FLOWSERVE

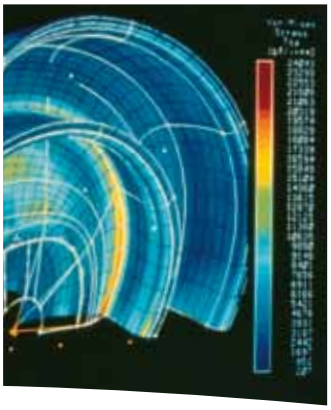
HWMA

Low-Flow, High-Head, Vertical In-line Process Pump With Bearing Housing

ISO 13709/API 610 (OH3)

Experience In Motion






Pump Supplier to the World

Flowserve is the driving force in the global industrial pump marketplace. No other pump company in the world has the depth or breadth of expertise in the successful application of pre-engineered, engineered and special purpose pumps and systems.

Life Cycle Cost Solutions

Flowserve provides pumping solutions that permit customers to reduce total life cycle costs and improve productivity, profitability and pumping system reliability.

Market Focused Customer Support

Product and industry specialists develop effective proposals and solutions directed toward market and customer preferences. They offer technical advice and assistance throughout each stage of the product life cycle, beginning with the inquiry.

Broad Product Lines

Flowserve offers a wide range of complementary pump types, from pre-engineered process pumps, to highly engineered and special purpose pumps and systems. Pumps are built to recognized global standards and customer specifications.

Pump designs include:
- Single-stage process
- Between bearing single-stage
- Between bearing multistage
- Vertical
- Submersible motor
- Rotary
- Reciprocating
- Nuclear
- Specialty

Product Brands of Distinction

ACEC™ Centrifugal Pumps

Aldrich™ Pumps

Byron Jackson® Pumps

Calder™ Energy Recovery Devices

Cameron™ Pumps

Durco® Process Pumps

Flowserve® Pumps

IDP® Pumps

Lawrence Pumps®

Niigata Worthington™ Pumps

Pacific® Pumps

Pleuger® Pumps

Scienco™ Pumps

Sier-Bath® Rotary Pumps

TKL™ Pumps

United Centrifugal® Pumps

Western Land Roller™ Irrigation Pumps

Wilson-Snyder® Pumps

Worthington® Pumps

Worthington Simpson™ Pumps

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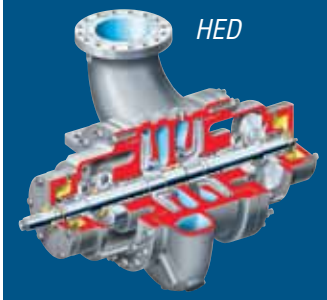
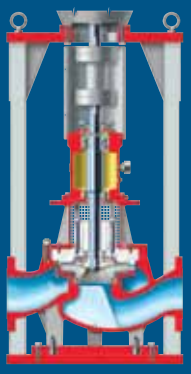
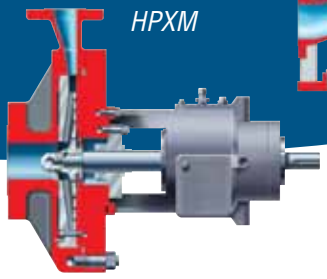
Complementary Pumps







The Preferred Low-Flow, High-Head, Vertical In-line Pump

Fully compliant with the latest edition of ISO 13709/API 610 (OH3), the Flowserve HWMA is a single-stage, vertical in-line overhung pump with a separate bearing bracket. With its small footprint, this low-flow, high-head process pump is a space-saving alternative to many overhung process pumps in upstream and downstream services. Its modular design offers more than 80 best efficiency point (BEP) fits in a single pump size while optimizing efficiency.

