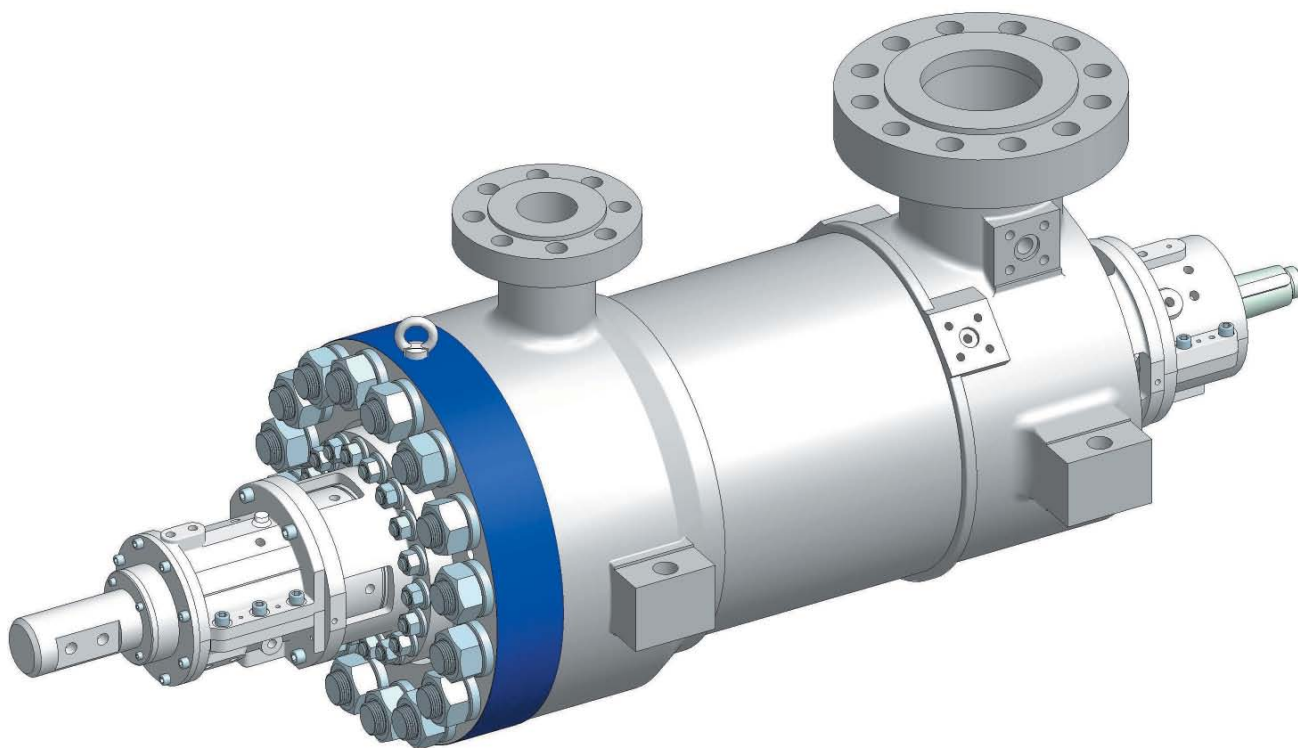


**SULZER**

Sulzer Pumps

## **GSG Diffuser Style Barrel Pump ISO 13709 (API 610) Type BB5**



The Heart of Your Process

# Sulzer Pumps

Sulzer Pumps is a world leader in reliable products and innovative pumping solutions. Our advanced research and development, detailed process and application knowledge together with a comprehensive understanding of market demands keeps us consistently at the leading edge of technical development. Our global network of modern manufacturing and packaging facilities together with sales offices, service centers and representatives located close to major markets provide fast responses to customer needs.

Sulzer Pumps has a long history of providing innovative pumping solutions to business partners in the following industries:

- Oil and Gas
- Hydrocarbon Processing
- Pulp and Paper
- Power Generation
- General Industry
- Chemical Process Industry
- Water and Wastewater

## GSG Global Manufacturing Facilities



Jundiai, Brazil



Dalian, China



Bruchsal, Germany



Navi Mumbai, India

## Application Knowledge for Better Efficiency

Hydrocarbon extraction plants, refineries, petrochemical plants and gas plants operate sophisticated production processes requiring reliable pumping solutions. Continuous product innovations such as our improved hydraulic performances on oil production, power generation and process pumps are helping the industries to improve its operational efficiency.

All our pumps are engineered in line with the latest standards issued by API, ISO and ANSI in order to ensure reliable and safe operation at your site. The Hydrocarbon Processing Industry is one of the core business segments of Sulzer Pumps. Following industry practice, we further subdivide the segment into:

- Synfuels
- Refining
- Gas Processing
- Petrochemicals
- Nitrogenous Fertilizer



## Extensive Product Range

The GSG is built to the latest edition of ISO 13709 (API 610). It is a type BB5, horizontal, radially split, diffuser type, multistage barrel pump. The rotor stack can be either inline (all the impellers facing towards the driver) or back-to-back. On the smaller pumps, the inboard seal chamber and bearing housing must be removed for cartridge removal. On larger pumps, the entire cartridge can be removed as an assembly to speed up overhaul or re-rate turnaround time.

Thousands of our GSG pumps are installed around the world in:

- Power Plants
- Refineries
- Petrochemical Plants
- Gas Processing Plants
- Onshore and offshore water injection services
- Onshore and offshore crude shipping service
- Onshore crude oil, refined product and LPG pipeline services



## Engineered for Application Flexibility

The barrel is available as either a casting or forging with a variety of flange ratings to meet individual specifications. It is normally center-line supported for thermal stability and maximum nozzle load capacity. The barrel closure is either the traditional flanged head-studs and nuts, flanged head-Supernuts™, or Sulzer's patented Twistlock closure for speedy removal and assembly.

