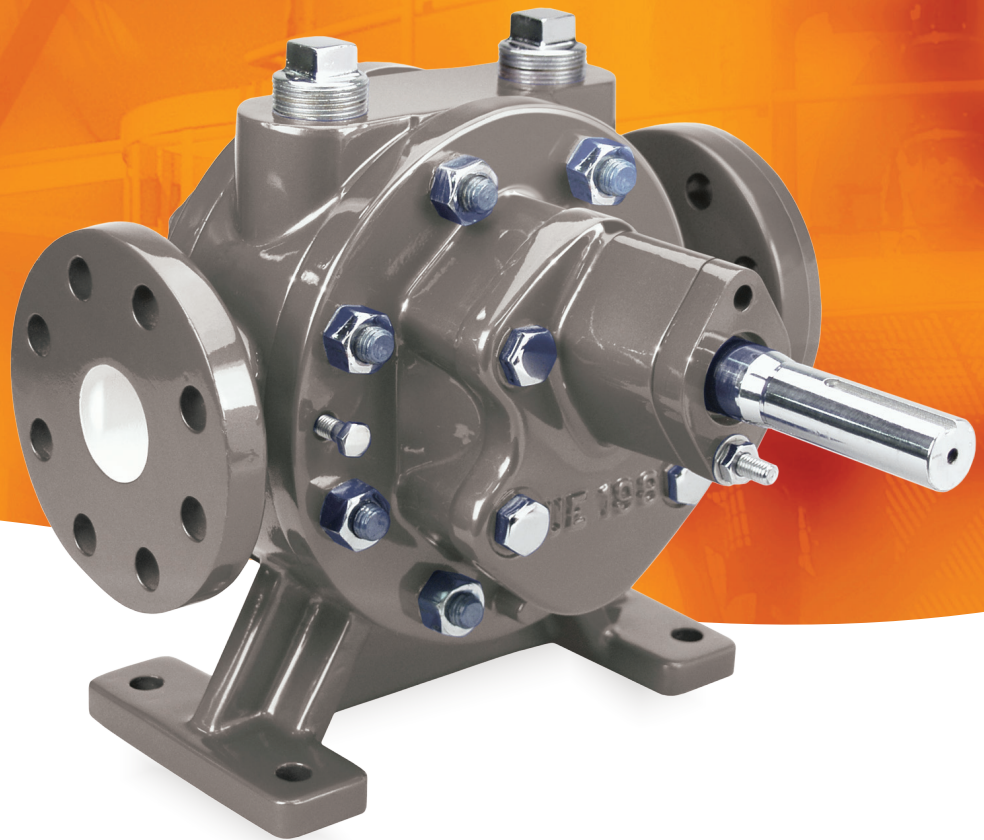


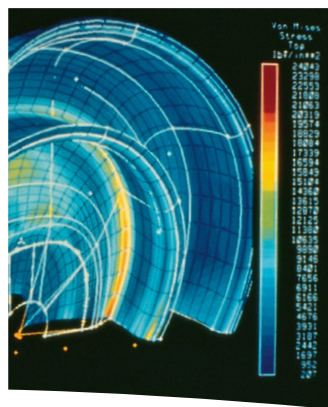
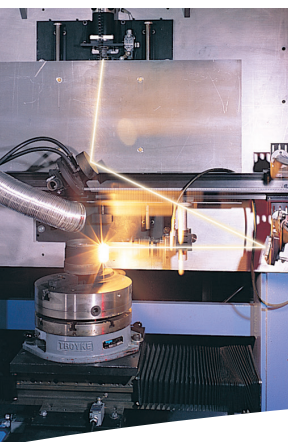


Gear Pumps Between Bearings, Herringbone Gear Designs

GA – GR – Gearex



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 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

