emissions and provide a hermetically tight product in the event of primary seal failures (Shown in figures 8 & 9). Chemically inert ceramic pistons with an extremely low coefficient of friction are fitted. Ceramic pistons extend the life of the seals and offer pump benefits with long service intervals. The compact three or six piston pumps operate with minimal pressure pulsation and are in accordance with the API 674 standard.

Flow rates of up to 40 l/m with the 15 kW XWC pump and up to 168 l/m with the 50 kW XWHC pump can be provided.

The CIMPU should be mounted horizontally.

The pump models XWC and XWHC are compliant to API 674.

Certification Details

This pump conforms to European Directive 94/9/EC relating to equipment intended for use in potentially explosive atmospheres and is ATEX compliant.

Bifold Marshalsea has been third party assessed and certified as meeting the requirements of ISO 9001: 2000 for the design, development, manufacture and servicing of Hydraulic Pumps, Relief Valves and Pressure Intensifiers.
Features

Smallest Overall Footprint

In Accordance with API 674

Hermetically Tight, Environmentally Friendly Product Option

Established XWC and XWHC Pumps Developed for use with Potentially Hazardous Chemicals

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Quality Assurance
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Chemical Injection Motor Pump Unit (CIMPU)

Features

Compact Multi-Piston Pumps
Provide Minimal Pressure Pulsation

Chemically Inert, Low Friction
Ceramic Pistons

Flow Rates of up to 168 l/m at 155 bar and 46 l/m at 636 bar
The pictures below show the difference in size between a Bifold Marshalsea pump and motor arrangement and a competitors equivalent product.

Advantages with the Bifold Marshalsea arrangement are:

- Smallest Overall Footprint.
- Chemically Inert, Low Friction Ceramic Pistons.
- In Accordance with API 674.
- Compact Multi-Piston Pumps Provide Minimal Pressure Pulsation.
- Hermetically Tight, Environmentally Friendly Product.

LOWEST COST SOLUTION

The pump arrangements illustrated in figure 5 show the difference in size between a competitors arrangement with a large footprint compared to the Bifold Marshalsea compact pump and motor arrangement. All our pump packages provide high performance, and reduction in maintenance and service requirements.

The pumps illustrated in figure 6 show the difference in size between a competitors pump with a large footprint compared to the Bifold Marshalsea compact pump.
Overview

Figure 7 shows Relative Sizes of the Two CIMPU’s

CIMPU with XWC Pump

1051 mm

CIMPU with XWHC Pump

1836 mm

Figure 7

Pump Development for use with Chemical Fluids

The well established XW and XWH pumps with pistons actuated by a single swash plate were originally designed for pumping water-based fluids. They have been developed for use with chemical fluids such as methanol or other toxic or inflammable substances to create the XWC and the XWHC pumps. These pumps use ceramic pistons, as shown below, and incorporate additional galleries and seals to produce a hermetically tight product. The XWC and XWHC pumps feature a double sealing system to prevent the ingress of oil into the process fluid (see figure 16) with any bypass from the pistons collected in an isolated cavity and returned to the inlet of the pump.

Figures 8 & 9 Show Optional Additional Galleries and Seals Designed to Provide a Hermetically Tight Product for use with Toxic Chemical Fluids

XWHC Pump HP Outlet

Return Gallery to Pump Inlet
Primary High Pressure Seal
Secondary Low Pressure Seal

Figure 8

XWHC Pump Delivery Valves

Primary High Pressure Seal
Return Gallery to Pump Inlet
Secondary Low Pressure Seal

Figure 9
Overview

High Density, Close Grained Ceramic Piston

The pump pistons are made from close-grained, high density ceramic material. Figure 10 shows the spherical nature of the grain structure which results in a very low friction running surface. This, in turn, results in a product with a particularly long service life. The chemically inert nature of ceramic also makes it an excellent material for pistons designed to pump chemical fluids.

Suction Valve Lifters

The pumps are fitted with suction valve lifters to assist with priming.

Pump Specifications

<table>
<thead>
<tr>
<th>Pump No.</th>
<th>No. of pistons</th>
<th>Size (inches) x Stroke</th>
<th>Theoretical Flow</th>
<th>Maximum Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>cc/rev</td>
<td>I/m at 1450 RPM</td>
<td>I/m at 1750 RPM</td>
</tr>
<tr>
<td>22500 - 52</td>
<td>3 x 0.562 x 1/3</td>
<td>2.63</td>
<td>3.8</td>
<td>4.6</td>
</tr>
<tr>
<td>22500 - 54</td>
<td>3 x 0.687 x 1/3</td>
<td>3.93</td>
<td>5.7</td>
<td>6.8</td>
</tr>
<tr>
<td>22500 - 62</td>
<td>3 x 0.562 x 2/3</td>
<td>5.26</td>
<td>7.6</td>
<td>9.2</td>
</tr>
<tr>
<td>22500 - 64</td>
<td>3 x 0.687 x 2/3</td>
<td>7.86</td>
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<td>13.7</td>
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<tr>
<td>22500 - 42</td>
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<td>7.90</td>
<td>11.5</td>
<td>13.8</td>
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<td>22500 - 44</td>
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<td>17.0</td>
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<td>22600 - 42</td>
<td>6 x 0.562 x 3/3</td>
<td>15.80</td>
<td>22.9</td>
<td>26.6</td>
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<td>6 x 0.687 x 3/3</td>
<td>23.58</td>
<td>34.2</td>
<td>41.2</td>
</tr>
</tbody>
</table>