The inner cartridge consists of stacked diffuser/impeller sets. A double suction first stage impeller is available on all but the smallest sizes. Axial thrust is compensated by a balance drum for inline stacked rotors. The diffusers hydraulically balance radial forces. For those services where intermediate pressure takeoff is needed, higher flow diffuser/impeller sets can be utilized up to the takeoff stage, and then lower flow sets are used after the takeoff stage to optimize efficiency and performance. When design conditions change, rerates are similarly achieved using

different diffuser/impeller combinations, or blank stages — all in the same barrel.

For applications on light gravity fluids with many stages, a back-to-back rotor stack is utilized to allow direct drive at normal motor speeds and provide improved rotordynamics. In such rotors, the opposed impellers cancel most of the axial thrust. The center bushing and throttle bushings take most of the residual axial thrust, so the thrust

bearing loads are minimal. The back-to-back design allows the use of a 7300 series ball thrust bearing — and saves the substantial cost and maintenance components associated with lube oil systems. For high pressure and high energy levels, inline, or back-to-back stack, high speed, semi-stiff rotor designs are available.

### Materials

All common ISO 13709 (API 610) material combinations are available.



GSG package ready for shipment at Sulzer Pumps Brazil

# GSG Inline Design Features and Benefits

## Casing Cover

- Flanged head, studs/nuts
- Flanged head, Supernuts™
- O-ring or spiral wound gasket

## Axial Thrust Balance

- Balance drum
- Swirl break technology

## Mechanical Seals

- ISO 21049 (API 682) seals
- Single, dual, dual pressurized
- Non-contact gas secondary

## Thrust Bearing

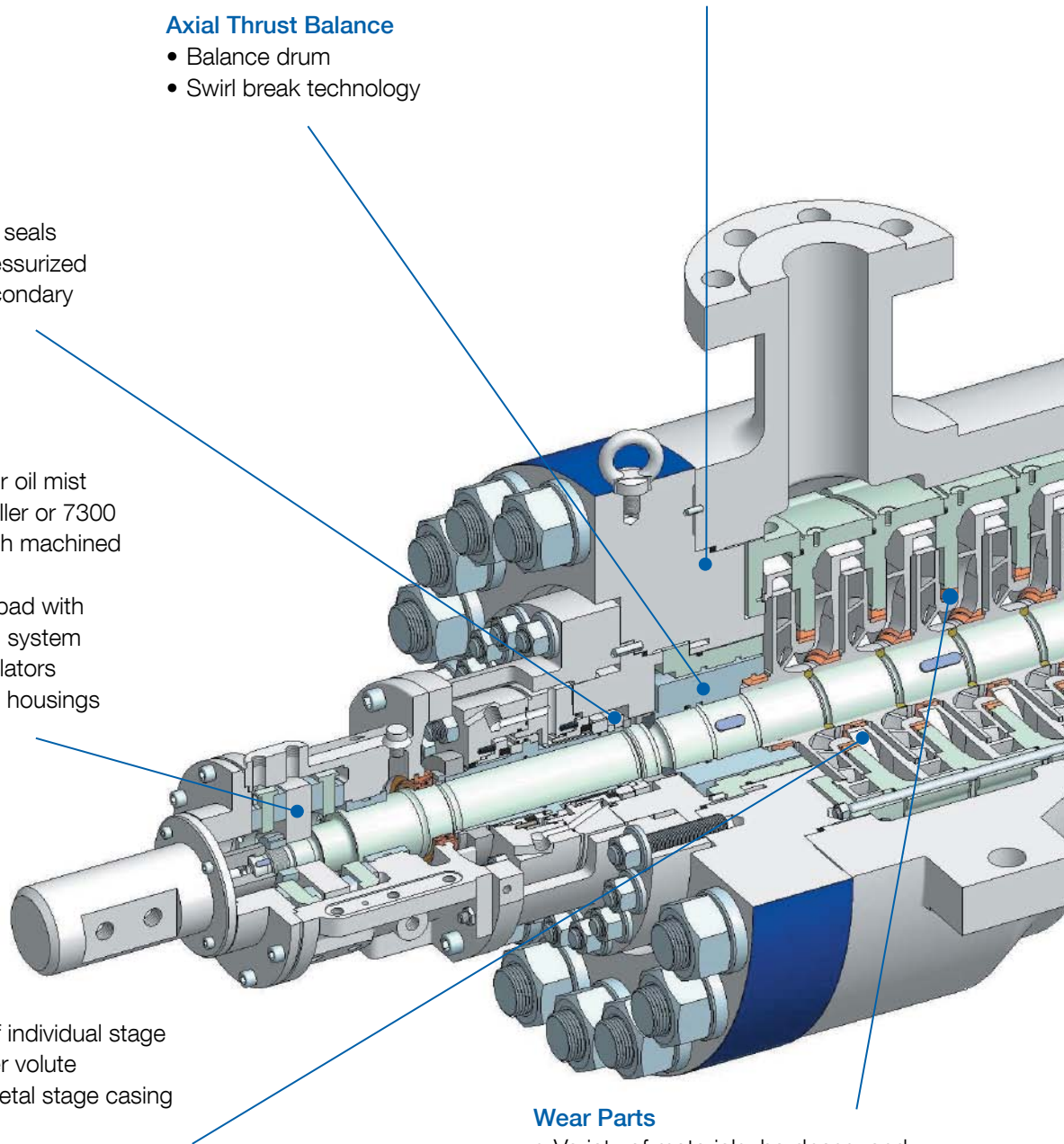
- Fan cooled ring oil, or oil mist lubricated tapered roller or 7300 series double ball with machined brass cages, or
- Double acting tilting pad with force feed lubrication system
- INPRO™ bearing isolators
- Carbon steel bearing housings with 360° support