Scienco™ Pumps

Sier-Bath® Rotary Pumps

TKL™ Pumps

United Centrifugal® Pumps

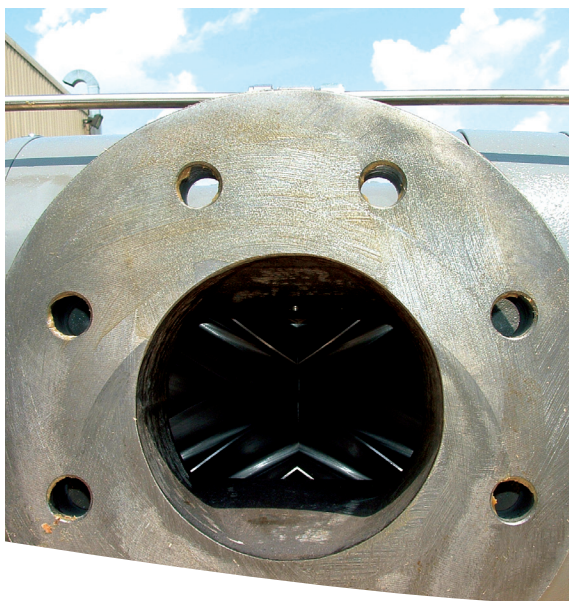
Western Land Roller™ Irrigation Pumps

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

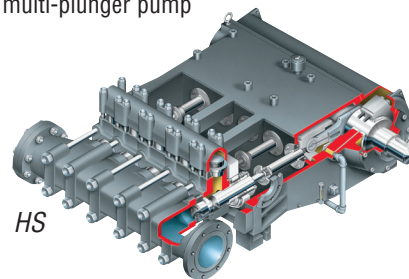
Applications

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

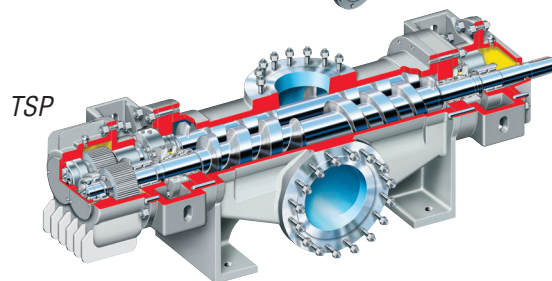
Complementary Pump Designs

Flowserve also can provide the following complementary pump models:

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

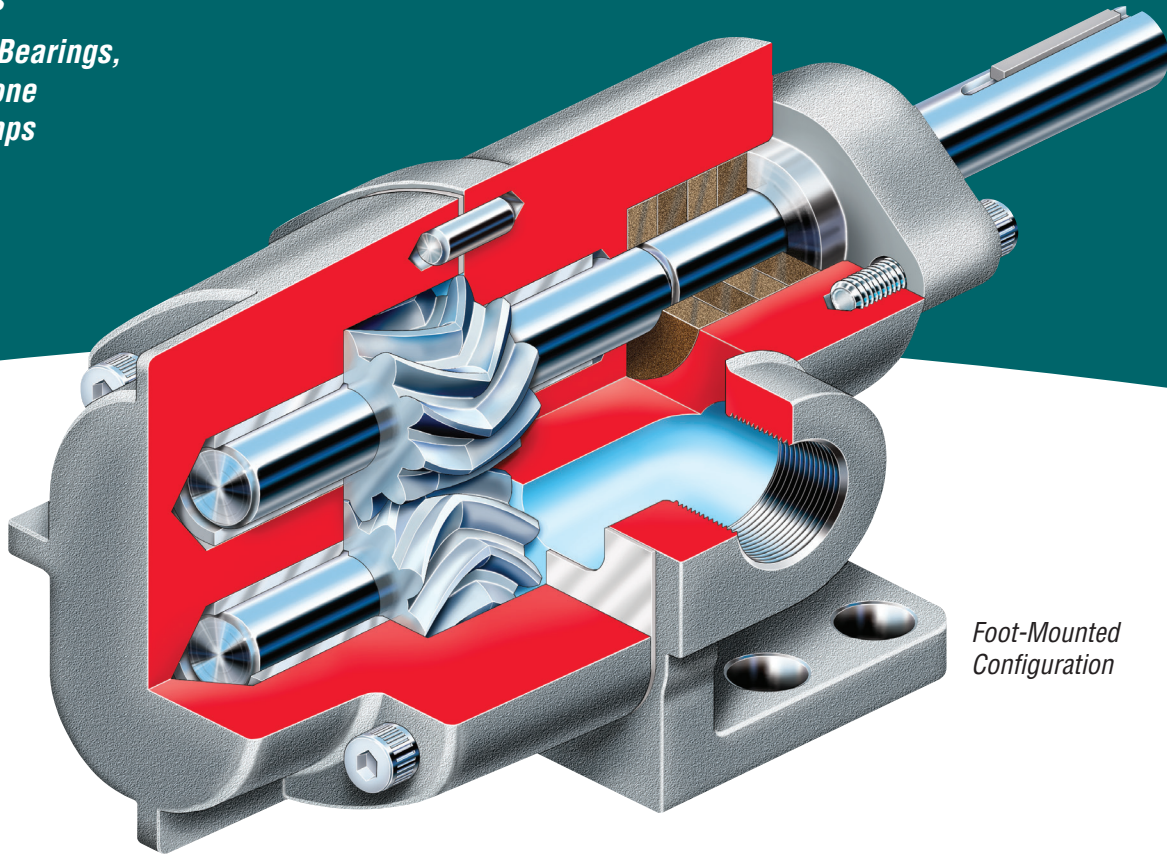


HS



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 m³/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.

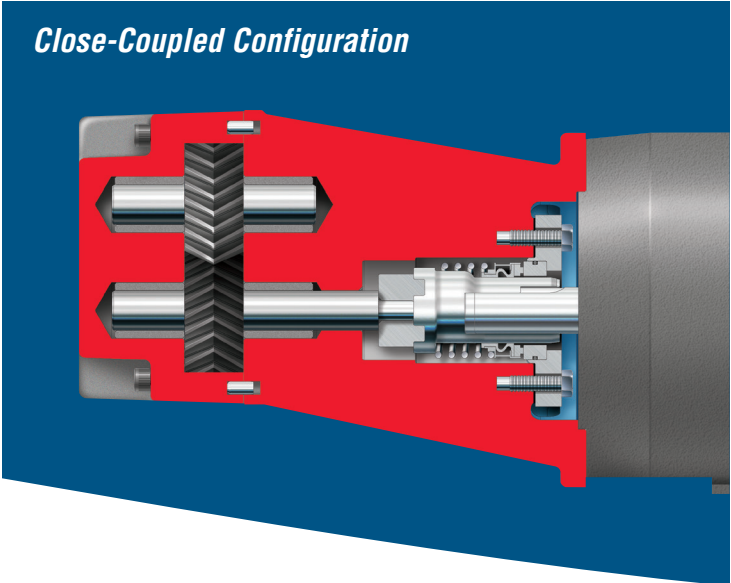
Suction and Discharge passages designed for free, even flow and greater suction lift capability.

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

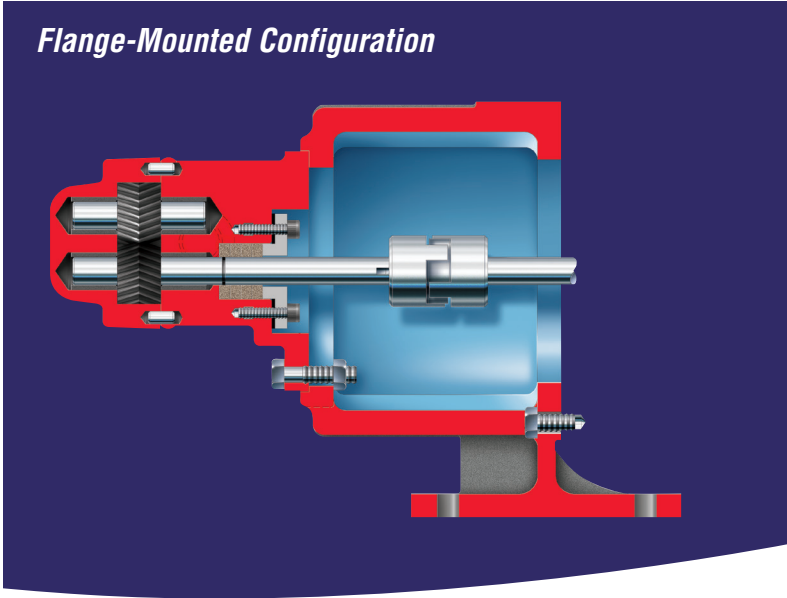
Standard Carbon Sleeve Bearings are self-lubricating for handling low-viscosity fluids. Bronze bearings are available for dirty fluid applications.

