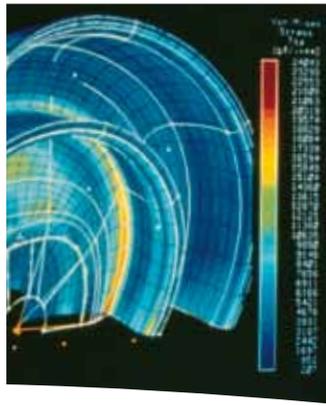


***Gear Pumps  
Between Bearings,  
Herringbone Gear Designs***

GA – GR – Gearex





## ***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 is providing pumping solutions which 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 bearings single-stage
- Between bearings 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*

**GA-GR – Gearex  
Between Bearings,  
Herringbone  
Gear Pumps**



## Superior Engineering and Low Cost of Ownership

*Designed to reliably handle viscous fluids across a broad range of flows and pressures, Flowserve gear pumps feature double helical, herringbone type gears. These pumps are widely used because of their reliability and low cost of ownership. Available in a variety of materials and mounting configurations, these robust pumps provide high-efficiency, pulse-free pumping, even under the most challenging conditions.*

### Advanced External Herringbone Gear Design

- Quiet, pulse-free flow
- Better load carrying ability, greater strength and minimal hydraulic shock
- Gradual, continuous gear tooth engagement ensures smooth flow and no air entrapment
- Elimination of end thrust and no need for thrust bearings with inherently hydraulically balanced design
- High-speed pump capability
- Compatible with off-the-shelf motors

### Benefits of Between Bearings Design

- Improved reliability and extended pump life
- High efficiency
- Minimal shaft deflection
- Long mechanical seal life
- Reduced bearing loads
- Superior TDH and high-pressure capability
- Tolerant of fluids with poor lubricating characteristics
- Reduced wear rates

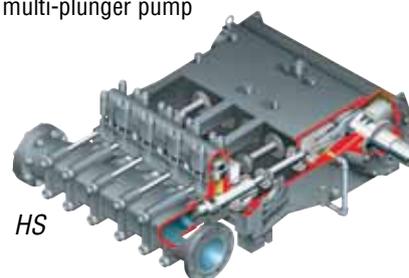
### Applications

- Lube oil/hydraulic oil circulation
- Process industries
- OEM
- Filtration equipment
- Fire foam systems
- Petrochemical blending and transfer
- Food and beverage industry

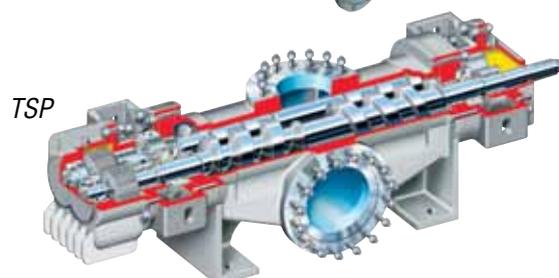
### Complementary Pump Designs

Flowserve also can provide the following complementary pump models:

- TSP double-suction, twin-screw pump
- HS reciprocating multi-plunger pump



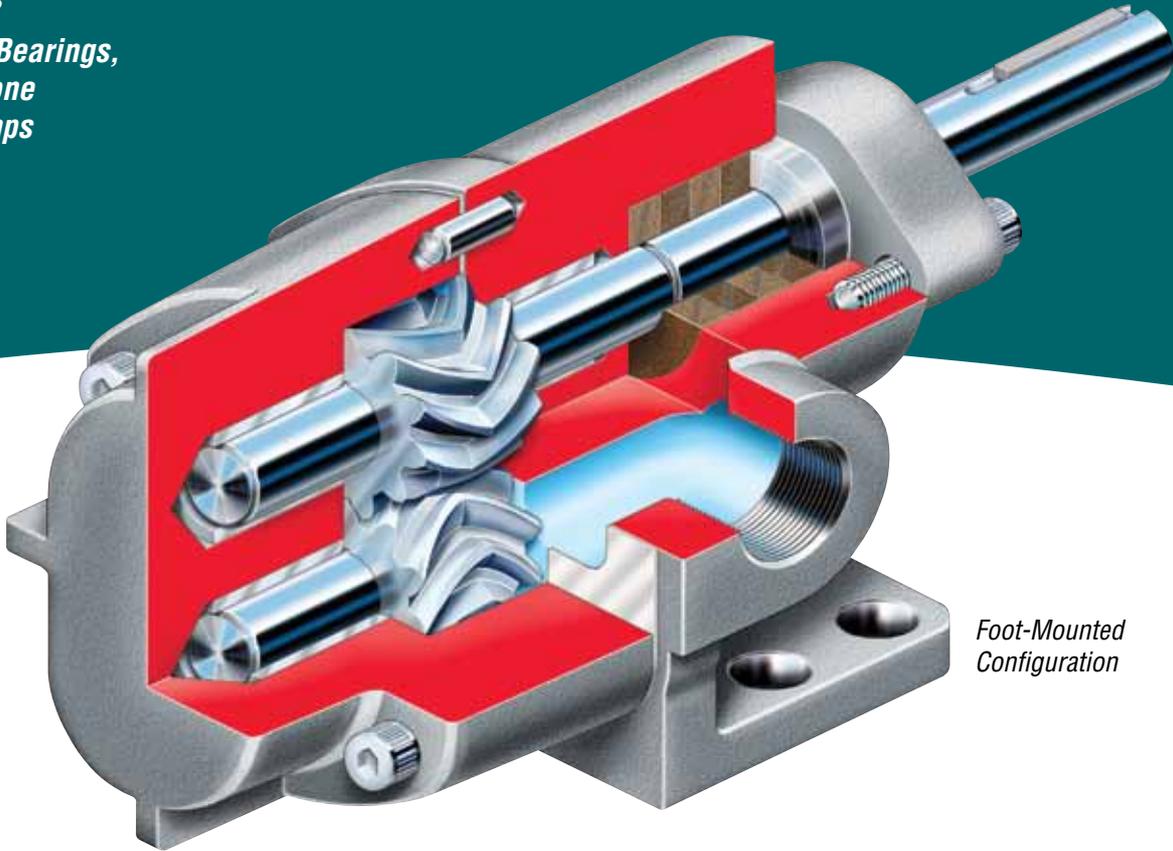
HS



TSP

## GA Series

*Between Bearings,  
Herringbone  
Gear Pumps*



*Foot-Mounted  
Configuration*

*GA Series gear pumps have long been workhorses in highly viscous applications within a multitude of industries due to their dependability, efficiency and low total life cycle costs. Engineered to reliably pump viscous fluids over a broad range of flows and pressures, the GA Series' superior between bearings, external gear design offers the benefits of pulse-free operation, dry-run capability and ease of maintenance.*

### **Operating Parameters**

- Flows to 27 m<sup>3</sup>/h (120 gpm)
- Speeds to 1800 rpm
- Viscosities to 50 000 ssu
- Temperatures to 175°C (350°F)
- Pressures to 17 bar (250 psi)
  - Flange Mounted: to 17 bar (250 psi)
  - Close Coupled: to 10 bar (150 psi)
  - Foot Mounted: to 17 bar (250 psi)

### **Features and Benefits**

**Two-Piece Doweled Construction** ensures accurate alignment and facilitates maintenance by allowing faster access to pump internals without disturbing piping.

**Stuffing Box** on long-coupled configuration allows for ample packing or mechanical seals for greater flexibility. To increase uptime and reduce maintenance costs, the stuffing box is exposed to suction pressure only.

**Full Hydraulic Balance** eliminates need for specialized balancing devices or thrust bearings.

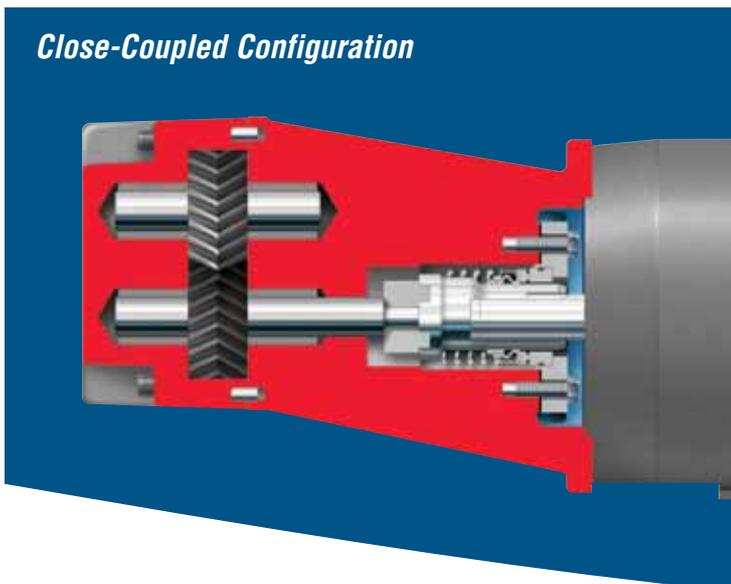
**Suction and Discharge** passages designed for free, even flow and greater suction lift capability.

**Horizontal and Vertical Suction and Discharge Openings** on sizes 1-4 of the flange-mounted and close-coupled designs permit greater piping flexibility.