## Diffusers/Impellers

- Allow replacement of individual stage pieces vs. entire inner volute
- O-ring or metal-to-metal stage casing fits
- Key driven enclosed impellers
- For HPI applications shrink fit, axially secured impellers, and stepped shaft at each stage
- Blank stages can be supplied for future conditions

## Wear Parts

- Variety of materials, hardness, and hard coatings available depending on pump material and application
- PEEK with reduced clearances available on clean fluids for enhanced efficiency



### Interstage Takeoff

- Partial flow takeoff from intermediate stage
- Able to stack high capacity and low capacity diffusers/impellers on same rotor for optimized stage takeoff
- Common on boiler feed pumps
- Available on recycle process applications
- Saves cost of additional pump

### First Stage Impeller

- Low Nss design is standard
- Double suction available on all but smallest sizes
- Improved NPSHr designs available

### Radial Bearings

- INPRO™ bearing isolator
- Carbon steel bearing housing with 360° support
- Ring oil or oil mist lubricated roller or ball bearing with C-3 clearance
- Ring oil or force feed lubricated sleeve bearings available

### Robust Shaft and Rotor

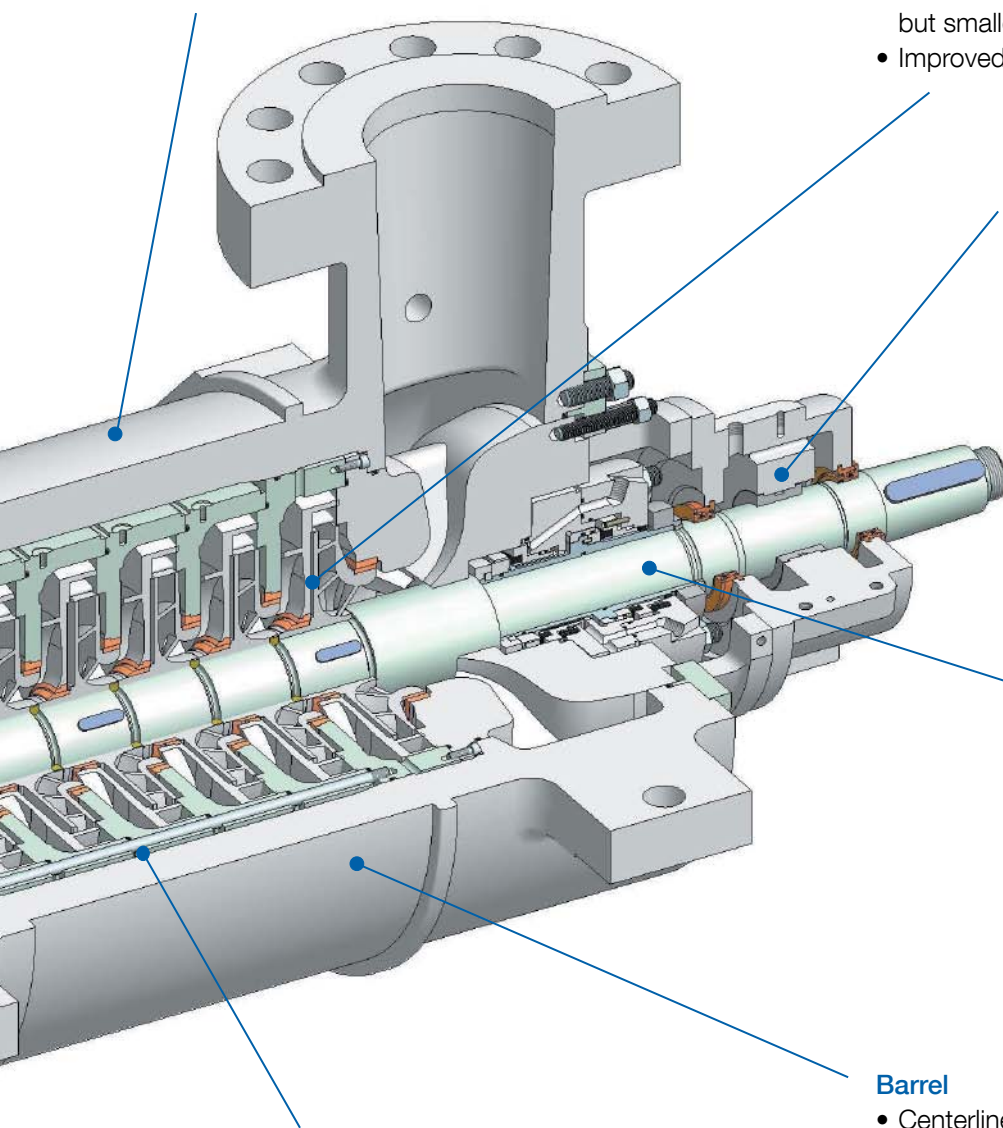
- Designed for low stress level
- Fully machined
- Dynamically balanced
- Straight bore, tapered bore, or hydraulic fit under coupling available per ISO 13709 (API 610)