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 doweled construction
- Reduced wear rates

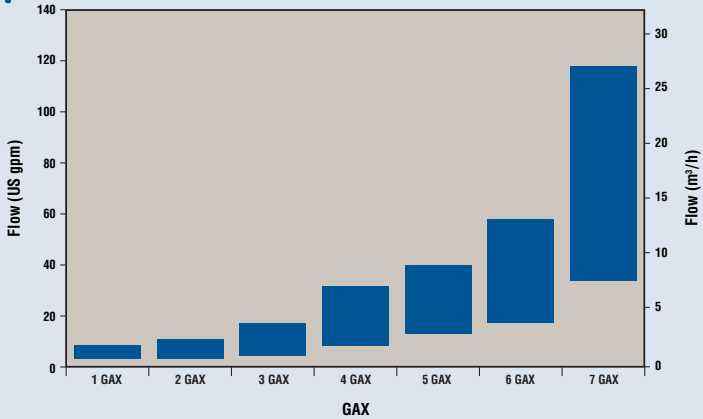
Low Operating Costs

- 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

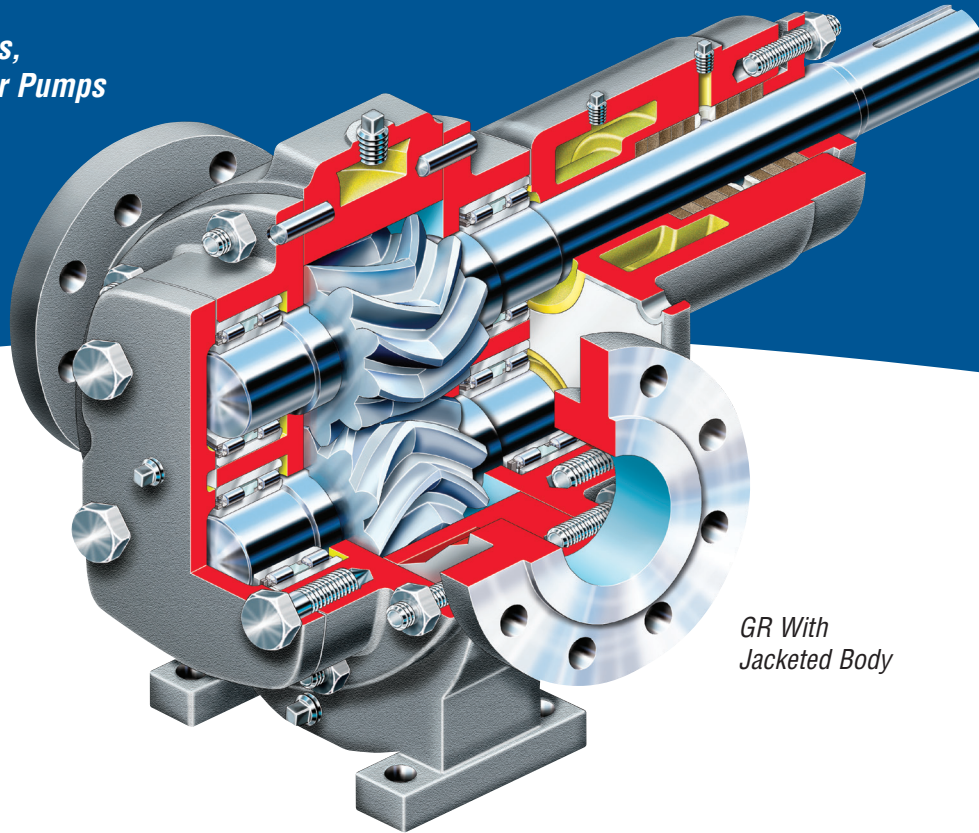
This chart may be used to identify the particular GA Series pump model and the corresponding performance curve at the desired flow rate. It is meant to direct the user to the appropriate performance curve, not to be a substitute for it.

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 m³/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.

