RODELTA®

PUMP SOLUTIONS IN THE OIL & GAS INDUSTRY API 610 RANGE

Dedicated Solutions for Leading Industries

distinctive vision

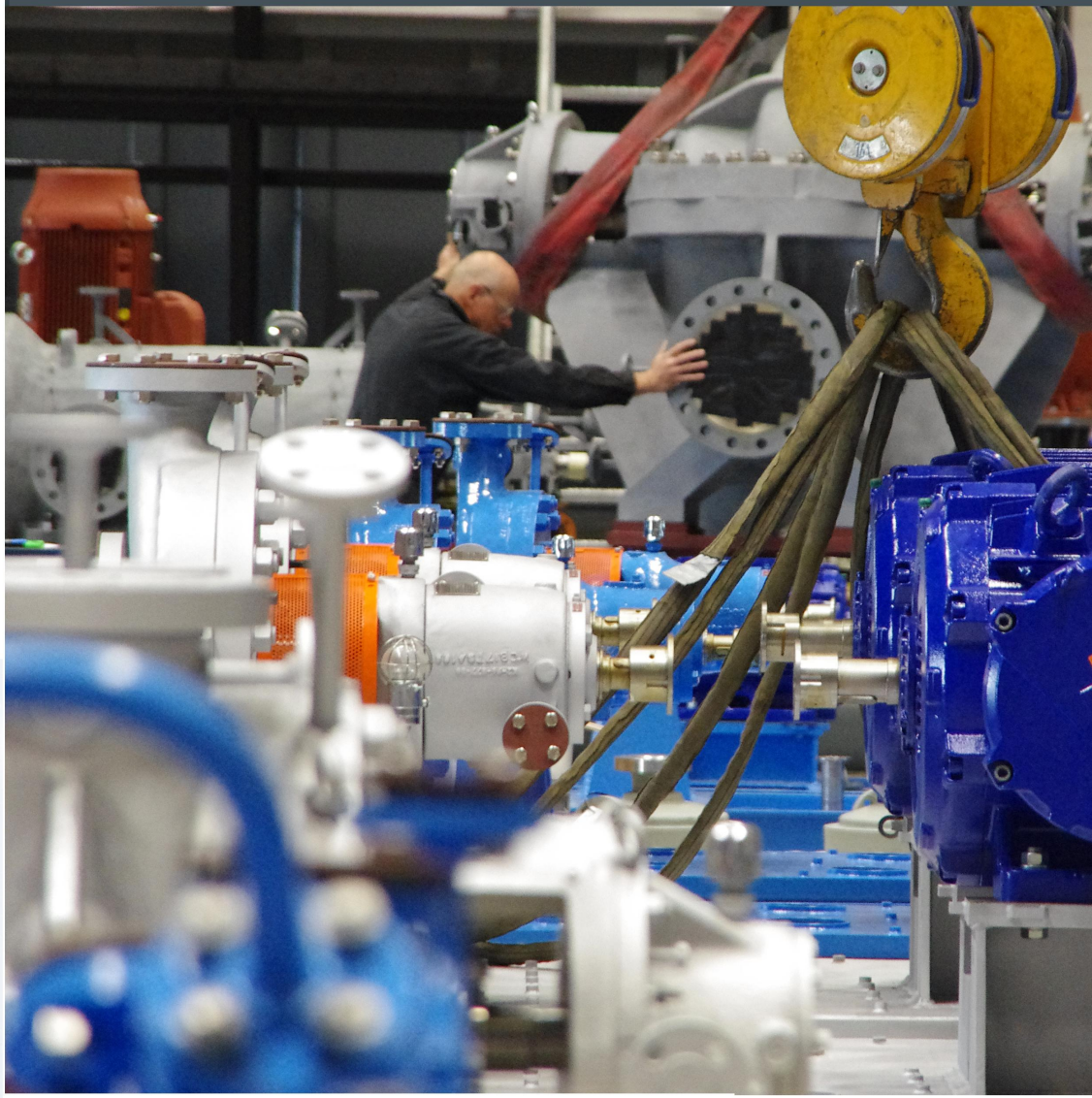
API PUMPS FOR EXTREME ENVIRONMENTS DEMAND

The Oil and Gas industry creates some of the most demanding scenarios for pump engineering. Environments are frequently remote and inhospitable. Unplanned downtime is not an option.

Diverse applications and product handling introduce unique pumping challenges. Rodelta's ability to safely handle a wide range of fluids - often hazardous or toxic at potential extremes of temperature - comes from many years of proven pump technology.

Exceptional performance and proven reliability are pre-requisites. Whether through highly engineered packages or the more standard API products, Rodelta commitment to providing the best solutions to meet stringent customer specifications is second to none.

With experience borne from the harsh environments of the North Sea, you'll find Rodelta pump equipment installed and operating in many onshore and offshore applications across the globe.



OIL AND GAS SECTOR APPLICATIONS

- Hydrocarbon and process pumps
- Cooling water (CVP)
- Booster pumps
- Utilities
- Main fire pump
- Firewater jockey pump
- Seawater lift
- Seawater intake

RODELTA PRODUCTS AND SOLUTIONS

- Overhung pumps
- Between bearing pumps
- Vertically suspended pumps
- Bespoke package solutions
- Custom engineered products
- CFD studies
- Pump system optimisation
- Transient calculations

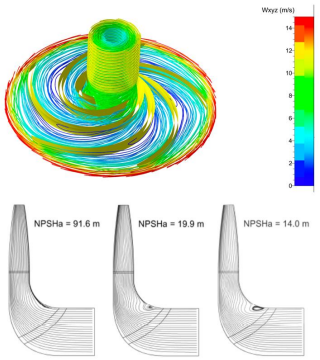
TRUSTED, MISSION-CRITICAL PERFORMANCE. ON AND OFFSHORE.

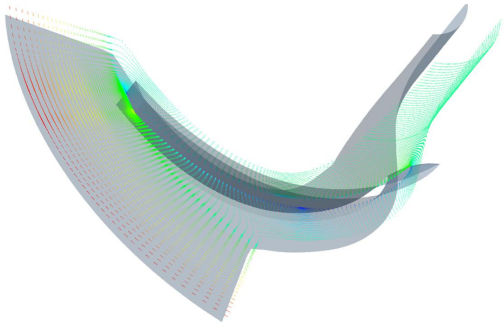
EXCEPTIONAL VALUE: CUSTOM DESIGNED AND PROJECT MANAGED

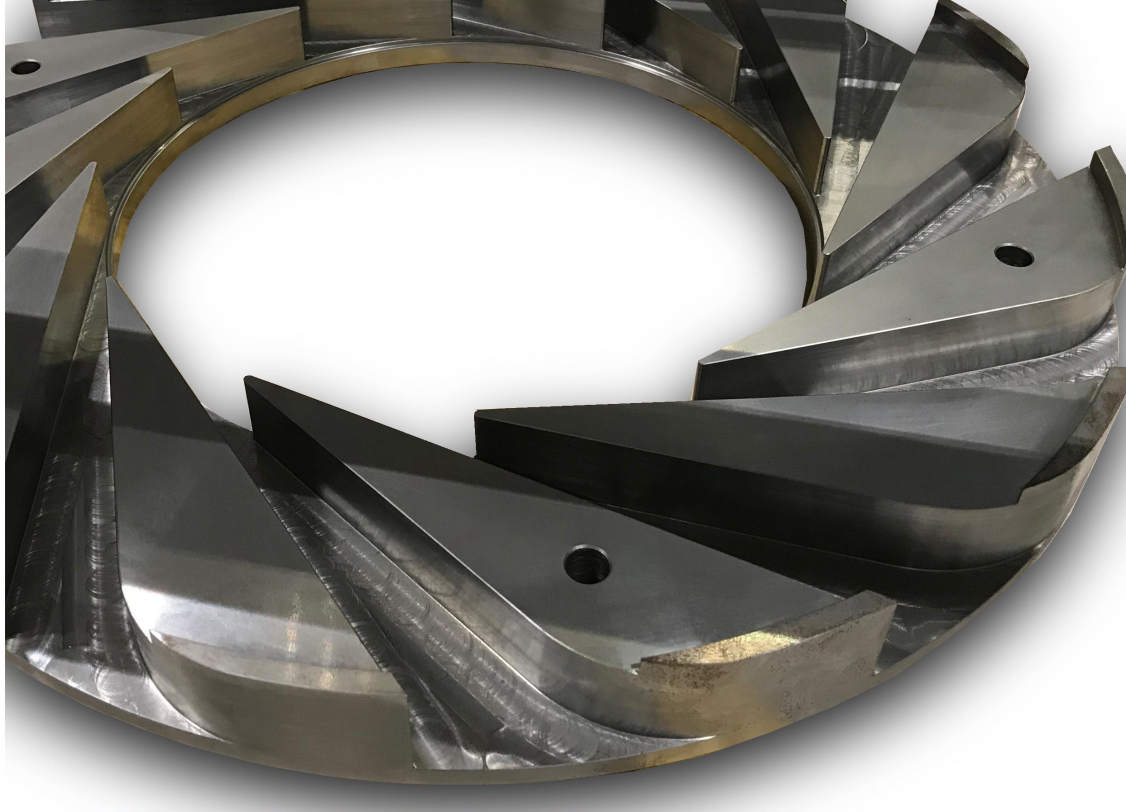
From the initial client criteria through CAD drawing to final product installation, the Rodelta team works tirelessly to design and deliver integrated projects. Customised in-house hydraulic and mechanical design quickly solves customer application challenges, whilst experienced project management offers unparalleled added value.

