

GSG 导叶式筒袋泵

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



The Heart of Your Process

苏尔寿泵业

苏尔寿泵业在产品可靠性和提供泵的解决方案方面是全球的领导者。我们将超前研发、详尽的制造工艺和丰富的应用经验与对市场需求的全面了解相结合，使之始终保持技术发展的领先优势。我们现代化的制造厂与设置于主要市场当地的销售办公室、服务中心及代表处配合，可以对客户需求提供快速响应。

长久以来，苏尔寿泵业致力于在如下领域为其商业伙伴提供创新的泵解决方案：

- 石油及天然气
- 石油化工
- 纸浆造纸
- 电力工业
- 通用工业
- 化工流程工业
- 给排水

GSG全球制造厂 GSG Global Manufacturing Facilities



容迪亚伊，巴西
Jundiai, Brazil



大连，中国
Dalian, China



布鲁克萨，德国
Bruchsal, Germany



孟买，印度
Navi Mumbai, India

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

运用专业知识来提高效率

烃类萃取、精炼厂、石化厂和天然气厂复杂的产品工艺需要可靠的泵解决方案。我们不断的产品创新，如改进在石油生产、发电行业流程泵的水力性能，有助于企业提高运行效率。

为保证产品可靠和安全运行，我们所提供的产品执行最新 API/ ISO 和 ANSI 标准。石化工业是苏尔寿泵业主要商业领域之一，以下是进一步细分的领域：

- 合成燃料
- 精炼
- 天然气处理
- 石油化工
- 氮肥



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

广泛的应用领域

GSG 列泵符合最新版本 ISO 13709 (API 610) BB5 结构形式，是卧式、径向剖分，导叶式、多级筒袋泵。转子设计成串联（所有叶轮吸入口朝向电机方向）或背靠背形式。对于小规格泵，机械密封箱体和轴承箱体必须拆卸，整个内部集装单元才可以抽出。对于大规格泵，整个内部集装单元可以随轴承箱体和机械密封箱体整体拆卸，检修后可以整体安装，节省检修时间。

上千台 GSG 泵已经在世界上安装，主要安装在：

- 电厂
- 精炼厂
- 石化厂
- 天然气处理厂
- 海上或陆地平台上注水
- 海上或陆地平台上原油的输送
- 陆地上原油输送，原油精炼和液化气管线输送



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
- 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

满足应用灵活性设计

根据法兰压力等级，筒体为铸造或锻造结构；筒体中心支撑，这样可以提高热稳定性和承受更高的管口载荷；筒体与筒体盖连接方式可以是传统的双头螺柱和螺母连接形式。为了快速安装和拆卸，可以采用 Supernuts™ 法兰型加强螺母连接方式，或苏尔寿专利扭锁结构 Twistlock 连接方式。

内部集装单元包括导叶和叶轮组件，大规格泵首级可以配双吸叶轮，对于泵串联设计，轴向推力由平衡鼓平衡，导叶平衡残余径向力。根据需要，可以采用中间抽头结构，大流量叶轮和导叶可以布置在抽头中段前，小流量叶轮和导叶布置在抽头中段后，以此获得最佳效率和性能。如果改变设计，通过使用不同的叶轮和导叶组合或使用空段，达到预期性能要求。

对于输送介质比重小的多级泵，背对背布置形式的转子可以电机直接驱动，达到转子正常工作转速，此结构大大提高了转子动力性能。叶

轮对称设计可以消除大部分轴向力，中间衬套和喉部衬套可以消除大部分残余轴向力，轴承只承受很小载荷，背对背设计可以使用 7300 系列球轴承，节省很多成本和润滑油系统等辅助设备。对于高压和高能级泵，可以串联或背靠背设计，如果采用高转速，可以采取逐级固定形式。

材料

材料按照 ISO 13709 (API 610) 要求选择。



GSG 在苏尔寿巴西厂准备装船启运
GSG package ready for shipment at Sulzer Pumps Brazil

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 hy-

draulically 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 rotordynam-

ics. 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 串联设计特点和优点

GSG Inline Design Features and Benefits

机械密封

- 符合 ISO 21049 (API 682) 标准
- 单端面或双端面密封，有压或无压设计
- 辅助密封（大气侧密封）可以采用非接触式干气密封

Mechanical Seals

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

推力轴承

- 风扇冷却，油环润滑或油雾润滑圆锥滚子轴承或 7300 系列铜保持架配对球轴承；或
- 承受两个方向的推力轴承，强制油润滑系统
- 苏尔寿标准迷宫密封或 INPRO™ 迷宫密封
- 碳钢轴承箱体 360° 支撑

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

导叶和叶轮

- 叶轮和导叶存在不同水力设计
- 中段之间 O 型圈或者金属 - 金属密封形式
- 闭式叶轮用键驱动
- 对于 HPI 市场用泵，叶轮为过盈配合，轴向固定，并且每级叶轮处采用阶梯轴
- 根据将来需要可以使用空段