### Barrel

- Centerline mounted for thermal stability and maximum nozzle load capability
- Cast with nozzles and flanges
- Forged barrel with NDE of nozzle welds
- Warm-up flow through discharge drain not required below 260° C (500° F). Warm-up flow required for higher temperatures
- Pin-and-key-slot thermal expansion system
- Jacketing, insulation or noise blankets available

### Pump Inner Cartridge Assembly

- Stage casings sealed by discharge pressure
- Free to expand towards discharge cover during warm-up
- Inner tie bolts for assembly/disassembly
- Coupling hub, inboard radial bearing and inboard seal chamber removal required on small pumps to remove cartridge
- Larger pumps have barrel bore diameters larger than bearing housing which allows cartridge to be removed with those parts assembled



# GSG Back-to-Back Design Features and Benefits

## Casing Cover

- Flanged head, studs/nuts
- Flanged head, Supernuts™
- Sulzer's patented Twistlock head
- O-ring or spiral wound gasket

## Axial Thrust Balance

- Opposed impellers absorb thrust
- Center and throttle bushing absorb residual thrust and only breakdown half of discharge pressure at each fit
- Axial thrust stable even with worn clearances
- Low thrust bearing loads

## Bearings

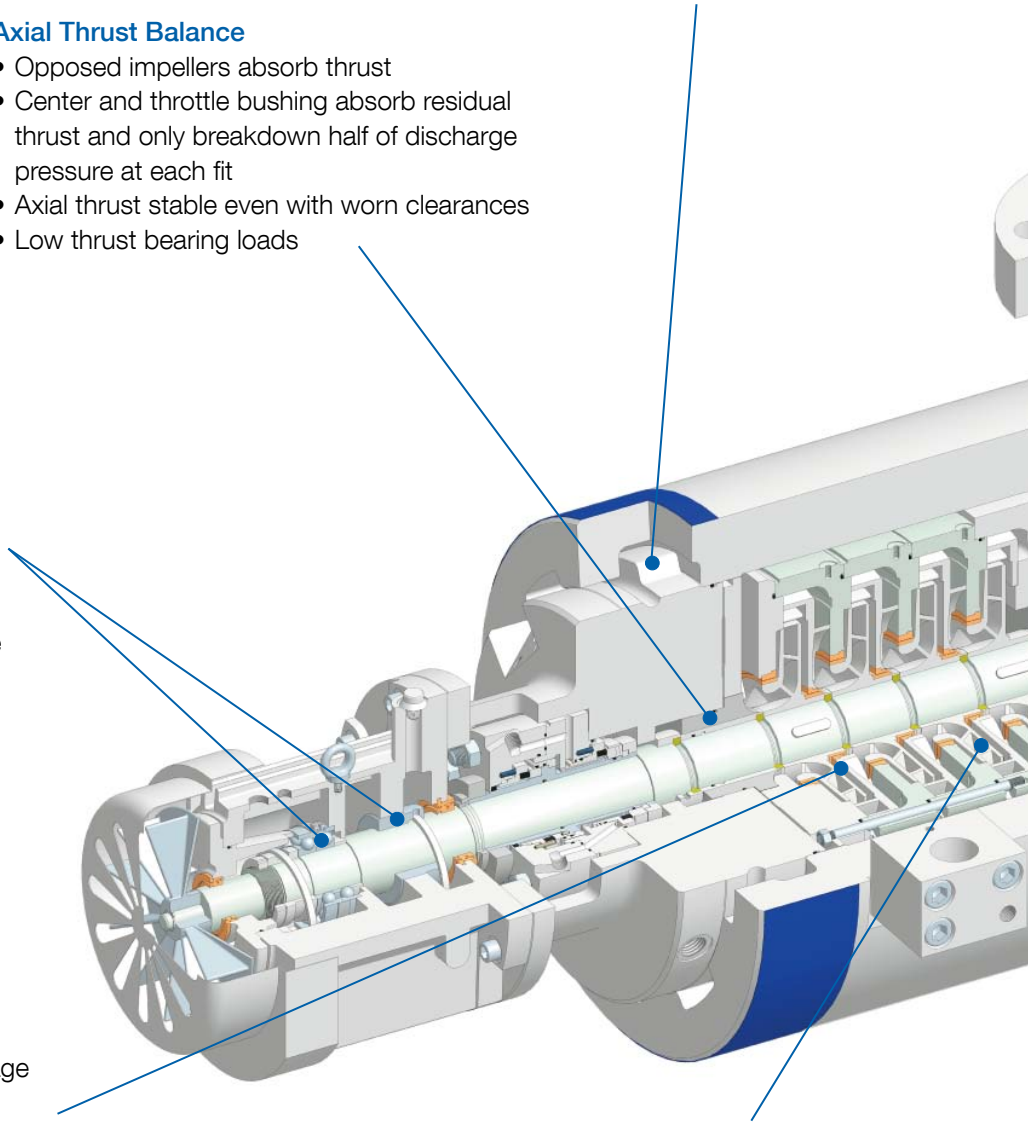
- INPRO™ bearing isolators
- Carbon steel bearing housings with 360° support
- Ring oil or oil mist lubricated roller or ball bearing with C-3 clearance
- Ring oil or force feed lubricated sleeve bearing
- Fan cooled 7300 series ball thrust bearing has low loads and long life
- Tilting pad thrust bearing and lube system available on larger sizes