EXCEPTIONAL PERFORMANCE: THE OPTIMUM PACKAGE FOR ANY APPLICATION

Rodelta Pumps' capability extends far beyond the design and manufacture of quality pumps. The company packages pump units into complete solutions. The result is finely tuned, bespoke-engineered units that precisely meet the performance specification each application requires.







EXCEPTIONAL VALUE: CUSTOM DESIGNED DIFFUSERS

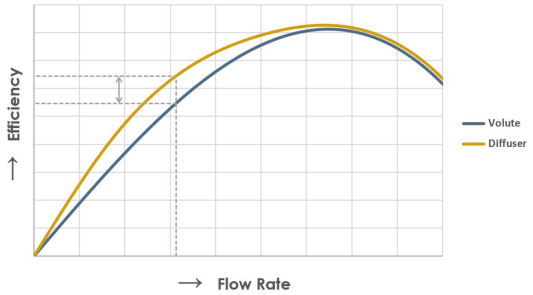
DIFFUSER PUMP ADVANTAGES OVER VOLUTE PUMPS

The working principle of centrifugal pumps is based on adding energy to the working medium using a rotating impeller. This process, in addition to increasing the static pressure, also increases the velocity of the fluid. The added energy in the form of velocity (or dynamic pressure) can be partially converted into static pressure by properly slowing down the fluid. This is often done by using a volute , which is a spiral-formed casing around the impeller, collecting and guiding the fluid towards the discharge pipe while gradually decreasing its velocity.

A volute pump casing combines two functions: providing the hydraulic flow path and the pressure casing for the fluid. In diffuser pumps, these functions are split into two separate parts. A casing (or collector) is used for creating the pressure boundary, while the velocity-pressure conversion is done by employing a diffuser, which is a ring with multiple diverging channels, placed around the impeller. This provides more guidance for the decelerating flow which can be beneficial from several points of view.

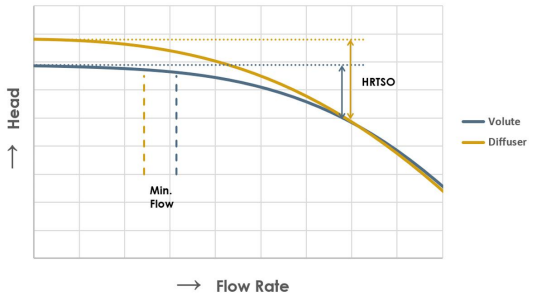
LOW FLOW RATES

Especially for pumps made for operation at relatively low flow rates, diffuser pumps outperform volute pumps efficiency wise. In addition to the higher maximum efficiency, the efficiency does not collapse as fast when operating in part load conditions



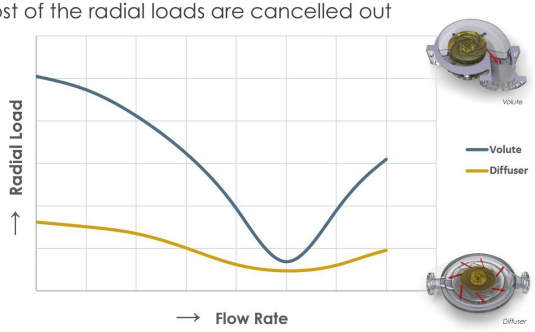
HEAD RISE TO SHUT-OFF

Furthermore, diffuser pumps mostly have higher head rise to shut-off (HRTSO) and greater steepness and stability of the head curve, which is especially required for pumps operating in the API market and for parallel operation. Requirements at API 610 can be done without destroying the efficiency



FORCES

Diffuser pumps are not just advantageous from an efficiency standpoint. The multi-channel diffuser geometries show more axial symmetry than the asymmetric volute shapes. As this axial symmetry is also present in the pressure distribution of the flow field, most of the radial loads are cancelled out



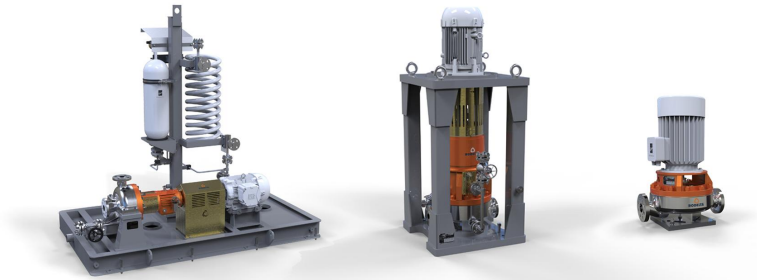
TIME BETWEEN MAINTENANCE

Due to a series of diffuser vanes as opposed to a single volute tongue, pulsations from the passing impeller blades and other unsteady flow phenomena are greatly reduced. Lower unsteady behavior means lower vibration and noise levels, which is especially noticeable at off-design operating conditions. The reduced loading and vibrations in turn lead to longer mean time between maintenance. Diffuser pumps are known for their characteristic longer life-cycle of the pump, lower spare part cost and the significant reduction in down-time of the entire process.

Another advantage arises from the fact that the diffuser is a separate part from the pump (pressure) casing. A lot of design flexibility is introduced because a single casing can fit a wide range of diffuser geometries. As the diffuser channels are machined, they do not suffer from the limitations of a casting process, which is the case for volute casings. This also provides the opportunity to make custom diffusers for every order.

For a volute this would be an impossible task, as designing a volute is more complex and casting patterns would have to be generated for every single volute. This means that volute pumps will mostly be a compromise: due to the limited number of volute pumps in a range, the customer duty point will deviate from the best efficiency point of the pump. This problem is circumvented using diffusers. By trimming the impeller diameter and creating a custom diffuser geometry, the best efficiency point is located exactly at the required pump performance.

This enables possibilities for retrofit existing diffuser pumps with a new impeller and/or diffuser, to change the duty point of the pump, increasing the life cycle of the pump even further. Compared to retrofitting of a volute pump, the customer will save cost on the pump and fandation / piping works at site.



ENGINEERED DIFFUSER TECHNOLOGY FOR COMPLETE NEW OVERHUNG SERIES "OH" PUMPS (API OH2 OH3 AND OH5)

At Rodelta Pumps International we are constantly working on improving our products package In 2018 we launched three completely new redesigned overhung pump lines to serve the process market. These overhung pump lines are designed to be fully API 610 12th edition compliant . The pump range is a fully coherent series of pumps, covering a range of flows and heads without leaving gaps.

For every duty a pump selection can be made that complies to the API 610 requirements with respect to the rated flow being in the 80-110% range of the best efficiency flow rate. Also, the selections will have at least 10% head rise to shut-off (HRTSO) and stable head curves, as required by the API 610 for parallel operation.