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

泵盖

- 法兰式，用双头螺柱和螺母与筒体连接
- 法兰式，用 Supernuts™ 螺母与筒体连接
- O 型圈或缠绕垫片密封

Casing Cover

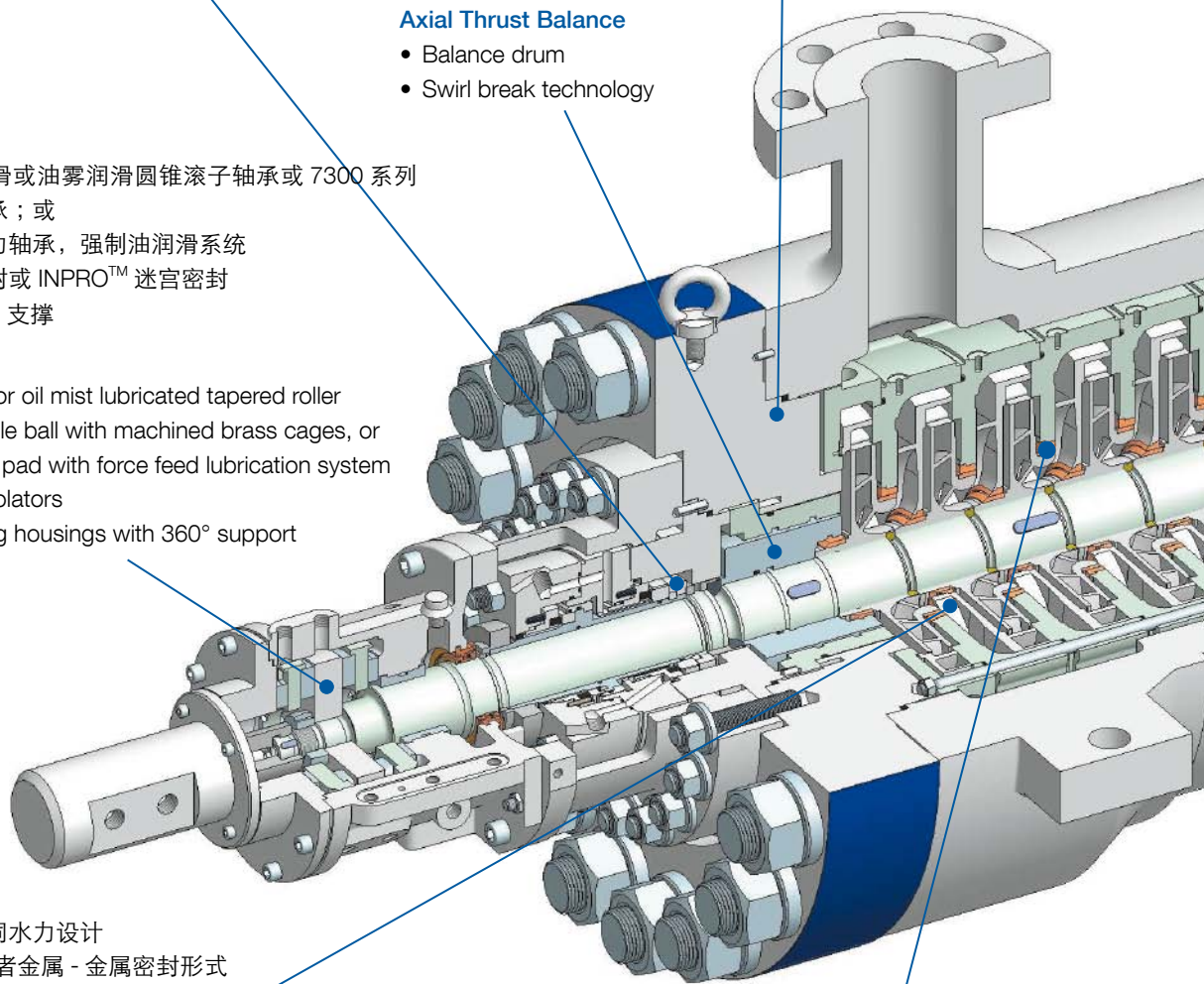
- Flanged head, studs/nuts
- Flanged head, Supernuts™
- O-ring or spiral wound gasket

轴向力平衡

- 平衡鼓
- 螺旋阻隔密封

Axial Thrust Balance

- Balance drum
- Swirl break technology



耐磨环

- 根据泵材质和应用，可以选用不同的材料、硬度和表面硬化方法
- 对于清洁介质，可使用小口环间隙的 PEEK 材料，以提高泵效率

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

中间抽头

- 可以从中间段抽取少部分介质
- 大流量和小流量叶轮、导叶组件可以安装在一个转子上，这样可以获取最佳的中段抽头流量
- 在锅炉给水水泵上是很普通的
- 应用在循环流程中
- 减少增加泵的成本

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

首级叶轮

- 低吸入比转速标准设计
- 大规格泵可以首级双吸
- 可以提高抗气蚀能力 NPSHr

First Stage Impeller

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

径向轴承

- 苏尔寿标准迷宫密封或 INPRO™ 迷宫密封
- 碳钢轴承箱体 360° 支撑
- 油环润滑或油雾润滑，具有 C3 系列圆柱滚子或球轴承
- 油环或强制油润滑径向滑动轴承

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

大直径轴和转子

- 低应力设计
- 全部机械加工
- 整个转子做动平衡
- 与联轴器连接轴为圆柱形或圆锥形，或液力偶合器，符合 ISO 13709 (API610)

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)

泵内集装单元的安装

- 通过泵出口压力，使中段之间紧密密封
- 暖泵时泵体向出口方向自由膨胀
- 内部穿杠只是为了安装和拆卸
- 小规格泵，联轴器、轴承箱体和机械密封箱体拆卸后才能拖出内集装单元
- 大规格泵由于筒体内孔大于轴承箱体，内集装单元可以整体拆卸