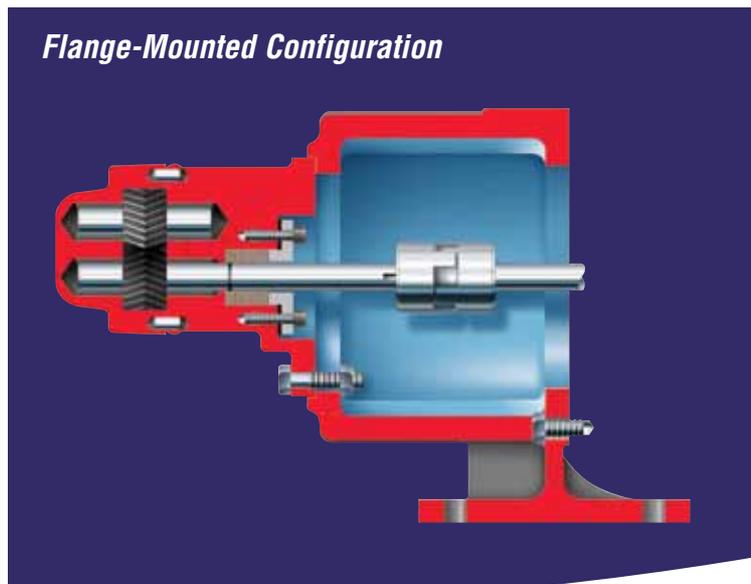
**Standard Carbon Sleeve Bearings** are self-lubricating for handling low-viscosity fluids. Bronze bearings are available for dirty fluid applications.

**Precision Machined Teeth** engage gradually, preventing trapping of liquid and eliminating shock loading.

### Close-Coupled Configuration



### Flange-Mounted Configuration



### Multiple Mounting Configurations

The cast iron GA Series pumps are available in three mounting configurations – foot-mounted, flanged and close-coupled. With its multiple options and modular design, GA Series pumps can be customized to satisfy a wide range of applications.

- **GAS:** Foot-mounted
- **GAF:** Flange-mounted
- **GAC:** Close-coupled

### Available Options

- Integral safety relief valve provides short-term emergency bypass
- Mechanical seal ensures positive sealing
- Mechanical seal with inboard shaft bearing for belt, chain or overhung gear drives
- Bronze sleeve bushings for dirty fluid applications

### Engineered for Low Cost of Ownership

#### Low Installation Costs

- Variety of mounting arrangements
- Horizontal and vertical suction discharge openings
- Stuffing box accommodates packing or mechanical seals

#### Low Maintenance Costs

- Minimal shaft deflection
- Reduced bearing loads and shaft deflection
- Accurate alignment with two-piece dove-tailed construction
- Reduced wear rates

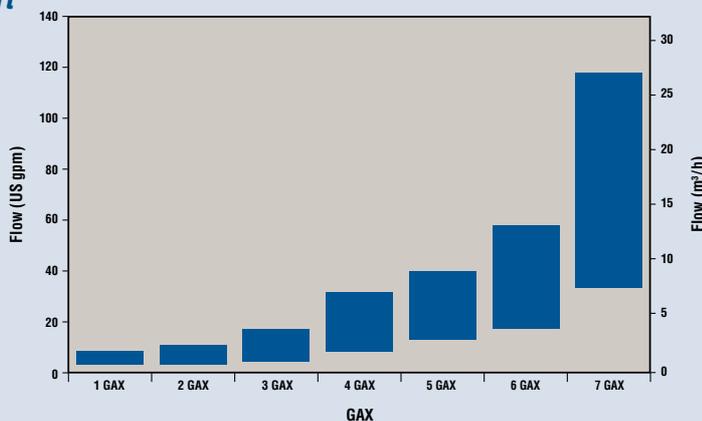
#### Low Operating Costs

- Prolonged service life
- Efficient operation over a broad range of speeds, pressures and viscosities
- No speed reducers
- Only one coupling guard