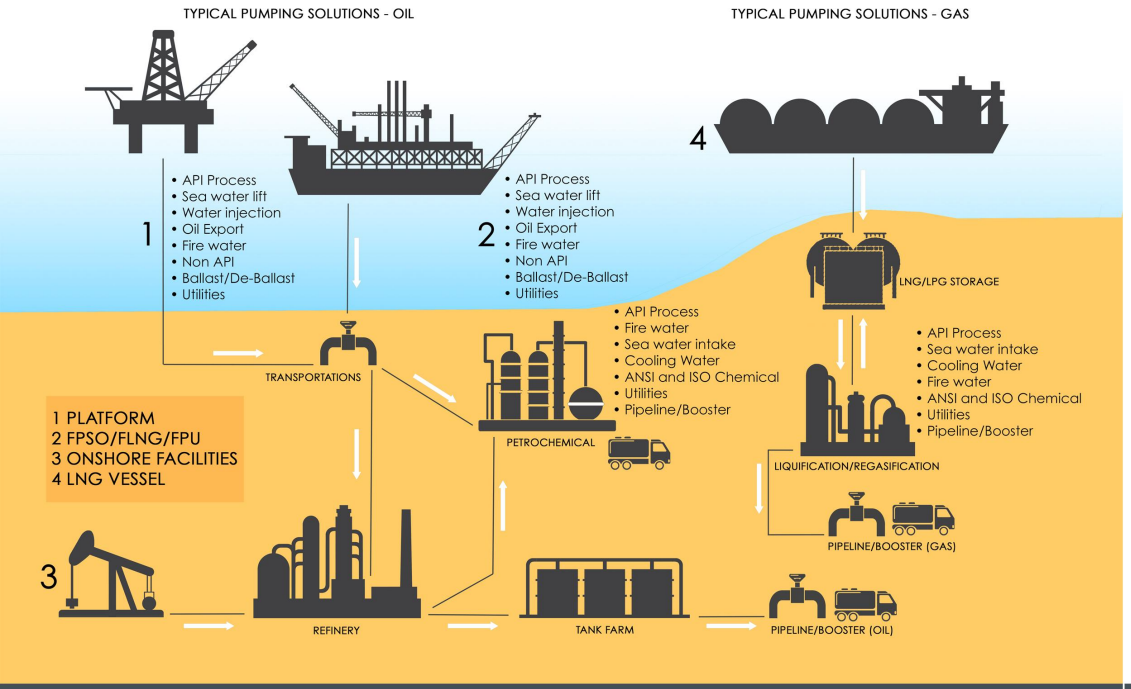
The use of custom engineered diffuser technology can be recognized by the following logo:

Custom engineered diffuser technology inside

WHERE CAN RODELTA PUMPS' PROVEN TECHNOLOGIES SUPPORT YOUR OPERATIONS?

We offer a portfolio of API products that covers all applications in the petroleum refinery, petrochemical, gas processing, oil processing, offshore (platform) installation, hydrocarbon and crude oil pipeline and jet aviation fueling.

WHATEVER THE PROCESS,WE HAVE THE PUMPING SOLUTION



PUMP SOLUTIONS IN THE OIL &GAS INDUSTRY API 610 RANGE

RODELTA®

For other API pump types than those listed above, please contact one of our sales employees. or go to www.rodelta.com

API PUMP RANGE

HZC
OH2

HZC	EU	US
Design standard	ISO 13709	API
Features	Overhung OH2, center line mounted, single stage pump	
Capacity	Upto 1920 m3/hr	8455 Gpm
Head	Upto 380 m	Upto 1245 feet
Temperature Range	-104 to 425 Deg C	-155 to 795 Deg F
Discharge Pressure	Upto Cl. 600#	
Suction Pressure	upto 80 Bar	1140 psig
Nozzle Orientation (suc/dis)	End-Top(Standard) & Top-Top(on request)	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1800/3000/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	Cl. 150/300/600	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

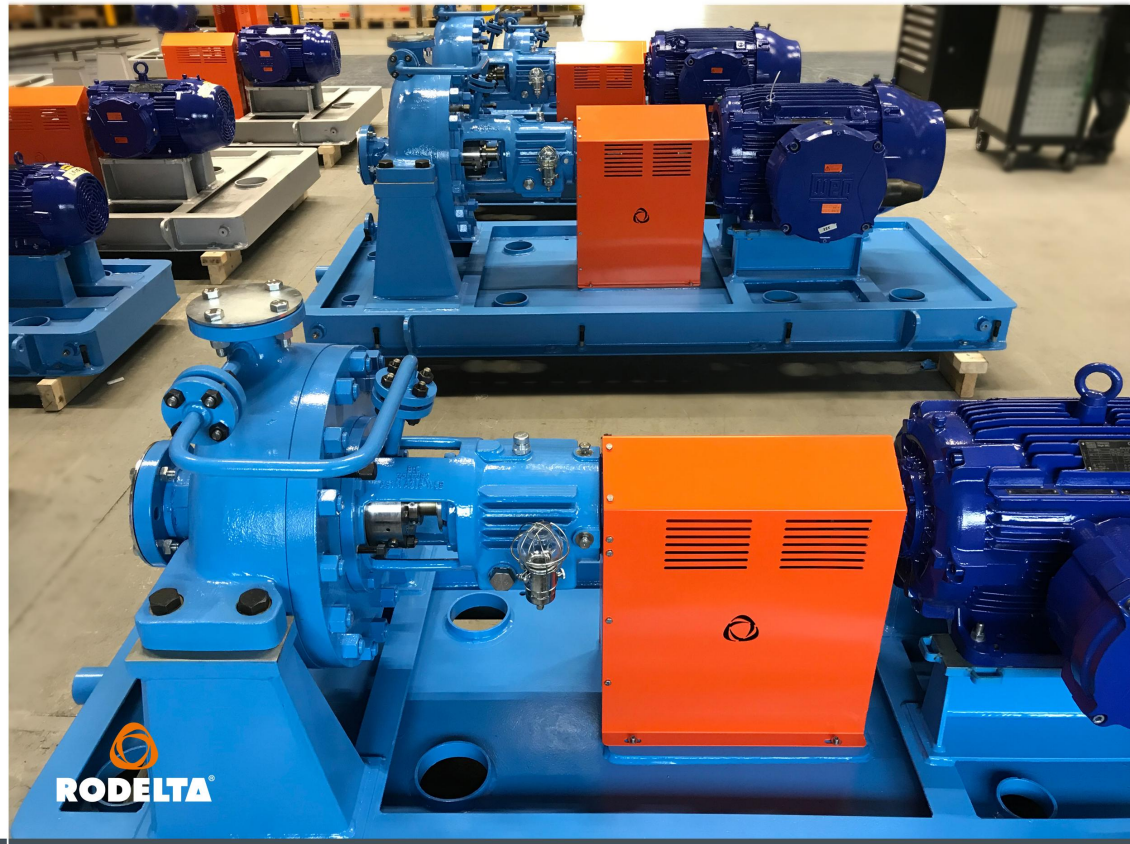
Custom engineered diffuser technology inside

The pump type HZC (OH2) is a series of horizontal overhung centerline mounted, single stage, single suction heavy duty centrifugal pumps with diffuser and volute design casings.
The design of HZC complies with the latest edition of the American Petroleum Institute standard 'Centrifugal Pumps For General Refinery Services', also known as API 610/ ISO13709. Satisfying this standard, the HZC meets the high level performance requested by refineries and petrochemical industries.

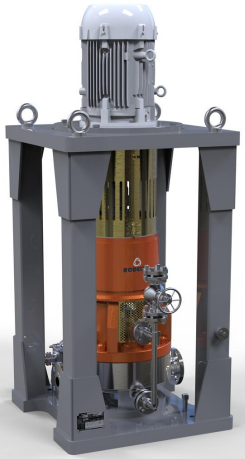
FEATURES:

- Single stage overhung design pump – API610 (OH2)
- Heavy duty, centerline mounted, radially split casing
- Back-pull out unit design. Pump internals can be taken out without disconnecting suction/delivery piping or moving driver.
- The casing is self-venting due to the centerline discharge
- The impeller is a closed radial design, dynamically balanced and incorporates a wear ring on either side of the impeller.
- Diffuser design, reduces radial loads, reduces minimum flow requirements, high efficiency at any duty
- Double volute design, to reduce radial loads

HZC (OH2 centerline mounted)



API PUMP RANGE



ETLS
OH3

ETLS	EU	US
Design standard	ISO 13709, BS4082-1	API
Features	Vertical In-line Overhung OH3,Long coupled	
Capacity	Upto 400 m3/hr	1760 Gpm
Head	Upto 180 m	Upto 590 feet
Temperature Range	-20 to 425 Deg C	-4 to 795 Deg F
Discharge Pressure	Upto Cl. 300#	
Suction Pressure	upto 20 Bar	290 psig
Nozzle Orientation (suc/dis)	In line position	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	Cl. 150/300	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