## Diffusers/Impellers

- Allow replacement of individual stage pieces vs. entire inner volute
- Milled diffusers on small sizes for hydraulic accuracy and efficiency
- O-ring or metal-to-metal diffuser fits
- Key driven enclosed impellers
- For HPI applications shrink fit, axially secured impellers and stepped shaft at each stage
- Blank stages can be supplied for future conditions

## Pump Inner Cartridge Assembly

- Joints sealed by discharge pressure
- Free to expand towards discharge cover during warm-up
- Inner tie bolts for assembly/disassembly
- Coupling hub, inboard radial bearing and inboard seal chamber removal required on small pumps to remove cartridge
- Larger pumps have barrel bore diameters which allows cartridge to be removed with those parts assembled



### Back-To-Back Design

- For many stages and/or light gravity fluids, or remote applications where lube oil systems are not desired
- Dramatically improves rotordynamics — even with worn clearances on light hydrocarbons
- Allows more stages at direct drive motor speeds; high speed with lube system may not be required — substantial first cost and maintenance savings

### First Stage Impeller

- Low Nss design is standard
- Double suction available on all but smallest sizes
- Improved NPSHr designs available

### Robust Shaft and Rotor

- Designed for low stress level
- Fully machined
- Dynamically balanced
- Straight bore, tapered bore or hydraulic fit under coupling available per ISO 13709 (API 610)

### Wear Rings

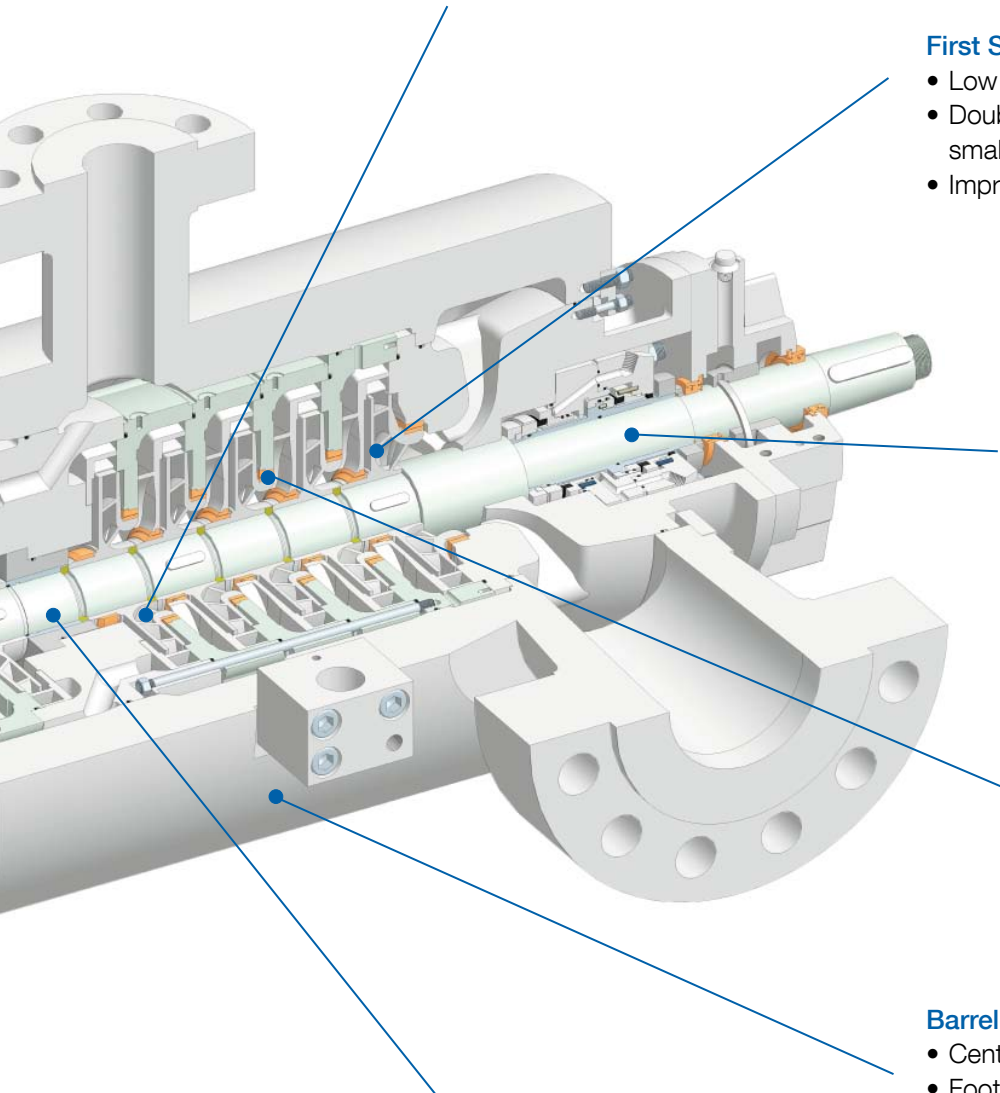
- Replaceable stationary and rotating wear rings

### Barrel

- Centerline mounted on hot services
- Foot mounting available
- Cast with nozzles and flanges
- Forged barrel with NDE of nozzle welds — side, top and other nozzle configurations available to prevent flange interference or simplify piping