### GA Series Quick Selection Chart

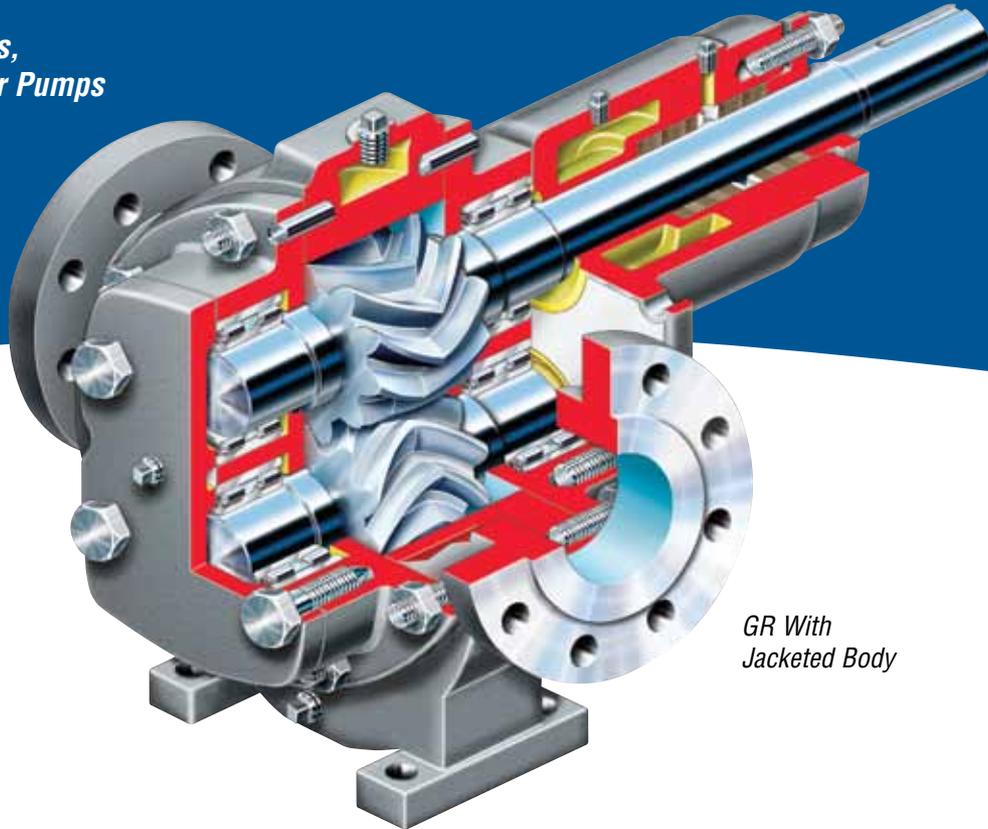
This chart may be used to identify the particular GA Series pump model and the corresponding performance curve at the desired flow rate. It is meant to direct the user to the appropriate performance curve, not to be a substitute for it.

The ranges shown are based on typical viscosities and speeds and assume zero differential pressure.



## GR Series

*Between Bearings,  
Herringbone Gear Pumps*



*GR With  
Jacketed Body*

Capable of higher flows and pressures than GA Series pumps, GR Series pumps provide high efficiency, pulse-free pumping, even under the most challenging conditions. They are designed to handle viscous fluids across a broad spectrum of flows and pressures. The GR Series' simple external design has only two moving parts and only one shaft seal to ensure long life and ease of maintenance.

GR Series pumps are self-priming and available in standard sizes from 40 mm to 200 mm (1.5 in to 8 in) ports. Standard construction is cast iron and carbon steel. For oil and gas applications, an API 676, second edition compliant configuration is available.

### **Operating Parameters**

- Flows to 275 m<sup>3</sup>/h (1200 gpm)
- Pressures to 35 bar (500 psi)
- Temperatures to 350°C (650°F)
- Viscosities to 33 000 cps (1 million ssu)
- Speeds to 1800 rpm

### **Features and Benefits**

**Between Bearings Gear Design** minimizes shaft deflection and reduces bearing loads, improving high-pressure and high-speed capabilities while increasing efficiency and lowering costs.

**Double Herringbone Gears** are deep cut to produce high flow rates with low tip speed and liquid velocity.

**Doweled Sideplates and Body** ensure accurate internal alignment. Joints are ground to maintain clearances and eliminate the need for gaskets.

**Convertible Stuffing Box** allows for ample packing or mechanical seals to be used for greater flexibility.

**Large, Unobstructed Suction and Discharge** passages keep entrance losses and turbulence to a minimum.

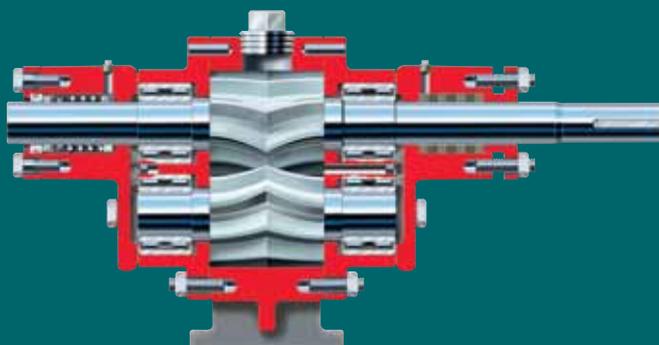
**High-Capacity Double-Row Roller Bearings** are anti-friction to assure long life.

**Optional Babbitted Carbon Sleeve Bushings** may be used when handling liquids with poor lubricity or low viscosities. Also available in antimony impregnated carbon for high-temperature applications.

**Shafts** are generously sized to minimize deflection.

**Back Pullout Design** facilitates maintenance and enables inspection without disturbing piping.

### GR With Dual Stuffing Box and Optional Mechanical Seal



### Three Standard Configurations

The GR pump is available in three basic gear widths and with multiple options. With its modular design, the GR can be customized to satisfy a wide range of applications.

