



*Specialist for Pumping Technology*

**Session 12 –  
Vertical Pumps  
(VS4/5, VS6, VS7)**

*Simon Smith January 2022*





# Presenter Profile – Simon Smith

Simon graduated with an honours degree in Chemical Engineering from the University of Surrey in 1978 and began a long career in the engineered pump industry spanning 40 years (so far!) with Peerless Pump, BW/IP International / Flowserve, SPP Pumps, Ruhrpumpen and Ebara Cryodynamics.

Over his long career he has filled various roles as Applications Engineer / Manager, Project Manager, Key Account Specialist, Vertical Pump Product Specialist, International Sales Engineer / Manager / Director and he has considerable experience in Training & Mentoring young engineers.





# RuhRPumpen Short Courses

**Here is a listing of all the previous courses.**

- No 1 – API610 12th v 11th editions
- No 2 - Curve Shape
- No 3 – The Importance of System Curves
- No 4 - Selecting the Right Pump for the Application
- No 5 - NPSH & Nss
- No 6 - Mechanical Seals & Systems
- No 7 - Firepumps
- No 8 - BB5 Barrel Pumps
- No 9 - Pump Instrumentation
- No 10 – Non-Destructive Examination
- No 11 - Vertical Pumps (Part 1) Type VS1, VS2, VS3

Any you have missed you can get from our Marketing Dept. Please send an e-mail to [info@ruhrpumpen.com](mailto:info@ruhrpumpen.com) referencing the "Short Courses hosted by Simon Smith"

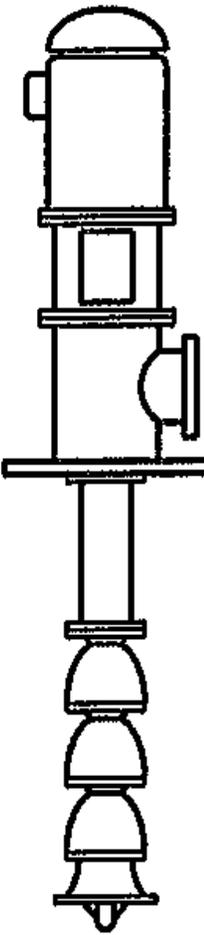
# Session 12 – “Vertical Pumps Part 2 (VS4, VS5, VS6, VS7)”

*Aimed at Process and Mechanical Engineers, and Consultant Engineers who specify pumping equipment as well as Applications & Sales Engineers selecting and quoting them.*

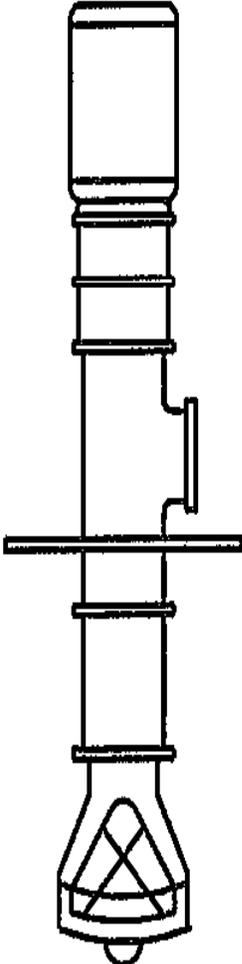
*While engineers generally have a good understanding of horizontal pumps, their exposure to vertical pumps is more limited and as a result they are frequently misunderstood and under-utilised.*

*This course will look to put that right and explain the features and benefits of vertical pumps and how they can frequently be problem solvers.*

# API 610 CONFIGURATIONS



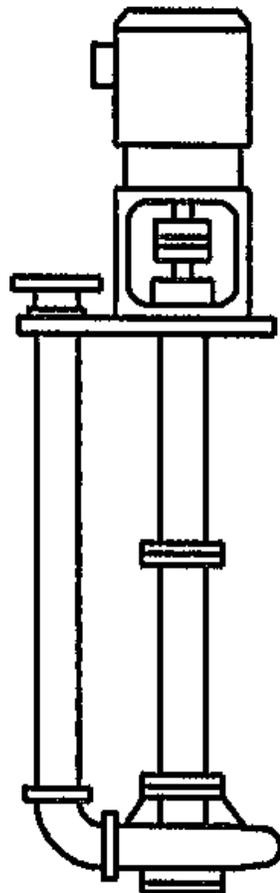
VS1



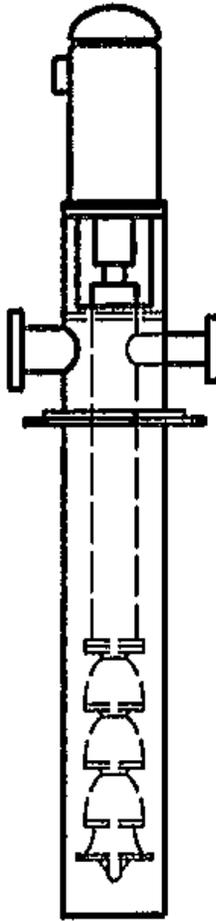
VS2



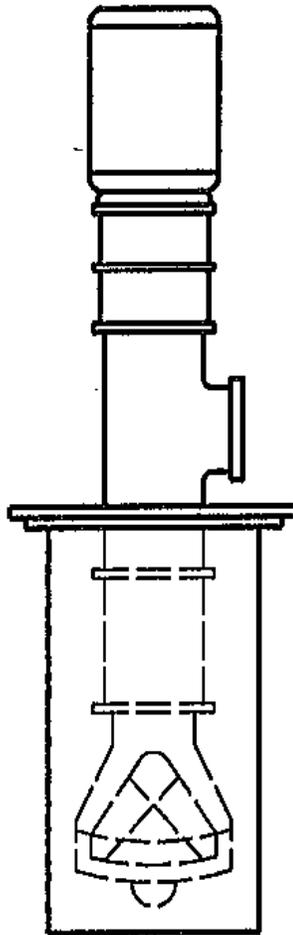
VS3



VS4/5



VS6



VS7

# RUHRPUMPEN VERTICAL PRODUCTS



VS1



VS1



VS2



VS3



VS4/5



VS6



VS6



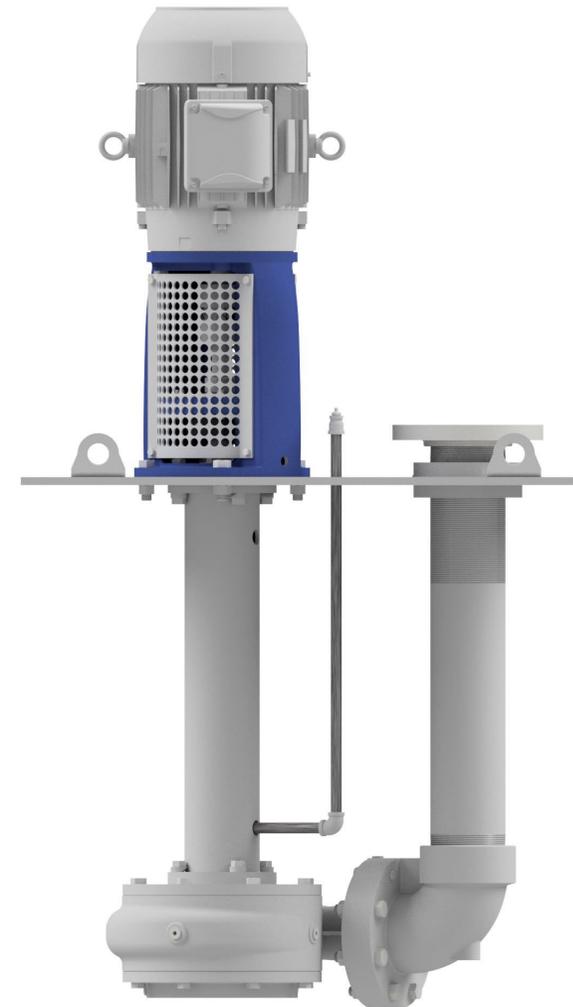
# Pump Type VS4 Sump Pumps

## General Description

## VSP

VSP are vertically suspended single casing pumps with separate discharge, semi open or closed impeller designed for wet pit applications.

VSP Pumps can be built according API 610 latest edition, type VS4.





**VSP**



**VSP Chem**

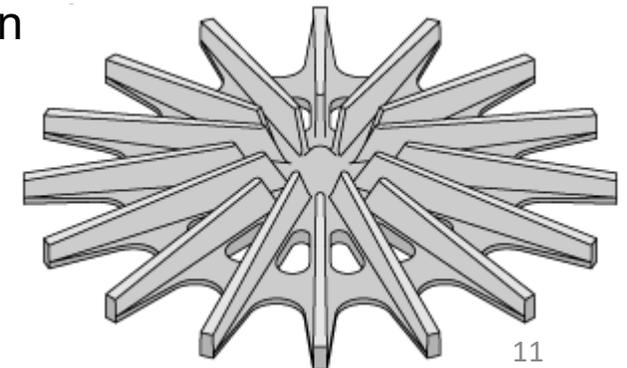


- HI design
- Single stage, vertical centrifugal pump
- Horizontal case in vertical configuration
- Clock-wise rotation (viewed from coupling end)
- Solid handling up to 4" diameter
- Semi-open, Open & Closed Impeller
- Standard construction in Cast Iron
- Grease lubrication for line shaft bearings
- Grease lubrication for ball bearings
- Threaded discharge pipe & 150# Rating Flange
- Available in 44 hydraulic sizes
  - 11 Non-Clog (SHD)
  - 33 Standard (GSD)



- HI & API Design
- Single stage, vertical centrifugal pump
- Horizontal case in vertical configuration
- Clock-wise rotation (viewed from coupling end)
- Open and Barske Impeller
- Standard materials and API
- Grease or external flush lubrication for line shaft bearings
- Grease or oil lubrication for ball bearings
- Threaded or welded discharge pipe design
- Enabled rating flanges in 150# and 300#
- Available in 27 hydraulic sizes
- Circular mounting flange to suit tan mounting

Barske Impeller –  
Low Flow High Head



## Application Range

## VSP / VSP-Chem

Wide range of industrial, chemical process and municipal applications such as:

- Sump drainage
- Flood control
- Air wash systems
- Power plants
- Industrial processes
- Condensation control
- Pollution control
- Dewatering service
- Process plants
- Utility service
- Wet pit
- Water treatment
- Effluent
- Hydrocarbon processing
- General industry
- Automotive Solvents
- Polymers
- Plating and electroplating
- Pharmaceuticals
- Chemical / Petrochemical industry



## HYDROCARBON PROCESSING (OIL & GAS)

VSP Chem Pumps are installed in horizontal tanks, usually in this kind of applications are used for hydrocarbon transference / Also for waste from the same processes



## FLOOD CONTROL

VSP Pumps are installed in open tanks to avoid water overflow from the collectors



**GENERAL INDUSTRY/CHEMICAL INDUSTRY/WASTE WATER /AUTOMOTIVE SOLVENTS**

VSP Pumps are used to collect effluent for many processes in general industry



# Performance Range

## VSP

### VSP

Capacity	up to 974 m <sup>3</sup> /h	4288 U.S. gpm
Head	2 to 104 m	5 to 342 feet
Temperature	-30°C to +135°C	-20°F to +275°F

### VSP (Non-Clog)

Capacity	up to 864 m <sup>3</sup> /h	3802 U.S. gpm
Head	3 to 76 m	7 to 249 feet
Temperature	-30°C to +135°C	-20°F to +275°F

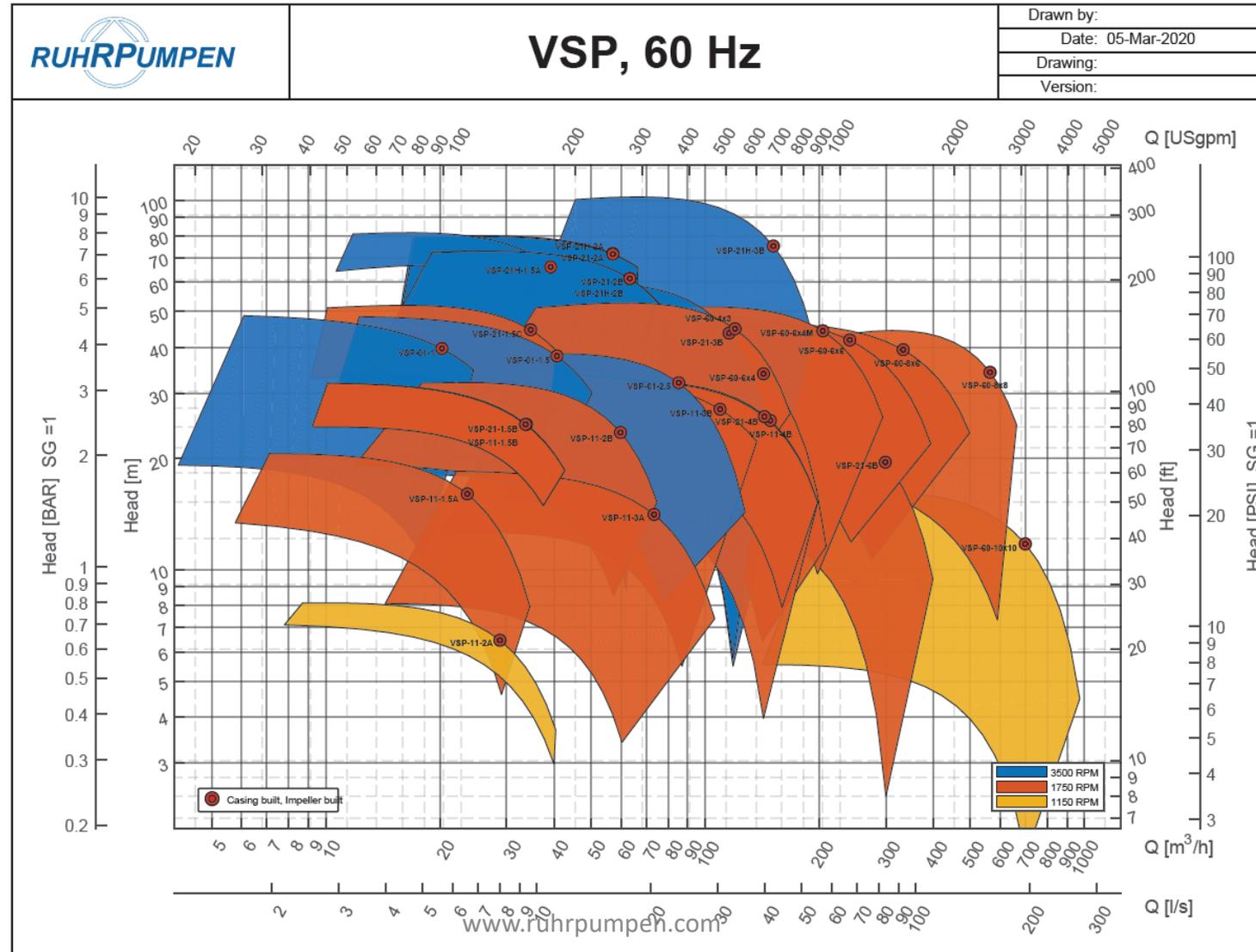
### VSP-Chem

Capacity	up to 1908 m <sup>3</sup> /h	8403 U.S. gpm
Head	12 to 262 m	38 to 861 feet
Temperature	-30°C to +135°C	-20°F to +275°F

**Twice the flow range of Flowserve, Sulzer or Goulds**

# Selection Chart

# VSP



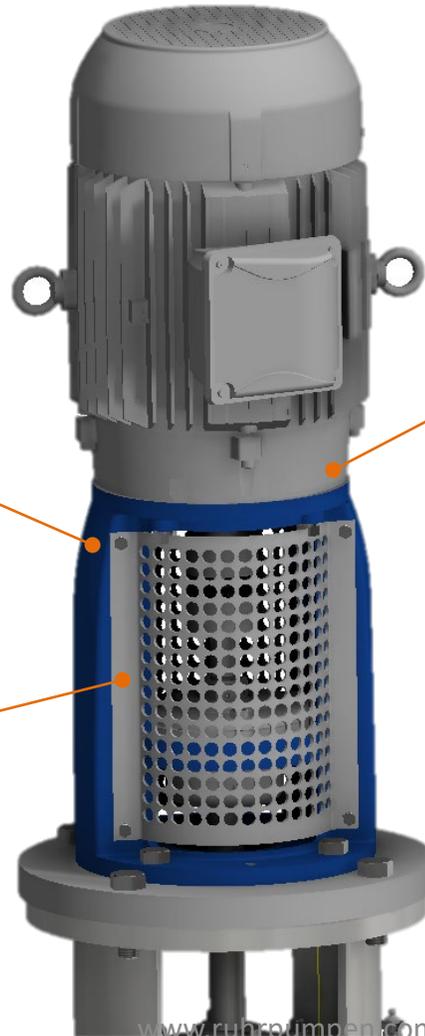


## Features & Benefits

VSP

**MOTOR SUPPORT**  
Designed to withstand the down axial thrust. With this advantage we can use a horizontal motor without thrust capacity.

**COUPLING GUARD**  
Fabricated in Aluminum or any other material required



**ELECTRICAL MOTORS**  
Designed for "C", NEMA and "D" (IEC) Flange

## Features & Benefits

VSP

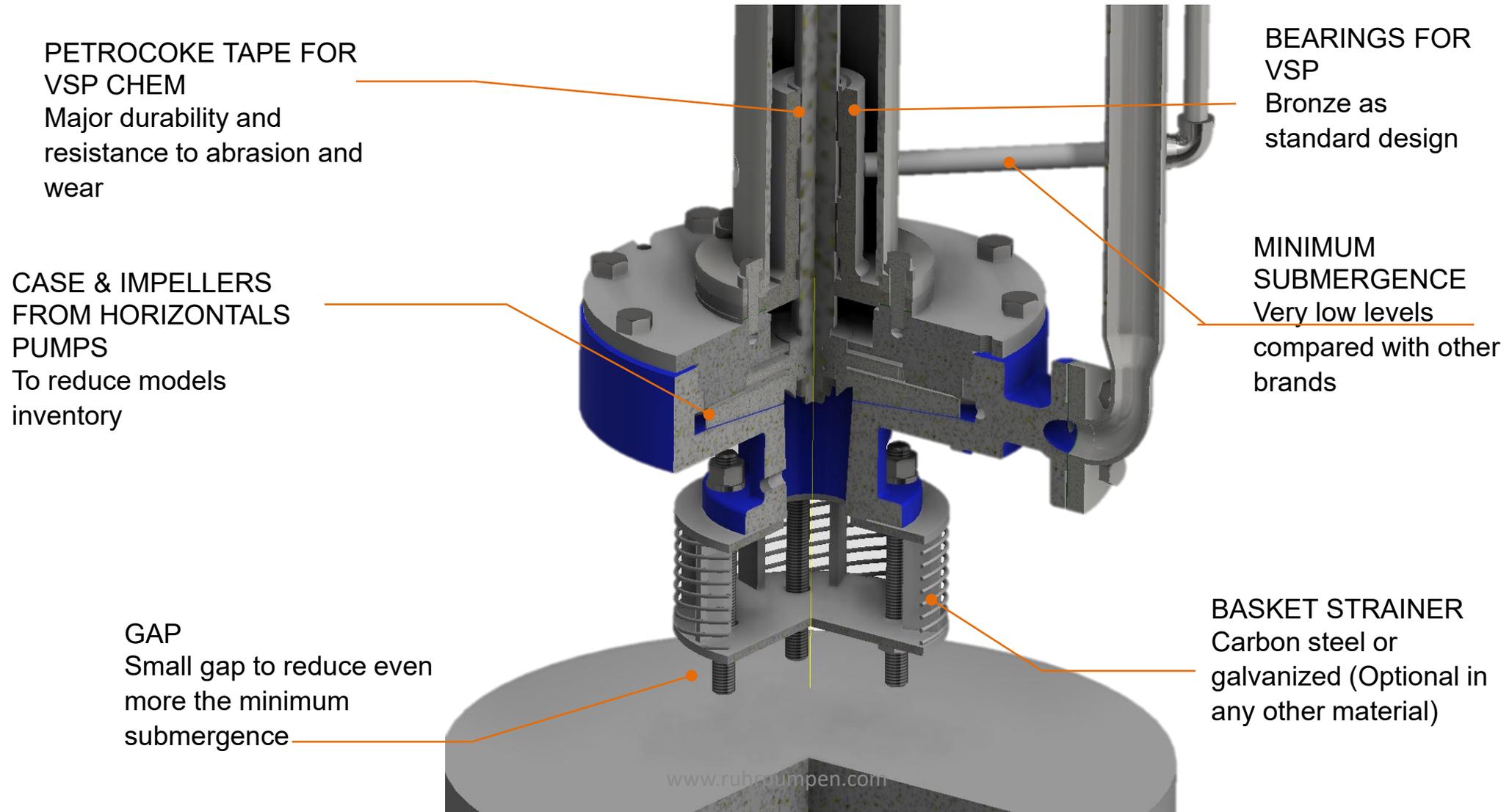
**LIFTING LUGS**  
Included in our two  
versions  
3 for round plates &  
4 for square plates