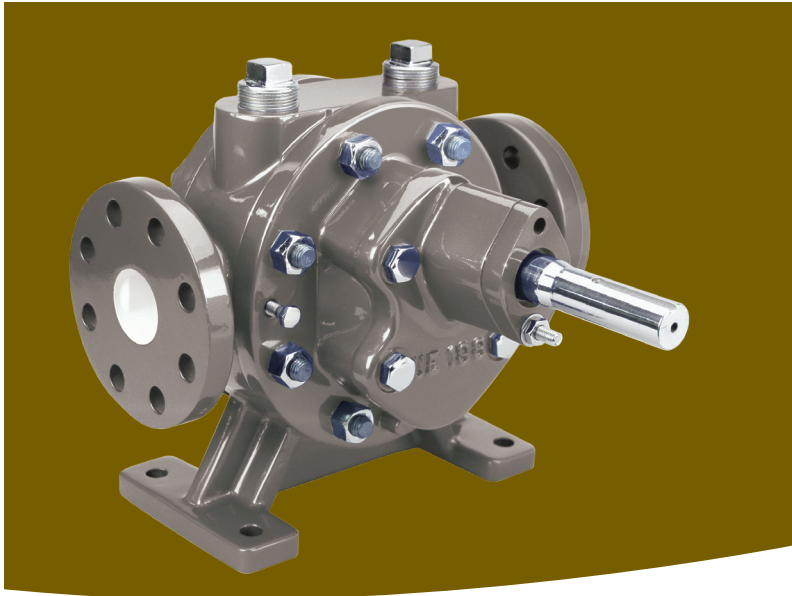
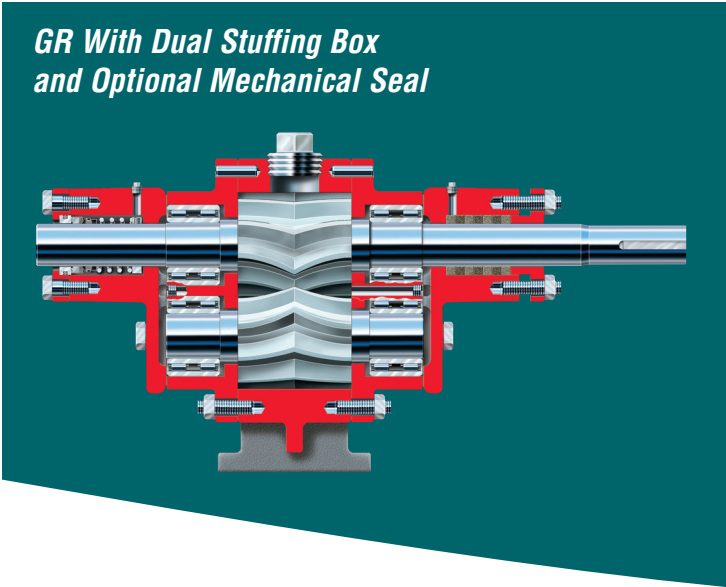
High-Capacity Double-Row Roller Bearings are anti-friction to assure long life.

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.

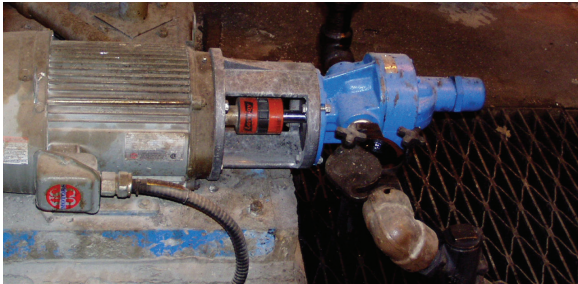
GR With Dual Stuffing Box and Optional Mechanical Seal



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

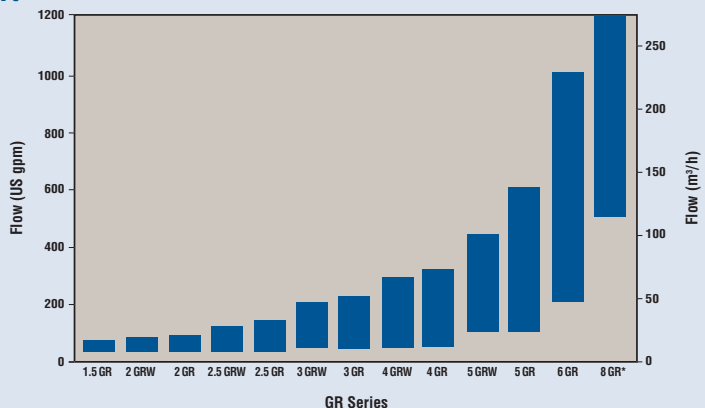
- Dual stuffing box with external bearing for high suction pressure applications
- Jacketed pump body maintains constant fluid temperature and viscosity
- Jacketed stuffing box
- Direct V-belt drive carries the load of mechanical power transmission equipment without shaft deflection. Includes inboard 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.