- **GR:** Standard gear width
- **GRW:** Wide gears for higher capacities
- **GRH:** Narrow gears for higher pressures



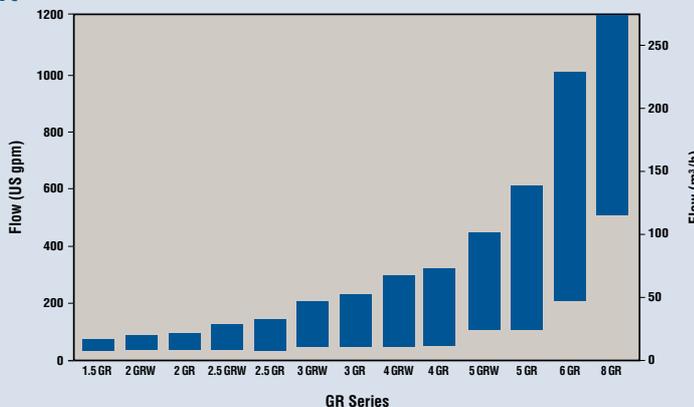
### Available Options

- Dual stuffing box with external bearing for high suction pressure applications
- Jacketed pump body maintains constant fluid temperature and viscosity
- Jacketed stuffing box
- Direct V-belt drive carries the load of mechanical power transmission equipment without shaft deflection. Includes inboard bearing and mechanical seal
- INSUROCK® Low-Friction Wearplates may be used to reduce sideplate and gear wear in low viscosity applications
- Mechanical seal
- API 676, second edition, compliance

### GR Series Quick Selection Chart

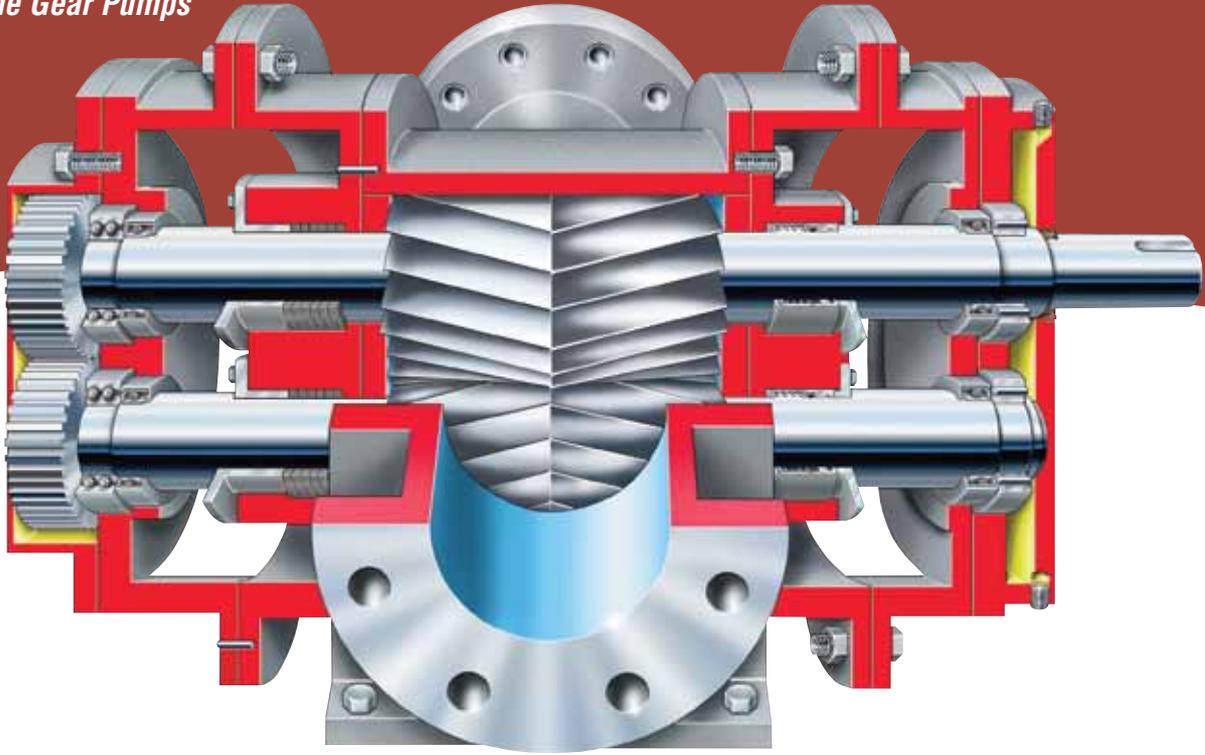
This chart may be used to identify the particular GR Series pump model and the corresponding performance curve at the desired flow rate. It is meant to direct the user to the appropriate performance curve, not to be a substitute for it.

The ranges shown are based on typical viscosities and speeds and assume zero differential pressure.



## *Gearex*

### *Between Bearings, Herringbone Gear Pumps*



*Extremely rugged and unusually compact for its high capacity and range, the Gearex rotary pumps are generally compliant with API 676, second edition. Precision machined herringbone pumping gears provide low vibration, pulseless discharge while timing gears quietly and evenly transfer power to the driven rotors, ensuring minimal wear and long life.*

The Gearex pump is directly connected to motors up to 1800 rpm. They do not require a heavy foundation, belts or reduction gears, thereby minimizing their total cost of operation.