Custom engineered diffuser technology inside

The pump type ETLS (OH3) vertically inline mounted, flexible coupled, radial split case, single stage, single suction, heavy duty centrifugal process pumps. The design complies with the latest edition of the American Petroleum Institute standard 'Centrifugal Pumps For General Refinery Services', also known as API 610/ ISO13709.
The inline configuration is a compact pumping solution that eliminates the need for an expensive baseplate saving valuable floor space. (This pump is also available in close coupled execution, pump type OH5- ETL for very compact applications)

FEATURES:
- According API 610 (OH3)
- Diffuser design reduces radial loads
- Reduces minimum flow requirements
- High efficiency at any duty
- Alignment free construction
- in line suction & discharge
- Space saving construction
- Stable head characteristics
- Meets API nozzle load requirements
- Accommodates API 682 seal systems

ETLS pump housings

ETLS special executions (optional)

API PUMP RANGE

ETL
OH5

ETL	EU	US
Design standard	ISO 13709, BS4082-1	API
Features	Vertical In-line Overhung OH5, Closed coupled	
Capacity	Upto 400 m3/hr	1760 Gpm
Head	Upto 180 m	Upto 590 feet
Temperature Range	-20 to 250 Deg C	-4 to 480 Deg F
Discharge Pressure	Upto Cl. 300#	
Suction Pressure	upto 20 Bar	290 psig
Nozzle Orientation (suc/dis)	In line position	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	Cl. 150/300	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

Custom engineered diffuser technology inside

The pump type ETL (OH5) vertically inline mounted, close coupled, radial split case, single stage, single suction, heavy duty centrifugal process pumps. The design complies with the latest edition of the American Petroleum Institute standard 'Centrifugal Pumps For General Refinery Services', also known as API 610/ ISO13709.
The inline configuration is a compact pumping solution with mounting the impeller to an extended motor drive shaft presents a very compact pumping solution. The ETL (OH5) offers a space saving footprint and eliminates expensive baseplates. (This pump is also available in long coupled pump type ETLS (OH3) for high temperature applications)

FEATURES:
- According API 610 (OH5)
- Diffuser design reduces radial loads
- Reduces minimum flow requirements
- High efficiency at any duty
- Alignment free construction
- In line suction & discharge
- Space saving construction
- Stable head characteristics
- Meets API nozzle load requirements
- Accommodates API 682 seal systems

Extended motor drive shaft

ETL pump housings

API PUMP RANGE

VIR
VS1

VIR	EU	US
Design standard	ISO 13709	API
Features	Vertical suspended, multi stage diffuser VS1 type	
Capacity	Upto 300 m3/hr	1320 Gpm
Head	Upto 300 m	Upto 980 feet
Temperature Range	-20 to 250 Deg C	-4 to 480 Deg F
Discharge Pressure	Upto Cl. 300#	
Maximum Suspension Lenth	10m (higher length can be engineered)	
Nozzle Orientation (suc/dis)	Discharge through the column and discharge elbow (above/below floor arrangement optional)	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	Cl. 150/300	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

The pump type VIR (VS1) is a single casing, single or multistage design incorporating single or multi radial vane impellers with front and rear wear rings, each impeller has its own diffuser. VIR (VS1) vertical shaft pumps are engineered for wet well installations. This range of pump is also available with a barrel, please see our VBR (VS6) pump. The design of VIR complies with the latest edition of the American Petroleum Institute standard 'Centrifugal Pumps For General Refinery Services', also known as API 610/ ISO13709. This pump group is also known as "vertical turbine pump" VCT.

3 stage vertical turbine pump. (duplex)

FEATURES:

- According API 610 (VS1)
- Replaceable wear rings & balance holes, minimize axial loads
- Length can be adapted to suit installation
- Multiple stages
- Renewable inter-stage bushings
- Stuffing boxes acc. to API 682 suitable for various API compliant seals.
- Spacer coupling permits easy removal of top bearings with motor is in situ
- Impeller/diffuser design offers high efficiency and stable flow
- Optionally these pumps can be offered with Inducer to meet critical NPSH requirements like LPG application where NPSH available is an issue

Assembly of 3 stage VS 1 diffuser bowls

Below: Single stage VS1 pumps

API PUMP RANGE

TAZN
VS4

TAZN	EU	US
Design standard	ISO 13709	API
Features	Vertical suspended, volute VS4 type	
Capacity	Upto 300 m3/hr	1320 Gpm
Head	Upto 250 m	Upto 820 feet
Temperature Range	-20 to 250 Deg C	-4 to 480 Deg F
Discharge Pressure	Upto Cl. 150#	
Maximum Suspension Lenth	14m (higher lengths can be engineered)	
Nozzle Orientation (suc/dis)	Discharge through side riser column pipe	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	Cl. 150/300	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

The pump type TAZN (VS4) is a modular single stage centrifugal sump pump that uses hydraulic components from our Z range which comply with API 610 (ISO 13709). This pump offers solutions for thin or slightly contaminated liquids. For less stringent "NON API" applications this versatile unit can be supplied with a wide variety of competitive hydraulic options.

Pumps in the welding department for welding of pressure pipes

Testing of TAZN on Almelo testbed

FEATURES:

- According API 610 (VS4)
- Double volute casing above 80mm reduces radial loads
- Low NPSHr suits many duties
- Modular line shaft, lengths up to 8m
- Easy maintenance Spacer coupling permits inspection of top bearings, replaceable wear plate
- Top mounted mechanical seal option
- Media or external lubrication option
- Space saving construction
- Circular or rectangular cover plate to suit

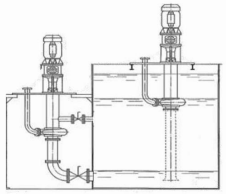
Below: TAZN pump

API PUMP RANGE

TCZ
VS5

TCZ	EU	US
Design standard	ISO 13709	API
Features	Vertical suspended, cantilever ,volute VS5 type	
Capacity	Upto 300 m3/hr	1320 Gpm
Head	Upto 250 m	Upto 820 feet
Temperature Range	-20 to 250 Deg C	-4 to 480 Deg F
Discharge Pressure	Upto Cl. 150#	
Maximum Suspension Lenth	upto 2,5m (with suction pipe higher depths possible)	
Nozzle Orientation (suc/dis)	Discharge through side riser column pipe	
Standard Motor Sync. Speed	750/1000/1500 rpm	900/1200/1800 rpm
Max. Operating Speed	1800 rpm	
Flange ratings(#RF)	Cl. 150/300	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.



Dry well Wet well

The pump type TCZ (VS5) is a vertically mounted suspended single casing volute pump "true" cantilever pump with no shaft supports, seals, bearings or bushings below the bearing housing. All bearings are suspended in a cartridge above the cover plate to provide protection in case of flooding. The TCZ has a closed impeller and can be supplied with a wide variety of competitive hydraulics.
Also see our pump types TCE (VS5), TCN (VS5), - TCF (VS5),on www.rodelta.com for more hydraulic options.

TCZ Cantilever shaft

FEATURES:
- According API 610 (VS5)
- Used in applications with liquids containing solids or abrasive slurries
- When no intermediate bearings inside the liquids are allowed
- Low OPEX and CAPEX which results in a low total cost of ownership
- Performance of the pump can be customized to customer requirements by means of a closed, open and semi-open impeller
- Where leakages are forbidden for environmental and health protection reasons
- Dry well or wet well
- Can run dry indefinitely

tcz ready for shipment

API PUMP RANGE

VBR
VS6

VBR	EU	US
Design standard	ISO 13709	API
Features	Vertical suspended, diffuser, double casing VS6 can type	
Capacity	Upto 300 m3/hr	1320 Gpm
Head	Upto 300 m	Upto 984 feet
Temperature Range	-20 to 250 Deg C	-4 to 480 Deg F
Discharge Pressure	Upto Cl. 300#	
Maximum Suspension Lenth	10m (higher lengths can be engineered)	
Nozzle Orientation (suc/dis)	Discharge through the column pipe and discharge elbow	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	Cl. 150/300	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

The pump type VBR (VS6) is a double casing single or multistage design incorporating single or multi radial vane impellers with front and rear wear rings, each impeller has its own diffuser. VBR vertical shaft pumps feature a barrel (suction can) and are suitable for dry or wet well uses. This range is also available without the barrel please see our VIR (VS1) pump type. The design complies with the latest edition of the American Petroleum Institute standard 'Centrifugal Pumps For General Refinery Services', also known as API 610/ ISO13709.