**EARTHING LUGS**  
Provided in API and HI  
design

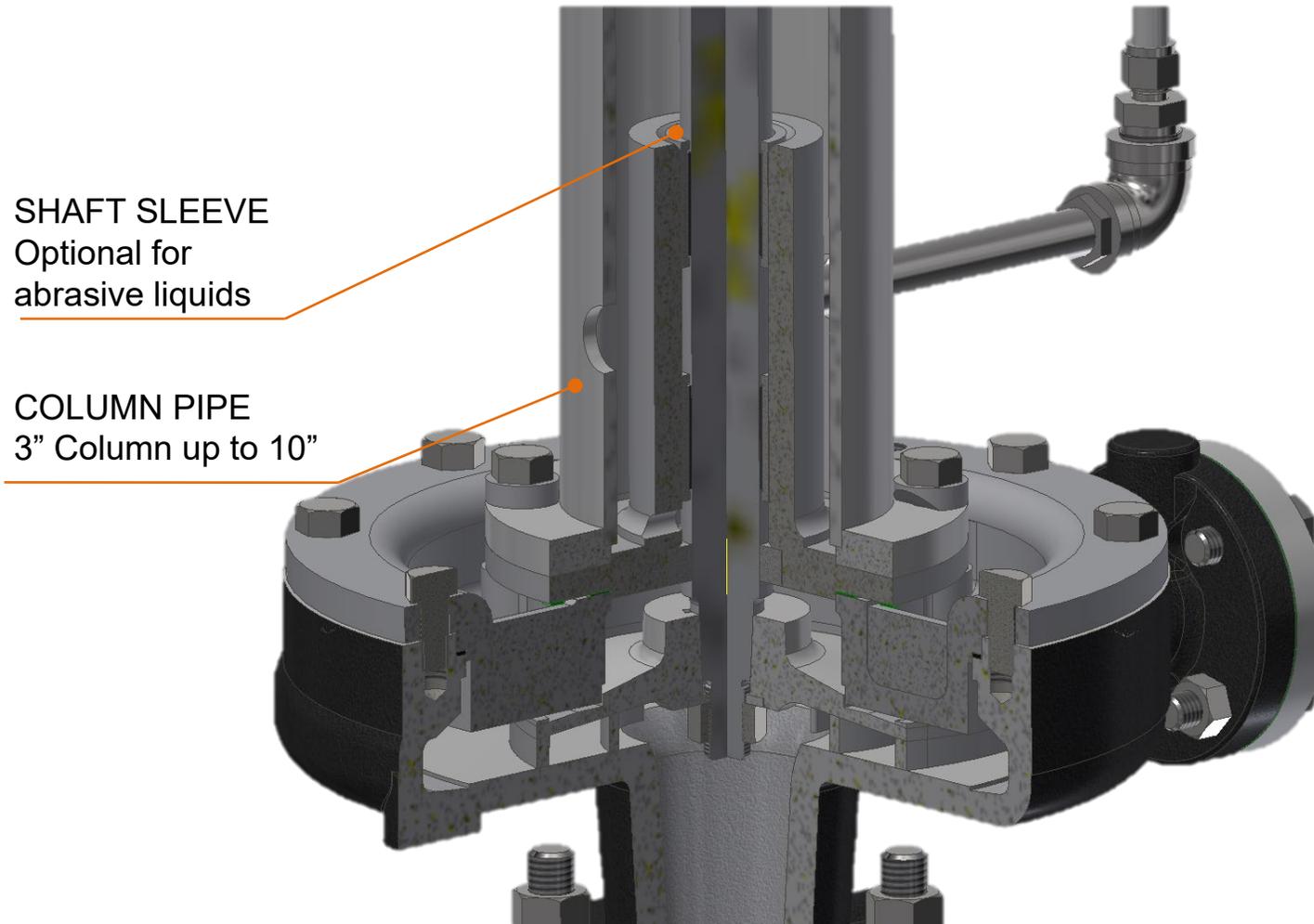
## Features & Benefits:

## VSP



## Features & Benefits: Intermediate bearings

VSP

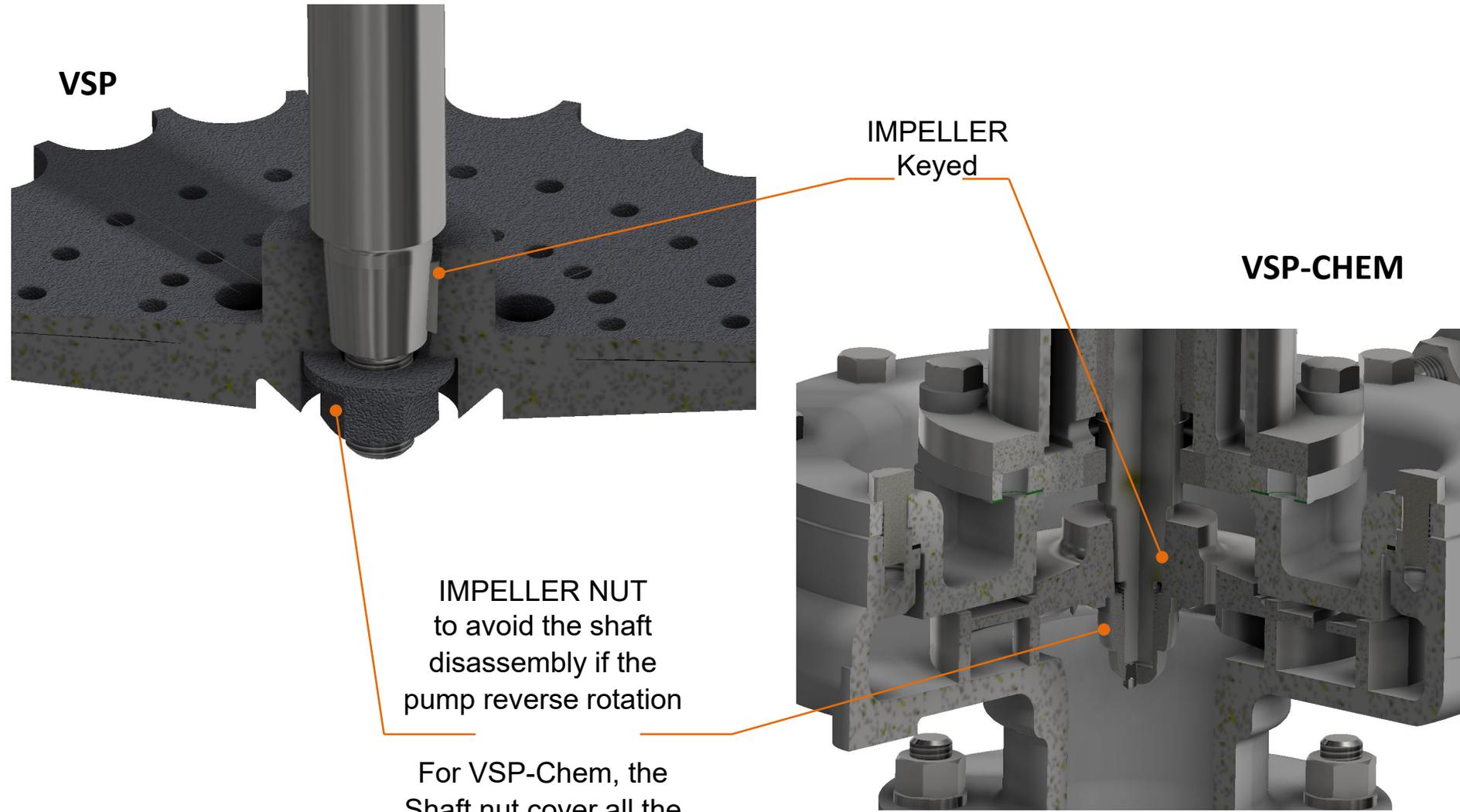


SHAFT SLEEVE  
Optional for  
abrasive liquids

COLUMN PIPE  
3" Column up to 10"

# Features & Benefits: Impeller

VSP



VSP

IMPELLER  
Keyed

VSP-CHEM

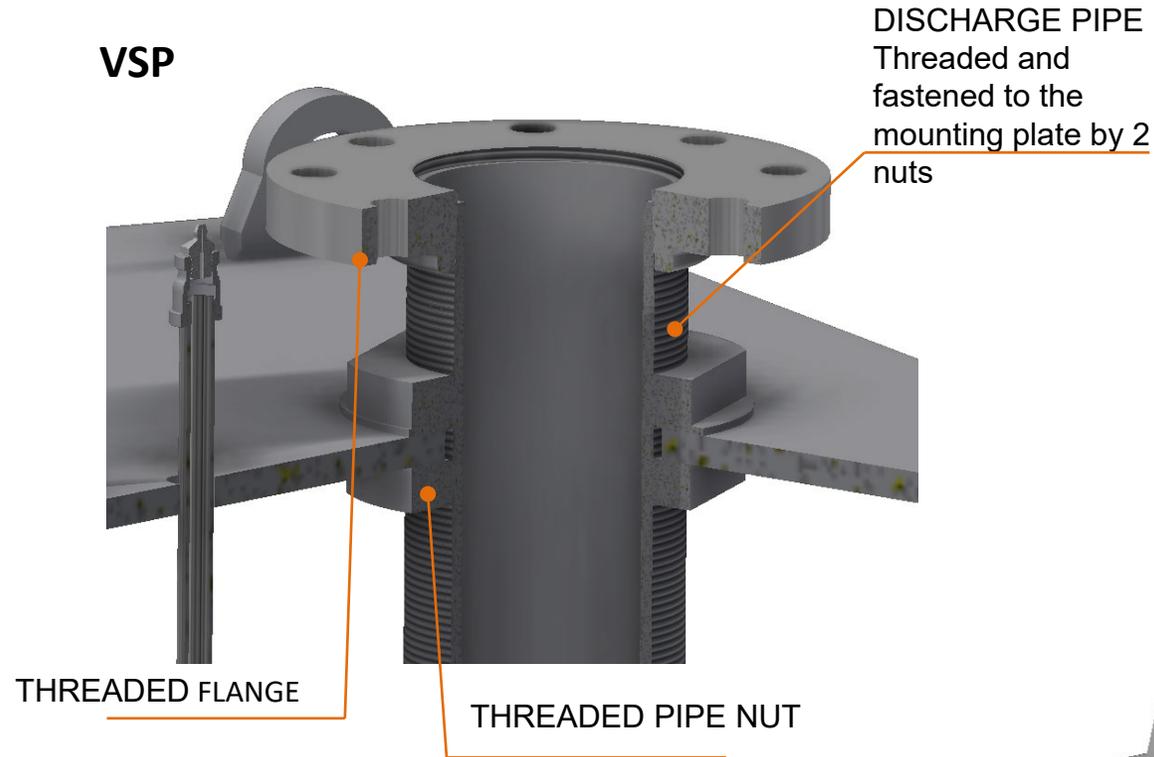
IMPELLER NUT  
to avoid the shaft  
disassembly if the  
pump reverse rotation

For VSP-Chem, the  
Shaft nut cover all the  
thread

# Features & Benefits: Discharge

## VSP

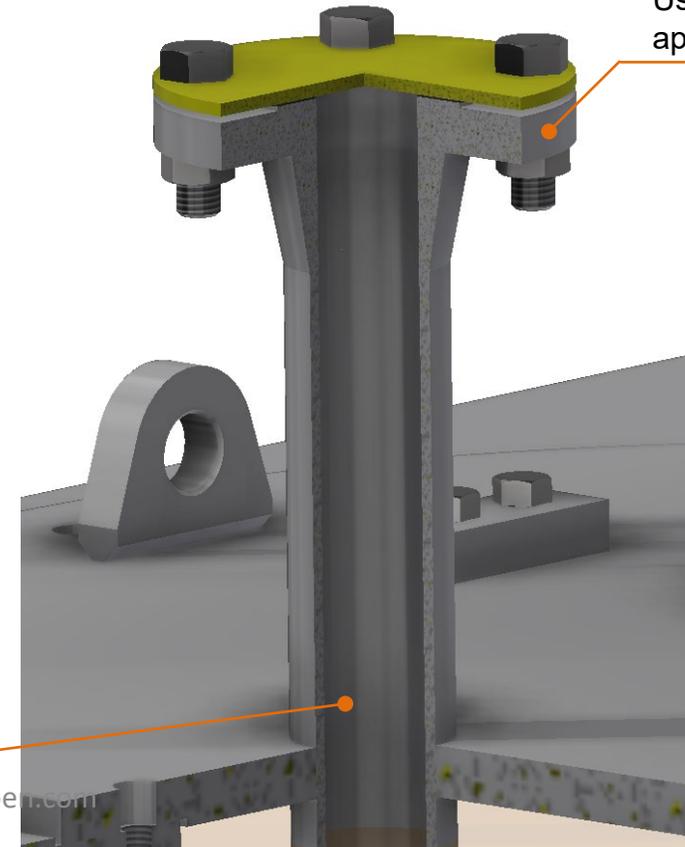
### VSP



### VSP-CHEM

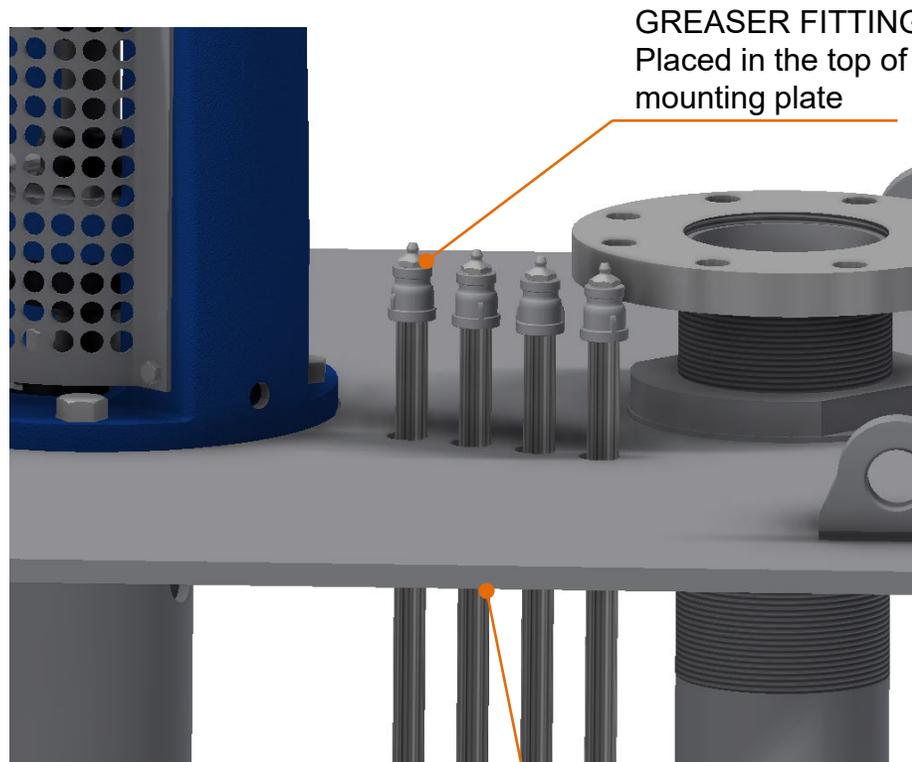
WELDING NECK FLANGE  
Used in VSP-Chem applications

WELDED DISCHARGE PIPE  
In API design or with Mechanical seal only



# Features & Benefits: Lubrication

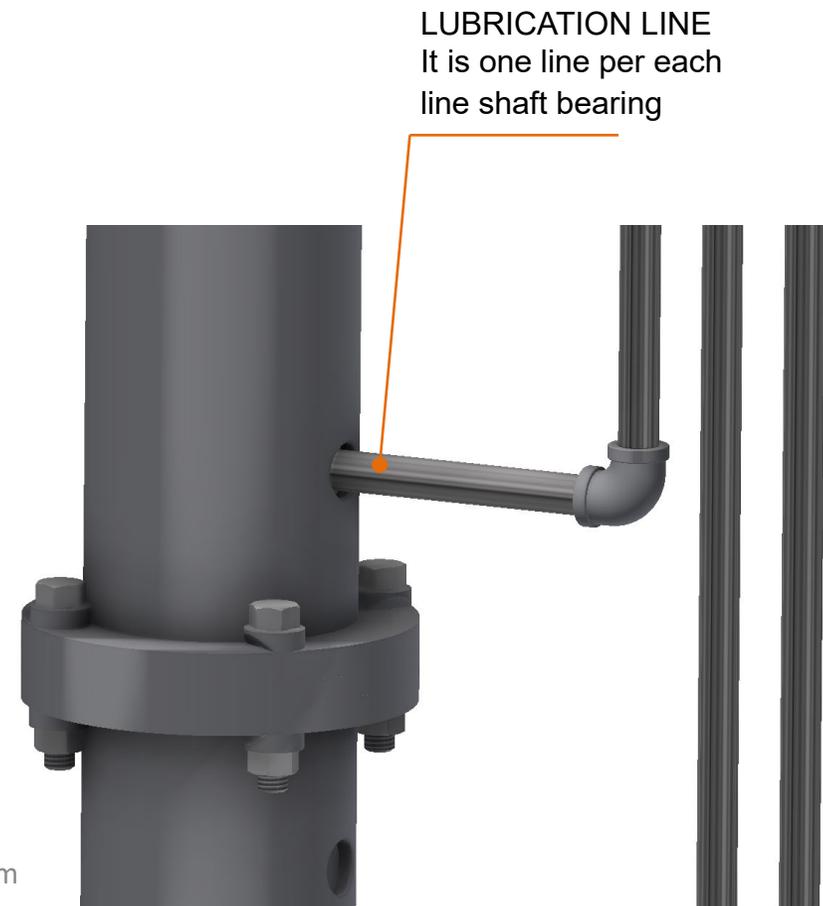
VSP



GREASER FITTING  
Placed in the top of  
mounting plate

LUBRICATION  
LINE  
The connections  
pass through the  
sole plate

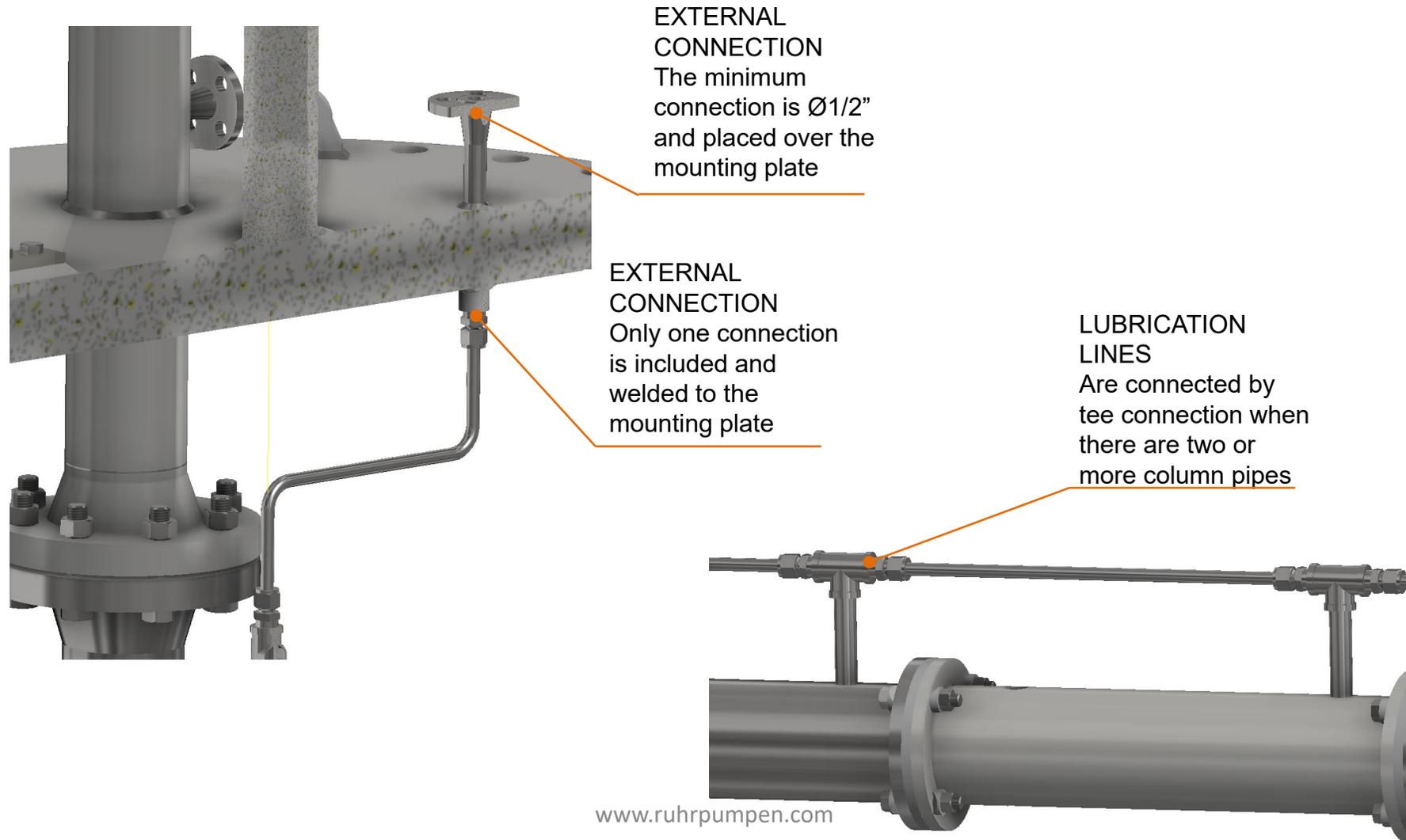
[www.ruhrpumpen.com](http://www.ruhrpumpen.com)