### Center and Throttle Bushings

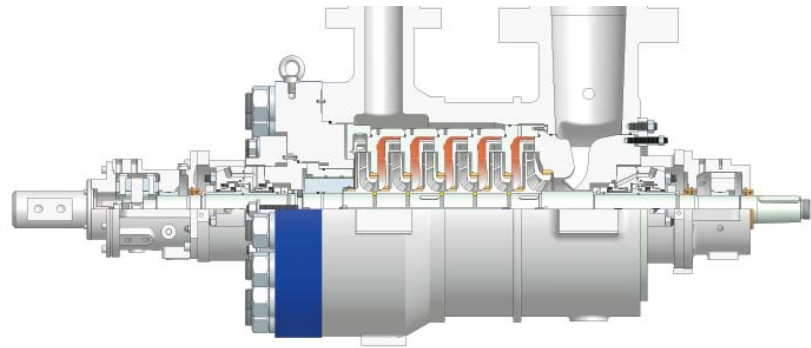
- Excellent rotor dynamic behavior
- Reduced wear
- Axial thrust balance even with worn clearances



# GSG Inline and Back-to-Back Design Features and Benefits

## GSG Inline

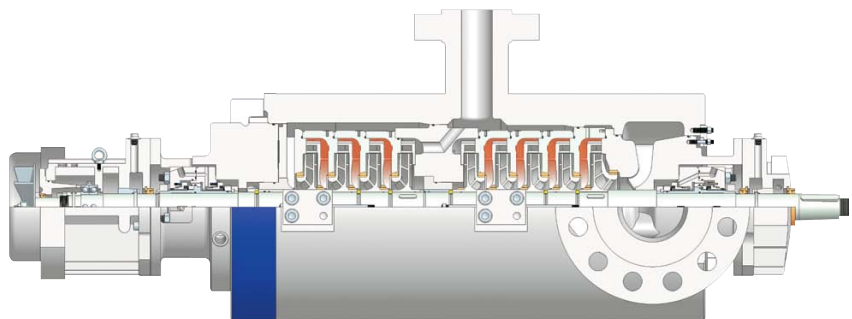
- Fulfills the majority of requirements for BB5 pumps with either cast or forged barrels to meet customer specifications.
- Multivane diffusers balance radial loads. Balancing drum takes the majority of axial thrust load. Heavy duty bearings support the rotor and carry residual thrust loads.
- Smaller size pumps fitted with ring oil lubricated antifriction bearings. Oil mist lubrication optional.
- All but smallest sizes may be fitted with pressure lubricated sleeve radial, double acting tilting pad thrust bearings, lube oil systems, bearing RTD's, X-Y vibration probes and Keyphasor, etc.



- Maximum number of interchangeable stage pieces minimizes spare parts inventory.
- In direct drive applications, clearly the best selection up to stage limits. If still more head is needed, first consider GSG back-to-back and direct drive. If that does not meet head requirement, then consider GSG inline with higher speed using gear box or VFD.
- For very high head and high energy levels beyond GSG back-to-back direct drive capabilities, GSG with semi-stiff rotor design (like Sulzer's HPcp, HPT pumps) can be offered. Could justify stand-alone, single unit — no standby. Discussion recommended.

## GSG Back-to-Back

- Available with up to 16 stages, fulfills direct drive applications that require more head than is available from direct drive inline GSG.
- Multivane diffusers balance radial loads. Opposed impellers balance majority of axial thrust. Center bushing and throttle bushing take nearly all the residual axial thrust. Even when clearances are worn, axial and radial loads are balanced.
- Fan cooled, ring oil lubricated, sleeve / ball thrust bearing without lube systems are common up to ISO 13709 (API 610) table 9

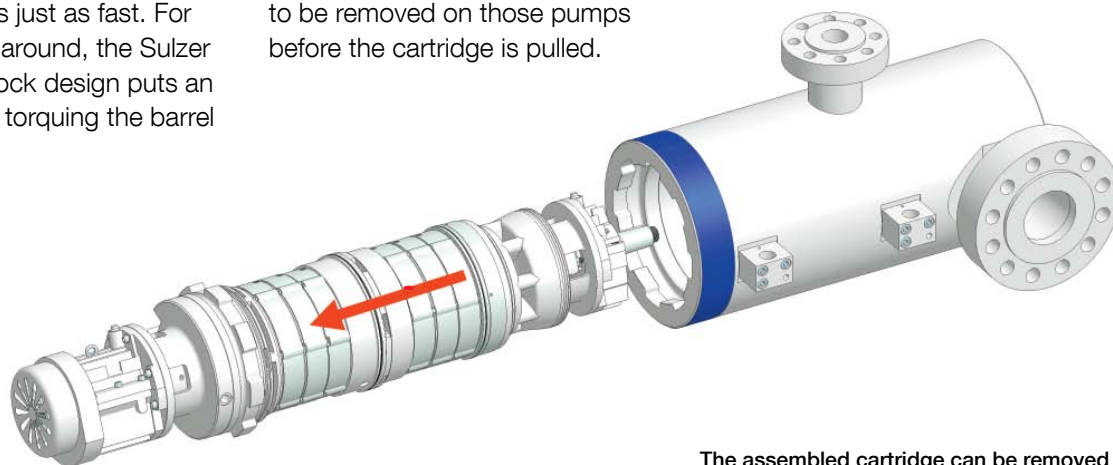


- limits, or Sulzer limits depending upon application. Significantly reduces installed cost and provides simple, reliable pumps.
- or cannot meet rotordynamic requirements a GSG with semi-stiff back-to-back rotor can be offered.
- When even high speed GSG with semi-stiff inline rotor does not meet head requirements,

## Rapid Pump Dismantling

To speed the repair of a GSG pump, larger sizes are designed using that cartridge concept. The pump coupling hub, inboard bearing housing, seal chamber and hydraulic cartridge slide through the barrel for quick removal. Re-installation is just as fast. For even faster turnaround, the Sulzer patented Twistlock design puts an end to hours of torquing the barrel