FEATURES:

- According API 610 (VS6)
- Replaceable wear rings & balance holes, minimize axial loads
- Length can be adapted to suit installation
- Multiple stages
- Renewable inter-stage bushings
- Stuffing boxes acc. to API 682 suitable for various API compliant seals.
- Spacer coupling permits easy removal of top bearings with motor is in situ
- Impeller/diffuser design offers high efficiency and stable flow
- Optionally these pumps can be offered with Inducer to meet critical NPSH requirements like LPG application where NPSH available is an issue

Below: Assembly VS6 pump

VBR (VS6) barrel /suction can

API PUMP RANGE

KBAD
BB1

KBAD	EU	US
Design standard	ISO 13709	API
Features	Between Bearing BB1, axially split, single stage pump	
Capacity	Upto 6240 m3/hr	27475 Gpm
Head	Upto 460 m	Upto 1510 feet
Temperature Range	upto 200 Deg C	upto 390 Deg F
Discharge Pressure	Upto Cl. 300# and 600# optional	
Suction Pressure	upto 20 Bar	285 psig
Nozzle Orientation (suc/dis)	Side-side(standard), Bottom-Side(optional)	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	Cl. 300/600	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

Large BB1

The BB1 type, KBAD pumps are axially split single stage between bearing pumps complying with API610 requirements. These pumps are suitable for wide applications in fluid handling in oil refineries and petrochemical industry. Other applications are including Quench water, cooling water, dewatering in mining and firefighting application. The discharge pressures are designed up to class 300 and class 600 if required and suitable for suction pressures up to 20 bar (g).

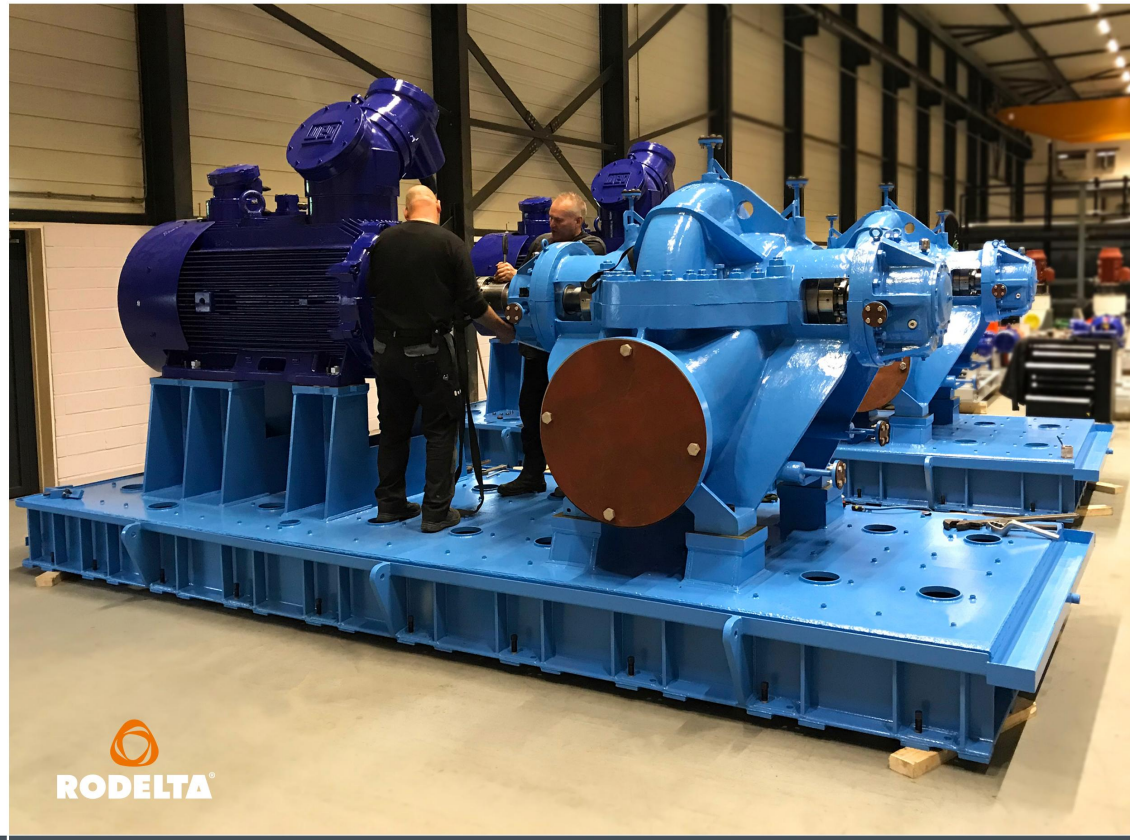
BB1

FEATURES:

- Design and manufacture as per API610 (BB1)
- This pump is supported between bearing and heavy duty design ensures high reliability under critical operating conditions.
- The axial split casing permits removal of the complete rotating element without disturbing suction and discharge piping.
- Various design options and material choices permit handling of a wide range of liquids in various process applications.
- This pump can be offered as Hydraulic power recovery turbine (HPRT)
- Axial thrust balancing is achieved with help of double suction impeller.
- These pumps can meet low NPSH requirement due to double suction impeller.

For optional Features KBAD pumps see: www.rodelta.com

Below: KBAD assembly



API PUMP RANGE

KBSD
BB2 single stage

KBSD	EU	US
Design standard	ISO 13709	API
Features	Between Bearing BB2, Radially split, single stage pump	
Capacity	Upto 5500 m3/hr	24215 Gpm
Head	Upto 550 m	Upto 1805 feet
Temperature Range	-104 to 425 Deg C	-155to 795 Deg F
Discharge Pressure	Upto Cl. 300# and 600# optional	
Suction Pressure	upto 80 Bar	1135 psig
Nozzle Orientation (suc/dis)	Top-Top, Side -Top & Side-Side	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	Cl. 300/600	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

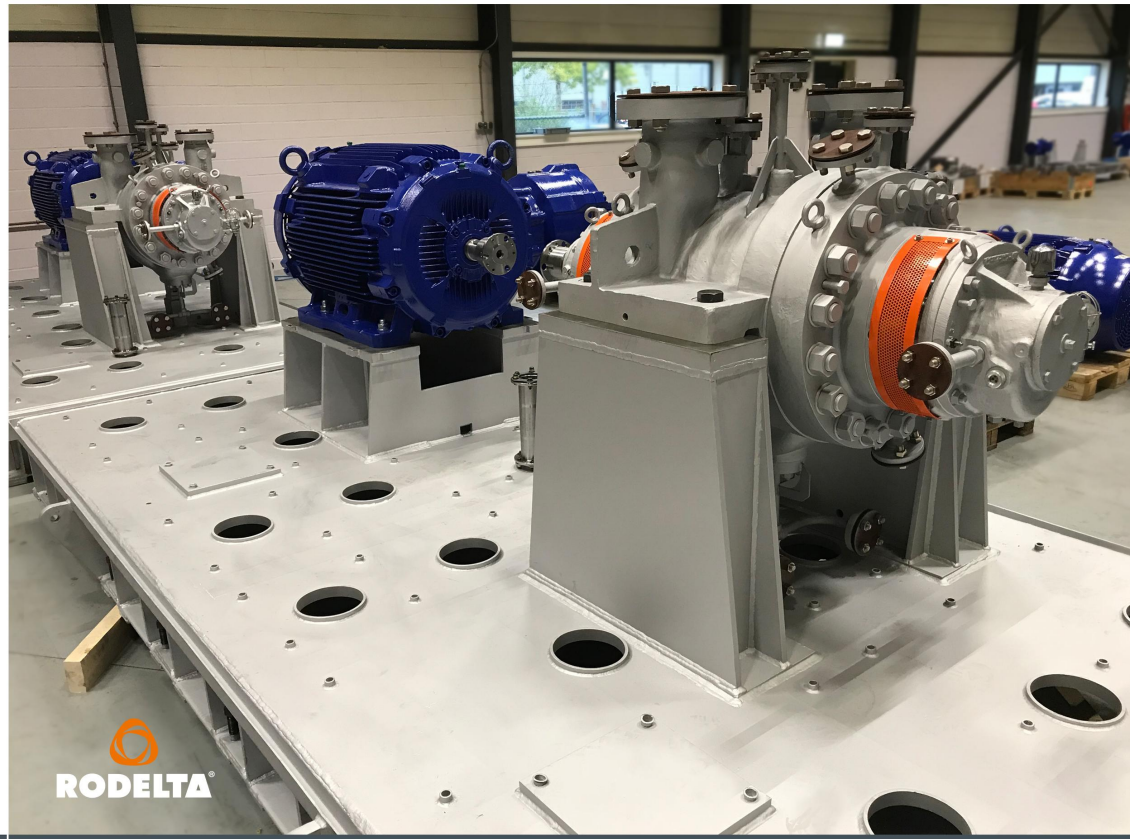
The BB2, type KBSD is a between bearing pump, single stage, double suction impeller pump conforming to API 610. The casing is center line mounted with case wear ring. Casing is radially split with metal to metal joint having confined controlled compression spiral wound metallic gasket grafoil filled. These pumps are suitable and used in applications of fluid handling in oil refineries and petrochemical industry. The discharge pressures are designed up to class 300 and class 600 if required and suitable for suction pressures up to 80 bar (g).