LUBRICATION LINE  
It is one line per each  
line shaft bearing

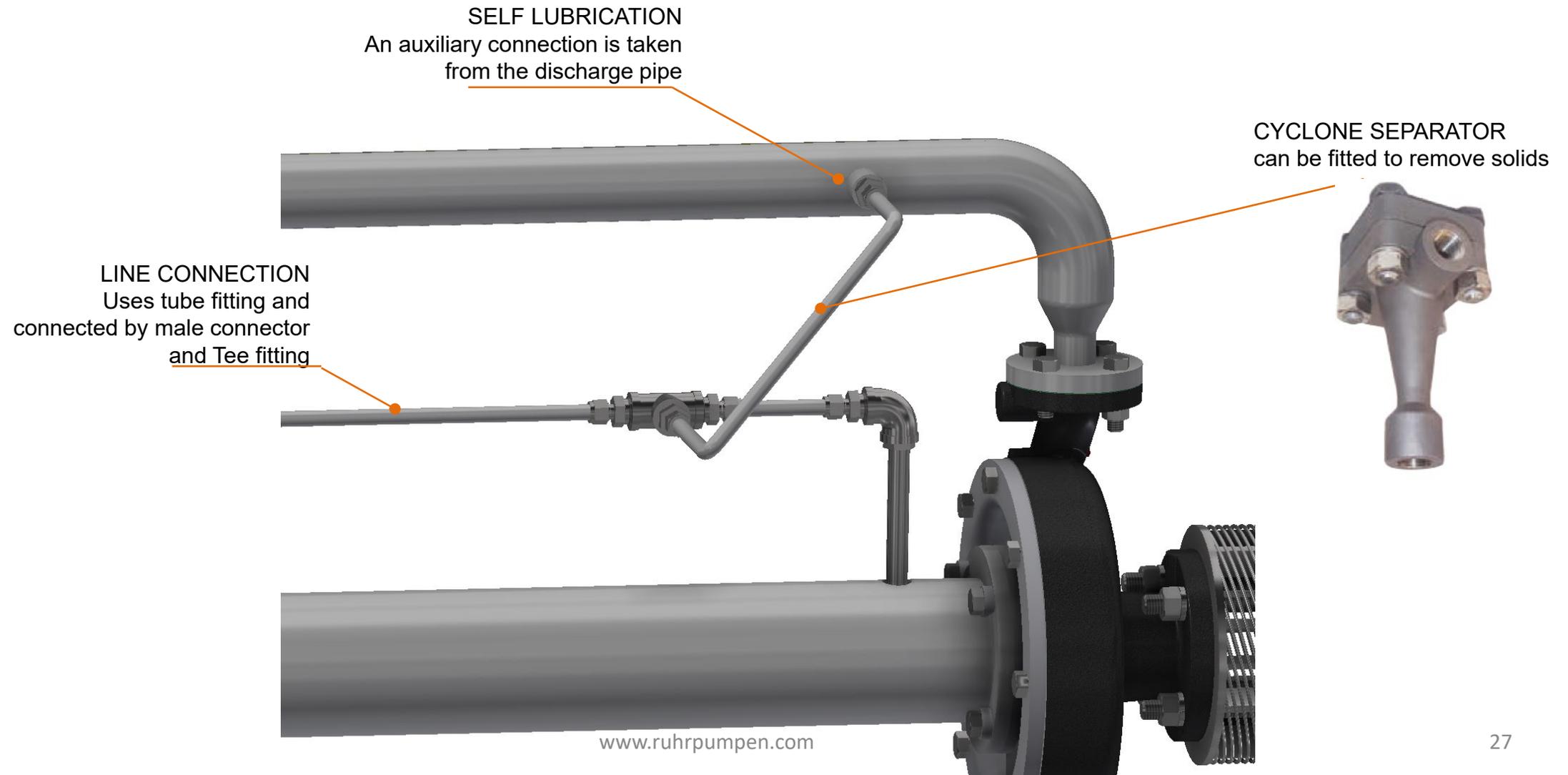
# Features & Benefits: Lubrication

## VSP



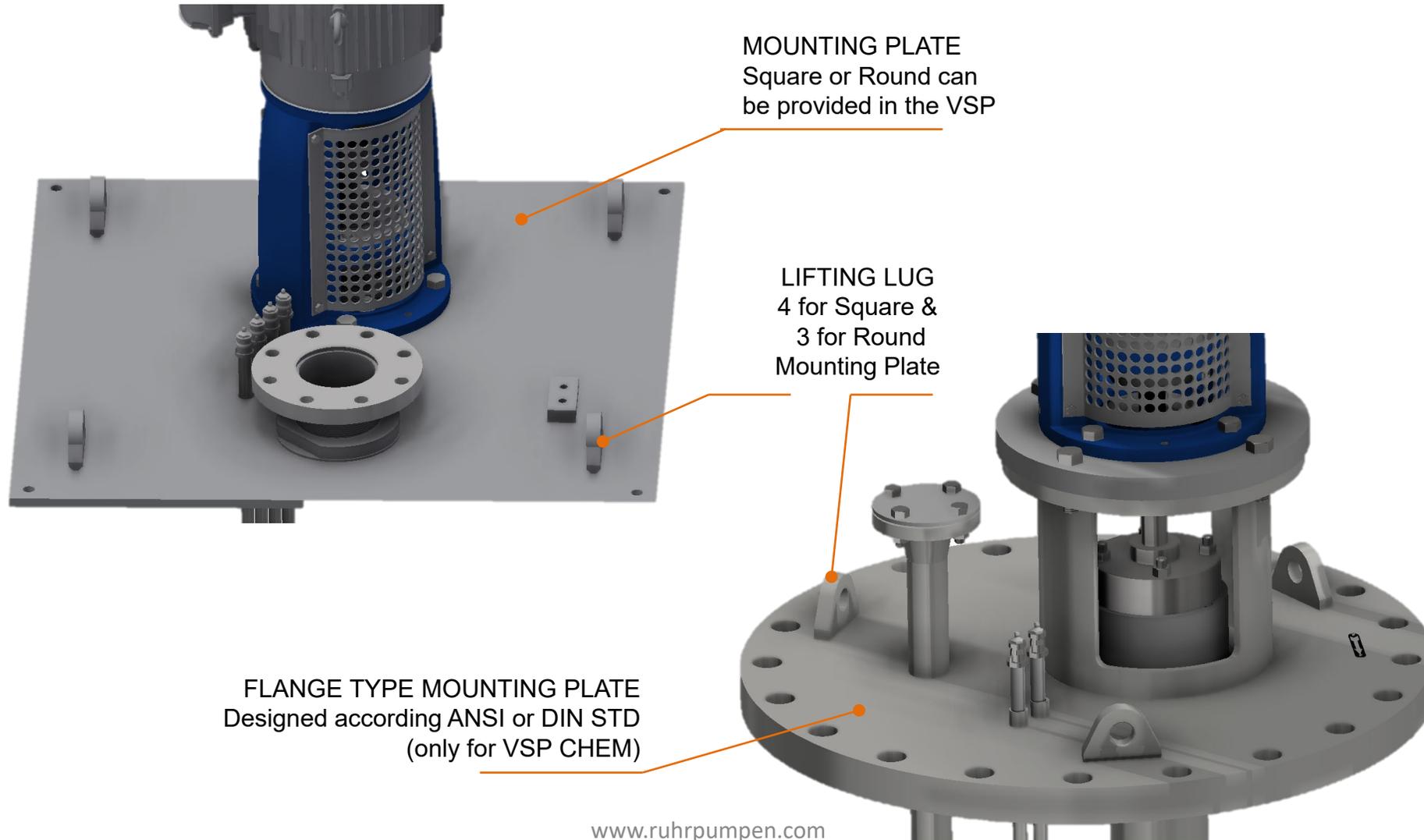
# Features & Benefits: Lubrication

VSP



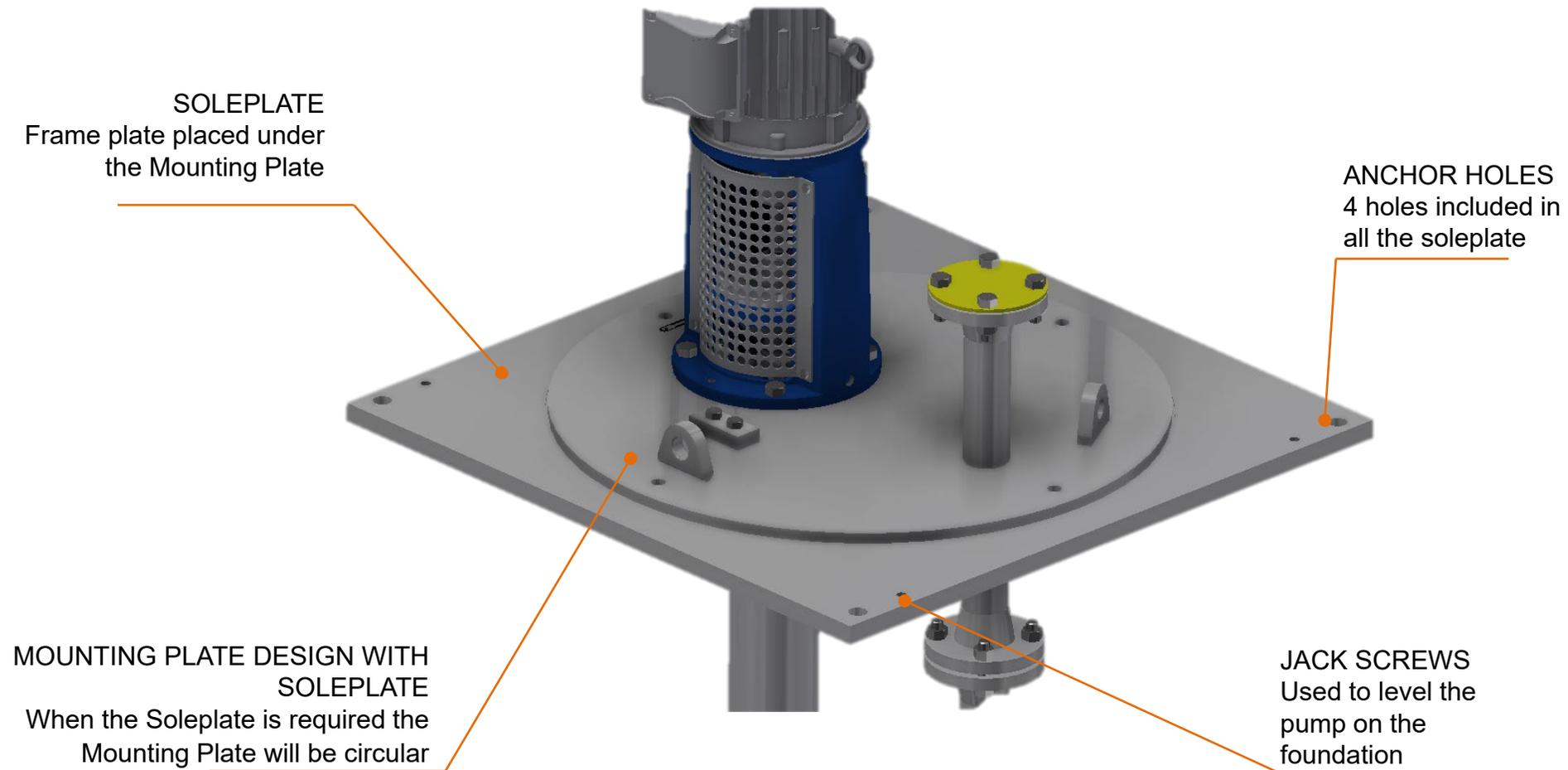
# Features & Benefits: Mounting plates

VSP



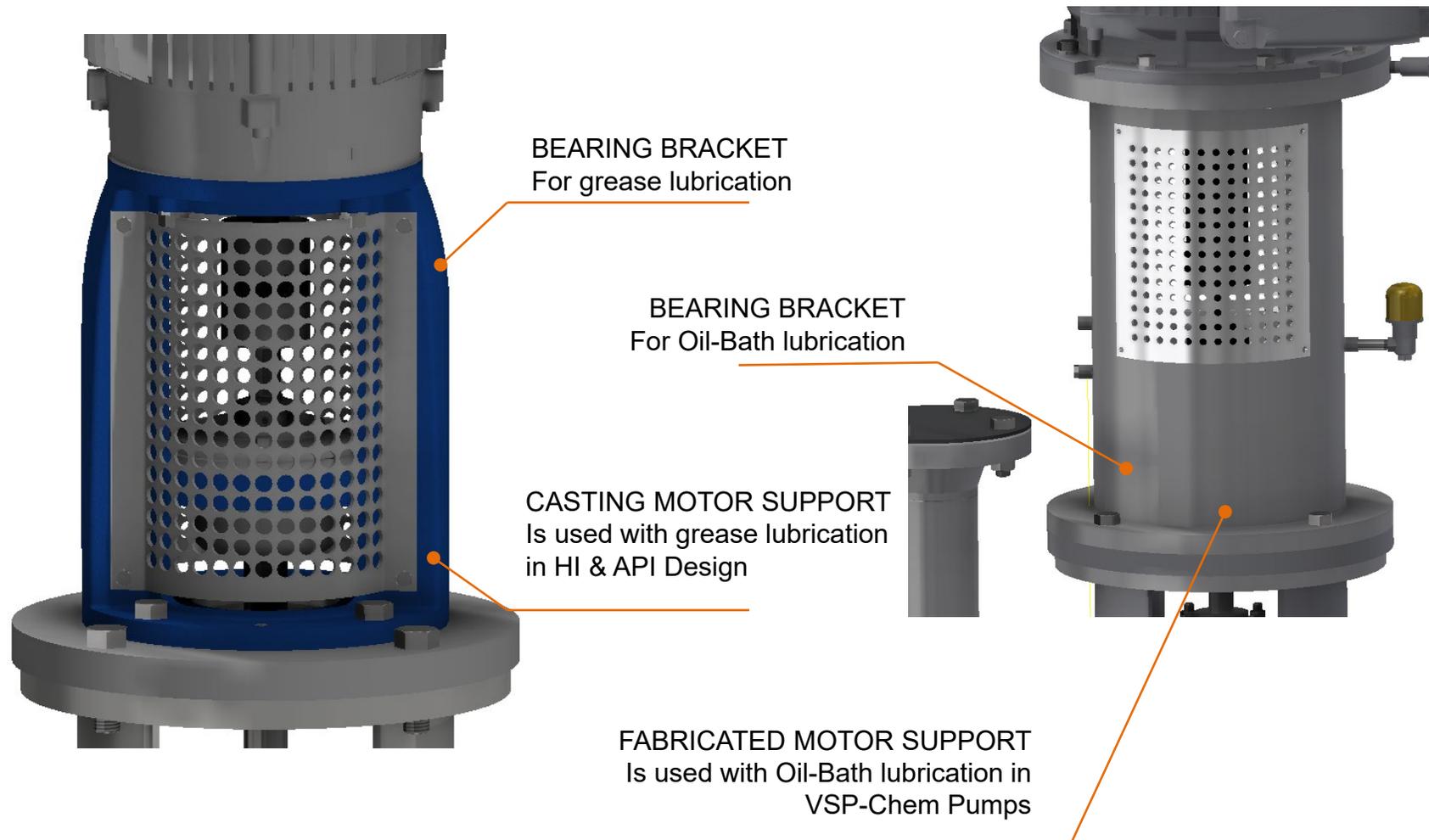
## Features & Benefits: Soleplate

VSP



## Features & Benefits: Bracket

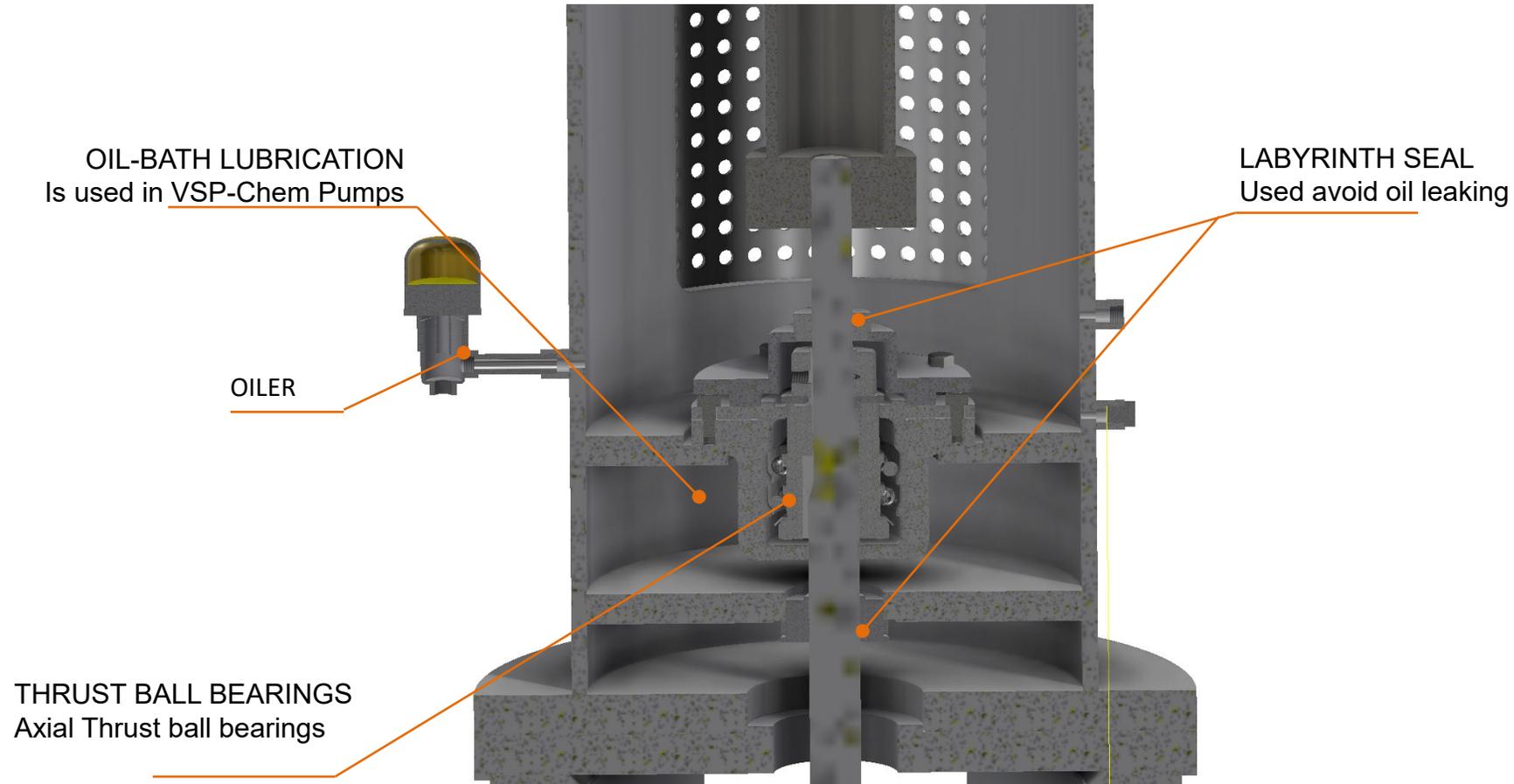
VSP



# Features & Benefits: Bearing Lubrication

VSP

## OIL-BATH

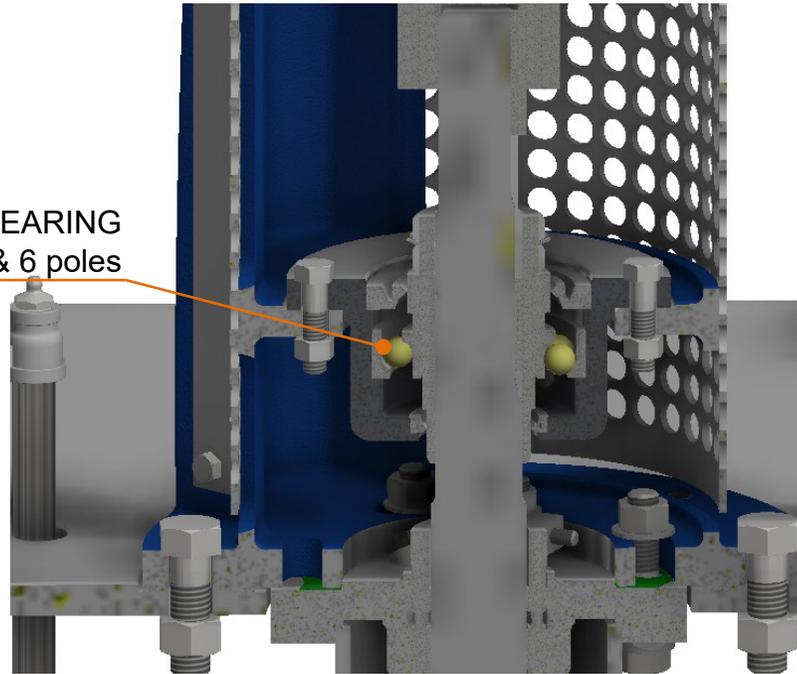


# Features & Benefits: Bearing Lubrication

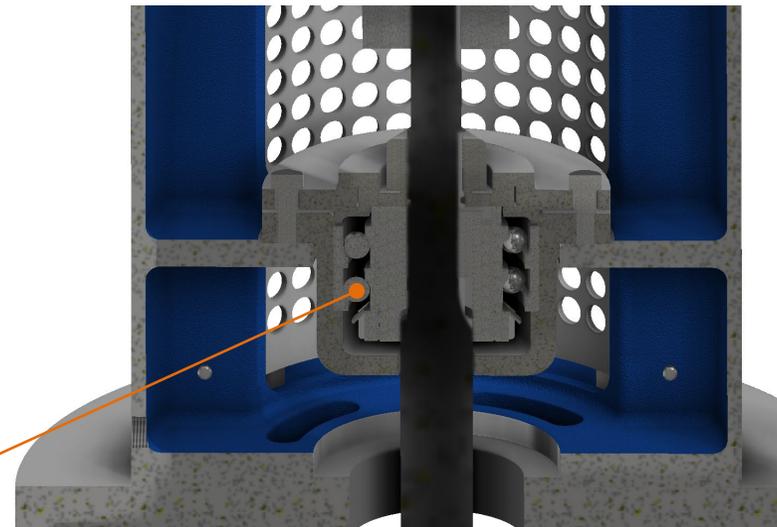
VSP

## GREASE

BALL BEARING  
1 ball bearing included for 4 & 6 poles

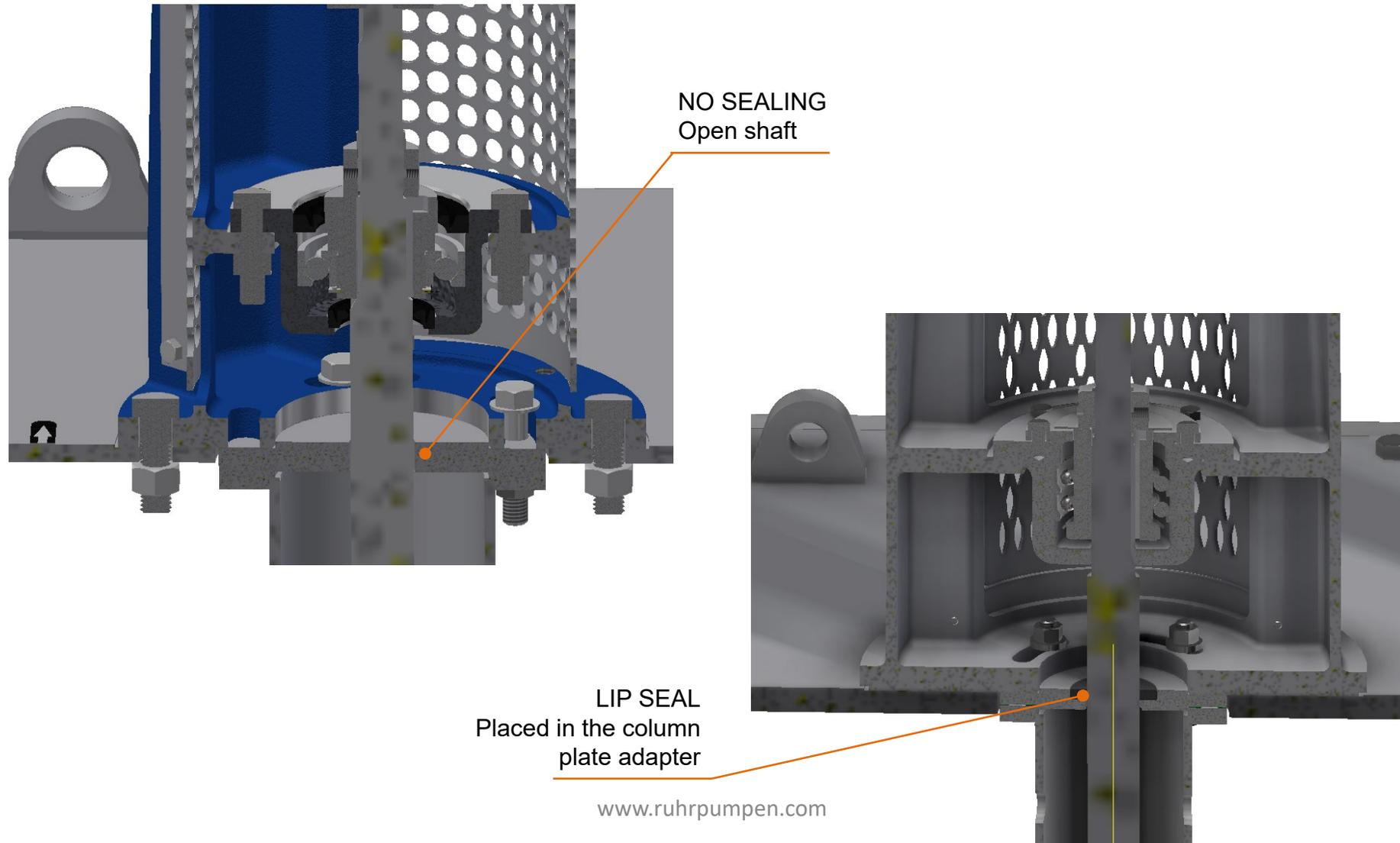


BALL BEARINGS  
2 ball bearings when the  
pump runs at 2 poles



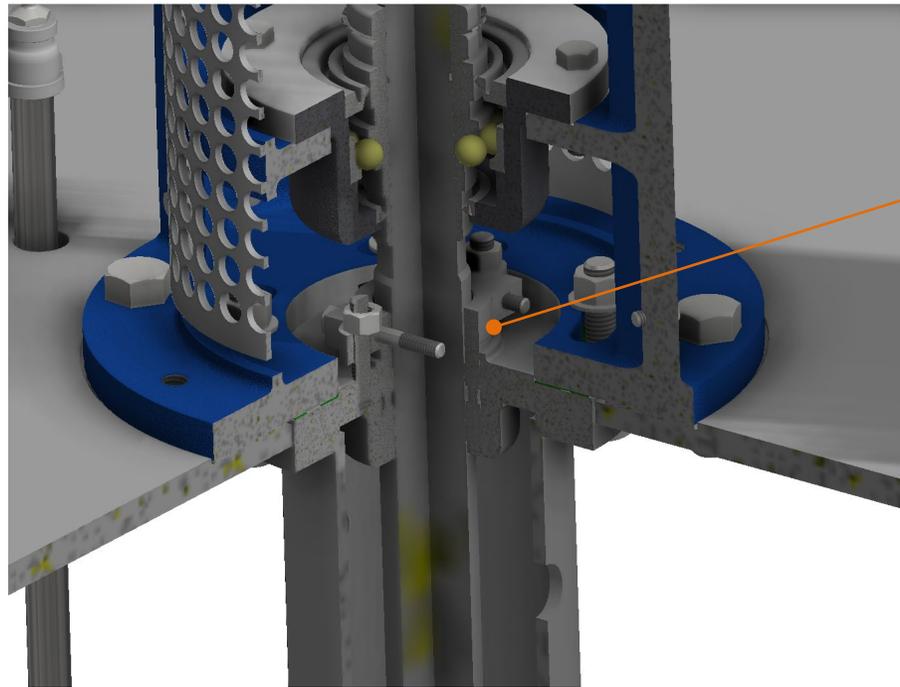
# Features & Benefits: Sealing

VSP



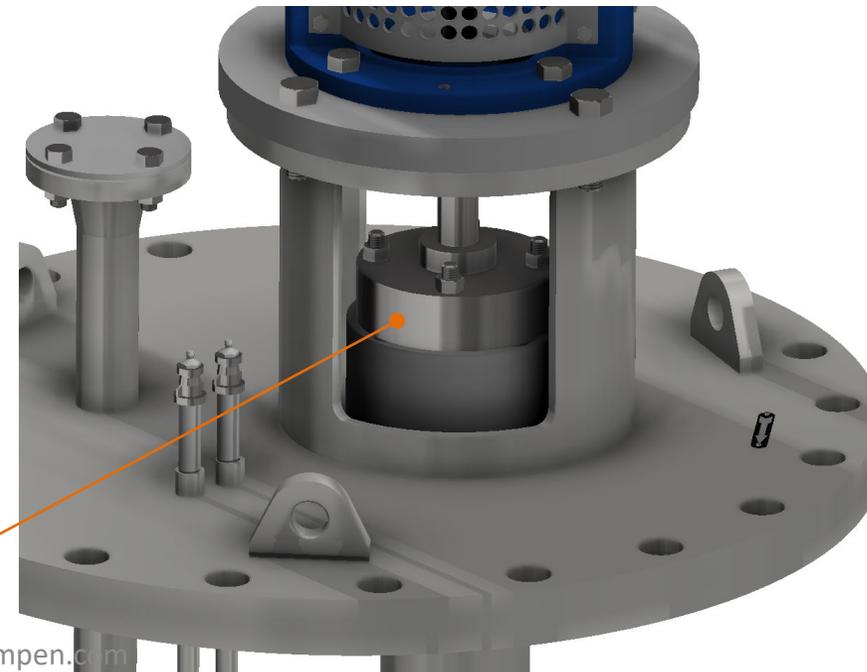
## Features & Benefits: Sealing

VSP



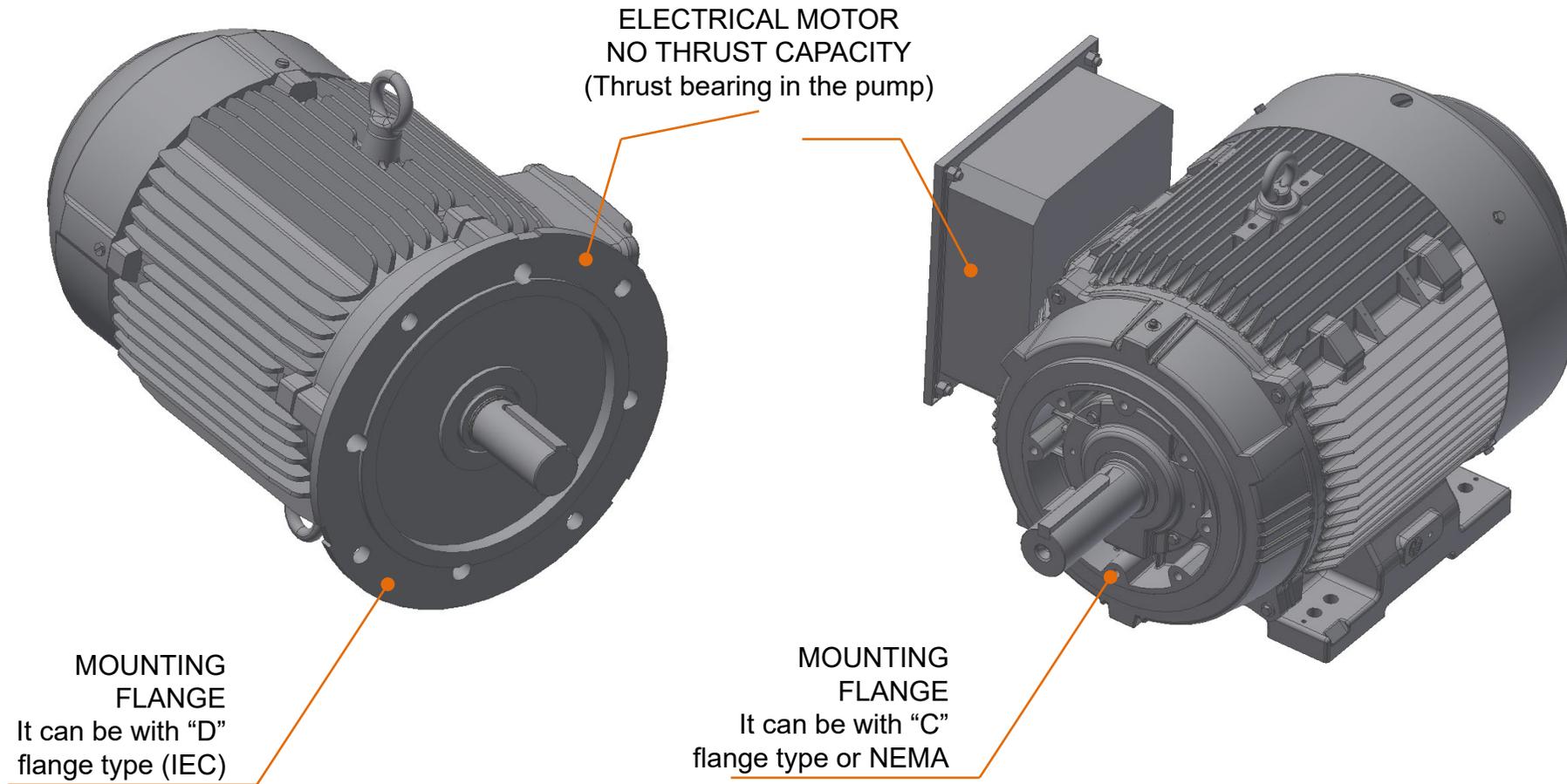
**PACKING**  
Used to avoid leaking of vapors

**MECHANICAL SEAL**  
Used in chemicals applications and placed over the mounting plate. It can be single dry or dual seal



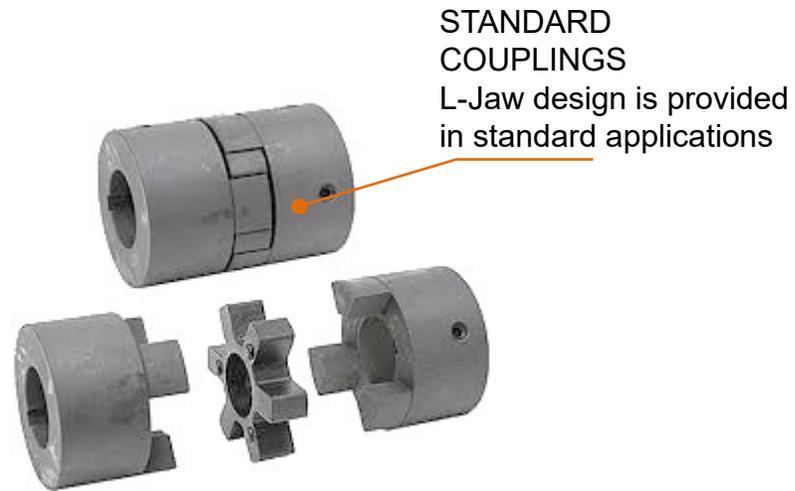
# Features & Benefits: Electrical Motors

VSP

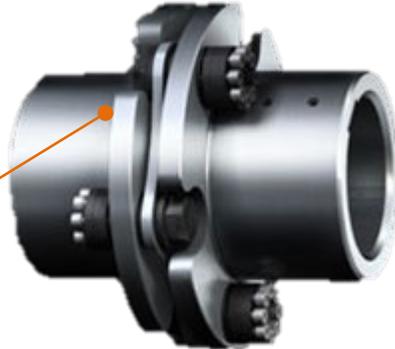


# Features & Benefits: Couplings

VSP



FLEXIBLE  
COUPLING  
FOR VSP-CHEM  