Comprehensive Hydraulic Range

The HWMA is one of many vertical in-line process pumps offered by Flowserve. All told, the company's flagship family of vertical in-line process pumps comprises the most comprehensive hydraulic range of low to medium flows and medium to high heads available to the industry. Among these are:

- **HWMA2:** two-stage, vertical in-line, process pump with bearing housing; low-flow high head
- **WMA:** rigidly coupled, single-stage, vertical in-line process pump; low-flow medium head
- **WMA2:** rigidly coupled, two-stage, vertical in-line process pump; low-flow high head
- **PVML:** single-stage, vertical in-line, diffuser pump with extended motor shaft design; conventional hydraulics
- **PVXM:** ISO 13709/API 610 (OH3) single-stage, vertical in-line, diffuser pump with bearing housing; conventional hydraulics
- **MSP:** One- or two-stage, medium speed vertical in-line pump with VFD; low-flow, high head

Broad Application

- Petroleum refining, production and distribution
- Petrochemical processing
- Heavy-duty chemical processing
- Gas industry services
- Boiler circulation
- Water services
- High-temperature applications
- General industrial

Complementary Pump Designs

The HWMA may be used with other Flowserve models of API design. These include:

- Single-stage, horizontal overhung pumps, including the centerline mounted HPXM, which features hydraulics identical to the HWMA
- Single- and two-stage between bearings pumps
- Multistage between bearings pumps
- Vertical, double-casing pumps

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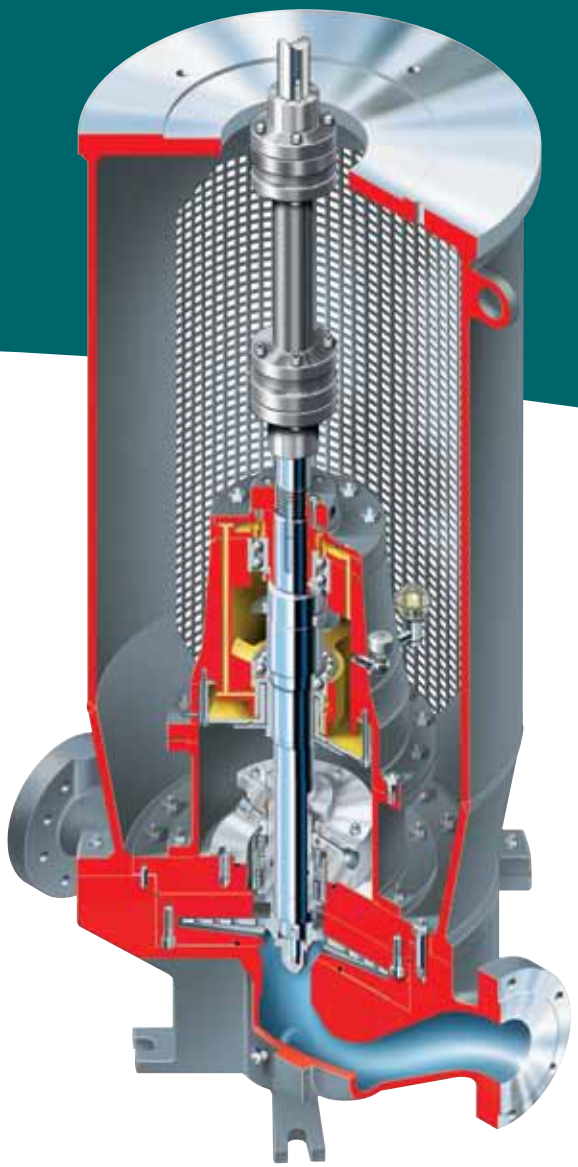
ISO 13709/API 610 (OH3)



Designed to ISO 13709/API 610 (OH3) latest edition requirements, the Flowserve HWMA in-line pump answers the industry's need for stable and efficient low-flow, high-head pumping; the pump's rated flow is at least 80% of BEP even at extremely low flows. More than 80 precision machined impeller and volute insert combinations are contained within one pump size, providing:

- *Optimal hydraulic performance*
- *Reduced power consumption*
- *Low-flow stability*

The result is a lower total cost of ownership than pumps with enclosed impeller designs or pumps that rely on flow-restriction orifices. Maintenance costs are lowered and mean time between repair (MTBR) is extended.