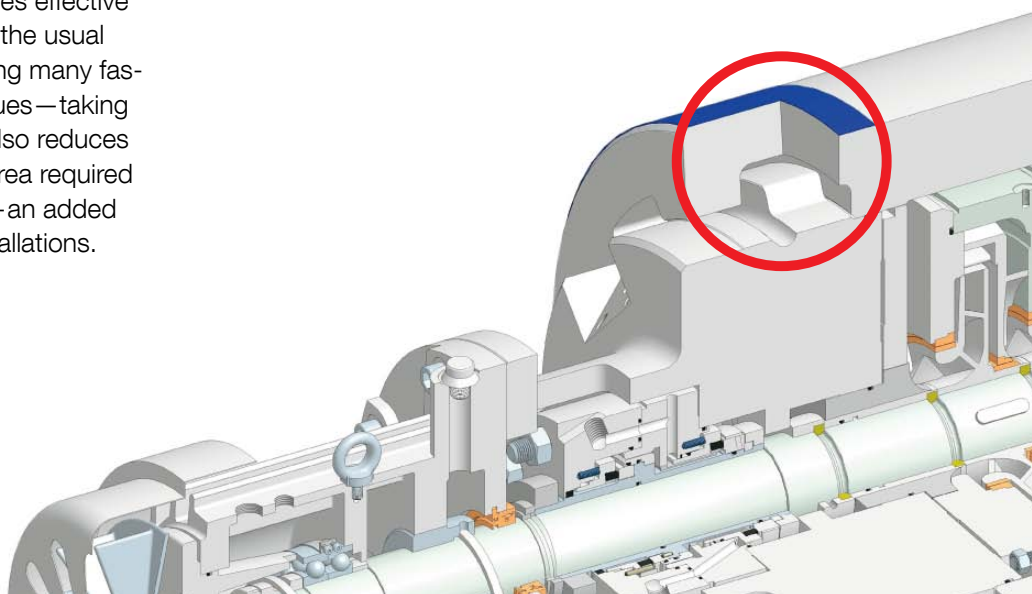
cover nuts. For remote locations or offshore applications this can be especially time and cost saving. Small GSG pump barrel bore are so small that the coupling hub, seal chamber and bearing housing will not fit through. Those parts have to be removed on those pumps before the cartridge is pulled.



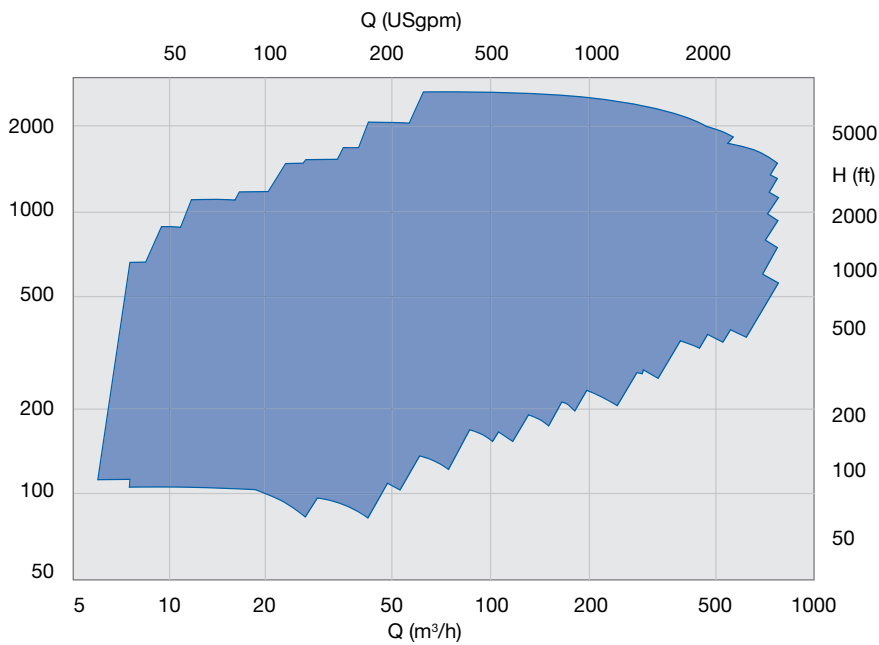
The assembled cartridge can be removed as one piece on larger pumps

## Sulzer's Patented Twistlock

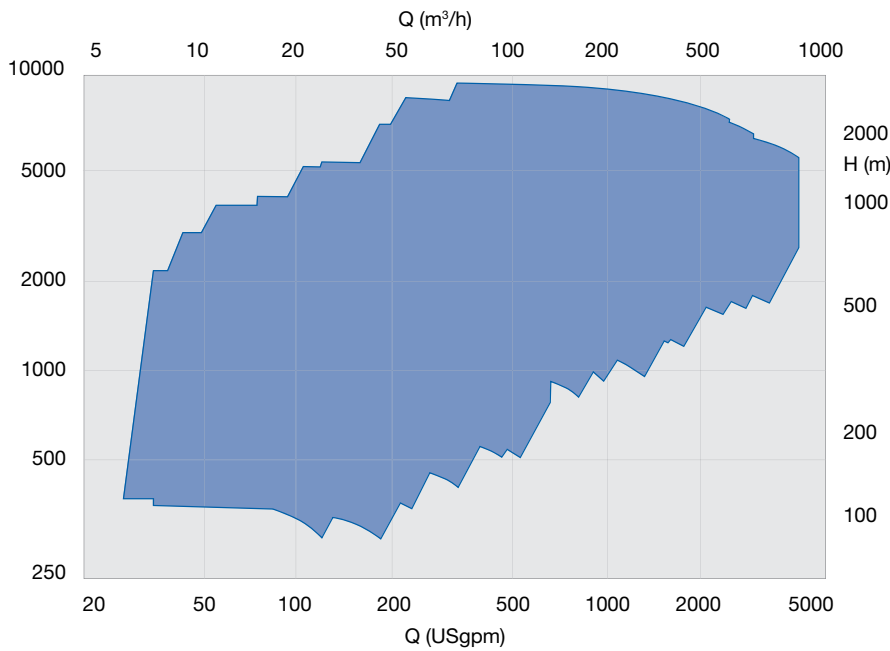
The innovative Sulzer Twistlock barrel cover design provides effective sealing and eliminates the usual requirements of torquing many fasteners to very high values—taking hours. The Twistlock also reduces the end cover flange area required thus reducing weight—an added bonus for offshore installations.