Without spacer



This image shows a flexible coupling for VSP-CHEM without a spacer. It is a complex, multi-part assembly with a central gear-like component and two cylindrical parts. An orange line points from the text to the top cylindrical part.

COUPLING WITH  
SPACER  
Upon customer request,  
however these are not  
required in our pumps



This image shows a coupling with a spacer. It is a complex, multi-part assembly with a central gear-like component, two cylindrical parts, and a spacer. An orange line points from the text to the spacer.

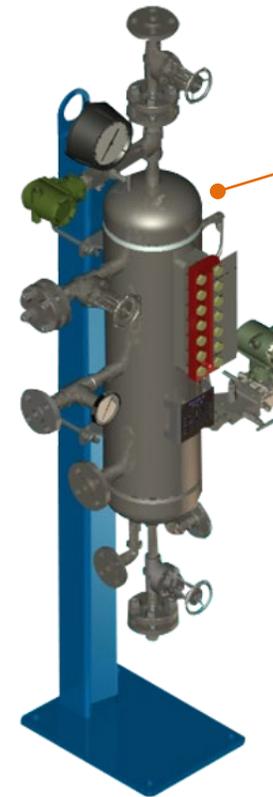
# Features & Benefits: Seal Lubrication Plans

VSP

PLAN 74



PLAN 52, 53 & 53B



# Features & Benefits: accesories

VSP

LEVEL INDICATORS  
Float or Ultrasonic



TEMPERATUE INDICATOR  
RTD



VIBRATION INDICATORS  
Accelerometer



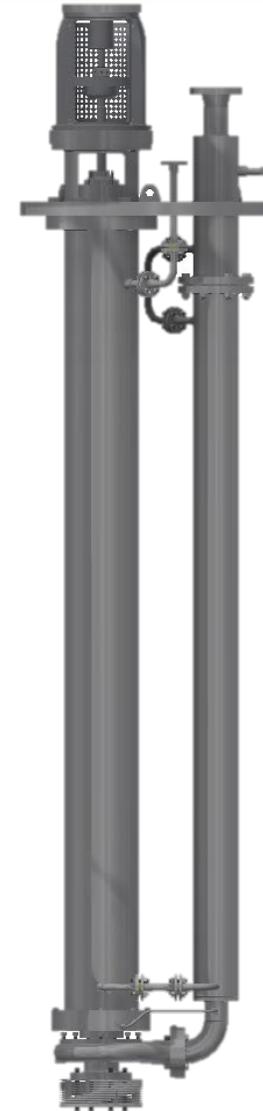
## Extra features – Jacketed pumps

VSP

Some fluids, such as molten Sulphur, need to maintain a certain temperature in the pump

This is possible with a steam jacket. The steam flows through the whole pump heating the fluid avoiding crystallization or any change in the operation conditions.

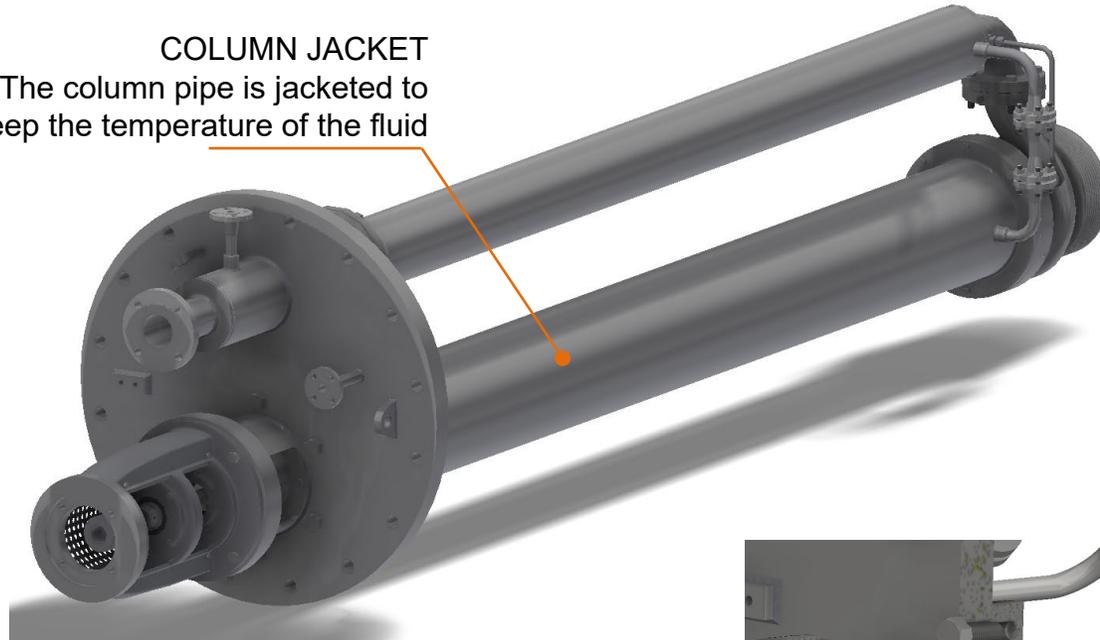
- Pressure of jacket: Up to 14 bar (200 psi)
- Materials: Available in all principal alloys according to API
- Self-lubricating system inside the jacket to avoid solidification of the fluid in the bearings (in case the pump stops).