Pump Inner Cartridge Assembly

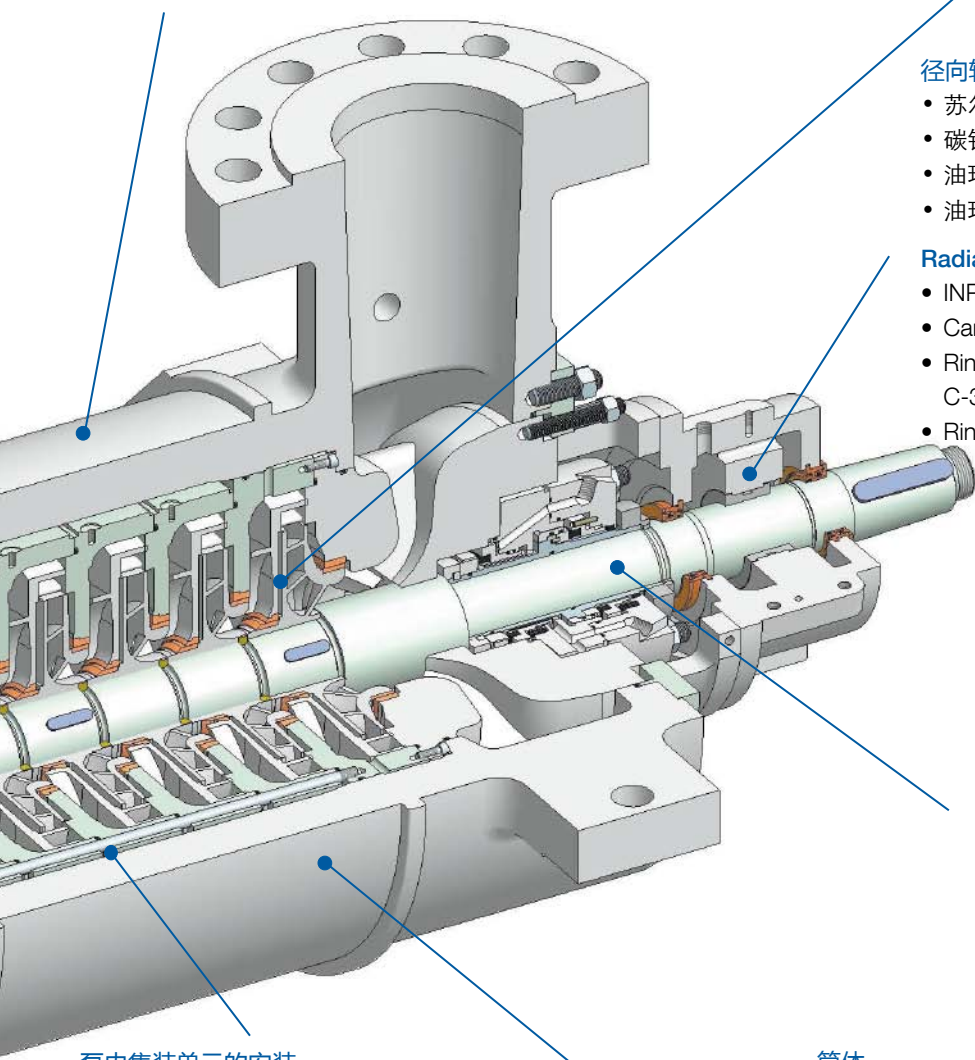
- Stage casings sealed by discharge pressure
- Free to expand towards discharge cover during warm-up
- Inner tie bolts for assembly/disassembly
- Coupling hub, inboard radial bearing and inboard seal chamber removal required on small pumps to remove cartridge
- Larger pumps have barrel bore diameters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

筒体

- 中心支撑，可以提高热稳定性和增大管口载荷
- 铸造筒体，进、出口法兰与筒体整体铸造
- 锻造筒体，进、出口法兰与筒体焊接，并且进行 NDE 检验
- 对于温度大于 260 °C 高温介质需要暖泵系统，通过排残液口筒体
- 高温介质的输送，需要提供定位座和导向座
- 可以配备隔离层或降低噪音防护罩

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



GSG背靠背设计特点和优点

GSG Back-to-Back Design Features and Benefits

轴向力平衡

- 叶轮对称布置平衡轴向力
- 中间衬套和喉部衬套平衡残余轴向力，每套平衡装置只平衡掉一半出口压力产生的轴向力
- 轴向力即使在口环磨损，间隙增大的情况下也是恒定的轴承只承受比较低的载荷

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

轴承

- 苏尔寿标准迷宫密封或 INPRO™ 轴迷宫密封
- 碳钢轴承箱体 360° 支撑
- 油环润滑或油雾润滑，配有 C3 系列圆柱滚子或球轴承
- 油环或强制油润滑滑动轴承
- 风扇冷却，配对推力球轴承 7300 系列，承受较低的载荷，轴承寿命长
- 对于大规格泵，可以配可倾瓦推力轴承，强制油润滑系统

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

导叶和叶轮

- 叶轮和导叶存在不同水力设计
- 小规格导叶可以用铣床加工，保证过流部件加工精确，效率高
- 中段之间 O 型圈或者金属 - 金属密封形式
- 闭式叶轮用键驱动
- 对于 HPI 市场用泵，叶轮为过盈配合，轴向固定，并且每级叶轮处采用阶梯轴
- 根据将来需要可以使用空段

Diffusers/Impellers

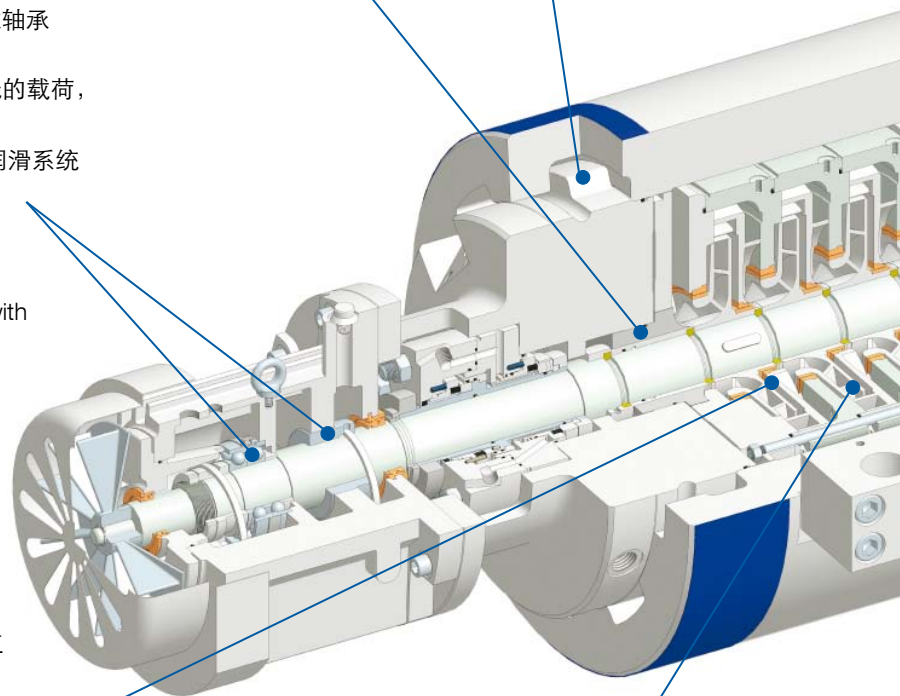
- Allow replacement of individual stage pieces vs. entire inner volute
- Milled diffusers on small sizes for hydraulic accuracy and efficiency
- O-ring or metal-to-metal diffuser fits
- Key driven enclosed impellers
- For HPI applications shrink fit, axially secured impellers and stepped shaft at each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