KBSD (BB2)

FEATURES:

- Conforming to latest API 610. (BB2)
- Between bearing pump, single stage
- Double suction impeller pump
- Casing is center line mounted and with case wear ring
- Removal of rotor or inner elements is possible without disconnecting suction and discharge piping or moving the driver.
- Enclosed impellers with wear rings.
- Inherent axial thrust balancing because of double suction impeller.
- Impeller is keyed to the shaft
- Impellers located using impeller nut with threads to tighten by liquid drag on the impeller during normal rotation.
- Shaft supported on antifriction bearings
- DE – A roller bearing with C3 clearance
- NDE – A pair of angular contact ball bearing in back to back arrangement
- Thrust bearing is located on the shaft with the help of lock washer and lock nut.
- Bearing housing is with bearing covers having replaceable labyrinth type end seals.
- Pump with cartridge type mechanical seals at DE and NDE as per API682.
- Pump is available with taper shaft which makes easier removal of the coupling.

Below: Single stage BB2 pump



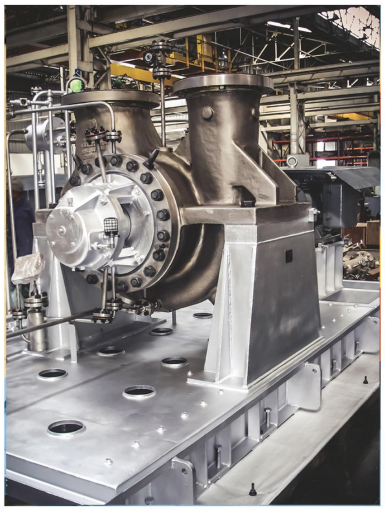
API PUMP RANGE

KBTS,KBTD
BB2 Two stage

KBTS,KBTD	EU	US
Design standard	ISO 13709	API
Features	Between Bearing BB2, Radially Split, two stage pump	
Capacity	Upto 1600 m3/hr	7045 Gpm
Head	Upto 520 m	Upto 1705 feet
Temperature Range	upto 425 Deg C	795 Deg F
Discharge Pressure	Upto Cl.600#	
Suction Pressure	upto 80 Bar	1135 psig
Nozzle Orientation (suc/dis)	Top-Top, Side -Top & Side-Side	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	3600 rpm	
Flange ratings(#RF)	upto Cl.600	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

The BB2 type, KBTS is a Between Bearing Two stage single suction centerline supported pump type. KBTD is a Between Bearing Two stage double suction centerline supported pump type conforming to API 610. The casing is center line mounted and with case wear ring. Casing is radially split with metal to metal joint having confined controlled compression spiral wound metallic gasket grafoil filled. These pumps are suitable and used in applications of fluid handling in oil refineries and petrochemical industry. The discharge pressures are designed up to class 600 and suitable for suction pressures up to 80 bar (g).



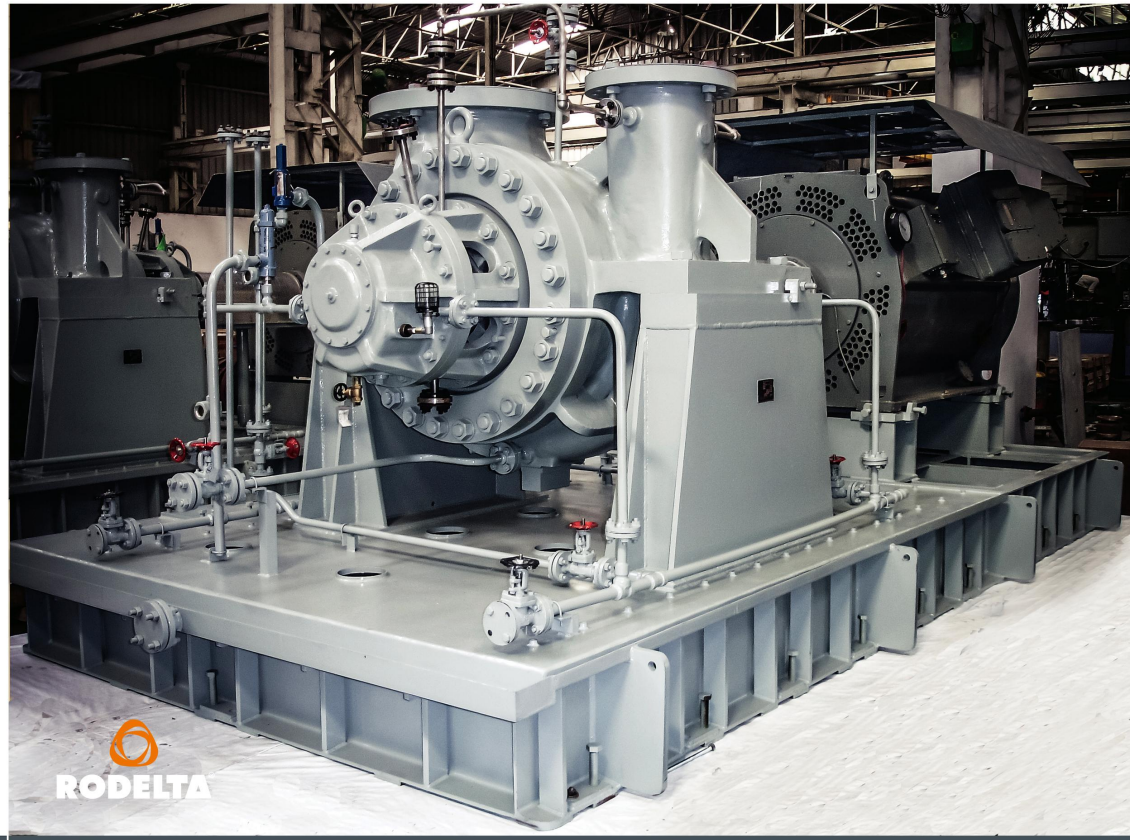
FEATURES:

- Conforming to latest edition API 610 (BB2).
- Two stage Between bearing pump
- Single and Double suction impeller pump
- Casing with Top-Top nozzle.
- Casing is center line mounted and with case wear ring
- Removal of rotor or inner elements is possible without disconnecting suction or discharge piping or moving the driver.
- Enclosed impellers with wear rings.
- Inherent axial thrust balancing because of double suction impeller for 1st stage for KBTD.
- Axial thrust balancing is with the help of impellers in opposed direction for KBTS.