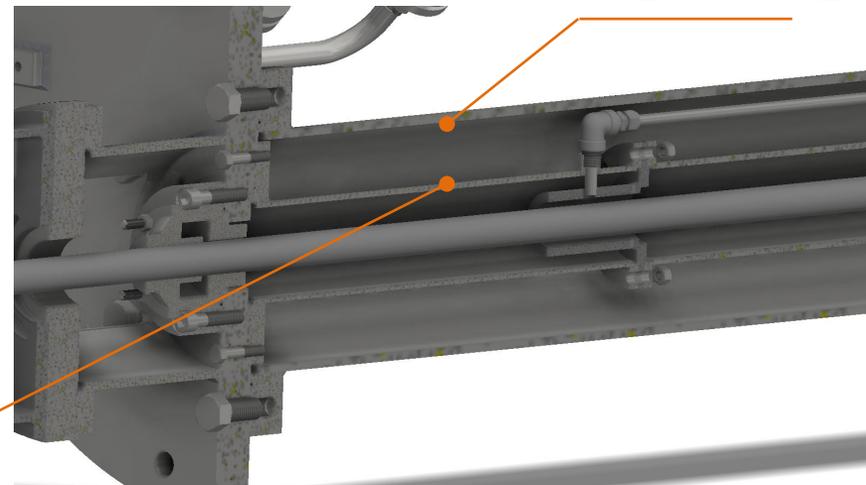
## Extra features – Jacket pumps

VSP

**COLUMN JACKET**  
The column pipe is jacketed to keep the temperature of the fluid



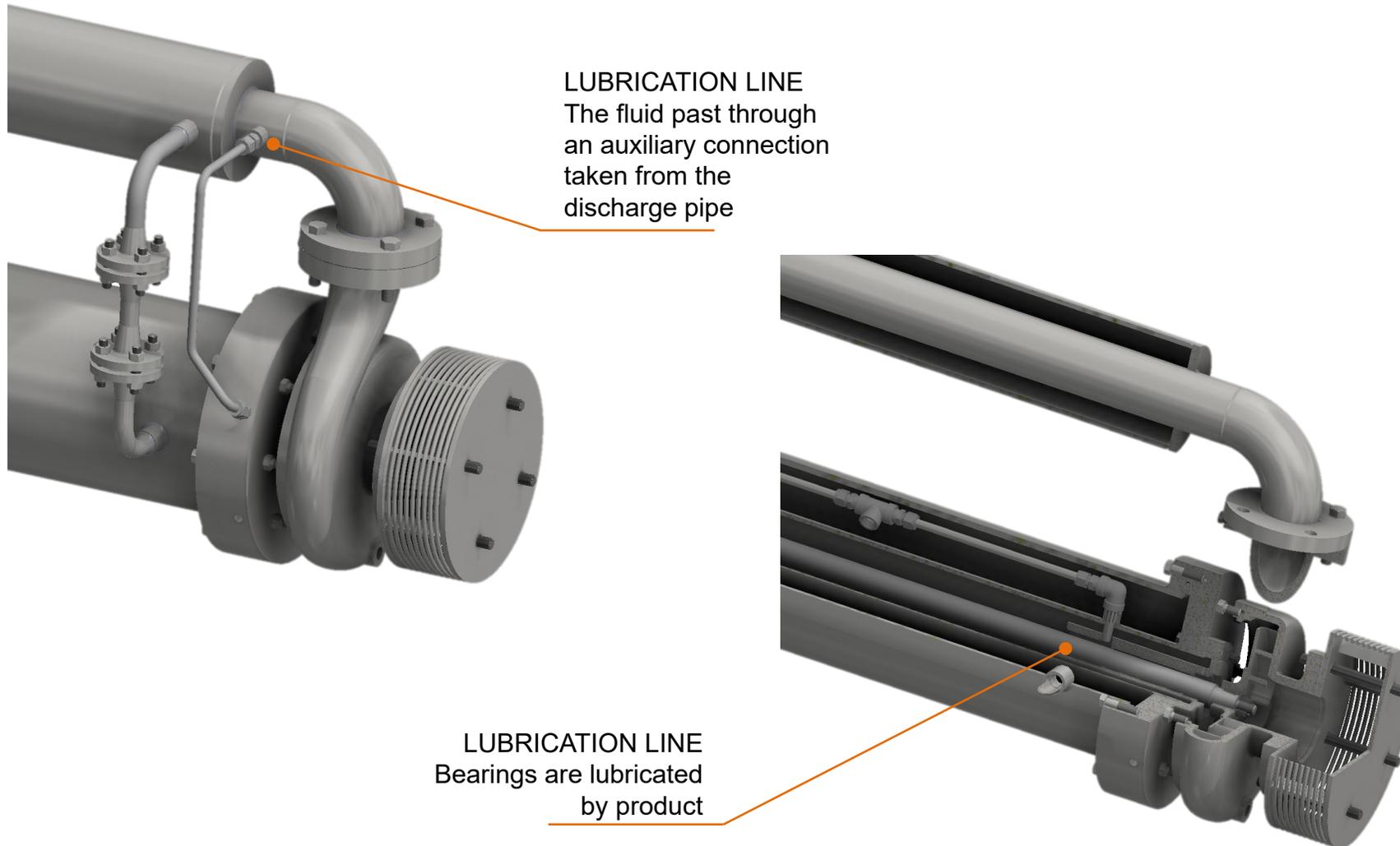
**COLUMN JACKET**



**COLUMN PIPES**

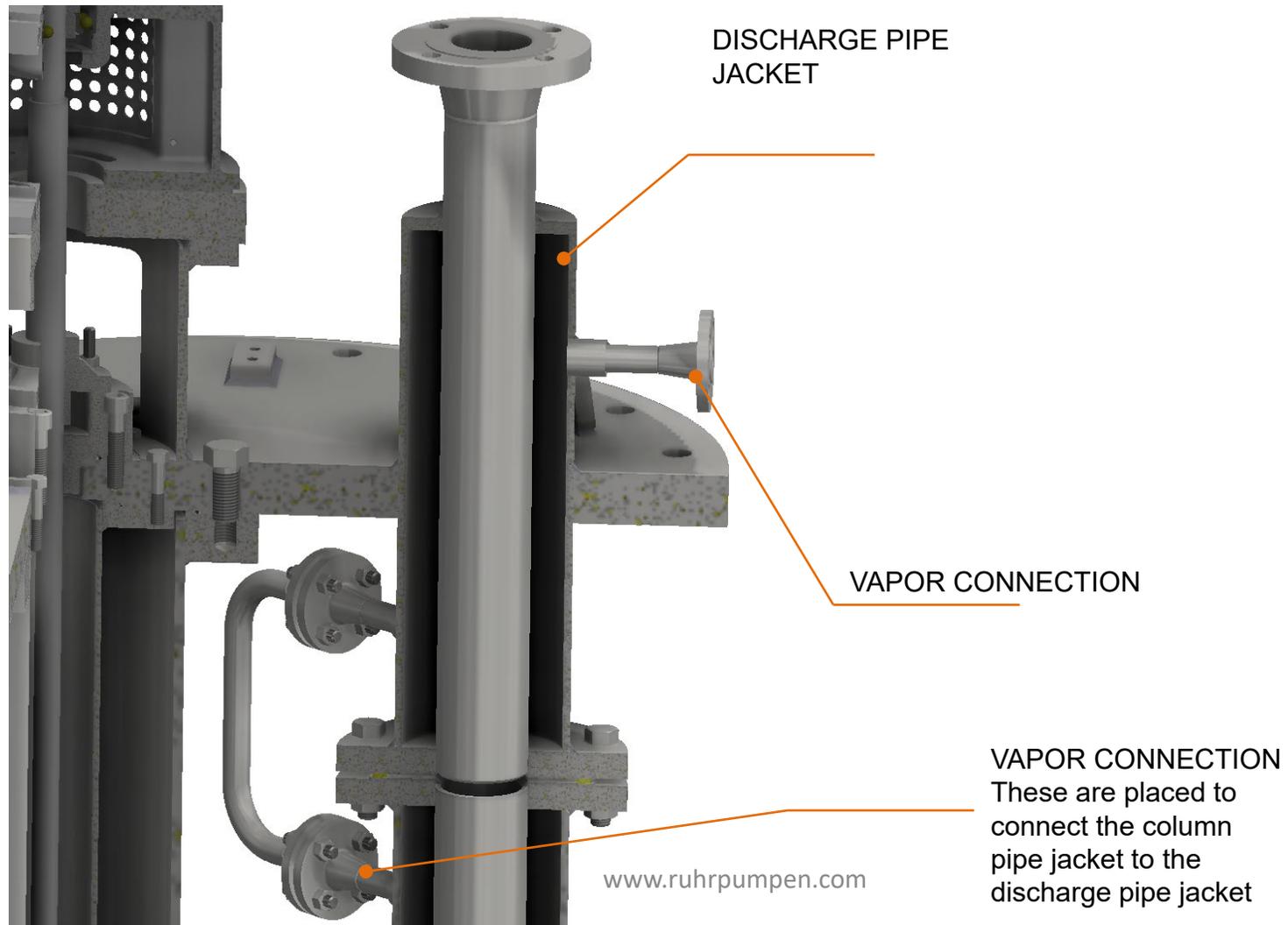
## Extra features – Jacket pumps

VSP



## Extra features – Jacket pumps

VSP



## Product Description

### API 610 11th edition, compliant VS4 sump pump

The Model 3171 is the Veteran vertical sump and process pump. Thousands of installations in industrial process, sump drainage, corrosive liquids, pollution control, molten salts attest to the 3171's remarkable performance. Simple mounting.



#### Specifications

- Capacities to 3180 GPM (722 m<sup>3</sup>/h)
- Heads to 344 Feet (105 m)
- Temperatures to 450° F (232° C)
- Pit Depths to 20 Feet (6 m)

#### Design Features

- Self-Priming
- Rugged Double Row Thrust Bearing
- Heavy Duty One-piece Shaft
- External Impeller Adjustment
- Available in a Wide Range of Alloys
- Open Impeller Design
- Vapor Proof Option: Choice of packing, mechanical or fluid sealing methods to seal sump vapors

## Sump Pumps - CPXV

The Flowserve CPXV is a vertical sump pump incorporating state-of-the-art hydraulic design for efficient and reliable service. The CPXV can be customized to meet a wide range of needs. Compliant with ISO 5199, the CPXV is available in more than 40 hydraulic wet-ends and numerous materials of construction. It is also available with multiple mechanical seal options and sump depths. Also, for oil and gas installations, the CPXV is available with many ISO 13709/API 610 compliant features.



## Operating Parameters

- Flows to 1400 m<sup>3</sup>/h (6160 gpm)
- Heads to 250 m (820 ft)
- Pressures to 25 bar (365 psi)
- Temperatures from -40°C (-40°F) to 400°C (752°F)

## Features and Benefits

- Heavy-duty casing with integral foot and multi-ribbed discharge flange provides superior resistance to pipe loads
- Standard front vane open-style impeller design delivers high-efficiency performance
- Reverse vane impeller available
- Additional column lengths are provided up to a maximum of 10 m (32 ft)
- Heavy-duty thrust bearings with axial adjustment made above soleplate level
- Recessed impeller version is available for enhanced solids handling capability
- Suction strainer is optional
- Fully jacketed version available for molten sulfur applications
- ATEX Category 1 (Zone 0) build for high risk explosive environments

## Sump Pumps - ECPJ

The ECPJ single-stage, vertical lineshaft sump pump is designed to perform tough jobs reliably, under a variety of difficult conditions. Based on a modular design system, this rugged pump is fully compliant with the latest ISO 13709/API 610 (VS4) standards and may be custom engineered for the specific application in which it will be used.

**Brand:** **Worthington**



### Operating Parameters

- Flows to 1000 m<sup>3</sup>/h (4400 gpm)
- Heads to 150 m (500 ft)
- Temperatures from -46°C (-51°F) to 350°C (660°F)
- Pressures to 20 bar (285 psi)

### Design Range

#### Size Range:

- 45 sizes
- Setting length up to 8 m (26 ft)

### Features and Benefits

- ECPJ vertical sump pumps are proven performers in chemical and hydrocarbon processing, delivering reliable performance in a wide range of applications
- The ECPJ is available in three ISO 13709/API 610 compliant hydraulic designs: closed, open and free-flow impeller
- A steam jacketed version for applications where it is critical to maintain a high temperature is available (such as liquid sulfur service)
- For low NPSHa service the ECPJ can be equipped with inducers
- A broad range of materials, including ISO 13709/API 610, NACE MR0175 and NACE MR0103 compliant alloys and specialty materials such as titanium are available
- ECPJ pumps can be provided in compliance with ATEX Zone 0 / Category 1.

CVT vertically suspended sump pump

# Vertical pumping expertise in ANSI markets

The CVT can be applied to any sump application with moderate solid content.



## Competitors – Sulzer

### ✓ Main benefits

- Interchangeable casing and impeller with CPT ANSI B73.1 chemical pump
- Ductile iron or Duplex SS casing with Duplex SS impeller for long life
- Heavy duty shaft in variety of materials for improved corrosion resistance and high torque capacity
- Variety of level switches, level transducers and other instrumentation available

### ✓ Main applications

- Drainage Sumps
- Oily Water Sumps
- Lube Oil Supply
- Tank Transfer

<b>Capacities</b>	Up to 750 m <sup>3</sup> /h / 3,200 US gpm
<b>Heads</b>	Up to 120 m / 550 ft
<b>Pressures</b>	Up to 26 bar / 375 psi
<b>Temperatures</b>	-45 to 205°C / -40 to 400°F
<b>Discharge sizes</b>	50 to 200 mm / 2 to 8 inches

- Bearing spacing follows API 610 to assure first critical speed of shaft system is above operating speed
- Epoxy coated carbon steel mounting plate standard
- Grease lubricated 7300 series BECBM thrust bearing with machined brass cages



# Pump Type VS5 Cantilever Pumps



## VS5 Cantilever Pumps



- Cantilever design
- Heavy duty shaft
- No support bearings for the shaft
- Typical use high solids content , slurries, strong acids (sulfuric acid)
- API or ANSI hydraulics.

# Pump Type VS6

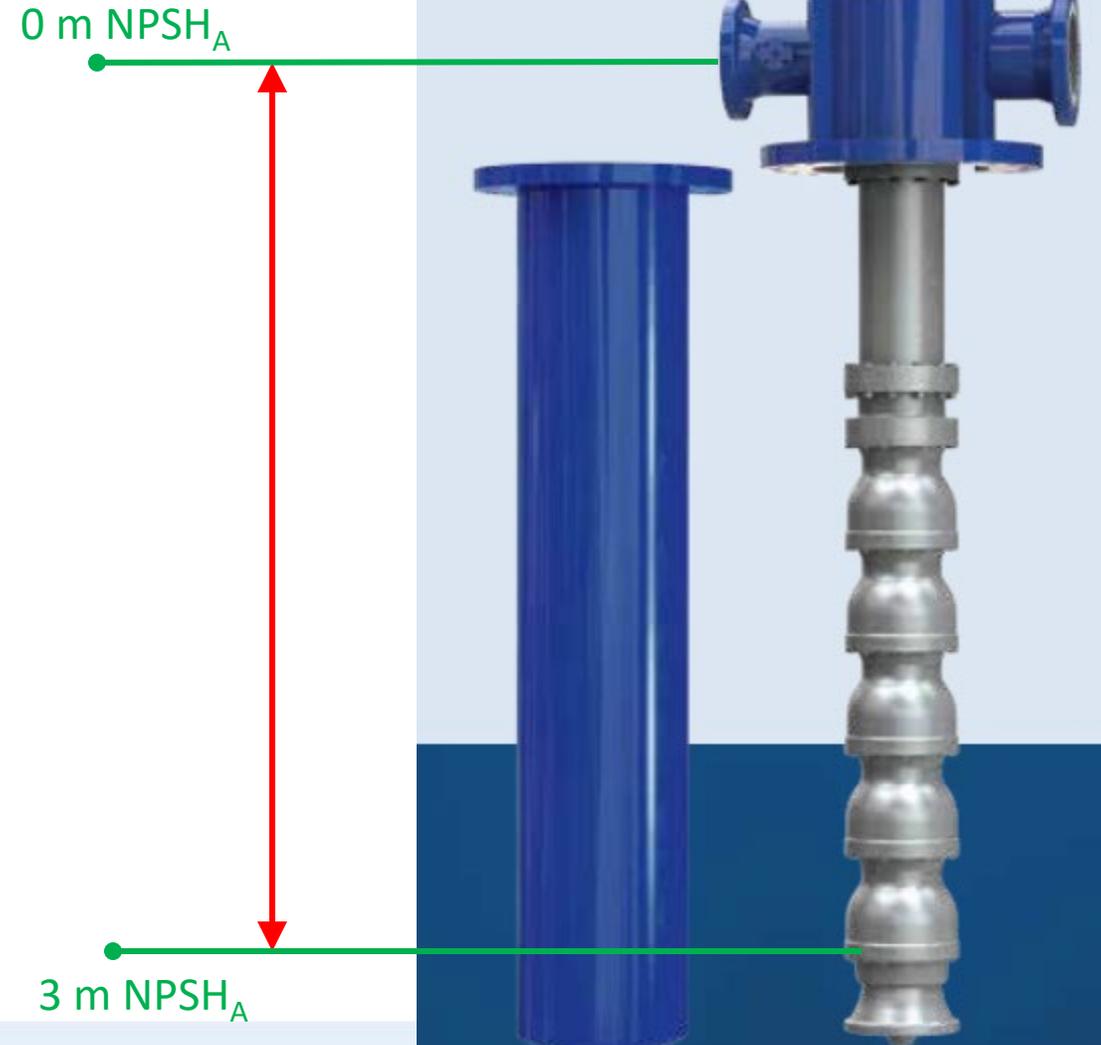
“Double Casing, **Diffuser** Type,  
Vertical Suspended” Pumps  
“Canned Suction” Pumps  
“Vertical Barrel” Pumps

# VS6 Pumps – Zero NPSH<sub>R</sub>

## The Spacesaver and Costsaver

Works on the basis that if you have 0m NPSHA at Grade, then 3m down you have 3m NPSHA  
So we make the pump long enough, by putting in spool pieces as necessary to position the first impeller low enough to give you sufficient NPSH margin.

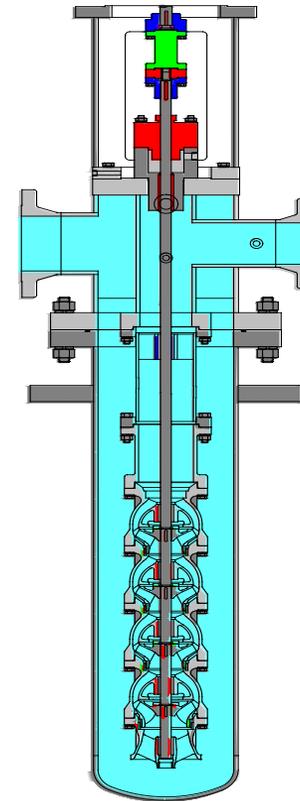
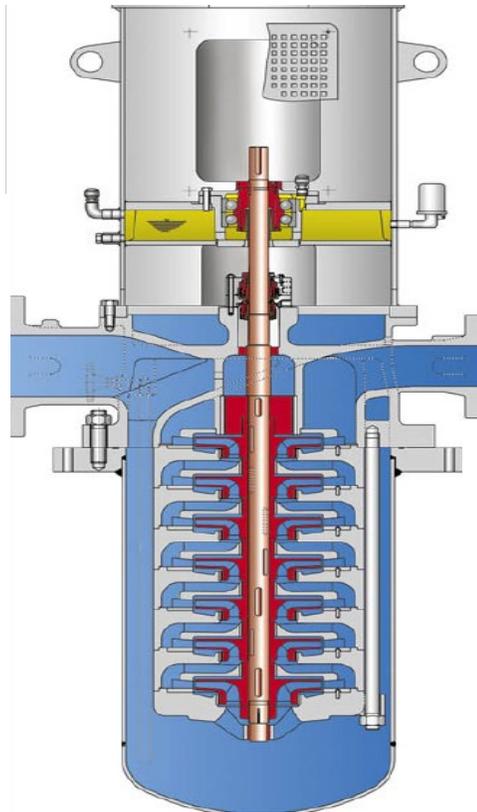
- Not just an NPSH saver but a space saver too. Around 20% of the floorspace of the equivalent BB2
- And a cost saver too. Less expensive than the equivalent BB2
- One seal, one sealing system
- Once you can persuade your civil engineers to dig a hole you are saving all the way.



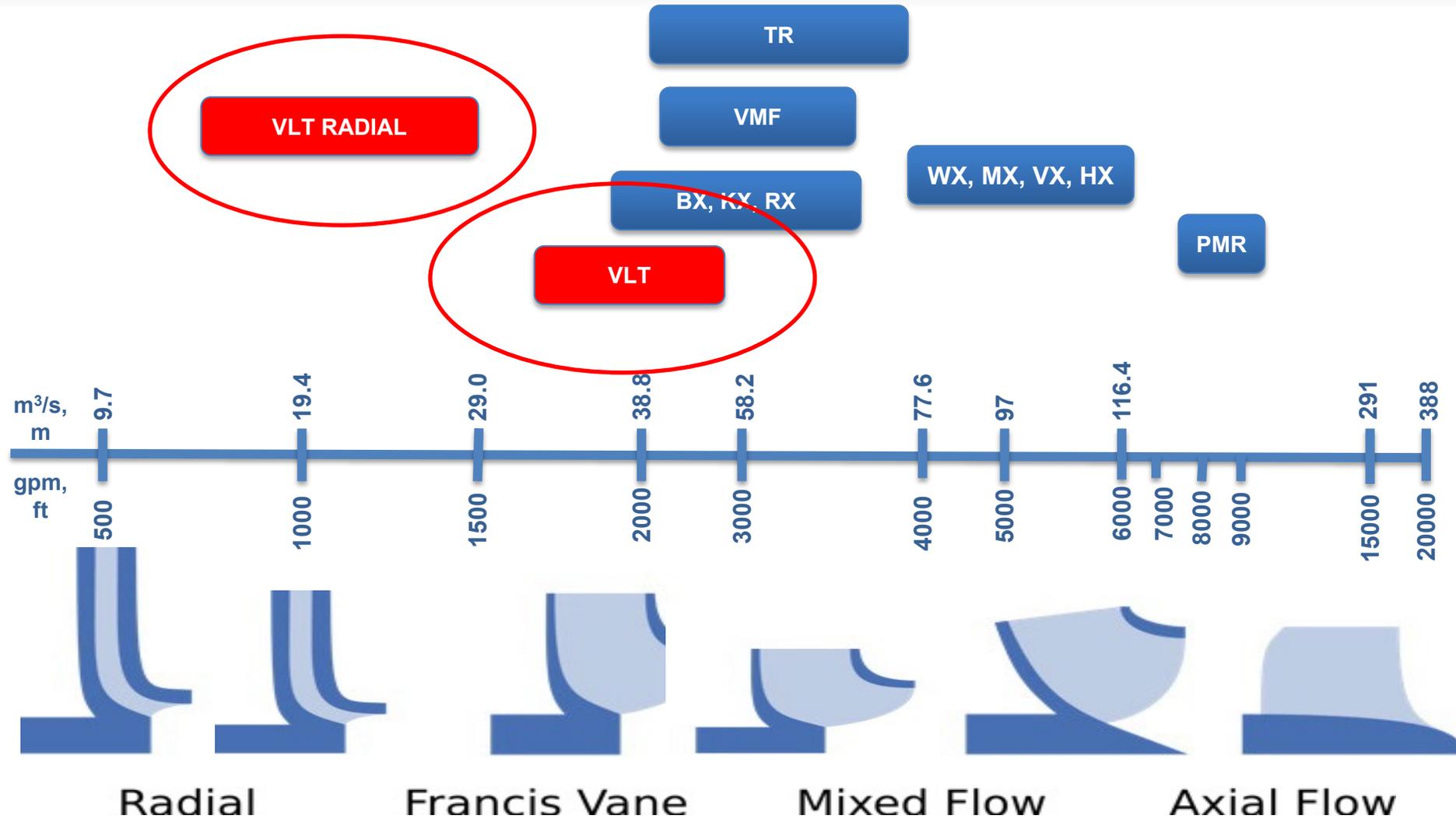
# SECTIONAL OF RADIAL VS FRANCIS VANE

Note the difference between 'flat' appearance of radial design "VLT-Radial" model (low flow, high head)