泵盖

- 法兰式，用双头螺柱和螺母与筒体连接
- 法兰式，用 Supernuts™ 螺母与筒体连接
- 苏尔寿专利扭锁结构
- O 型圈或缠绕垫片密封

Casing Cover

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



泵内集装单元的安装

- 通过出口压力，使中段之间紧密密封
- 暖泵时泵体向出口方向自由膨胀
- 内部穿杠只是为了安装和拆卸
- 小规格泵，拆卸联轴器、轴承和机械密封后才能拆卸内集装单元
- 大规格泵由于筒体内孔大于轴承箱体，内集装单元可以整体拆卸

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

背对背设计

- 对于级数多、介质密度低或远距离安装等应用场合不希望使用润滑油系统
- 在间隙增大的情况下，转子的动力性能依然稳定
- 在电机驱动转速下泵级数可以增多，在高转速下可以不配置润滑油系统——大量节约采购成本和维修成本

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

首级叶轮

- 低吸入比转速标准设计
- 大规格泵可以首级双吸
- 可以提高抗气蚀能力 NPSHr

First Stage Impeller

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

大直径轴和转子

- 低应力设计
- 全部机械加工
- 整个转子动平衡
- 与联轴器连接轴为圆柱形或圆锥形，可以使用液力耦合器，符合 ISO 13709 (API 610)

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)

耐磨环

- 动、静口环可以更换

Wear Rings

- Replaceable stationary and rotating wear rings

筒体

- 中心支撑，可以提高热稳定性
- 可以设计成脚支撑
- 铸造筒体，进、出口法兰与筒体整体铸造
- 锻造筒体，进、出口法兰与筒体焊接，并且进行 NDE 检验，进出口法兰可以顶顶顶出，或其他布置形式，防止法兰之间干涉或便于配管

Barrel

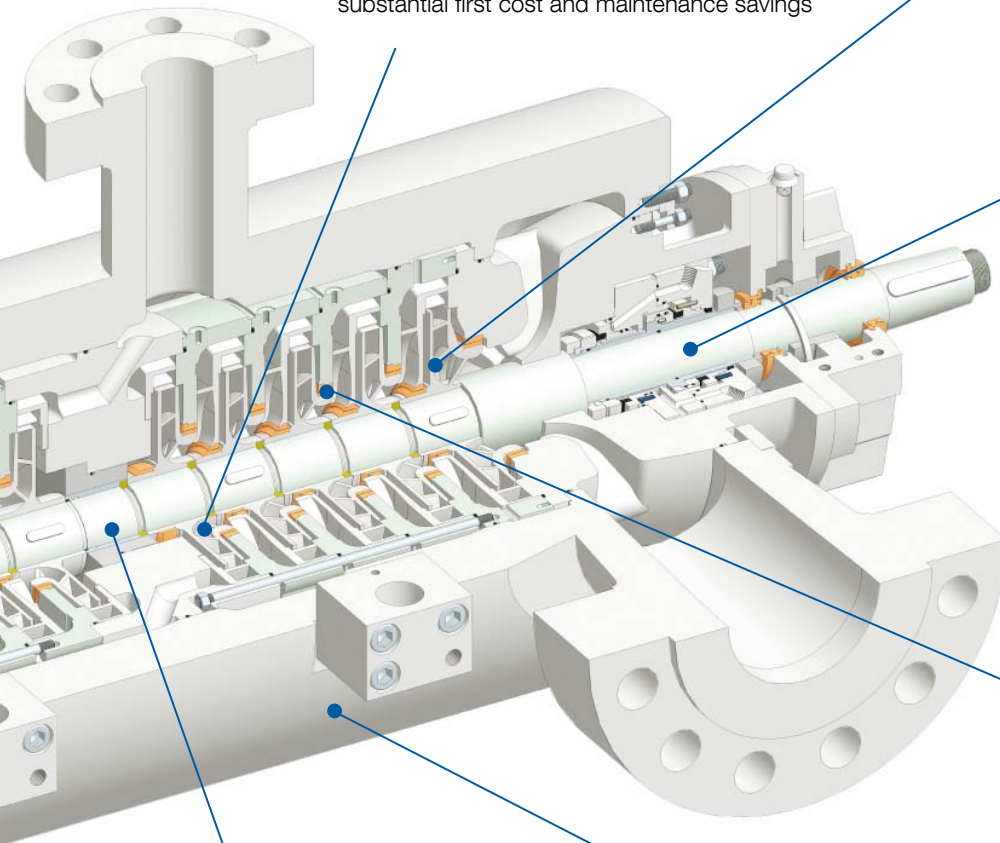
- Centerline mounted on hot services
- Foot mounting available
- Cast with nozzles and flanges
- Forged barrel with NDE of nozzle welds — side, top and other nozzle configurations available to prevent flange interference or simplify piping