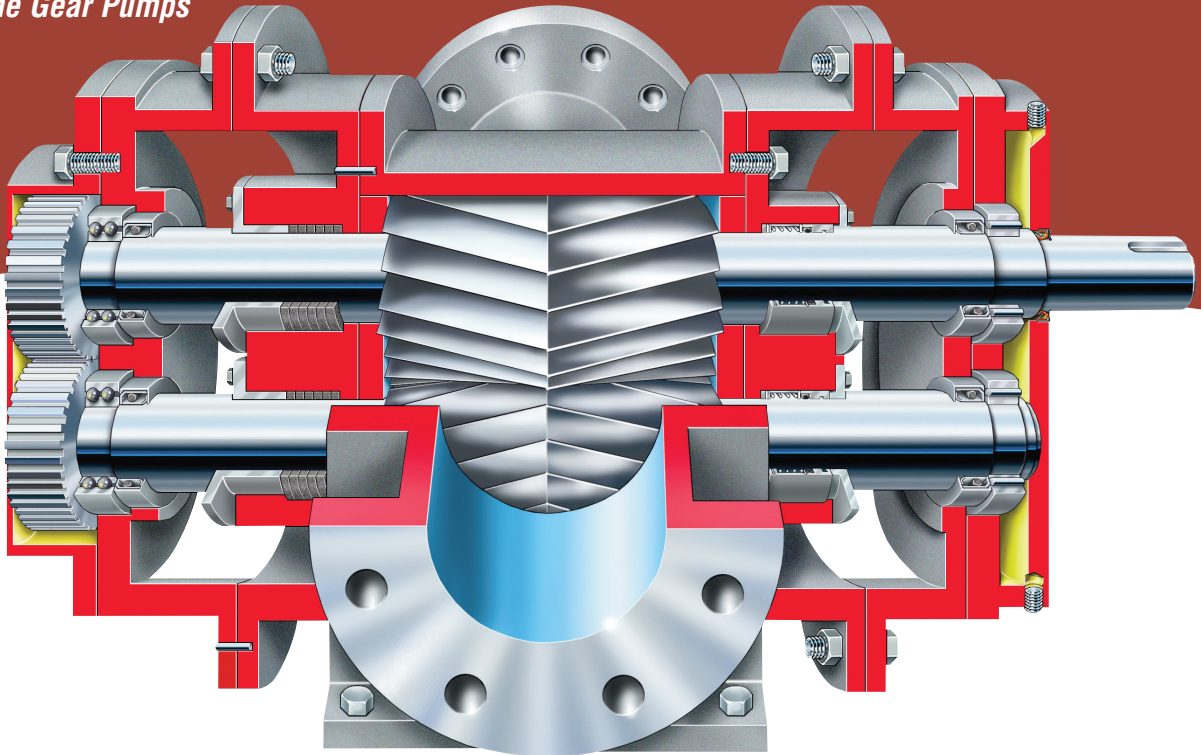
The ranges shown are based on typical viscosities and speeds and assume zero differential pressure.

*Available upon request.



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 m³/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.

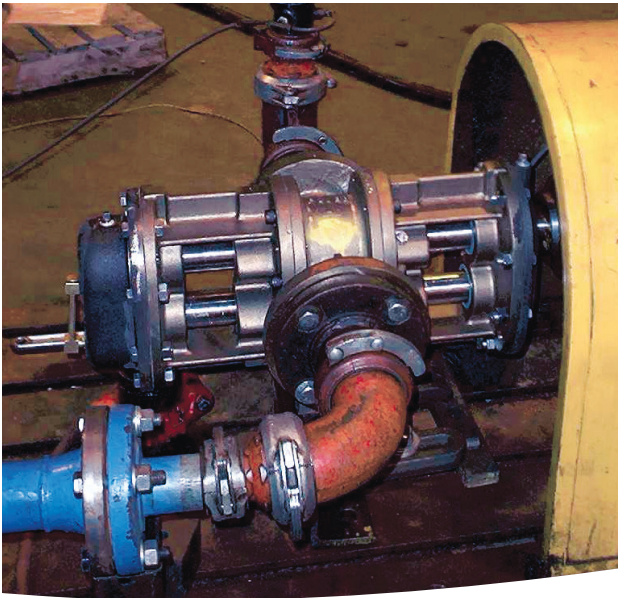
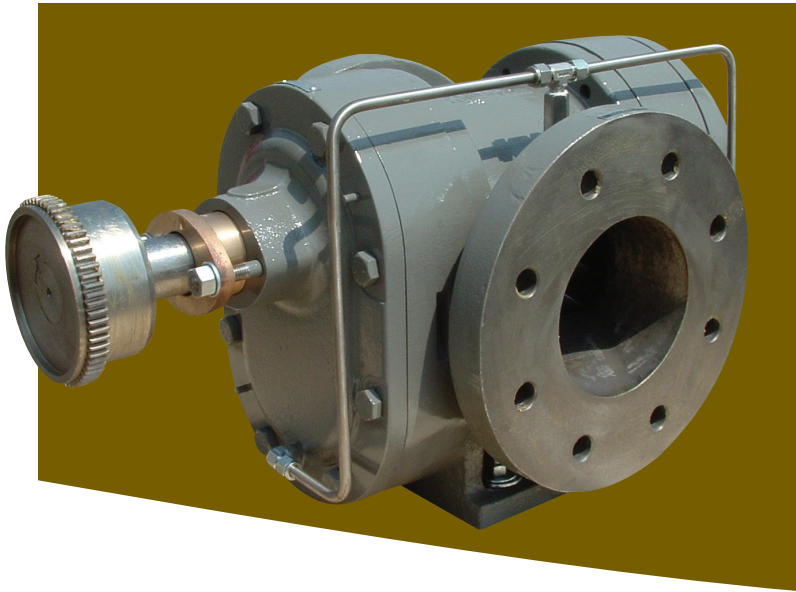
Externally Lubricated Bearing design is well suited for corrosive, erosive, non-lubricating and run-dry services.