Table 1
Pump Performance

XWC Pump Performance

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**Pump Specifications**

**XWHC Pump Specifications**

<table>
<thead>
<tr>
<th>Pump No</th>
<th>No. of pistons</th>
<th>Size (inches)</th>
<th>cc/rev</th>
<th>I/m at 1450 RPM</th>
<th>I/m at 1750 RPM</th>
<th>USg/m at 1450 RPM</th>
<th>USg/m at 1750 RPM</th>
<th>Maximum Pressure</th>
</tr>
</thead>
<tbody>
<tr>
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<td>38</td>
<td>46</td>
<td>10</td>
<td>12.0</td>
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<td>21450 - 02</td>
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<td>46</td>
<td>56</td>
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<td>7499</td>
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<tr>
<td>21450 - 03</td>
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<td>21450 - 10</td>
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<td>139</td>
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<td>172</td>
<td>2495</td>
</tr>
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<td>155</td>
<td>168</td>
<td>41</td>
<td>49.5</td>
<td>155</td>
<td>2248</td>
</tr>
</tbody>
</table>

Table 2

**XWHC Pump Performance**

Graph 3
Pump Performance

XWHC Pump Performance

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Different Pump Styles

Graph 4

Figure 13

XWC Pump

Figure 14

XWHC Pump

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MMC Pump Type for Low Flow Applications

MMC Pump

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<table>
<thead>
<tr>
<th>Pump No</th>
<th>No. of pistons</th>
<th>Theoretical Flow</th>
<th>Maximum Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Size (inches)</td>
<td>cc/rev</td>
<td>l/m at 1450 RPM</td>
</tr>
<tr>
<td>22700 - 01</td>
<td>1 x 0.250</td>
<td>0.2</td>
<td>0.29</td>
</tr>
</tbody>
</table>

Table 3

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Comparison of Pump Types for Water-Based Fluids

Figure 15 shows the internal arrangement of a typical three piston triplex pump design. As can be seen from previous illustrations, pumps of this design are large and occupy a significant level of skid space. An external drive belt and pulley system is needed to drive these pumps. Typically, motors are mounted on top of the pump producing a large unit.

Guarding is required to enclose the belts further adding to the overall footprint and cost. Anti-sparking materials and corrosion protection are necessary for the external drive system components and guards. It is unusual for pumps of this type to be manufactured from stainless steel and as such further corrosion protection required.

Pulsation dampers are generally required when using triplex pumps.

The Bifold Marshalsea compact pump design is shown in figure 16. The motor is close-coupled to the pump, negating the requirement for pulleys and drive belts. There are no exposed rotating parts resulting in improved user and application safety, particularly in hazardous (classified) locations. These pumps are manufactured from 316 Stainless Steel. The flow delivery of these pumps is smoother than with triplex pumps and there is generally no requirement for pulsation dampers. Since the design does not have belts or pulleys and is dynamically balanced, it has extremely low levels of vibration.
Weight
The 15 kW pump weighs 45 kg.
The 50 kW pump weighs 350 kg.

Installation
The units must be mounted horizontally. To ensure that low speed self-priming operates, a positive head must be provided by mounting the process fluid tank above the suction intake line.

Quotations
For this product, variations in ranges of flow rates, operating pressures, control options and other parameters are extensive. If you can provide the information shown opposite, we will be delighted to respond with a specific quotation.

Pump Fluid
Flow rate range required from ___ l/m to ____ l/m.
Operating pressure at discharge flange ______ bar.
Operating pressure at suction flange ______ bar.
Operating temperature, min ______°C to max ______°C.
Density at max operating temperature ______ g/cm³.
Viscosity at max operating temperature ______ cP.
Solids content / solids density ______ %/g/cm³.
Solids grain size / solids hardness ______ mm/Mohs.

Motor Data
Hazardous (classified) location and protection technique requirements.
Voltage, phases and frequency or dc.

Examples of Projects Supply for Pumps of this type

<table>
<thead>
<tr>
<th>Operator</th>
<th>Project / Rig</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
<td>Clair</td>
<td>North Sea</td>
</tr>
<tr>
<td>BP</td>
<td>Nam Con Son</td>
<td>Vietnam Offshore</td>
</tr>
<tr>
<td>BP</td>
<td>Shearwater</td>
<td>North Sea Central (UK)</td>
</tr>
<tr>
<td>BP</td>
<td>Thunderhorse</td>
<td>Gulf of Mexico</td>
</tr>
<tr>
<td>British Gas</td>
<td>Blake</td>
<td>North Sea</td>
</tr>
<tr>
<td>ConocoPhillips</td>
<td>Britannia</td>
<td>North Sea</td>
</tr>
<tr>
<td>Encana</td>
<td>Ross FPSO</td>
<td>North Sea (UK)</td>
</tr>
<tr>
<td>Esso</td>
<td>Balder</td>
<td>Norway</td>
</tr>
<tr>
<td>Statoil</td>
<td>Garn West</td>
<td>North Sea</td>
</tr>
<tr>
<td>Total</td>
<td>Nuggets</td>
<td>North Sea</td>
</tr>
</tbody>
</table>

Table 4
The table above is an extract taken from our main Project Reference List, where our range of pumps have been utilized.
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Innovative and Reliable Pump Solutions

Bifold FluidPower
Bifold Subsea
Marshalsea

Pneumatic and Instrumentation Valves
Hydraulic Valves
Subsea Valves
Hydraulic Pumps, Intensifiers and Valves

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