中间衬套和喉部衬套

- 极好的转子动力性能
- 减少磨损
- 即使磨损，间隙增大，轴向力平衡也非常好

Center and Throttle Bushings

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

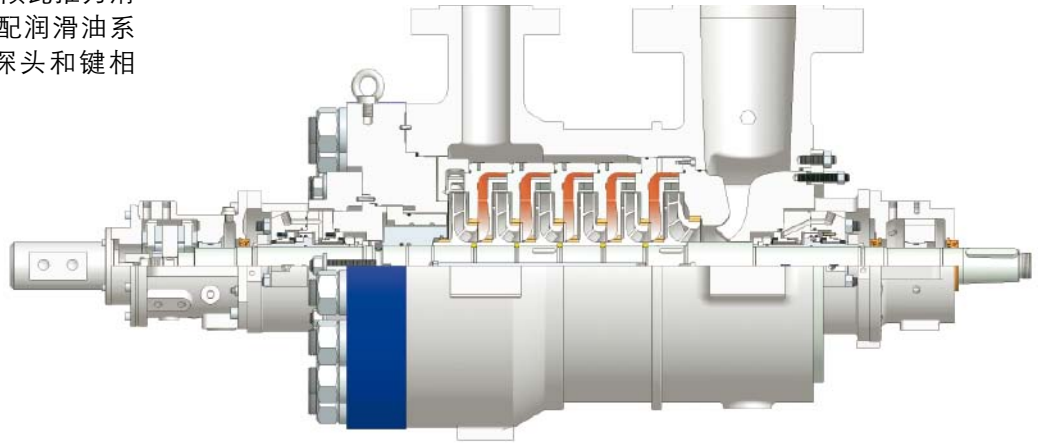


GSG串联和背靠背设计特点和优点

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

GSG 串联设计

- 满足用户对 BB5 结构设计要求，筒体可以铸造或锻造。
- 多叶片导叶平衡径向力，平衡鼓平衡大部分轴向力，重型轴承支撑转子，同时平衡残余轴向力。
- 小规格泵配备甩油环，润滑耐磨轴承，油雾润滑是可选设计。
- 大规格泵可以配压力润滑油来润滑径向滑动轴承和可倾瓦推力滑动轴承。同时，可以配润滑油系统、RTD、X-Y 振动探头和键相位探头等。
- 内集装单元水力部件可以相互替换，减少备件库存。
- 在直接驱动情形下，有很明确的级数限制，如果扬程比较高，可以考虑背靠背设计，并且直接驱动。如果还满足不了高扬程的需要，可以提高转速、串联设计——可以使用齿轮箱或变频器。
- 如果扬程或者能级超过了 GSG 泵背靠背直接驱动使用范围，转子可以设计成 semi-stiff 形式（类似于苏尔寿的 HPcp、HPT 泵），可以推荐单台运转而不需要备用设备。

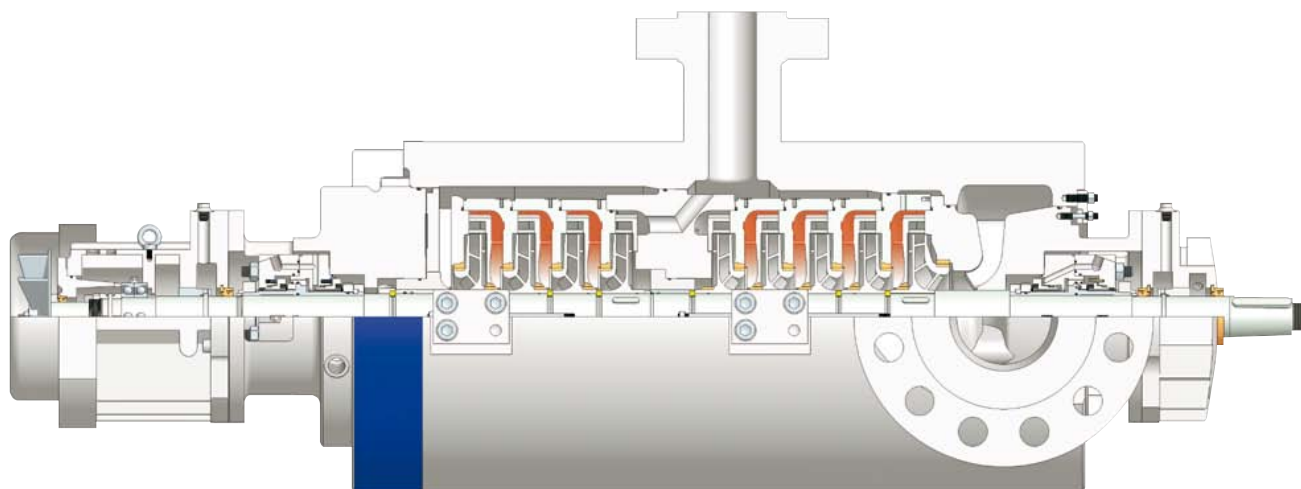


GSG Inline

- 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背靠背设计

- 叶轮可以达到 16 级，适合在直接驱动下，比串联 GSG 泵要求更高扬程的场合。
- 多叶片导叶平衡径向力，叶轮背靠背布置可以平衡大部分轴向力，中间衬套和喉部衬套可以平衡残余轴向力。在间隙增大的情况下，轴向力和径向力仍然可以平衡。
- 风扇冷却、油环润滑，不需要润滑油系统、滑动轴承和推力球轴承，符合 ISO 13709 (API 610) 表 9 要求或苏尔寿要求，可以减少安装成本并提供简单、可靠泵组。
- 当转子按照 semi-stiff 设计时，在即使提高转速，串联 GSG 泵也无法达到用户的扬程要求，或者无法满足转子动力学性能要求的情况下，可以设计成背靠背结构。