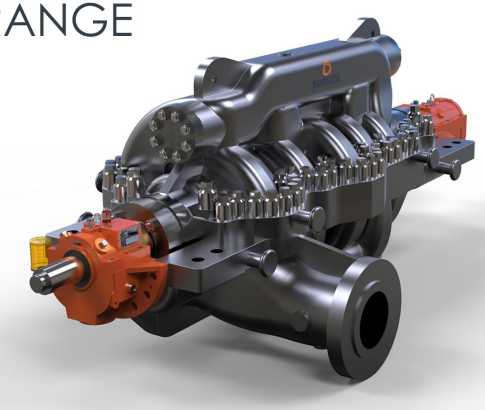
For morel features see: www.rodelta.com

KBTD BB2 stainless steel

Below: KBTS BB2 assembly



API PUMP RANGE



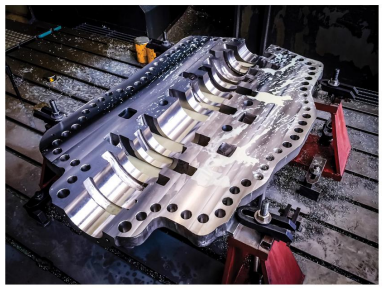
KB3S,KB3D
BB3

KB3S,KB3D	EU	US
Design standard	ISO 13709	API
Features	Between Bearing BB3, axially split, multi stage pump	
Capacity	Upto 1750 m3/hr	7705 Gpm
Head	Upto 1840 m	Upto 6035 feet
Temperature Range	upto 200 Deg C	upto 390 Deg F
Discharge Pressure	Upto Cl.1500#	
Suction Pressure	upto 80 Bar	1135 psig
Nozzle Orientation (suc/dis)	Side-Side	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	upto 7000 rpm(higher capacity & head is possible when pumps are operated at higher speed using gear box/VFD)	
Flange ratings(#RF)	upto Cl.1500	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

The BB3 type, KB3S and KB3D pumps are axially split case volute casing multistage pumps which are conforming to API610. These pumps are suitable for wide applications in upstream / midstream / downstream, applications in petroleum, petrochemical, gas industry, fertilizer and allied chemical industry as a centrifugal pump as well as hydraulic power recovery turbine (HPRT). The discharge pressures are designed up to class 2500 and suitable for suction pressures up to 80 bar (g).

Machining of BB3 top part

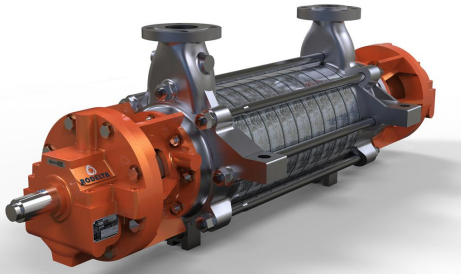


FEATURES:

- Design and manufacture as per API610 (BB3)
- Casing horizontally split with a sheet gasket. Bottom half casing with integral suction and discharge nozzles.
- Axial thrust balance with the help of impellers in opposed position and balance piston arrangement. Shaft supported in hydrodynamic sleeve bearings.
- Entire rotor with all internals can be removed without disconnecting suction and discharge piping and without disturbing driver after disassembling the upper half casing.
- Bearings and mechanical seals can be removed without disassembling the upper half casing or without disconnecting suction / discharge piping and driver.
- Bearing lubrication with non pressure fed oil lubrication with oil ring to feed oil.
- Casing with pump feet very close to pump centerline.
- Radial hydraulic force on shaft is balanced with the help of casing with double volute design.

For more features see: www.rodelta.com

API PUMP RANGE



KBSH,KBDH
BB4

KBSH,KBDH	EU	US
Design standard	Company standard,can also meet ISO 13709	Company standard,can also meet, API
Features	Between Bearing BB4, radially split,single casing multi stage pump	
Capacity	Upto 550 m3/hr	2425 Gpm
Head	Upto 2500 m	Upto 8200 feet
Temperature Range	upto 200 Deg C	upto 390 Deg F
Discharge Pressure	Upto Cl.1500#	
Suction Pressure	upto 16 Bar	225 psig
Nozzle Orientation (suc/dis)	Top-Top and Side-Side	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	upto 7000 rpm (higher capacity & head is possible when pumps are operated at higher speed using gear box/VFD)	
Flange ratings(#RF)	upto Cl.1500#	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.

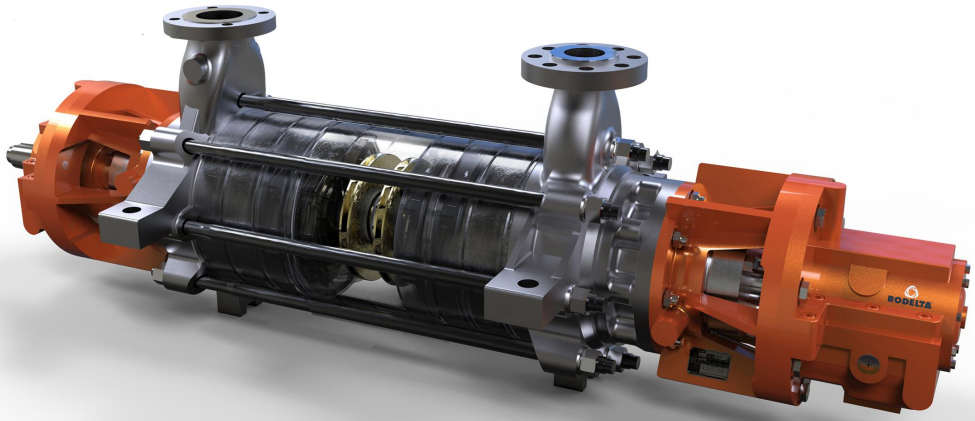
The BB4 type, KBSH and KBDH pumps are single casing, radially split multistage between bearing pumps. The design and manufacture is as per company standard but can meet API610 requirements. These pumps are suitable for wide applications in high pressure boiler feed water applications, high pressure mine drainage applications, high pressure applications in water treatment plant. The discharge pressures are designed up to class 1500 and suitable for suction pressures up to 16 bar (g).

FEATURES:

- Design and manufacture as per company standard but can meet API610 (BB4) requirements.
- Easy inspection and repair maintenance of bearings and mechanical seal after removal of coupling spacer only.
- Multistage pump with ring section diffuser casing design with centerline support to meet high temperature and high pressure applications especially in BFW applications.
- Pump with cartridge type mechanical seal at Driving end and Non driving end as per API682.
- First stage impeller with double suction is provided in KBDH models to improve NPSHR performance.
- Specially designed to meet high performance for superior and extended low cost operation.
- Pump family designed to have maximum parts interchangeability.

Diffuser stages BB4

KBSH (BB4) Single casing

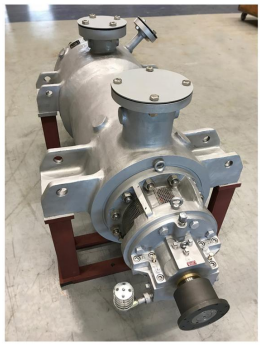


API PUMP RANGE

KBDS,KBDD BB5

KBDS,KBDD	EU	US
Design standard	ISO 13709	API
Features	Between Bearing BB5, radially split, double casing multi stage pump	
Capacity	Upto 750 m3/hr	3300 Gpm
Head	Upto 2500 m	Upto 8200 feet
Temperature Range	upto 425 Deg C	upto 795 Deg F
Discharge Pressure	Upto Cl.2500#	
Suction Pressure	upto 79 Bar	1125 psig
Nozzle Orientation (suc/dis)	Top-Top, Side-Side, Side-Top	
Standard Motor Sync. Speed	1000/1500/3000 rpm	1200/1800/3600 rpm
Max. Operating Speed	upto 7000 rpm(higher capacity & head is possible when pumps are operated at higher speed using gear box/VFD)	
Flange ratings(#RF)	upto Cl.2500#	
API material options available, NACE & ATEX approvals available on request		

For alternative specifications, other than above, please contact us.



The BB5 type, KBDS and KBDD pumps are double casing, radially split multistage between bearing pumps conforming to API 610 requirements. These pumps are suitable for wide applications in high pressure fluid handling in oil refineries and petrochemical industry. The discharge pressures are designed up to class 2500 and suitable for suction pressures up to 79 bar (g).