... compared with curved Francis Vane design of "VLT" model



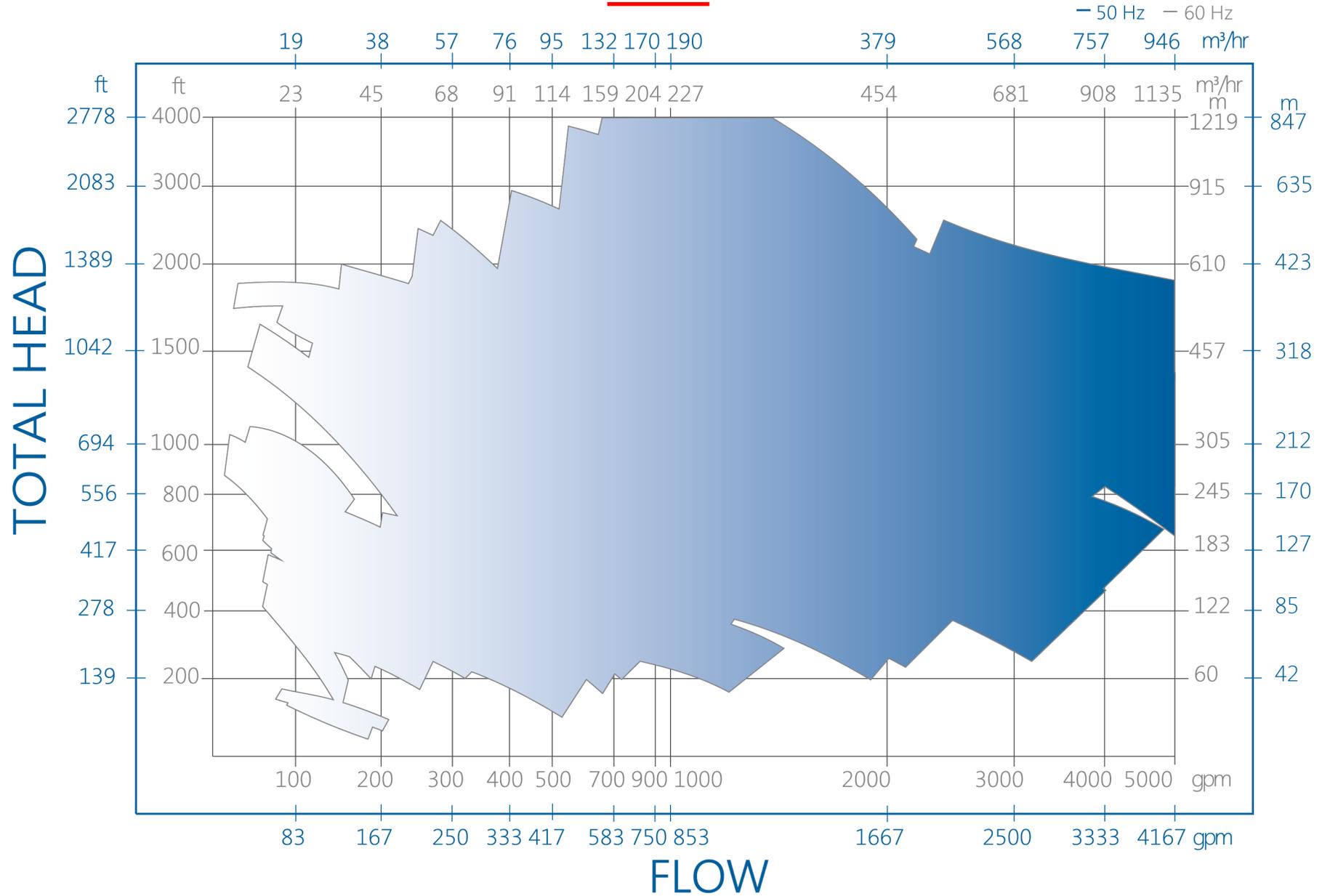
# SPECIFIC SPEED, $N_s$





VS6 – Multispeed – Semi Engineered Range

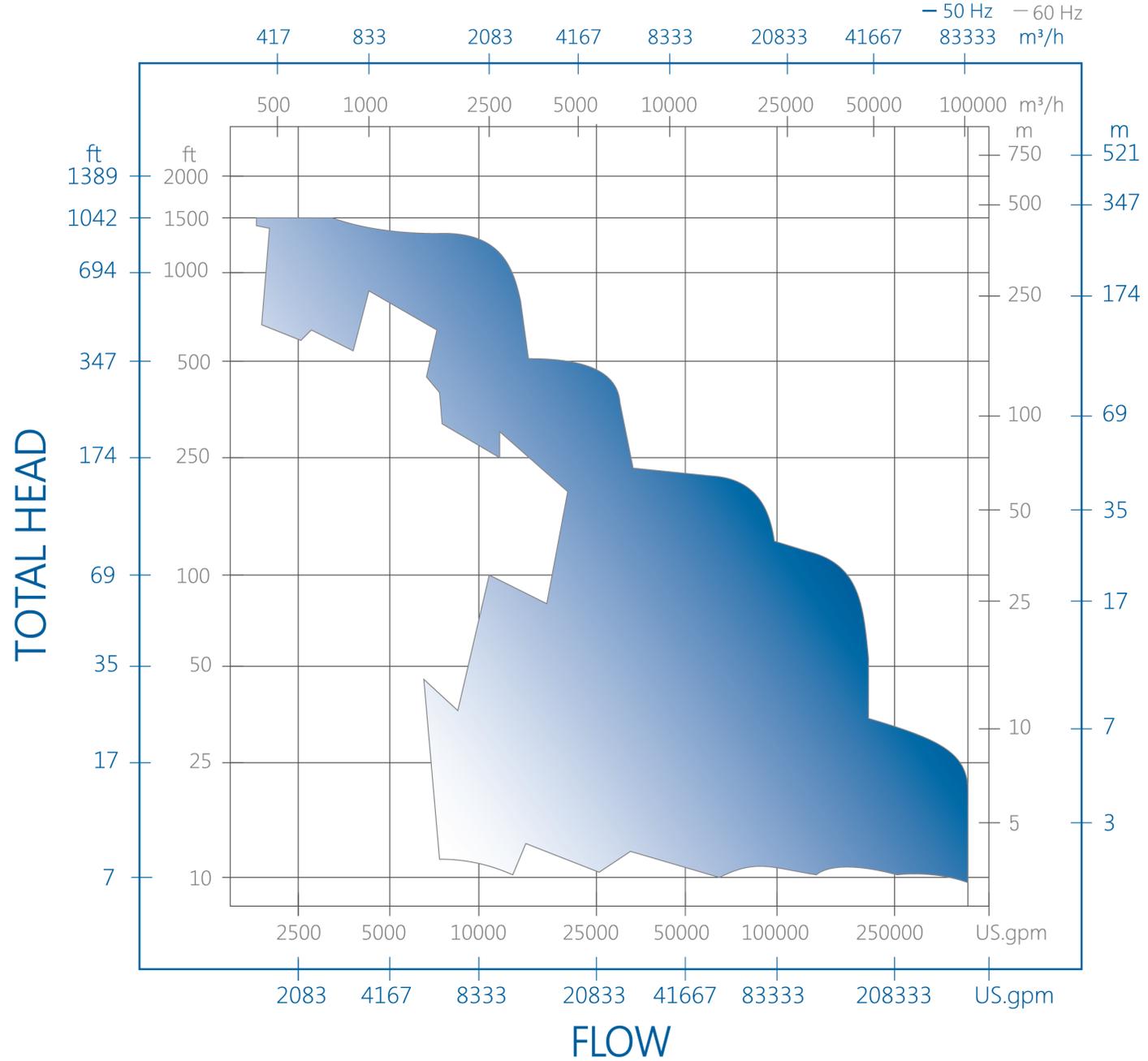
# Selection Chart VLT VS6





**VS6 – Multispeed – Engineered Range**

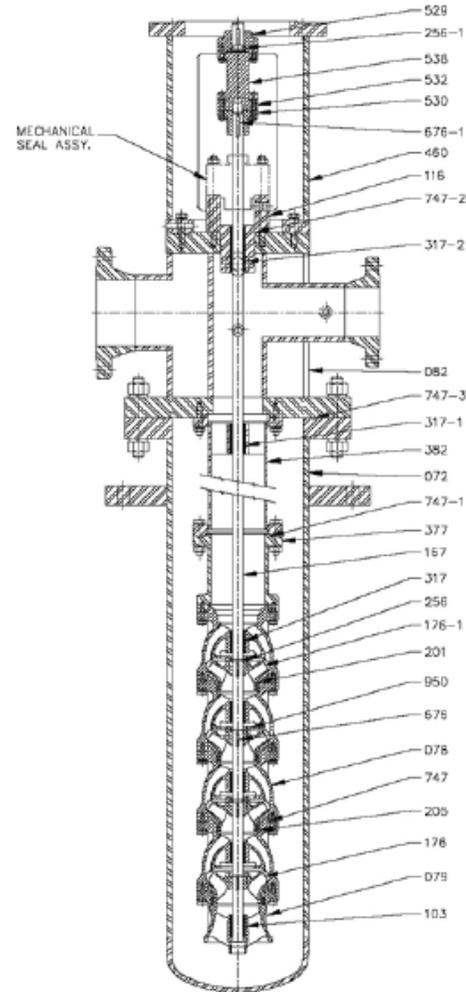
# Selection Chart VMT VS6





# CONFIGURATION AND MOUNTING OPTIONS

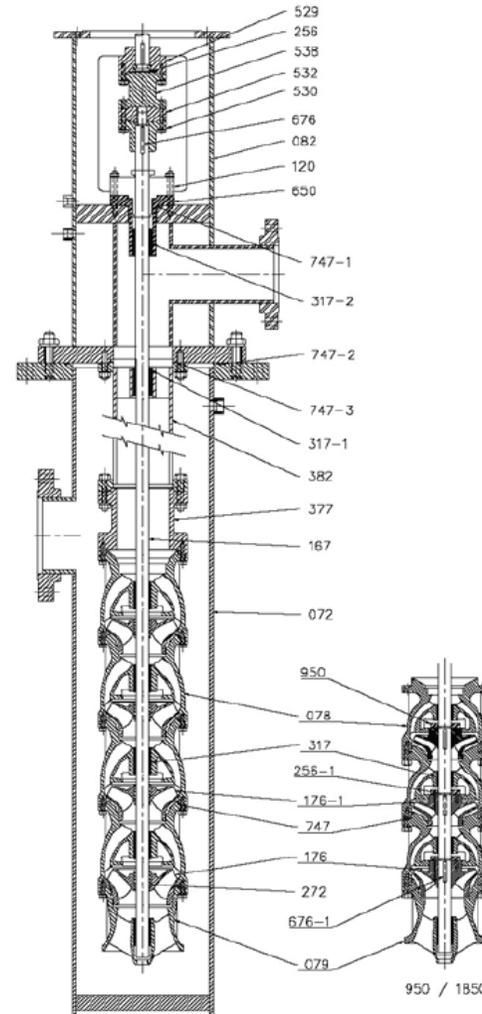
# SH (SUCTION IN HEAD)



REFERENCE NUMBER	PART DESCRIPTION
072	CAN
078	CASE, SERIES
079	CASE, BOTTOM
082	NOZZLE HEAD
103	BEARING, CASE, BOTTOM
116	SEAL CHAMBER
167	SHAFT, PUMP
176	IMPELLER, 1ST STAGE
176-1	IMPELLER, SERIES
201	WEAR RING, IMPELLER
205	WEAR RING, CASE
256	RING, SPLIT, IMPELLER
256-1	RING, SPLIT, COUPLING
317	BEARING, CASE, SERIES
317-1	BEARING, COLUMN
317-2	BEARING, SEAL CHAMBER
377	FLANGE, CASE, TOP
382	COLUMN, SPOOL
460	SUPPORT, DRIVER
529	COUPLING, DRIVER
530	COUPLING, PUMP
532	PLATE, ADJUSTING
538	COUPLING, SPACER
676	KEY, IMPELLER
676-1	KEY, COUPLING
747	O-RING, CASE
747-1	O-RING, COLUMN
747-2	O-RING, SEAL CHAMBER
747-3	O-RING, BARREL
950	GUARD, RING, RETAINING

NOTE: S-1 Bowls have integrally cast impeller wear rings as Standard.

# SB (SUCTION IN CAN)



REFERENCE NUMBER	PART DESCRIPTION
072	CAN
078*	CASE, SERIES
079	CASE, BOTTOM
082	NOZZLE HEAD
120*	SEAL, CRTG
167*	SHAFT, PUMP
176*	IMPELLER, 1ST STAGE
176-1*	IMPELLER, SERIES
256	RING, SPLIT, COUPLING
256-1	RING, SPLIT, IMPELLER
272	COLLER, LOCK
317*	BEARING, CASE
317-1*	BEARING, COLUMN
317-2*	BEARING, STUFFING BOX
377	FLANGE, CASE, TOP
382	COLUMN, SPOOL
529	COUPLING, DRIVER
530	COUPLING, PUMP
532	PLATE, ADJUSTING
538	COUPLING, SPACER
650	HOUSING, BEARING
676	KEY, COUPLING
676-1	KEY, IMPELLER
747*	O-RING, CASE
747-1*	O-RING STUFFING BOX
747-2*	O-RING, BARREL
747-3*	O-RING, COLUMN
950	GUARD, RING, RTNG

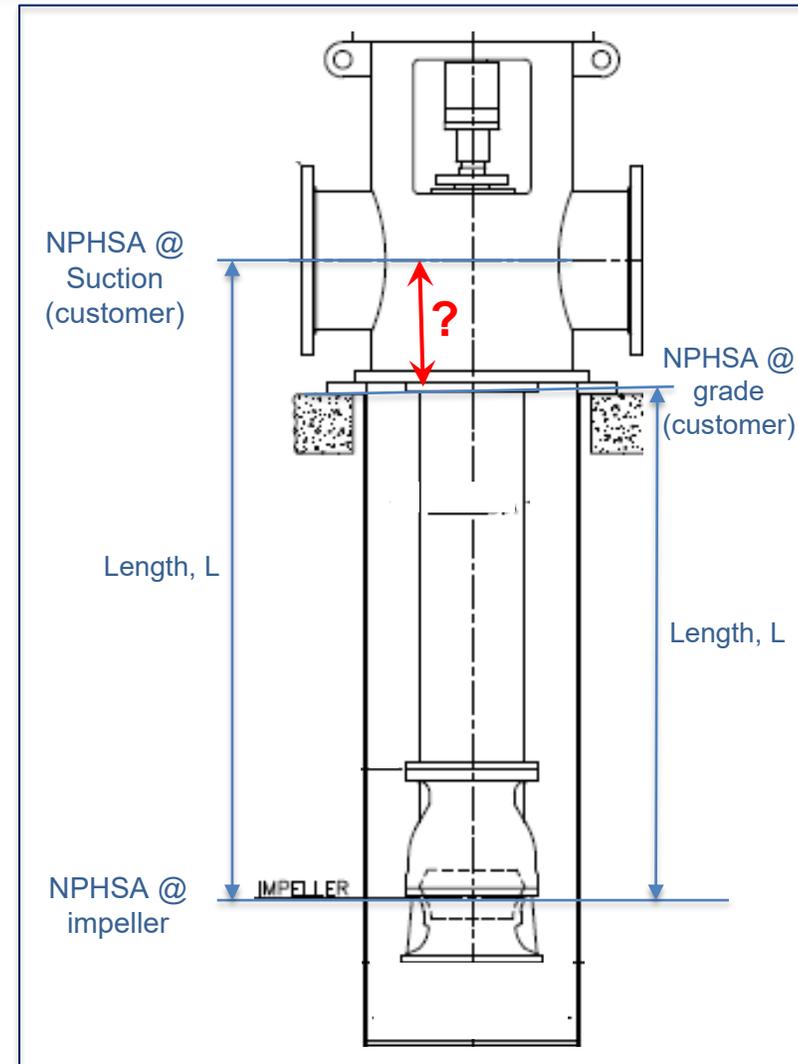
\* Recommended Spare Parts

# 1. IMPACT OF NPSH (SUCTION IN HEAD)

- NPSH Available must be stated by the customer
- We can assume head/can is always full of fluid
- Vendor should ensure that it's clear what is the reference level of customer NPSHA. Often stated @ pump suction flange or @ grade. When stated @ suction flange vendor should check with customer what is the assumed height of pump suction from grade. This ensure we are 100% clear on the actual submergence over the impeller

$$NPSHA @ Impeller = NPSHA customer + L$$

- If NPSHA @ Impeller is still not sufficient - lengthen the pump with column pipe to increase L
- NPSHR of pump defined by 1<sup>st</sup> stage only
- Once 'L' is known then total can length can be calculated

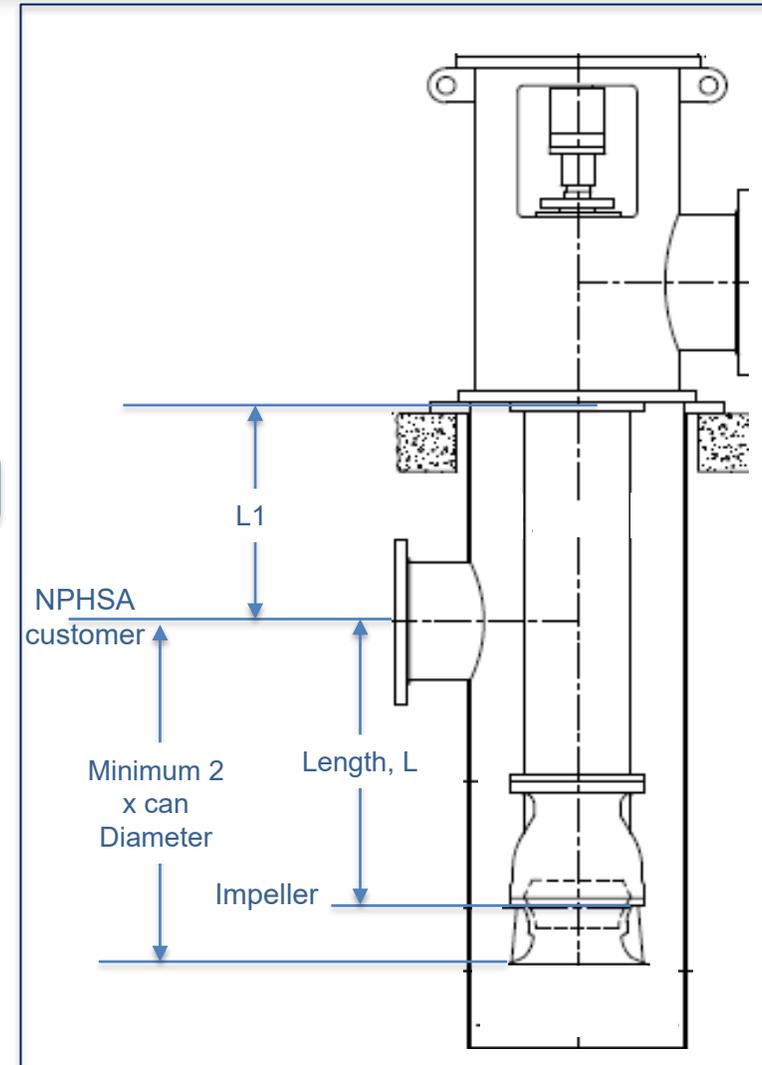


# 1. IMPACT OF NPSH (SUCTION IN CAN)

- With suction-in-can the situation is different
- Minimum distance of 2 can diameters must be considered for distance from CL of suction-in-can to inlet of pump
- Vendor shall ensure that it's clear what is the reference level of customer NPSHA and correct to CL suction if necessary

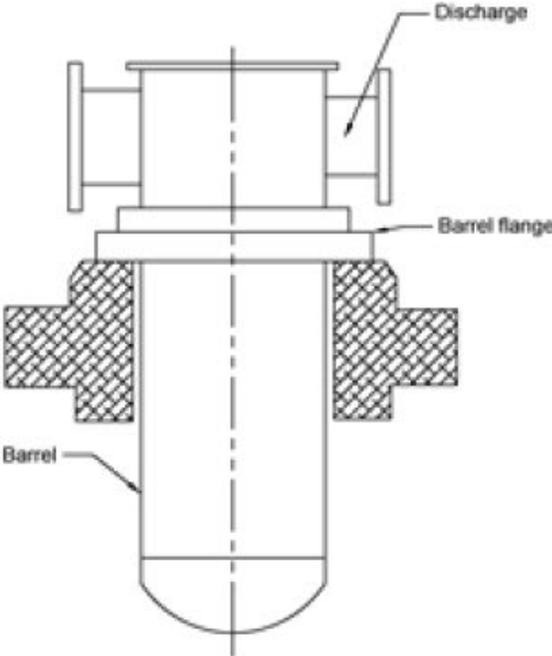
$$NPSHA @ Impeller = NPSHA customer @ CL Suction + L$$

- If NPSHA @ Impeller is still not sufficient then lengthen the pump with column pipe to increase L. Suction flange remains on same elevation
- Can is likely to be full above CL suction during operation, but we do not assume it. Also there is usually some turbulence on the open surface of the fluid so we do not consider L1 for NPSH purposes
- Once 'L' is known then total can length can be calculated



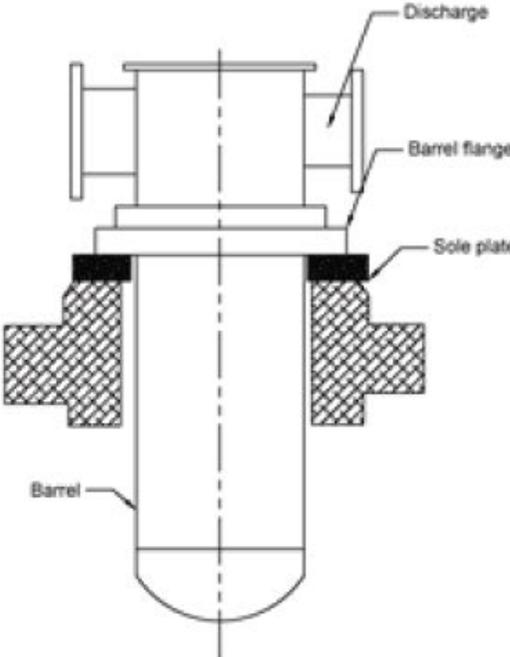


# MOUNTING OPTIONS



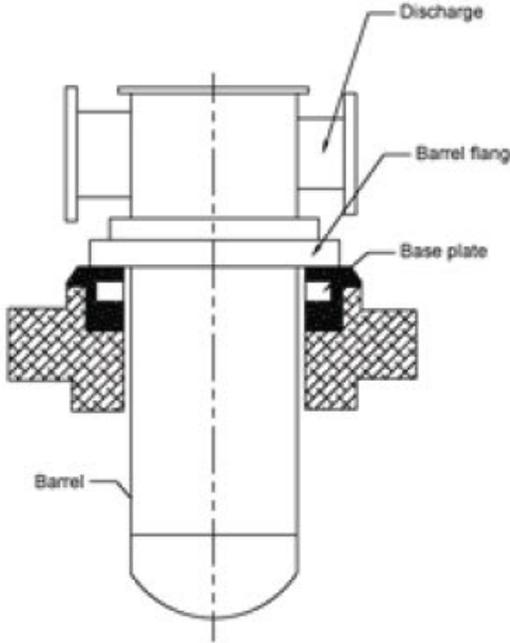
## Standard Design

One flange at the barrel  
Barrel directly mounted on the foundation



## Standard Design with Sole Plate

One flange at the barrel  
Barrel mounted on the sole plate  
Sole plate mounted and adjusted on the foundation

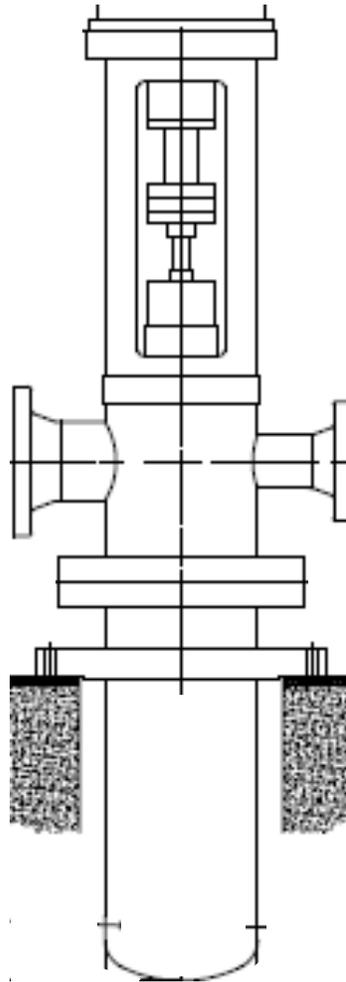


## Standard Design with Base Plate

One flange on the barrel  
Barrel mounted on the base plate  
Base plate mounted and adjusted in the foundation Grouted with concrete