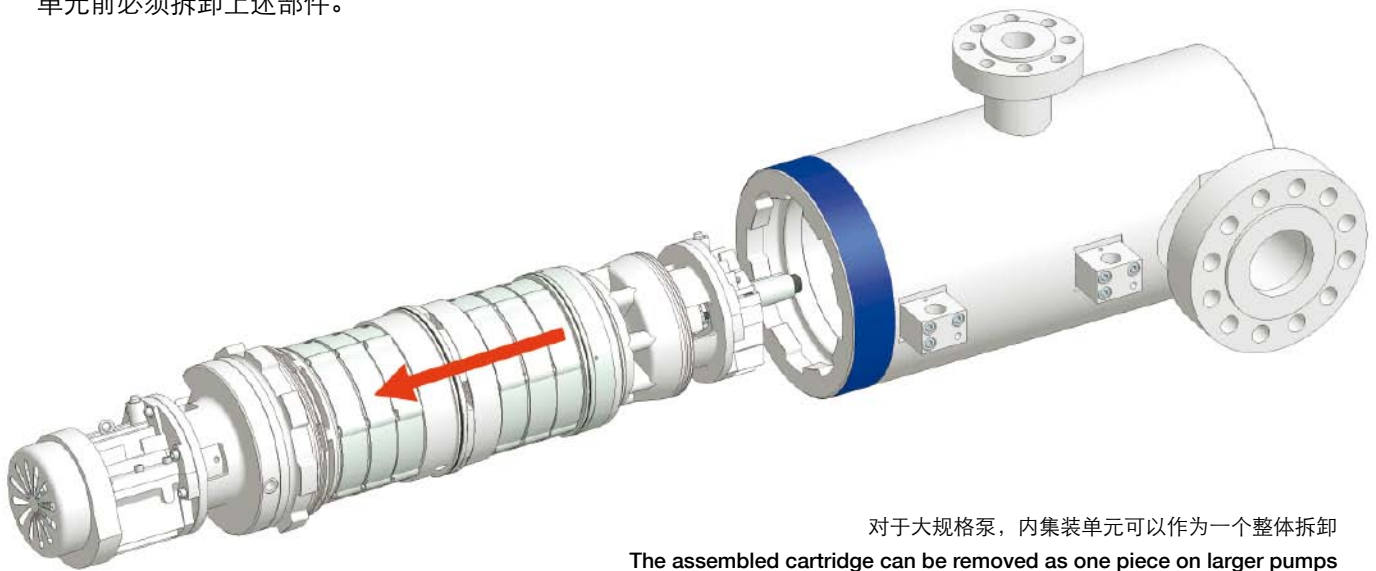


GSG Back-to-Back

- 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.
- When even high speed GSG with semi-stiff inline rotor does not meet head requirements, or cannot meet rotordynamic requirements a GSG with semi-stiff back-to-back rotor can be offered.

快速拆卸泵

可以设计成集装芯包式，泵联轴器、轴承箱体、密封箱体和水力部分等内单元快速从简体中拆卸和安装，为了更快的安装，苏尔寿专利设计扭锁结构，取消简体与简体盖之间螺母连接，适合海上平台安装，这样大大节约维修时间和维修成本。小规格泵由于联轴器、机械密封箱体和轴承箱体尺寸比筒体内腔大，无法通过简体，所以移动内部水力单元前必须拆卸上述部件。

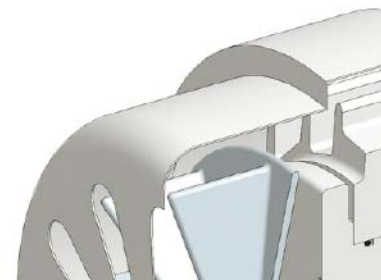


对于大规格泵，内集装单元可以作为一个整体拆卸
The assembled cartridge can be removed as one piece on larger pumps

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.