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.

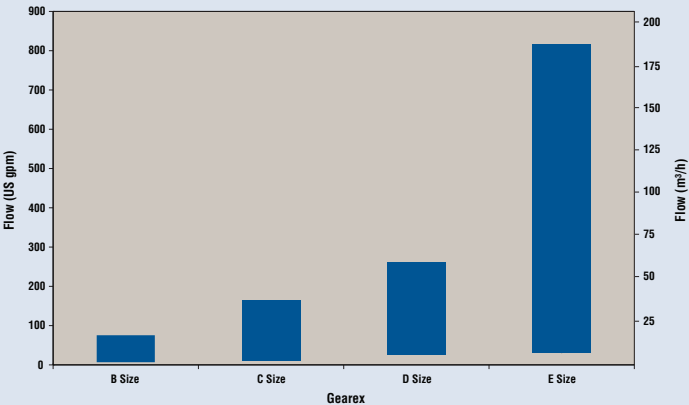
Available Options

- 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

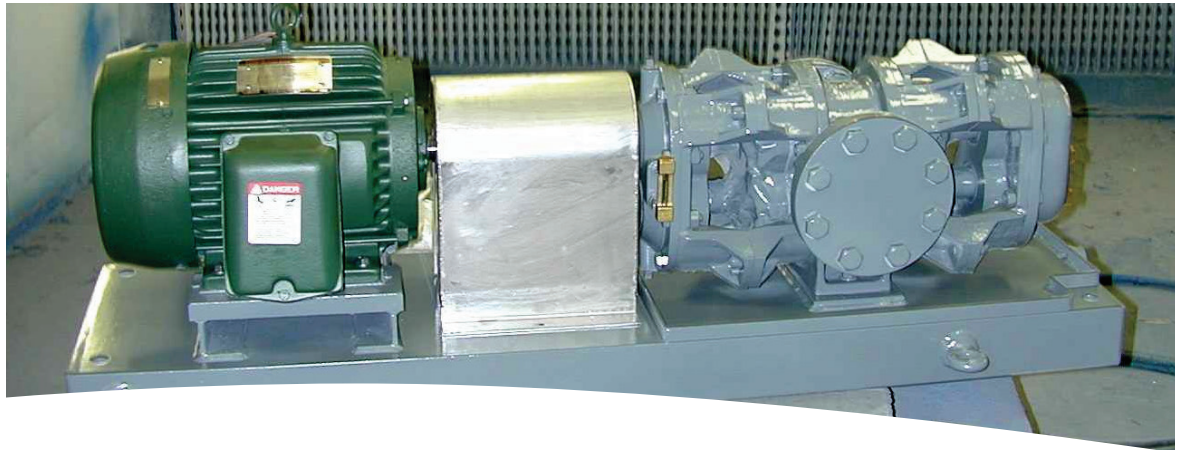
Gearex Quick Selection Chart

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



**Options and
Technical Data**



Materials of Construction

Component	GA Series	GR Series		Gearex		
	Cast Iron	Cast Iron	Cast Steel	Cast Iron	Cast Steel	Stainless Steel
Body	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
Bracket		–	–		ASTM A48, Class 30 Cast Iron	
Shaft	ASTM A108, Class 1040 Carbon Steel	ASTM A108, Class 1040 Carbon Steel		AISI 1040 or 1060 Steel		
Rotor Spacers	–	–	–	Fine Grain Cast Iron		17-4PH SS
Bushing	Babbitted Carbon	Babbitted Carbon*		–	–	–