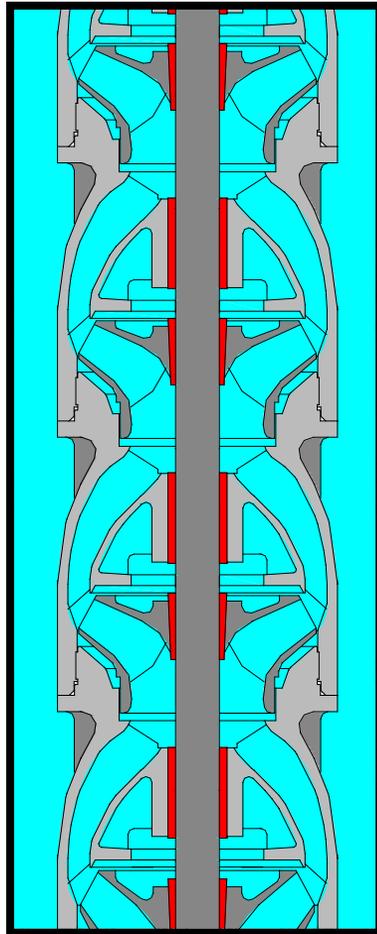
## MOUNTING OPTIONS



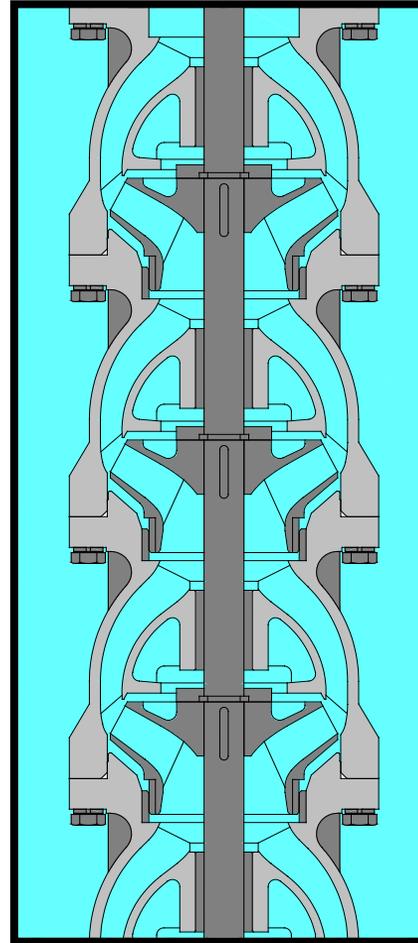
- Separate mounting flange on can was required for API 610 8<sup>th</sup> edition
- No longer required by API, but is available as an option if required by the customer

## FLANGED VS THREADED BOWLS

Threaded Bowls (Non API)



Flanged Bowls (API)



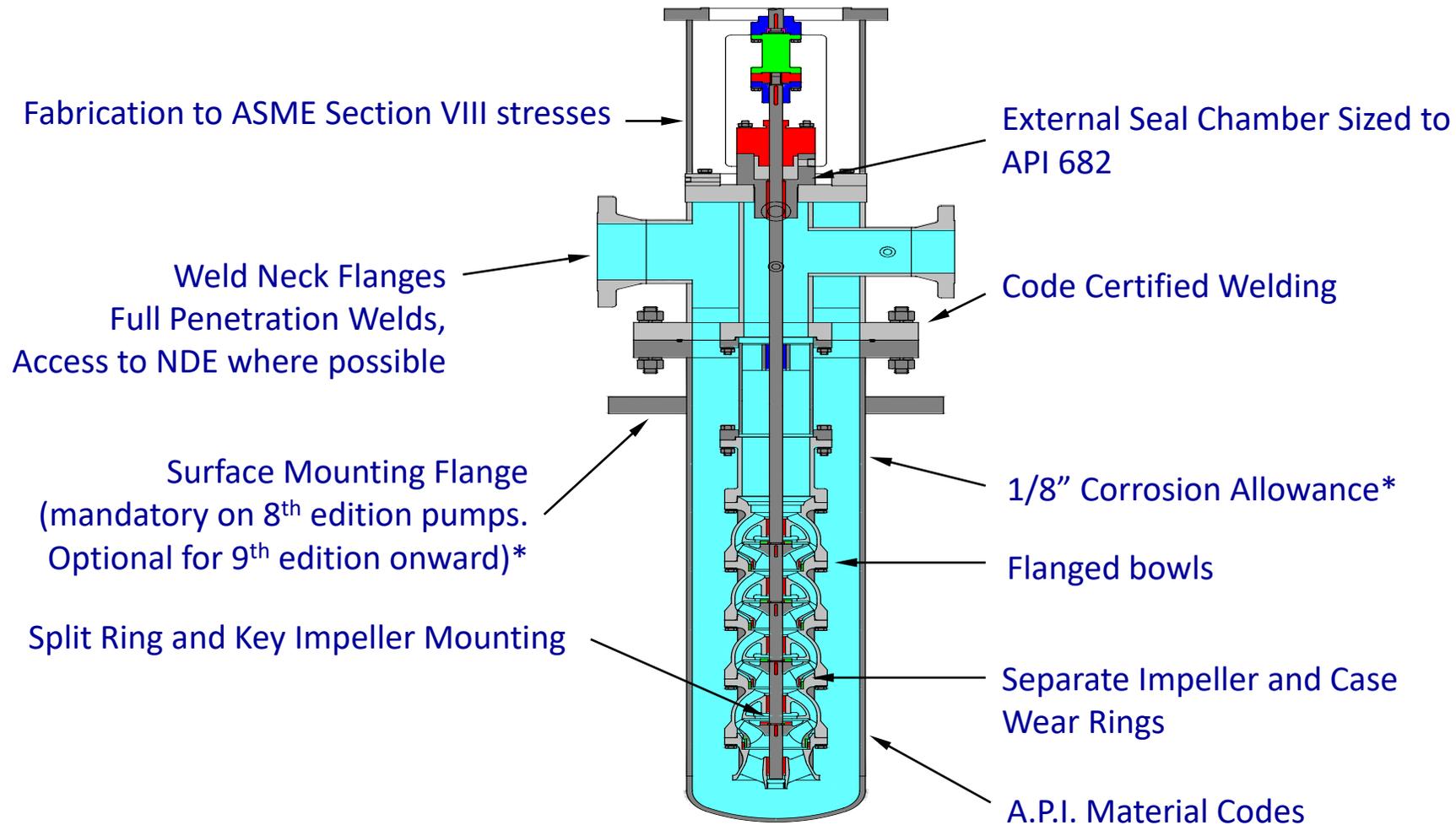


## LOW NPSH FIRST STAGE

- Low NPSH First Stage (13,000 Nss) with wide operating range (15-120% BEP)
- Some (non RP) designs use an inducer.
- Inducers historically had a limited operating range (U shaped NPSH curve)
- More recent designs have a broader range



# API 610 - MANDATORY REQUIREMENTS

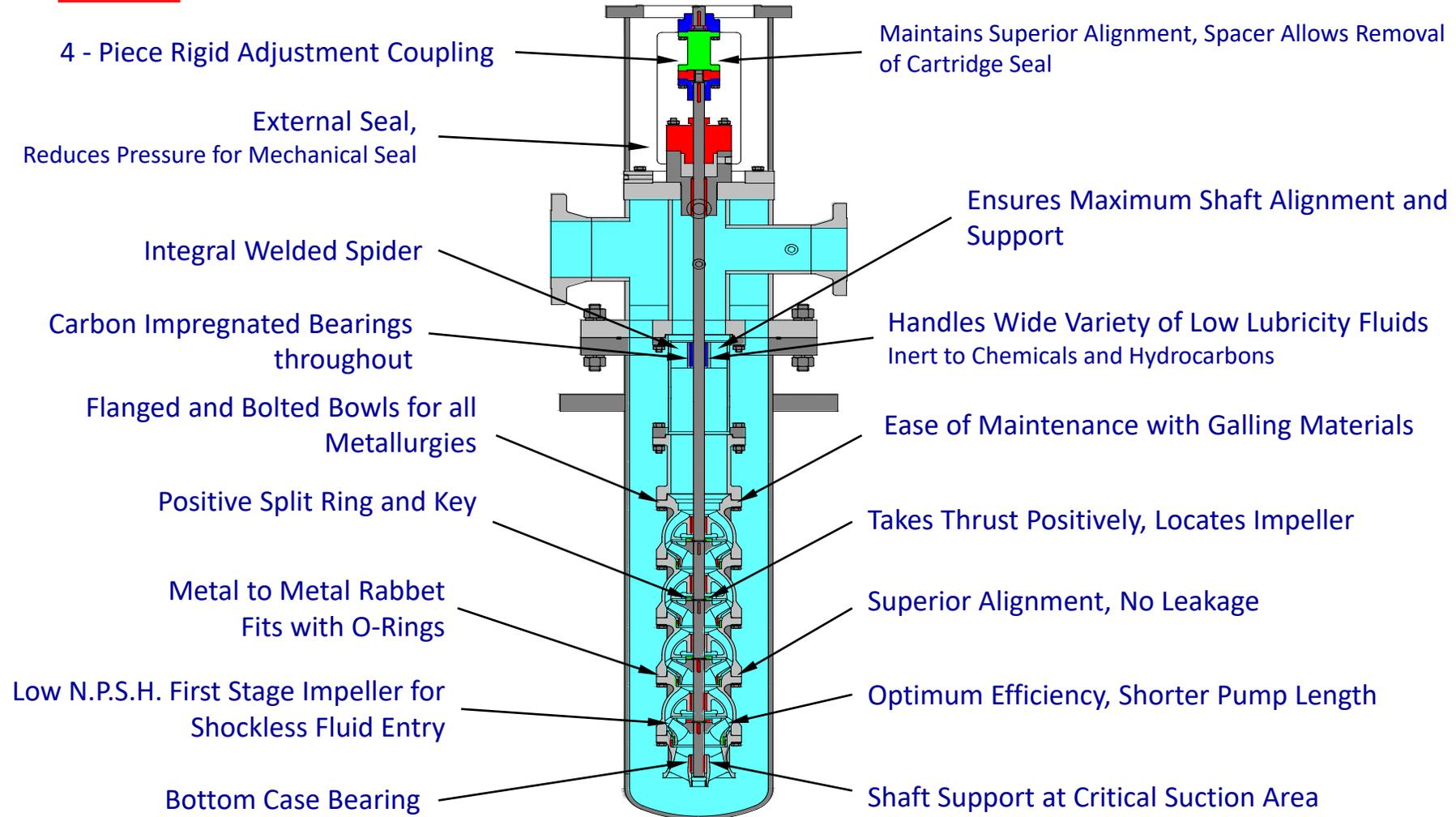


# FEATURES AND BENEFITS

## API 610 VLT

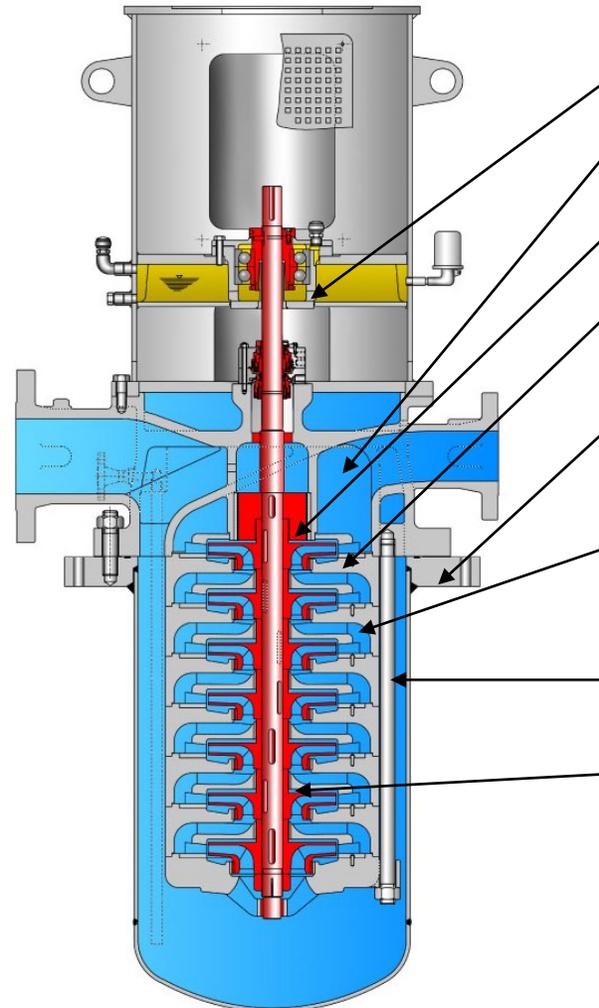
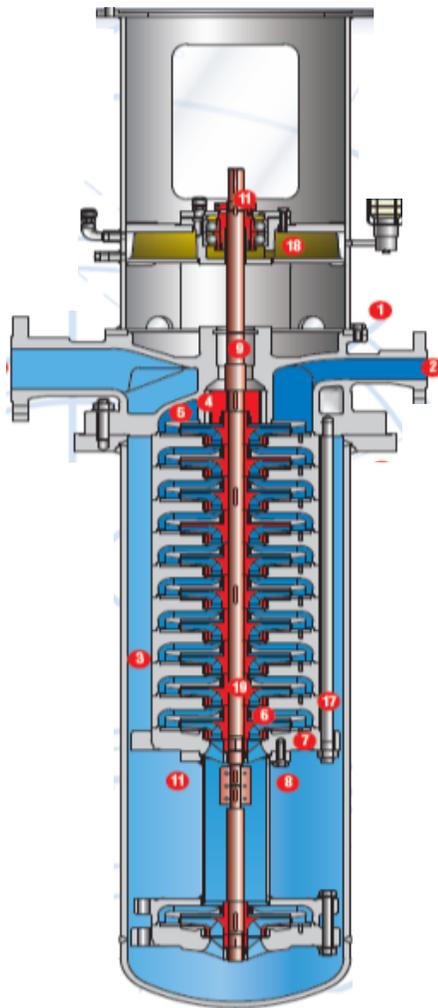
### Feature

### Benefit



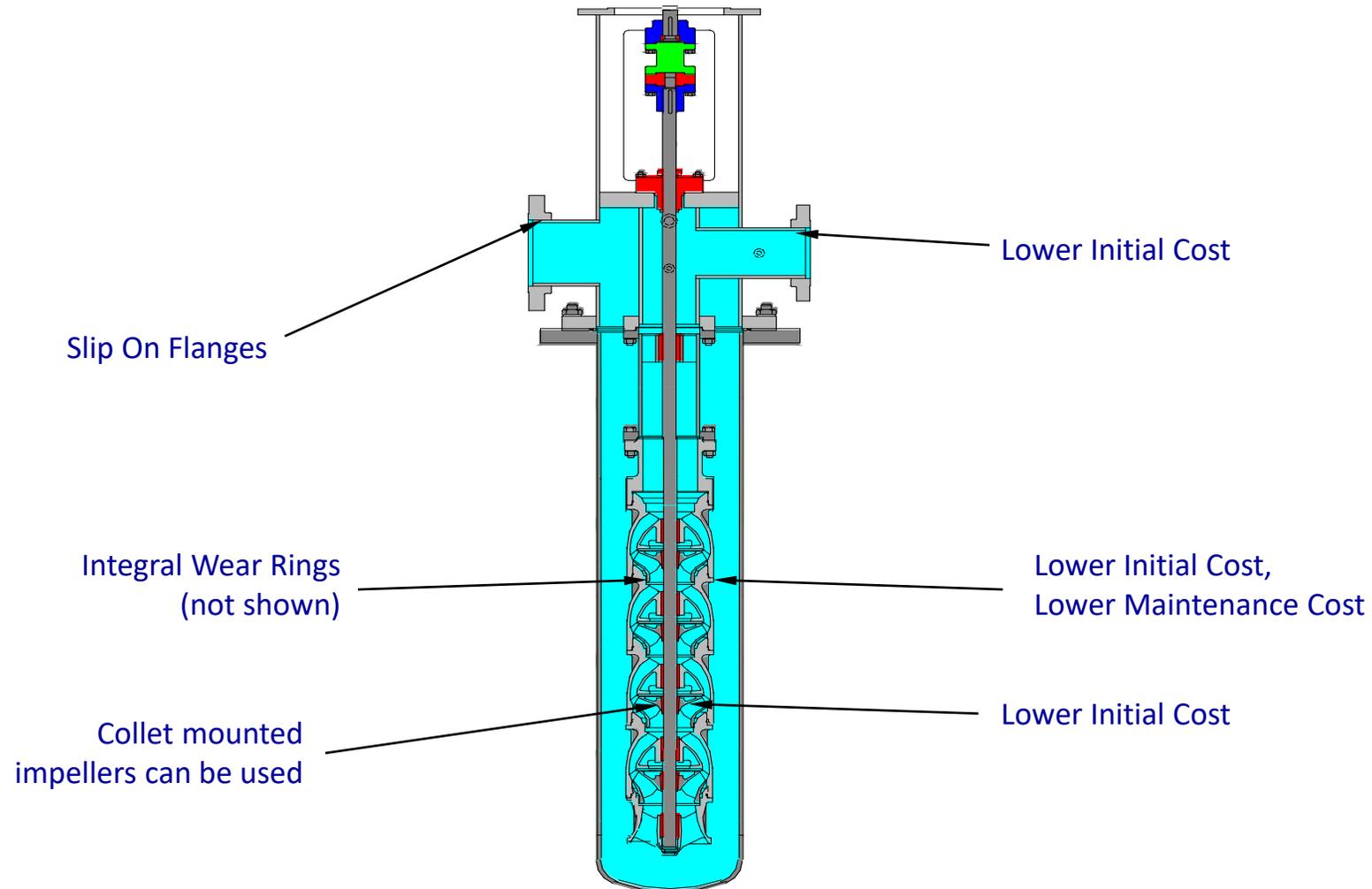
# FEATURES AND BENEFITS

## VLT RADIAL FLOW



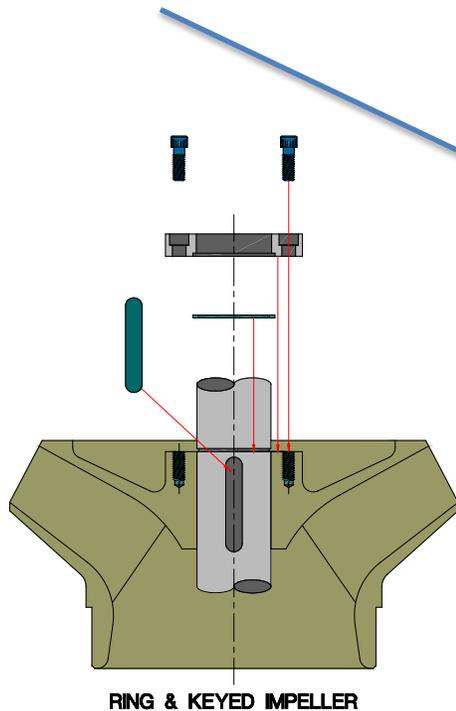
- **Integrated thrust bearing**
- **Casted head**
- **Balance drum**
- **Discharge stage directly mounted to nozzle head**
- **Integral can and mounting flange**
- **Stage casings – metal to metal, rabbet fits, no o-ring**
- **Tie-rod (6x or 12x) design**
- **Impeller hub and interstage bush serve as sleeve bearing**

# FEATURES AND BENEFITS COMMERCIAL VLT – DIFFERENT FROM API



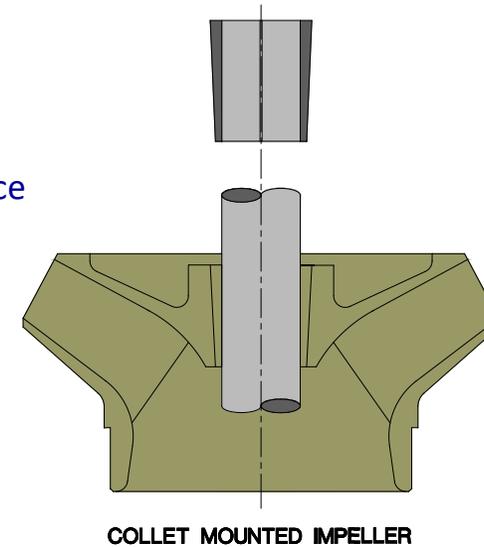
# FEATURES AND BENEFITS DESIGN CHARACTERISTICS

API



- Collet mounted Impellers
  - Ease of assembly and disassembly
  - Ensures positioning of impeller
  - Lower cost and easier for maintenance

Non API

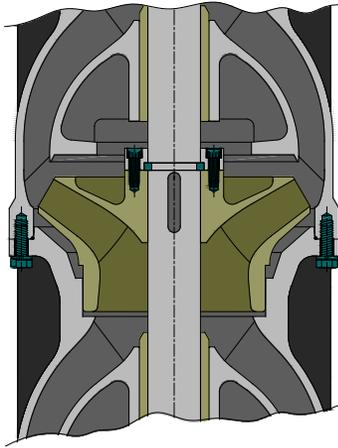


- Locked and keyed Impellers.
  - Positive retention.
  - Important when pumping hot/cold liquids.
  - Less susceptible to loosening when subject to shock load

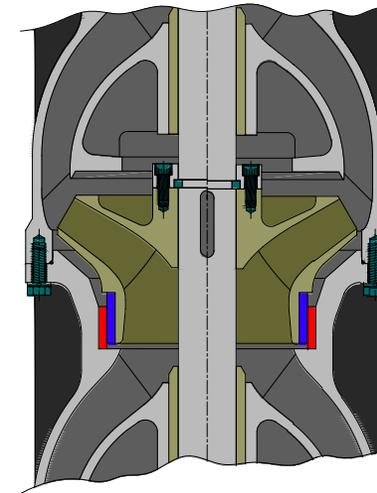
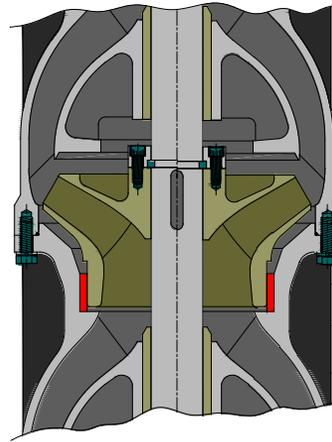
The use of locked and keyed impellers is mandatory for hot services above 230 deg F and below -20 deg F. The reason for this is the tendency for collets to loosen.