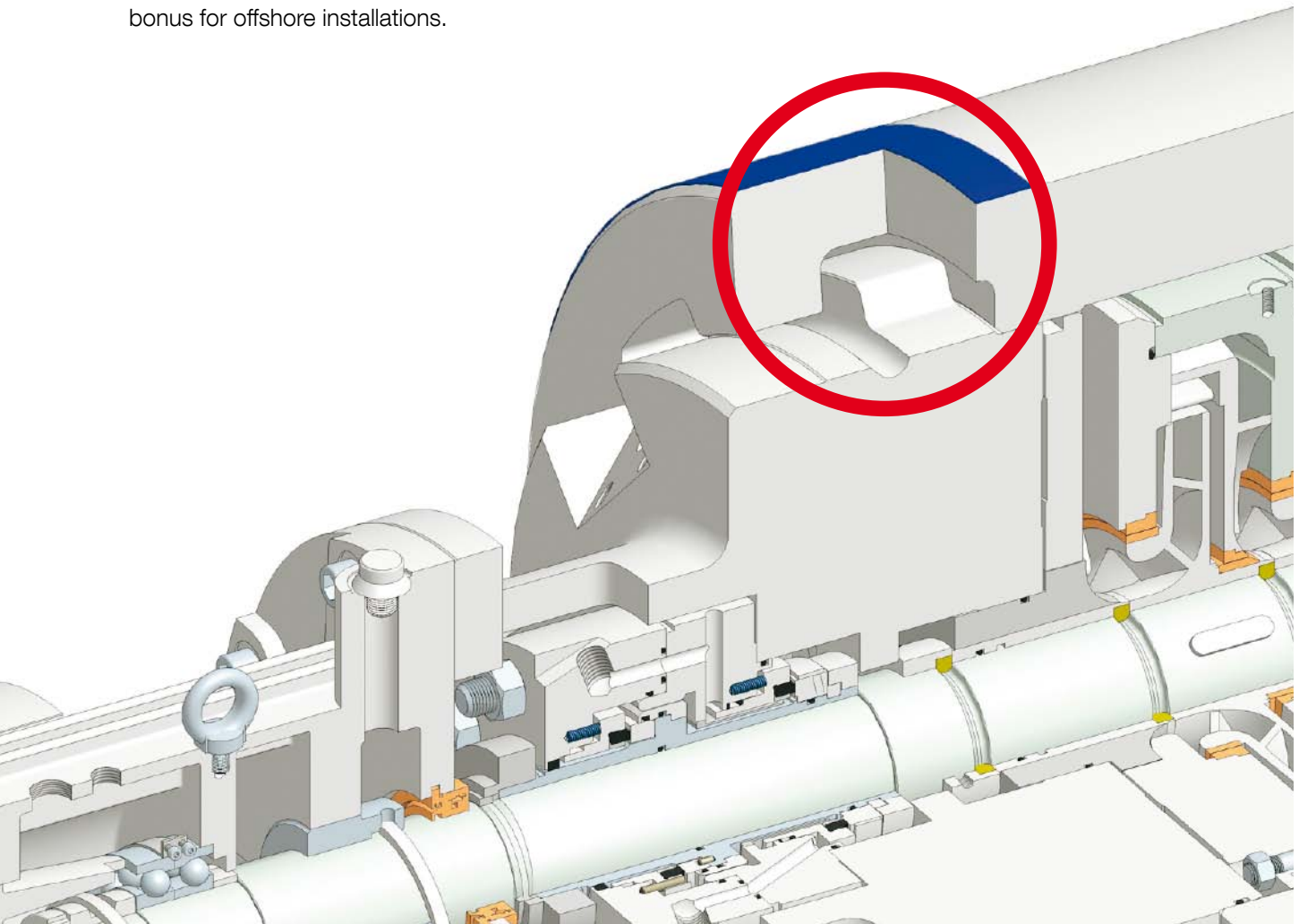


苏尔寿专利扭锁技术

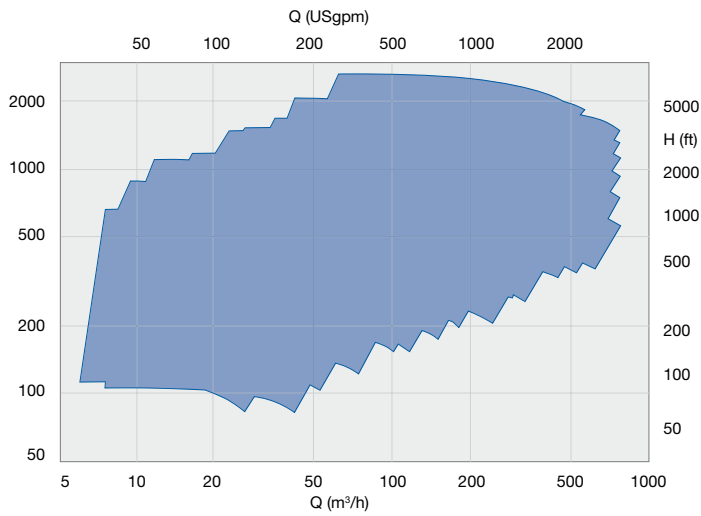
苏尔寿专利扭锁技术特点是高效的密封结构，不需很大的扭紧力矩，不需要多次扭紧，减少筒体盖径向尺寸，这样大大减少了泵总重量，对于海上平台使用泵，如果设计此结构，将会有很大的优势。

Sulzer's Patented Twistlock

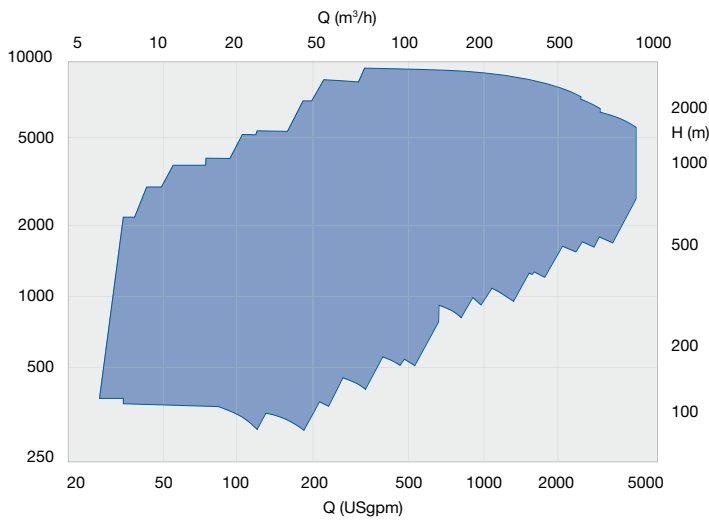
The innovative Sulzer Twistlock barrel cover design provides effective sealing and eliminates the usual requirements of torquing many fasteners to very high values—taking hours. The Twistlock also reduces the end cover flange area required thus reducing weight—an added bonus for offshore installations.



性能范围 GSG Performance Ranges



50 Hz



60 Hz

运行参数 Operating Data

	50 Hz	60 Hz
规格	40 to 200 mm	1.5 to 8 inches
流程	up to 900 m³/h	up to 4,600 USgpm
扬程	up to 2,600 m	up to 10,000 feet
压力	up to 300 bar	up to 4,500 psi
温度	-30 °C to + 425 °C	-20 °F to + 800 °F

	50 Hz	60 Hz
Pump sizes	40 to 200 mm	1.5 to 8 inches
Capacities	up to 900 m³/h	up to 4,600 USgpm
Heads	up to 2,600 m	up to 10,000 feet
Pressures	up to 300 bar	up to 4,500 psi
Temperatures	-30 °C to + 425 °C	-20 °F to + 800 °F

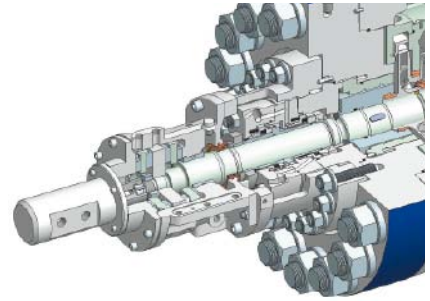
可选设计 GSG Options

轴承可选设计

- 风扇冷却油环或者油雾润滑耐磨轴承
- 油环润滑径向滑动轴承配耐磨推力轴承
- 强制润滑径向滑动轴承配能够承受双向载荷可倾瓦推力滑动轴承
- 根据要求，可以配置不同仪表