#### **Operating Parameters**

- Flows to 180 m<sup>3</sup>/h (800 gpm)
- Pressures to 20 bar (300 psi)
- Temperatures from -50°C (-60°F) to 450°C (850°F)
- Viscosities from 32 to 1 million ssu
- Speeds to 1800 rpm

#### **Features and Benefits**

**External Timing Gears** evenly transmit power to the rotors while eliminating rotor contact and promoting long pump life.

**Between Bearings Design** virtually eliminates shaft deflection, even under highly viscous loads.

**Split Bracket Construction** facilitates maintenance.

**Heavy-Duty Ball and Roller Bearings** support the rotating element to prevent contact with the housing, thus reducing wear on the rotors and the body bore.

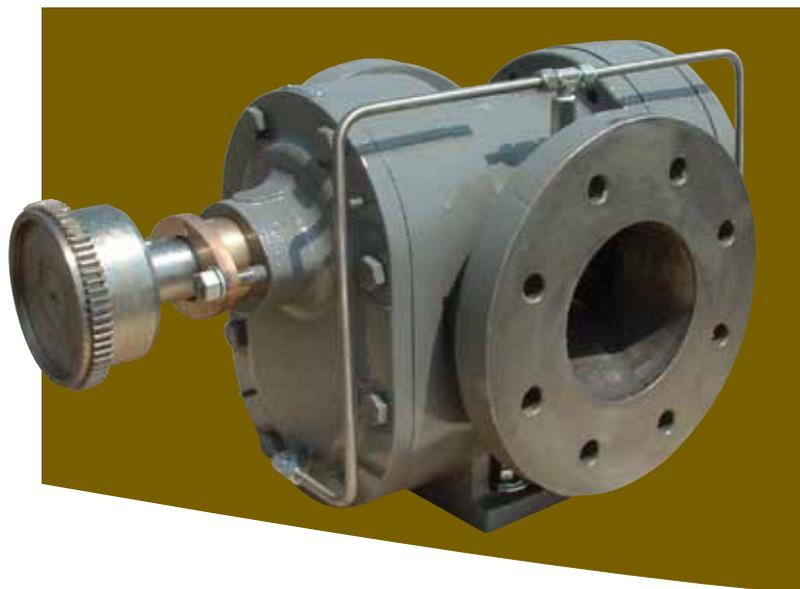
**Externally Lubricated Bearing** design is well suited for corrosive, erosive, non-lubricating and run-dry services.

**Conventional Packing and Glands** are standard, but mechanical seals are easily accommodated.

**Standard Motor Speeds** can be used, eliminating V-belt drives and gear reducers.

**High Carbon Steel Shafts** are machined and ground to close tolerances for accurate fit, symmetrical clearance and precise alignment.

**Directly Connected** to motors up to 1800 rpm, Gearex pumps do not require heavy foundations, belts or reduction gears.



### No Contact Between the Pumping Gears

Gearex timing gears transfer power to the rotors quietly and evenly. This design prevents metal-to-metal wear, promotes long pump life and reduces maintenance costs. The timing gears also make it possible to build external design Gearex pumps in stainless steels.

### Vertical Mounting Configurations\*

- Submerged sump configuration cold oil handling
  - Eliminates high suction lift
  - Conserves floor space
  - Ensures flooded suction without need for foot valves
- Pedestal configuration bolts to floor or wall and is ideal for commercial marine and navy service
  - Conserves space
  - Straight through flow
  - All parts are easily accessible

\*Require internally lubricated bearings.

### Split Brackets Ease Maintenance

An option for external bearing pumps, split brackets are easily separated to facilitate seal maintenance. When seal service is required, the bearing half of the bracket can be removed, offering full access to individual mechanical seals.