Operating Parameters

- Flows to 45 m^3/h (200 gpm)
- Heads to 220 m (725 ft)
- Pressures to 60 bar (870 psi)
- Temperatures from -50°C (-58°F) to 260°C (500°F)

Features and Benefits

Replaceable Volute Insert permits precise hydraulic customization. Each insert is engineered for specified head and flow requirements. Accommodates future system changes.

Casing and Cover feature metal-to-metal fits with fully confined, controlled compression gasket to ensure proper sealing and alignment.

Raised Face Flanges are to ASME B16.5, Class 300 for one-stage and Class 600 for two-stage models.

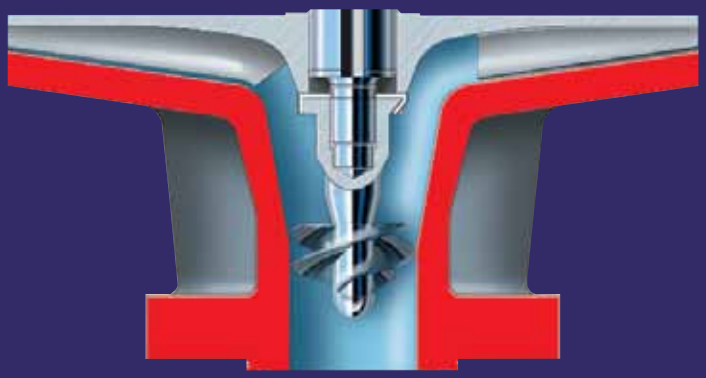
ISO 21049/API 682 Seal Chamber accommodates a wide variety of seal configurations including dual pressurized and unpressurized cartridge types for the most severe services.

Stiff Shaft Design limits deflection at seal faces to 0.05 mm (0.002 in) max. Vibration levels are well below that required by ISO 13709/API 610.

Heavy-Duty Motor Support Head features a registered fit motor mount and does not use spacer plates. Accommodates NEMA, IEC and existing C-face and P-base field drivers. Generously sized openings allow ample access to all bolting and permit the entire wet end assembly, including mechanical seal, to be removed without dismantling the casing or the driver.

Multiple Radial Blade Impeller

Optional Inducer



Reliability, Maintenance and Safety Enhancing Design Features

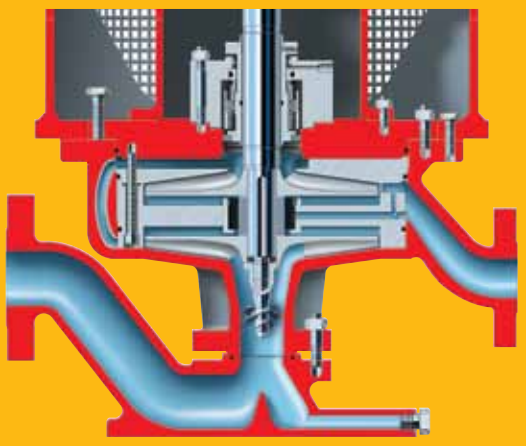
- Choice of bearing lubrication systems:
  - Oil cascade
  - Oil mist
  - Grease
- Only one bearing housing frame and bearing set
- Complete back pullout OH3 design
- Labyrinth type top bearing isolator; Inpro VBX isolators optional
- Flexible disc spacer coupling design
- Standard fan air cooling for extreme operating temperatures (not applicable or needed for oil mist designs)
- Adjustable axial screws for easy driver mount positioning and provided where dowelling driver is not possible or practical
- Coupling guard encloses coupling, pump shaft and motor shaft areas for increased safety
- Optional field extraction tool facilitates removal of complete rotor assembly

Multiple Radial Blade Impeller

The HWMA uses a Barske type, multiple radial blade impeller that provides a continuously rising performance curve with exceptional low-flow stability. Smooth, investment cast surface enables precise, repeatable hydraulic performance. Dynamically balanced for low vibration over a wide flow range, the impeller is secured by an anti-rotation impeller nut.