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

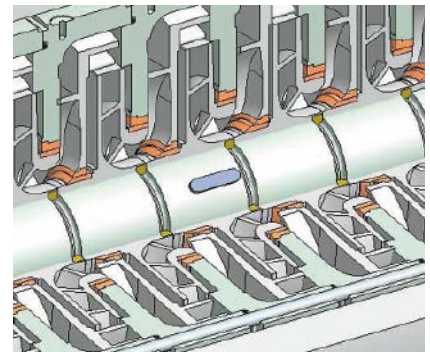


转子和叶轮可选设计

- 根据 ISO13709 (API 610) 要求，叶轮需要逐级固定，并且与轴过盈配合，为便于装配，轴设计成台阶形式
- 根据需要，叶轮和轴可以设计成过渡配合形式
- 与联轴器连接轴可以为圆柱形或者锥形，根据 ISO13709 (API 610)，可以使用液力偶合器
- GSG 转子串联或背靠背设计
- 对于低 NPSHr，首级叶轮可以设计成双吸结构

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

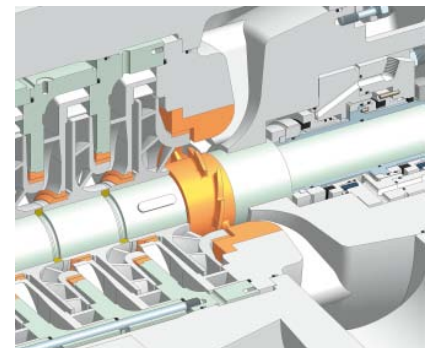


高温和易产生固体颗粒可选设计

- 对于有焦炭颗粒的介质输送可以使用焦炭粉碎轮
- 对于高温，需要提供定位座和导向座
- 隔垫或噪音隔离装置根据需要，可以提供

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



大连苏尔寿泵及压缩机有限公司
大连市双 D 港双 D7 街 6 号
总机 +86 (0) 411 8758 1888
订货电话 +86 (0) 411 8758 1738
备件订货 +86 (0) 411 8758 1864/1865
售后服务 800890 9528
传真 +86 (0) 411 8758 1878-8738
邮编 116600

Sulzer (Dalian) Pumps & Compressors Ltd.

No.6 DD 7th Street, DD Port
Dalian 116600
Tel. +86 (0) 411 8758 1888
Order Tel. +86 (0) 411 8758 1738
Parts Order Tel. +86 (0) 411 8758 1864/1865
CSS Tel. 800 890 9528
Fax +86 (0) 411 8758 1878 - 8738

北京分公司

北京市建国门内大街 7 号光华长安大厦
2 座 1618-19 室
电话 +86 (0) 10 6510 1777/1781
传真 +86 (0) 10 6518 5011
邮编 100005

Beijing Branch

Room 1618-19, Tower 2,
No.7, Bright China Chang An Building,
Jian Guo Men Nei Dajie,
Beijing, China 100005
Tel. +86 (0) 10 6510 1777/1781
Fax +86 (0) 10 6518 5011

广州办事处

广东省广州市天河区林和西路 9 号
耀中广场 1914-1915 室
电话 +86 (0) 20 3810 5611
传真 +86 (0) 20 3810 5612
邮编 510610

Guangzhou office

Room 1914-1915, China Shine Plaza,
No.9, Lin He Xi Road, Tianhe District,
Guangzhou, Guangdong China 510610
Tel. +86 (0) 20 3810 5611
Fax +86 (0) 20 3810 5612

苏州苏尔寿泵业有限公司
苏州新区建林路 433 号
总机 +86 (0) 512 8187 3888
传真 +86 (0) 512 8187 3591
邮编 215000

Sulzer Pumps Suzhou Ltd.

No.433, Jianlin Road, Suzhou New District,
Suzhou 215000
Tel. +86 (0) 512 8187 3888
Fax +86 (0) 512 8187 3591

上海分公司

上海市虹桥路 3 号港汇中心 2 座 2102 室
电话 +86 (0) 21 6448 5060
传真 +86 (0) 21 6448 5061
邮编 200030

Shanghai Branch

Room 2102, 2 Grand Gateway,
No.3 Hongqiao Road,
Shanghai, China 200030
Tel. +86 (0) 21 6448 5060
Fax +86 (0) 21 6448 5061

西安办事处

陕西省西安市高新技术产业开发区科技路 33 号
高新国际商务中心 2206 室
电话 +86 (0) 29 8833 7458
传真 +86 (0) 29 8833 7458 - 8866
邮编 710075

Xi'an office

Room 2206, Gaoxin Interational Business Center
No.33 Keji Road, Gaoxin High-new Technology
Development District,
Xi'an, Shaan'xi China 710075
Tel. +86 (0) 29 8833 7458
Fax +86 (0) 29 8833 7458 - 8866

www.sulzerpumps.com

上海技术服务分公司

上海市浦东新区合庆镇东川公路 5578 号
电话 +86 (0) 21 5897 3801
传真 +86 (0) 21 5897 3803/3605
邮编 201201

Shanghai Service Center

No.5578, Dongchuan Road,
Heqing Pudong New Area
Shanghai, China 201201
Tel. +86 (0) 21 5897 3801
Fax +86 (0) 21 5897 3803/3605

成都办事处

四川省成都市武侯区科华北路 62 号
力宝大厦 1008 室
电话 +86 (0) 28 8528 3691/3693
传真 +86 (0) 28 8528 3692
邮编 610041

Chengdu office

Room 1008, LIPPO Tower
No.62 Kehua North Road, Wuhou District,
Chengdu, Sichuan China 610041
Tel. +86 (0) 28 8528 3691/3693
Fax +86 (0) 28 8528 3692

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