# GSG Performance Range



**50 Hz**



**60 Hz**

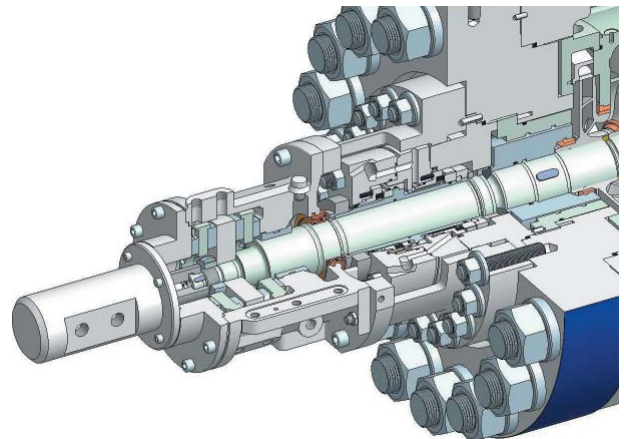
## Operating Data

	50 Hz	60 Hz
Pump size	40 to 200 mm	1.5 to 8 inches
Capacity	up to 900 m <sup>3</sup> /h	up to 4,600 USgpm
Head	up to 2,600 m	up to 10,000 feet
Pressure	up to 300 bar	up to 4,500 psi
Temperature	-30° C to + 425° C	-20° F to + 800° F

# GSG Options

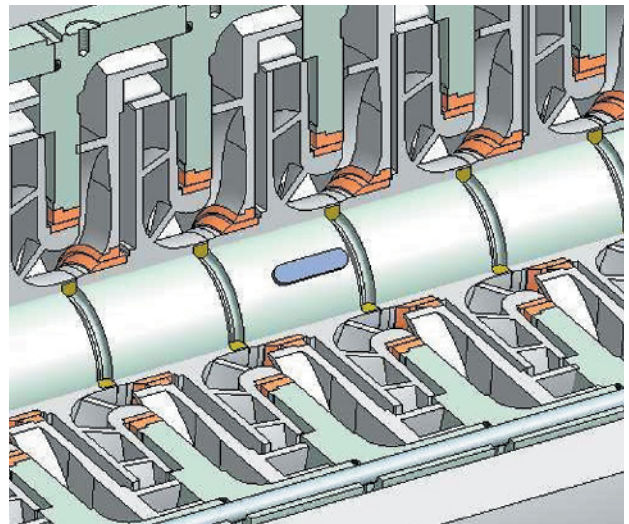
## Bearing Options

- Fan cooled ring oil or oil mist lubricated antifriction bearings
- Ring oil lubricated sleeve radial bearings with antifriction thrust bearing
- Force feed lubricated sleeve radial bearing and double acting tilting pad thrust bearing
- A variety of bearing instrumentation is available to meet specifications



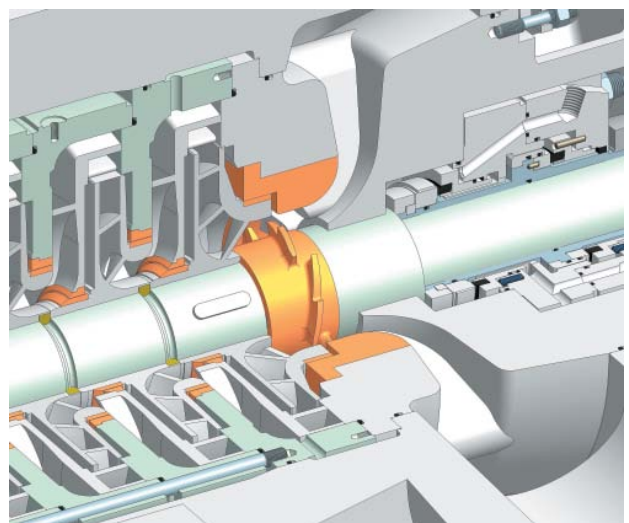
## Rotor and Impeller Options

- For ISO 13709 (API 610) applications, impellers are individually axially secured and are shrink fit to the shaft — which is stepped under each impeller for ease of assembly
- For other applications a slip-fit impeller stack is available
- Straight bore, tapered bore, or hydraulic fit coupling hub is available per ISO 13709 (API 610)
- Double Suction first stage impeller for lower NPSHr



## High Temperatures and Options for Bottoms / Residues

- Proven coke crusher available for services with coke particles
- Pin-and-block thermal expansion system provided on hot services
- Jacketing, insulation or noise blankets available



[www.sulzerpumps.com](http://www.sulzerpumps.com)