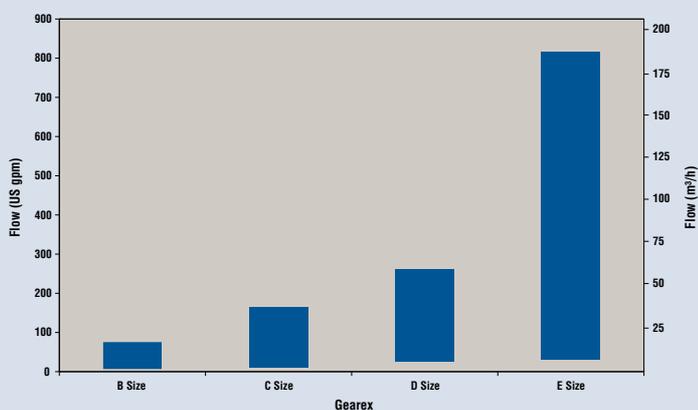
### Available Options

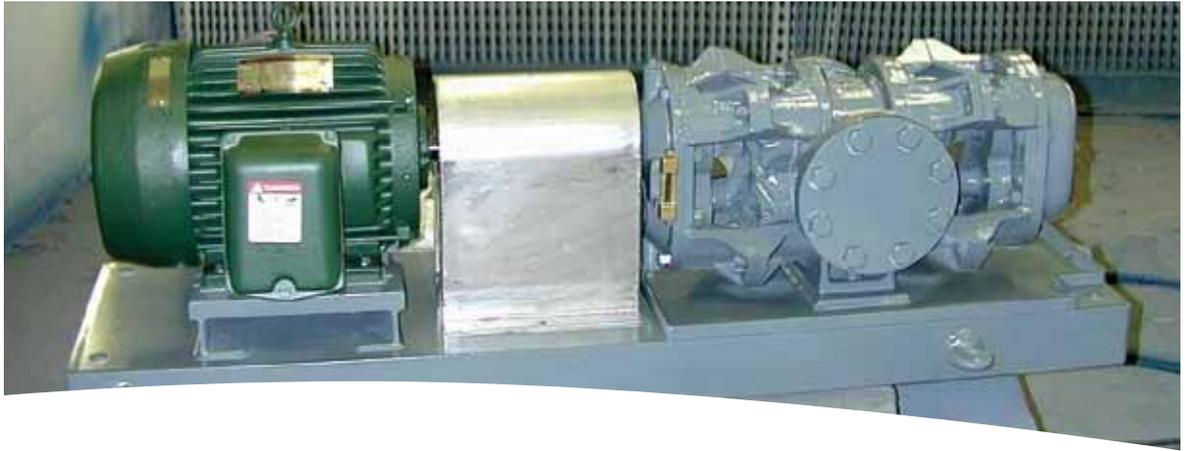
- Flange mounting brackets for engine mounting lube oil pumps
- Jackshafts for V-belt drives
- Portable, truck mounted design
- Jacketed bodies to prevent hardening of heavy liquids
- Special shaft lengths
- Water-cooled bearings
- Lantern rings
- Mechanical seals
- Internally lubricated bearings

### Gearex Quick Selection Chart

This chart may be used to identify the particular Gearex pump model and the corresponding performance curve at the desired flow rate. It is meant to direct the user to the appropriate performance curve, not to be a substitute for it.

The ranges shown are based on typical viscosities and speeds and assume zero differential pressure.





### Materials of Construction

Component	GA Series	GR Series		Gearex		
	Cast Iron	Cast Iron	Cast Steel	Cast Iron	Cast Steel	Stainless Steel
<b>Body</b>	ASTM A278, Class 30 Cast Iron	ASTM A48, Class 40 Cast Iron	ASTM A48, Class 1040 Carbon Steel	ASTM A48, Class 30 Cast Iron	ASTM A216 Grade WCB	316 SS
<b>Bracket</b>		–	–		ASTM A48, Class 30 Cast Iron	
<b>Shaft</b>	ASTM A108, Class 1040 Carbon Steel	ASTM A108, Class 1040 Carbon Steel		AISI 1040 or 1060 Steel		
<b>Rotor Spacers</b>	–	–	–	Fine Grain Cast Iron		17-4PH SS
<b>Bushing</b>	Babbitted Carbon	Babbitted Carbon*		–	–	–
<b>Packing</b>	Graphited Acrylic Yarn (GASP and GAFP Only)	Acrylic Yarn	Graphited	Carbon Filled TFE		PTFE
<b>Pumping Gears</b>	Highly Pearlitic Cast Iron	Cast Iron	Cast Iron	Sizes B and C: AISI 1040 or 1060 Steel; Sizes D and E: Fine Grain Cast Iron		316 SS
<b>Timing Gears</b>	–	–	–	AISI 4150 or 8620 Heat Treated Steel		

\*Optional

### Flowserve Quality Herringbone Gears

Double herringbone rotors provide hydraulic balance to avoid undesired thrust on the bearings. This design also allows for gradual meshing, resulting in quiet operation while minimizing pulsation and in turn reducing vibration.



Performance Characteristic	Spur Gears	Single Helical Gears	Double Helical Herringbone Gears
<b>Axial Balance</b>	Yes	No	Yes
<b>Low Noise</b>	No	Yes	Yes
<b>Low Pulsation</b>	No	Yes	Yes