Optional Inducer Reduces NPSHR

For low NPSH applications, the HWMA can be fitted with an optional inducer. This high suction specific speed, axial flow pumping device provides significant improvement in suction performance by reducing NPSHR.



Available High-Head, Two-Stage Design

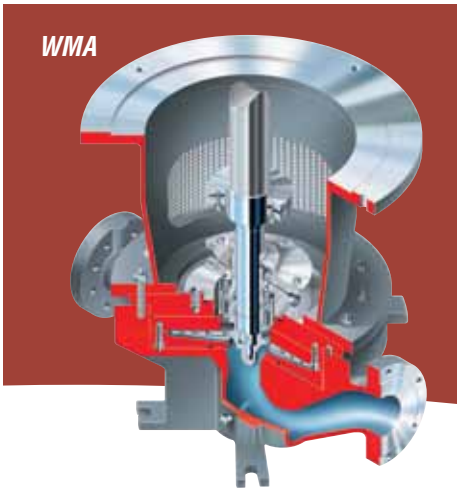
Flowserve offers a two-stage version of the HWMA – the HWMA2 – for high-head applications. The high-head hydraulics in the HWMA2 are achieved using back-to-back, radial blade impellers for equalized axial thrust. The HWMA2 uses conventional two-pole motors without any high-speed gear boxes.

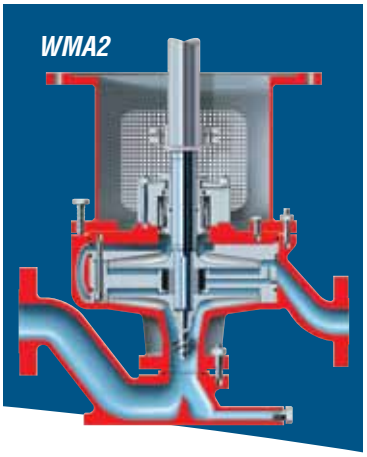
An optional variable frequency drive (to 4000 rpm) provides increased hydraulic coverage.

HWMA2 Operating Parameters

- Flows to 45 m^3/h (200 gpm)
- Heads to 440 m (1445 ft)
- Pressures to 60 bar (870 psi)
- Temperatures from -50°C (-58°F) to 260°C (500°F)

Options and Technical Data





Available Rigid Coupling Design

The WMA is a rigidly coupled, ISO 13709/API 610 (OH4) design vertical in-line pump and features the same hydraulics as the HWMA. The WMA uses a P-base motor and is shorter in height than the ISO 13709/API 610 (OH3) design of the HWMA.

A two-stage rigidly coupled pump – the WMA2 – is also available. The WMA2 is designed to comply with API requirements for OH4 pumps. Like the HWMA2 pump, the high-head hydraulics of the WMA2 are achieved using back-to-back, radial blade impellers and two-pole P-base motors without high-speed gear boxes.