Packing	Graphited Acrylic Yarn (GASP and GAFP Only)	Acrylic Yarn	Graphited	Carbon Filled TFE		PTFE
Pumping Gears	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
Timing Gears	–	–	–	AISI 4150 or 8620 Heat Treated Steel		

*Optional

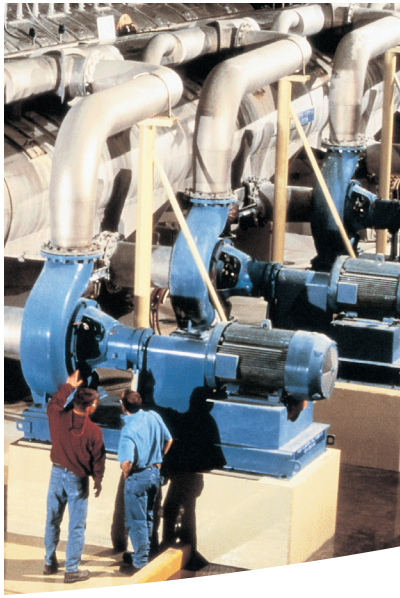
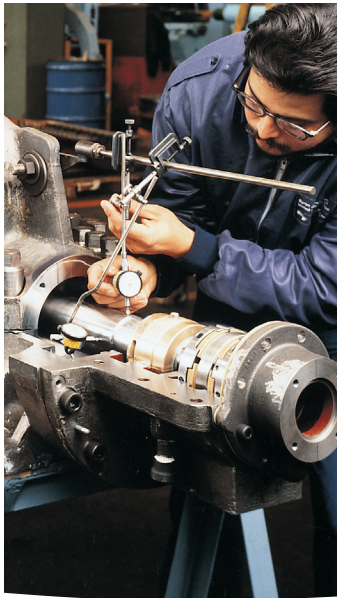
Flowserve Quality Herringbone Gears

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
Axial Balance	Yes	No	Yes
Low Noise	No	Yes	Yes
Low Pulsation	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

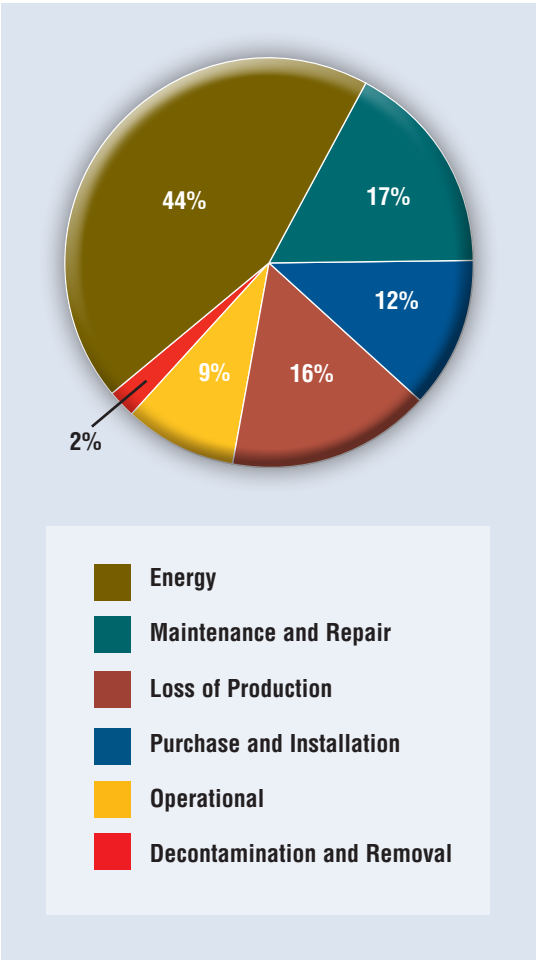
Operating Expenses

- 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 Costs¹



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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