**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

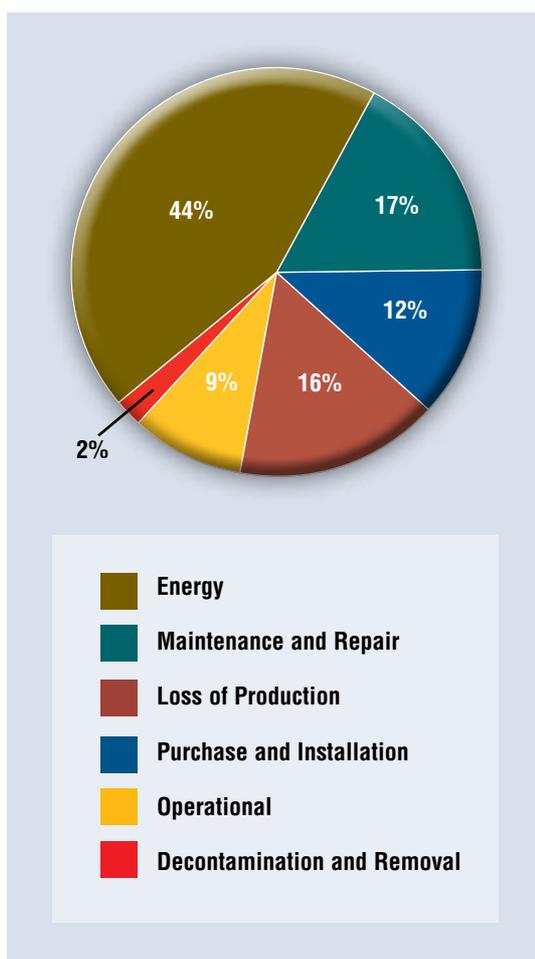
### Operating Expenses

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

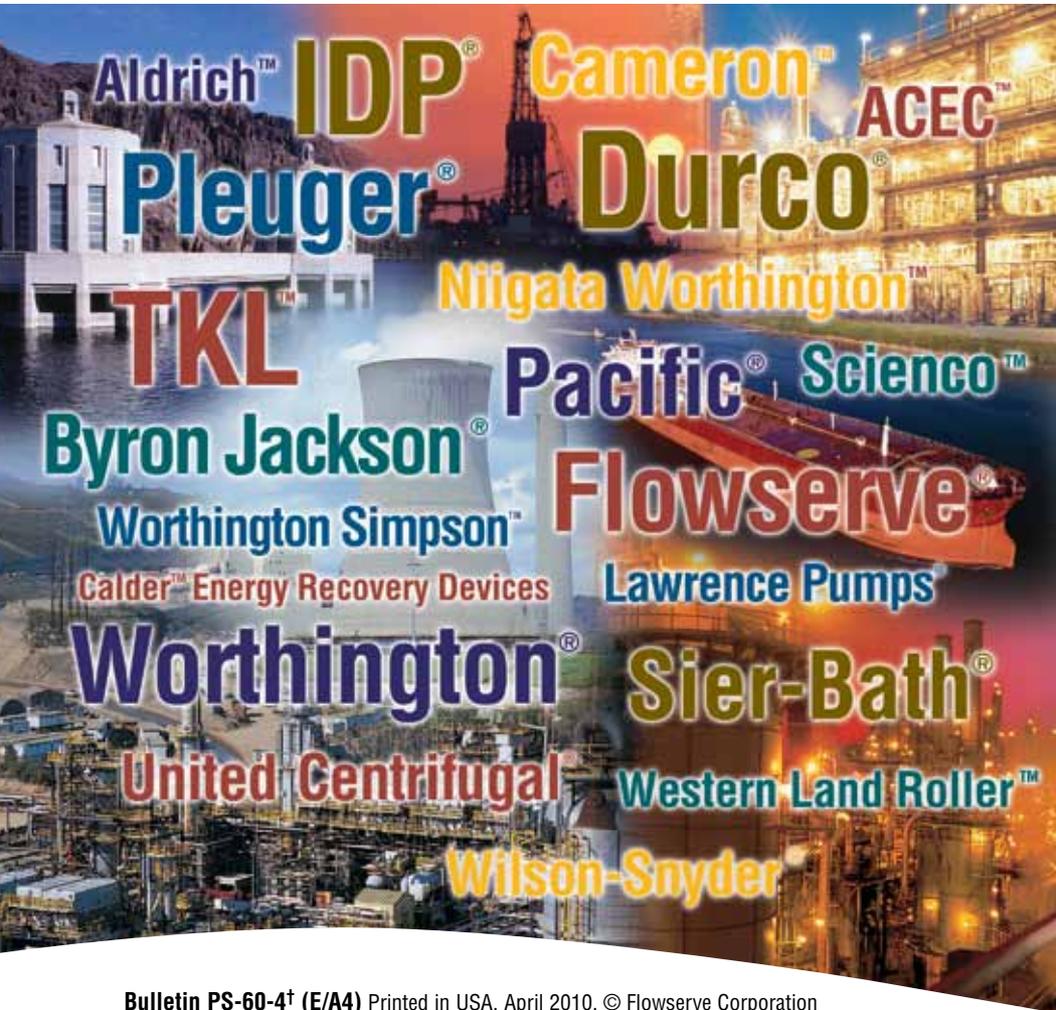
### Innovative Life Cycle Cost Solutions

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

### Typical Pump Life Cycle Costs<sup>1</sup>



<sup>1</sup> 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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