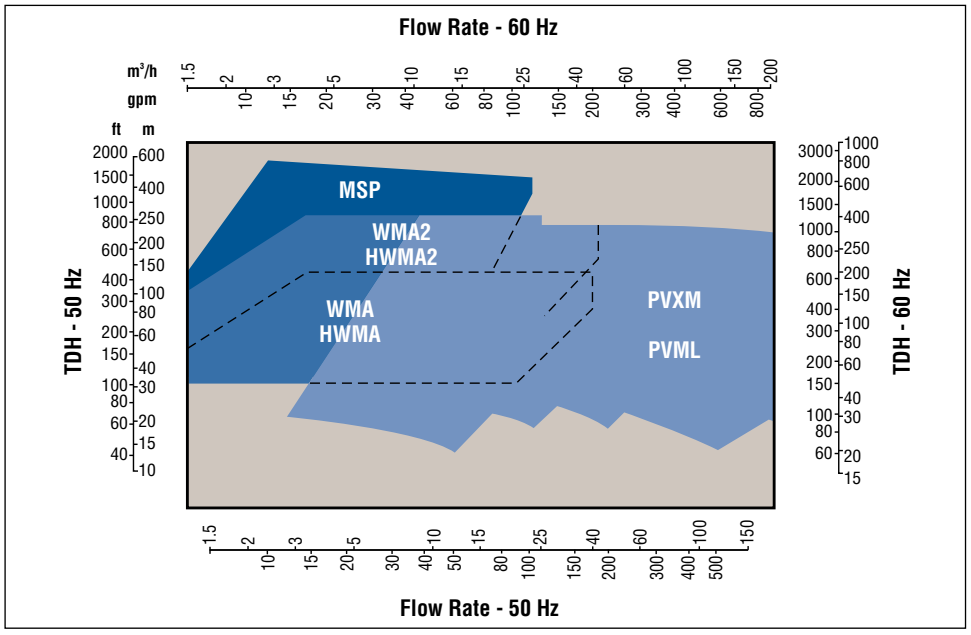
WMA Operating Parameters

- Flows to 45 m^3/h (200 gpm)
- Heads to 220 m (725 ft)
- Pressures to 50 bar (750 psi)
- Temperatures from -50°C (-58°F) to 260°C (500°F)

WMA2 Operating Parameters

- Flows to 45 m^3/h (200 gpm)
- Heads to 440 m (1445 ft)
- Pressures to 60 bar (870 psi)
- Temperatures from -50°C (-58°F) to 260°C (500°F)

Range Chart



Global Service and Technical Support

Life Cycle Cost Solutions

Typically, 90% of the total life cycle cost (LCC) of a pumping system is accumulated after the equipment is purchased and installed. Flowserve has developed a comprehensive suite of solutions aimed at providing customers with unprecedented value and cost savings throughout the life span of the pumping system. These solutions account for every facet of life cycle cost, including:

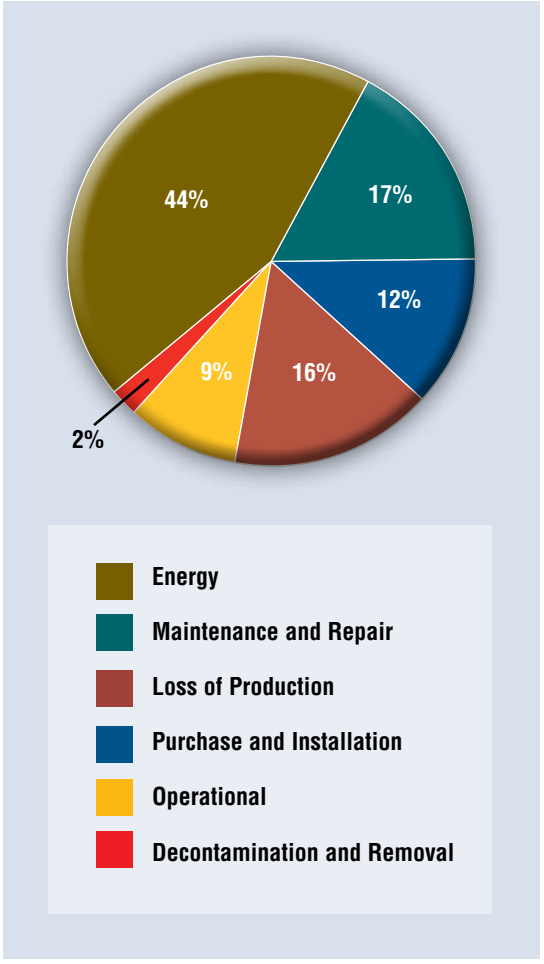
Capital Expenses
- Initial purchase
- Installation

Operating Expenses
- Energy consumption
- Maintenance
- Production losses
- Environmental
- Inventory
- Operating
- Removal

Innovative Life Cycle Cost Solutions

- New Pump Selection
- Turnkey Engineering and Field Service
- Energy Management
- Pump Availability
- Proactive Maintenance
- Inventory Management

Typical Pump Life Cycle Costs[1]



[1] While exact values may differ, these percentages are consistent with those published by leading pump manufacturers and end users, as well as industry associations and government agencies worldwide.

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