Rodelta(BB5)

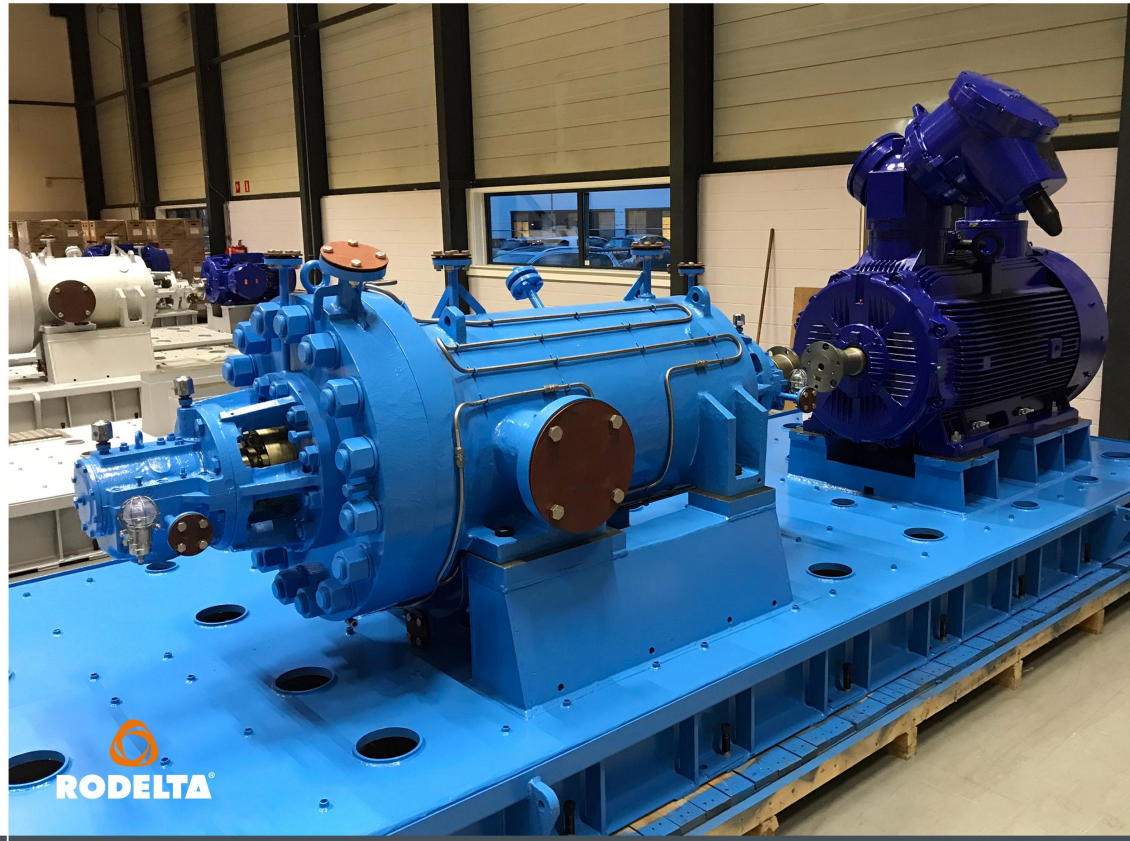
FEATURES:

- According API 610 (BB5 pump)
- Cartridge Design – Removal of entire rotor with inner casings without disturbing suction or discharge piping and motor
- Multistage, double casing between bearing pump with 1st stage single suction (KBDS) / double suction (KBDD) impeller – API BB5 category
- Casing with top-top nozzle orientation (option)
- First stage impeller designed to achieve minimum NPSH(R). Option of first stage double suction impeller is also available for better NPSH(R)
- Casing with centerline mounting (option)
- Casing radially split with metal to metal joint having confined controlled compression spiral wound metallic gasket grafoil filled
- Enclosed impellers with wear rings

For more features: go to: www.rodelta.com

Two BB5 pumps for high temperature use

Below: BB5 pump with heat tracing

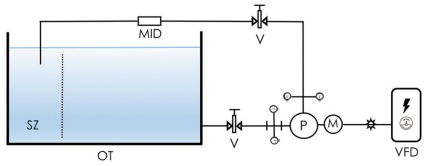


RODELTA TESTBED IS FULLY COMPLIANT TO THE LATEST API 610 AND HYDRAULIC INSTITUTE REQUIREMENTS

RODELTA TEST LABORATORY.

Pumps that leave the factory at Rodelta are individually tested at our test laboratory to ensure that they deliver what is promised to the customer. This testbed is fully compliant to the latest API 610 and Hydraulic Institute test requirements and standards.

To reliably test various types of pumps it is necessary to have several test loops. Some pumps require different environments to be tested properly. Most pumps are tested on an open-pit testbed. This means the pump is mounted next to a pit and draws water from it. Through a series of valves and measurement devices, the performance of the pump can be established. The main advantage of this is quick setup times and large volume pumps can be handled. The downside to this is that testing these pumps with lower than atmospheric inlet pressure can be a challenge due to dissolved air in the water. Another plus is that this set-up mimics most of the set-ups of water pumps in the field, therefore it yields a proper replication of the pump performance on-site.

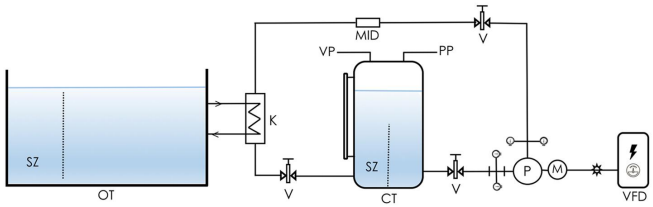


Open-pit testbed
BB type and Special products

Closed test loop

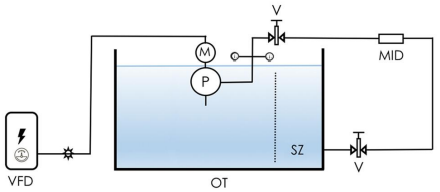
The main advantage of a closed test loop is that all the air in the water can be removed, resulting in more accurate NPSH measurements up to one twentieth of the normal atmospheric pressure. The inlet pressure can be increased to investigate the performance impact of the inlet pressure on the performance of the pump or simulate actual inlet pressures which occurs on-site.

Open-pit testbed VS type



Closed test loop
OH type of pumps (API)

All equipment is calibrated within the specifications of the HI standards and the layout is made in such a manner that the highest measuring accuracy is acquired. For high accuracy Rodelta chooses for a Threewatt power measurement and very accurate flow and pressure measurers. This ensures we can perfectly measure the performance of the pump and proves that the customer gets what was offered.



Open-pit testbed
VS type of pumps

P = Pump
M = Motor
K = Cooler
MID = Flow measurement (Magnetic- inductive)
VFD = Variable-frequency drive
OT = Open tank
CT = Closed tank
SZ = Stabilization / Degassing zone
V = Valve
= Measuring point
PP = Compressed-air connection
VP = Vacuum pump
= Three Wattmeter Measurement

RELIEVE CUSTOMERS FROM ENGINEERING PROBLEMS AND OFFER TOTAL SYSTEM SOLUTIONS.

EXCEPTIONAL VALUE: OUR DISTINCTIVE VISION

At Rodelta Pumps International we always think of benefit to the customer, in terms of how we differentiate ourselves in the market. That means we dare to compare ourselves with the best in the field. Our target is to relieve customers from engineering challenges and provide total system solutions.

We believe that our responsibility starts with advising the right pump based on system criteria as the pump is the heart of the system. Part of providing solutions is continuous support after supply of the equipment. Rodelta also provides service like maintenance, repairs, upgradation, spare parts and system engineering. Our organization and resources are heavily focused on the care of the complete pump function for our customers. One endeavor is to provide pump systems that operate smoothly, predictably and at lower cost.

DISTINCTIVE VISION

RODELTA SERVICE

ROTASERVE®

Your Service Partner

Diagnostic and consulting Services
Energy scans- On-site inspections

Maintenance and support services
Spare part fast track- On-site service - Workshop service
Preventive and corrective maintenance

Technical and economic optimization
Upgrades - Modifications - Pump hydraulic optimization

For more info www.rotaserve.com

ROTASERVE, RODELTA'S DEDICATED SERVICE PARTNER

EXCEPTIONAL VALUE: A TOTAL SERVICE AND SOLUTIONS PROVIDER

At Rodelta, we like to think in terms of a system instead of just the pump when selecting the appropriate solution. However, selecting a pump is only a first step. To ensure long pump lifetime, low down time and minimized maintenance and operation costs, it is important that pumps are installed and aligned properly. Rotaserve, Rodelta's dedicated service partner takes care of all pump installation activities. The team consists of highly skilled service engineers, who have all the required knowledge and experience in hand. Furthermore, they are widely qualified for on-site jobs and API pumps.

In addition, Rotaserve provides a wide range of pump service jobs, including aligning and balancing, on-site inspection and preventive and corrective maintenance. Please contact Rotaserve, has many possibilities for overhauling old and damaged pumps, instead of replacing them entirely. Parts can be repaired and restored to its original new condition. They can also supply spare parts directly from stock, or reproduce specific parts, even for old discontinued pump types. Rotaserve can perform pump upgrades, if you need increased capacity or efficiency for instance. This can be achieved by replacing parts or by creating a completely new custom hydraulic design. Rotaserve gets your old pumps up and running again! For more info go to Rotaserve

RODELTA®

Sales Program of API Pumps Equipment

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distinctive vision