We also like to use locked and keyed impellers for high suction pressures and also series pump operation

# FEATURES AND BENEFITS WEAR RINGS



Integral Wear Rings **(Non API)**

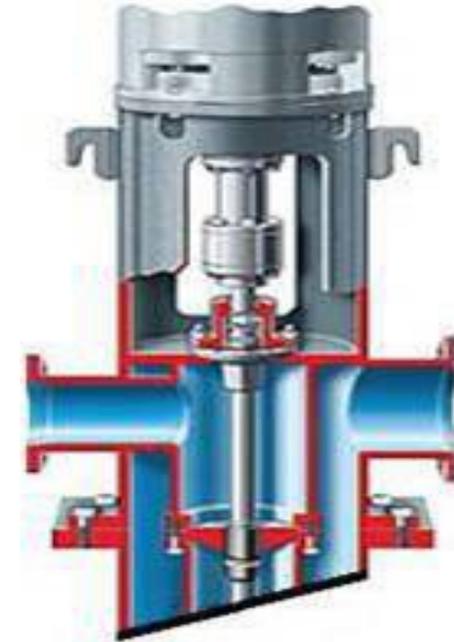


Renewable Wear Rings **(API)**

- The choice of wear rings is available
- Integral wear rings is a cost saving

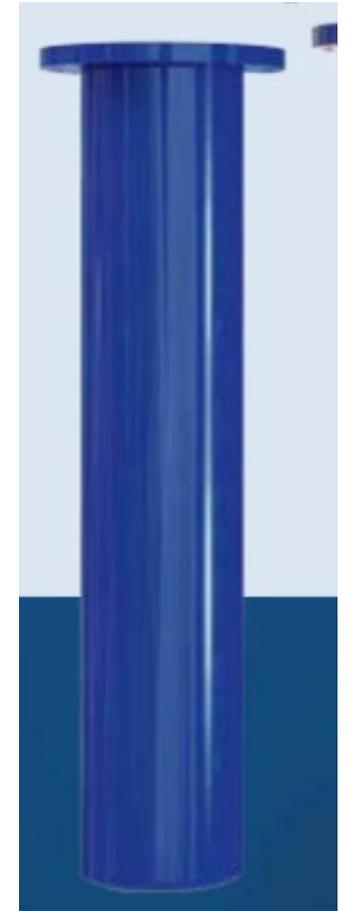
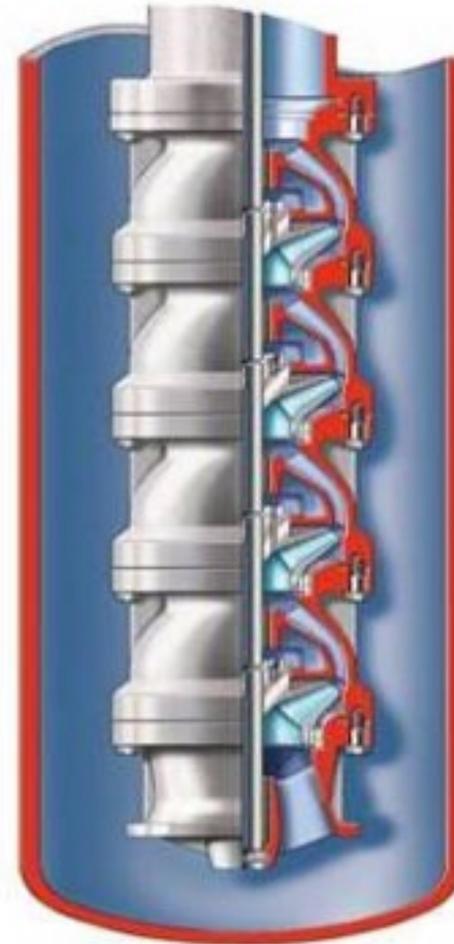
# FEATURES AND BENEFITS NOZZLE HEAD

- Fabricated Steel Discharge Heads
- Pre-Engineered standard designs for the 100 to the 2000 VLT size
- Meets API 610 nozzle load requirements (Only API model)
- 300# flanges standard for API VLT. 150#, 600# & 900# optional
- All pipe, vent & gauge connections are ANSI Class 300
- 150# flanges are standard for Commercial VLT
- 300# and above optional
- Top flange has rabbet / register fit for motor - no field doweling or fit-up
- Lifting Lugs
- OSHA coupling guards
- Standard motor mating flanges to NEMA standards for Vertical Solid Shaft Motor



# FEATURES AND BENEFITS SUCTION CAN AND SHAFTING

- Fabricated Steel Barrel (or “Can”)
- O-ring gasket seal to the head
- Sized to meet allowable velocities
- Elliptical bottom is standard on API VLT
- Flat bottom standard on Commercial VLT
- 416ss shafting as standard



## DESIGN CHARACTERISTICS COLUMN AND LINE SHAFT

- For API design bearing holder / 'spider' is welded into the top of each column piece and machined concentric with mating flanges
- For Commercial design spiders can be drop—in type. But there is an option for welded
- Better radial loading capability
- Rabbet /Register fit and o-ring sealing between column and head, and column and bowl assembly
- Carbon Impregnated bearings as standard (usually graphalloy)
  - Suitable for wide range of services and can tolerate upset conditions
  - These bearings give excellent life when pumping dry liquids like propane, butane, ethane and also condensate
- Bronze, Cast Iron, Nitronics are also available depending on the service



- Seal chambers suitable for API 682 mechanical seals
- Choice of arrangements to suit process
- Seal systems normally mounted away from the pump, but engineering will look at mounting on pump head on case to case basis if required (photo)



# THRUST HANDLING IN PUMP IN-HEAD THRUST POTS

REFERENCE NUMBER	PART DESCRIPTION	MATERIAL
120	SEAL, CARTRIDGE	ASSY
167	SHAFT, PUMP	A582 TP 416
252	NUT, SHAFT, DRIVER	A582 TP 416
346	SLEEVE, BEARING, BALL, THRUST	STL 1213
486	RING, SEALING-V	NITRILE
486-1	RING, SEALING-V	NITRILE
508	THRUST POT	A48, CL 30
510	COVER, THRUST POT	A36
655	BEARING, BALL, RADIAL	ASSY
673	WASHER, LK, BBRG	A36
678	KEY, GIB	AISI 302-316
747-4	O-RING	NITRILE
878	NUT, LK, BBRG	A36

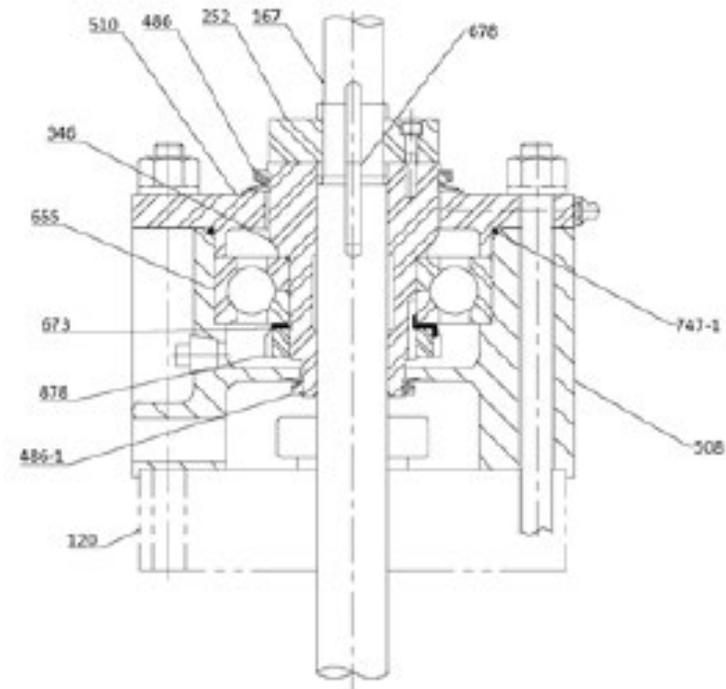
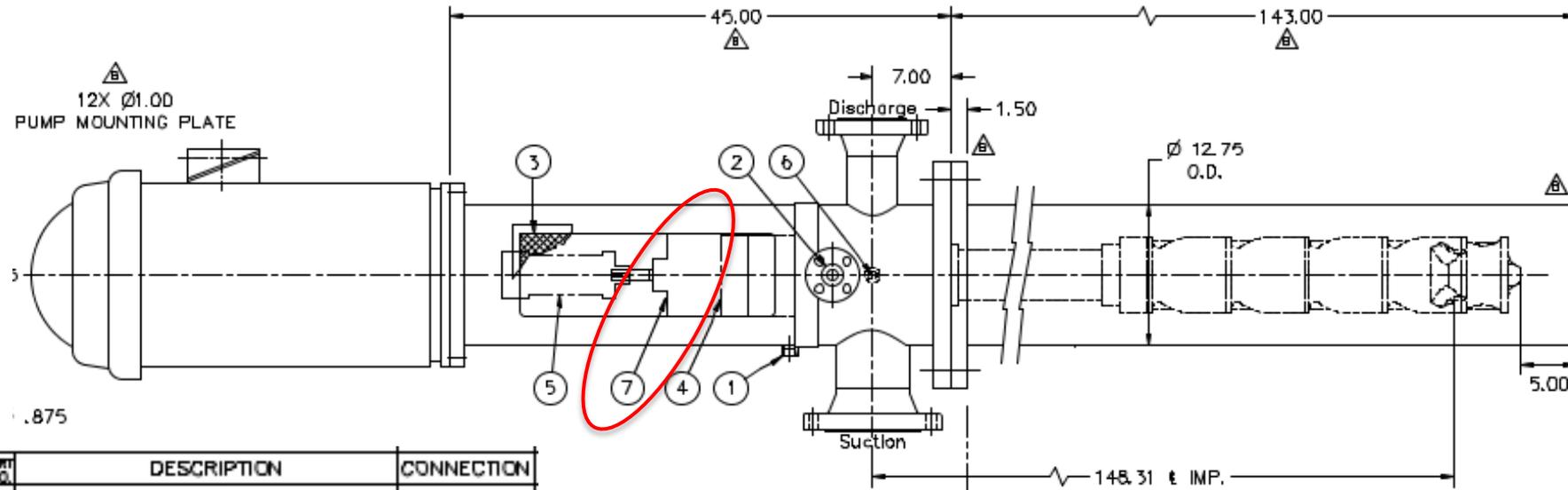


Figure 6.1 Thrust Pot Model 311 / 311 QJ Sectional Drawing

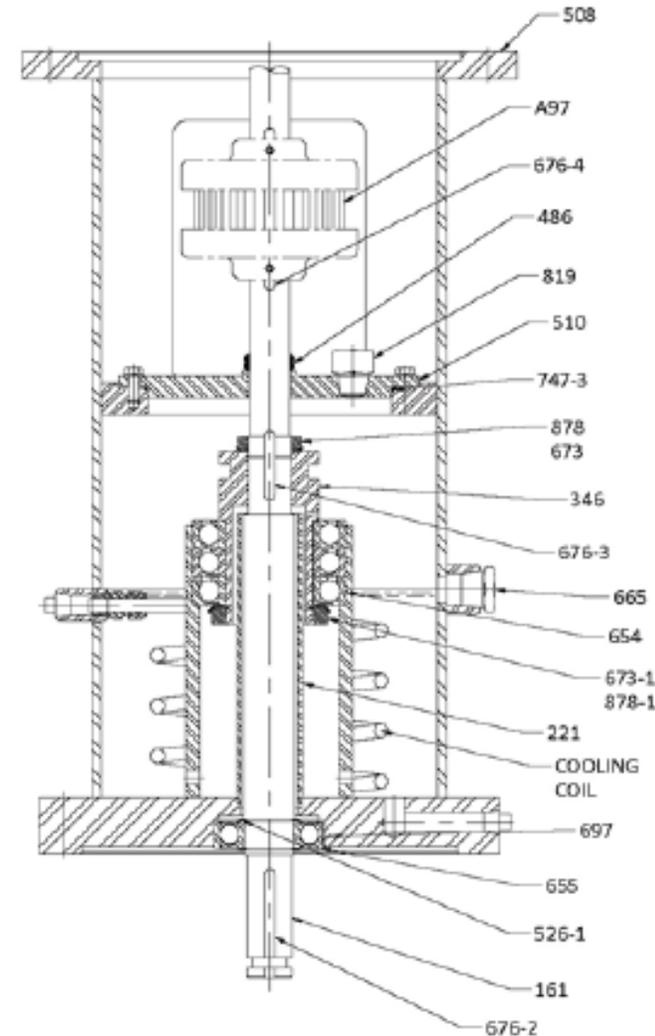
# THRUST HANDLING IN PUMP IN-HEAD THRUST POTS



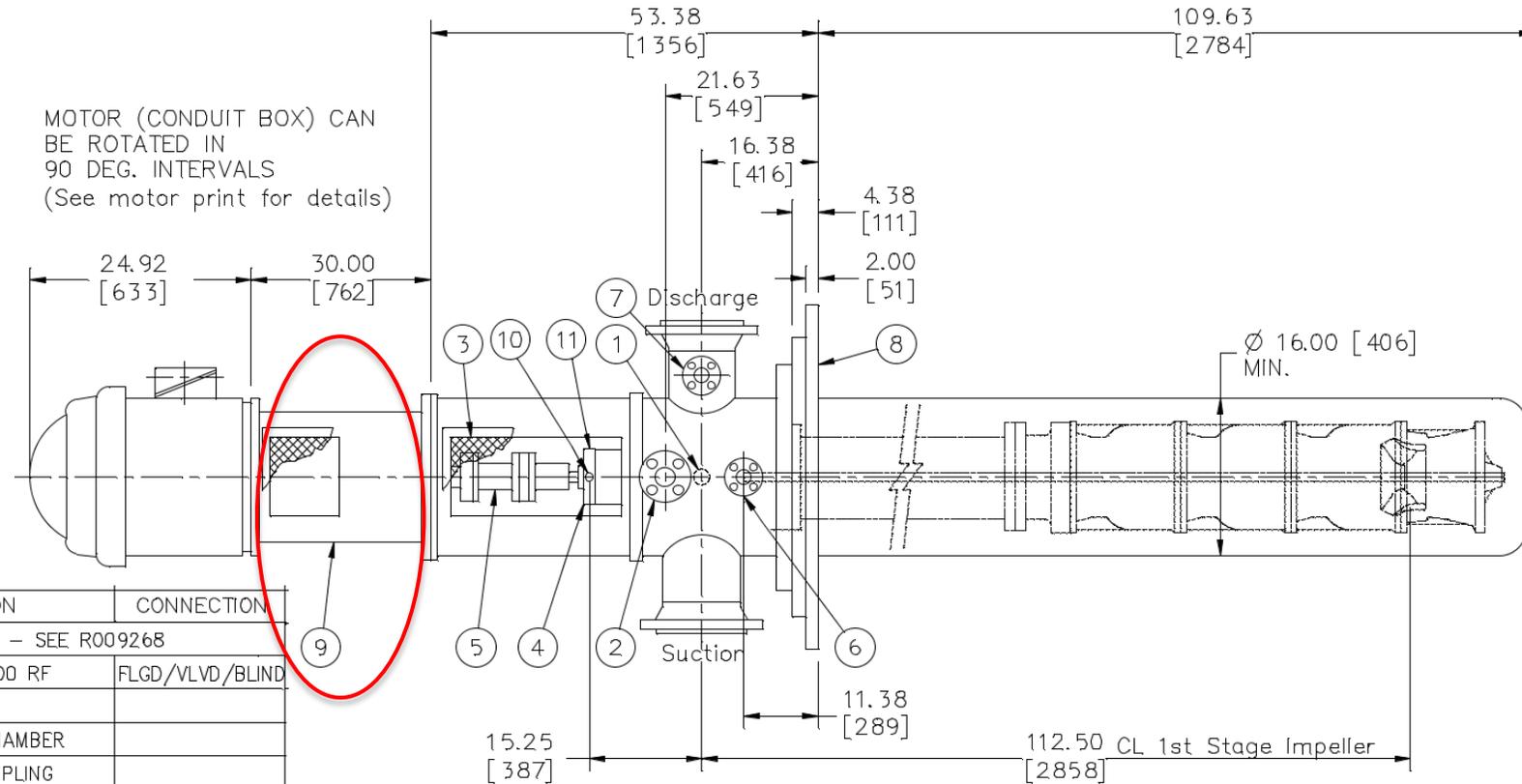
PART NO.	DESCRIPTION	CONNECTION
1	WINDOW DRAIN .750NPT	-
2	SUCTION VENT 1.0 CL 300 RFWN	FLANGED
3	COUPLING GUARD	
4	MECH. SEAL	
5	METASTREAM COUPLING ASSY	
8	API PLAN13 CONN. .750NPT - SEE R009332	
7	311 THRUST POT ASSY - SEE R009331	
8		
9		

# THRUST HANDLING IN PUMP SEPARATE THRUST POTS

REF. NO.	PART DESCRIPTION	MATERIAL
161	SHAFT, THRUST POT	A528 TP 416
221	SLEEVE, OIL	A36 - STL LC
346	SLEEVE, BEARING, BALL	A36 - STL LC
486	RING, SEALING-V	NITRILE
508	THRUST POT	FABRICATION NOTE
510	COVER, THRUST POT	A36 - STL LC
523-1	RING, RETAINING	AISI 302
654	BEARING, BALL, THRUST (QTY: 3)	SKF # 7216-BG
655	BEARING, BALL, RADIAL (QTY: 1)	SKF # 6309-2RSNR
665	GAUGE, LEVEL	BW20 GITS # 04054
673	WASHER, LOCKNUT 40 W-80	STL SKF W08
673-1	WASHER, LOCKNUT 80 W-16	STL SKF W16
676-3	KEY, PRL (QTY: 1)	AISI 302-316
676-4	KEY, PRL (QTY: 2)	AISI 302-316
697	PIN, ANTI-ROTATION	AISI 302
747-3	O-RING	NITRILE
819	FITTING, VENT, BREATHER	M-841 TEDECO
878	NUT, BEARING, THRUST 40 N-08	STL SKF N-08
878-1	NUT, BEARING, THRUST 80 AN-16	STL SKF AN-16
A97	COUPLING METASTREAM TSKS 0135	



# THRUST HANDLING IN PUMP SEPARATE THRUST POTS



PART NO.	DESCRIPTION	CONNECTION
1	PLAN 13 CONN. .750NPT - SEE R009268	
2	SUCTION VENT 1.0 CL-300 RF	FLGD/VLVD/BLIND
3	COUPLING GUARD	
4	MECH. SEAL W/ SEAL CHAMBER	
5	4 PC. RIGID SPACER COUPLING	
6	INTERNAL BARREL DRAIN - .75 CL-300 RF	FLGD/VLVD/BLIND
7	DISCHARGE VENT .75 CL-300 RF	FLGD/VLVD/BLIND
8	36.0 SQ. FOUNDATION PLATE	
9	THRUST POT	
10	LBO FOR SEAL SYSTEM 0.50 NPT	TO PLAN 53
11	LBI FOR SEAL SYSTEM 0.50 NPT	TO PLAN 53



**VLT prepared for Can**

#### Technical Details

Pump	VTP 10B-41
Application	Water / Mining
Flow	392 gpm (89 m <sup>3</sup> /h)
Head	95 ft (29 m)
Motor	15 Hp (11 kW)

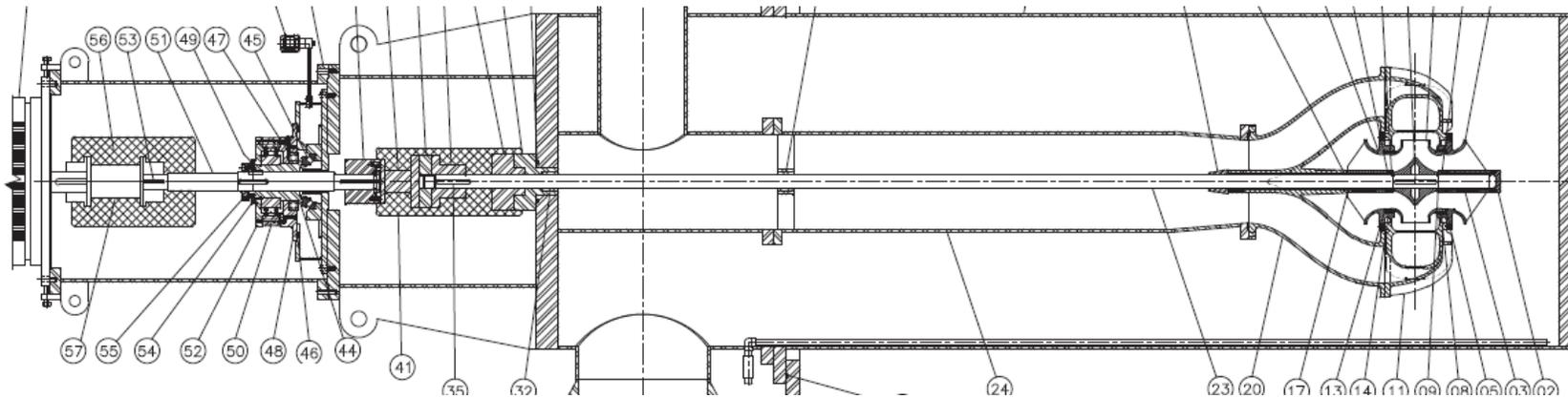
# Pump Type VS7

“Double Casing, **Volute** Type  
Vertical Suspended” Pumps



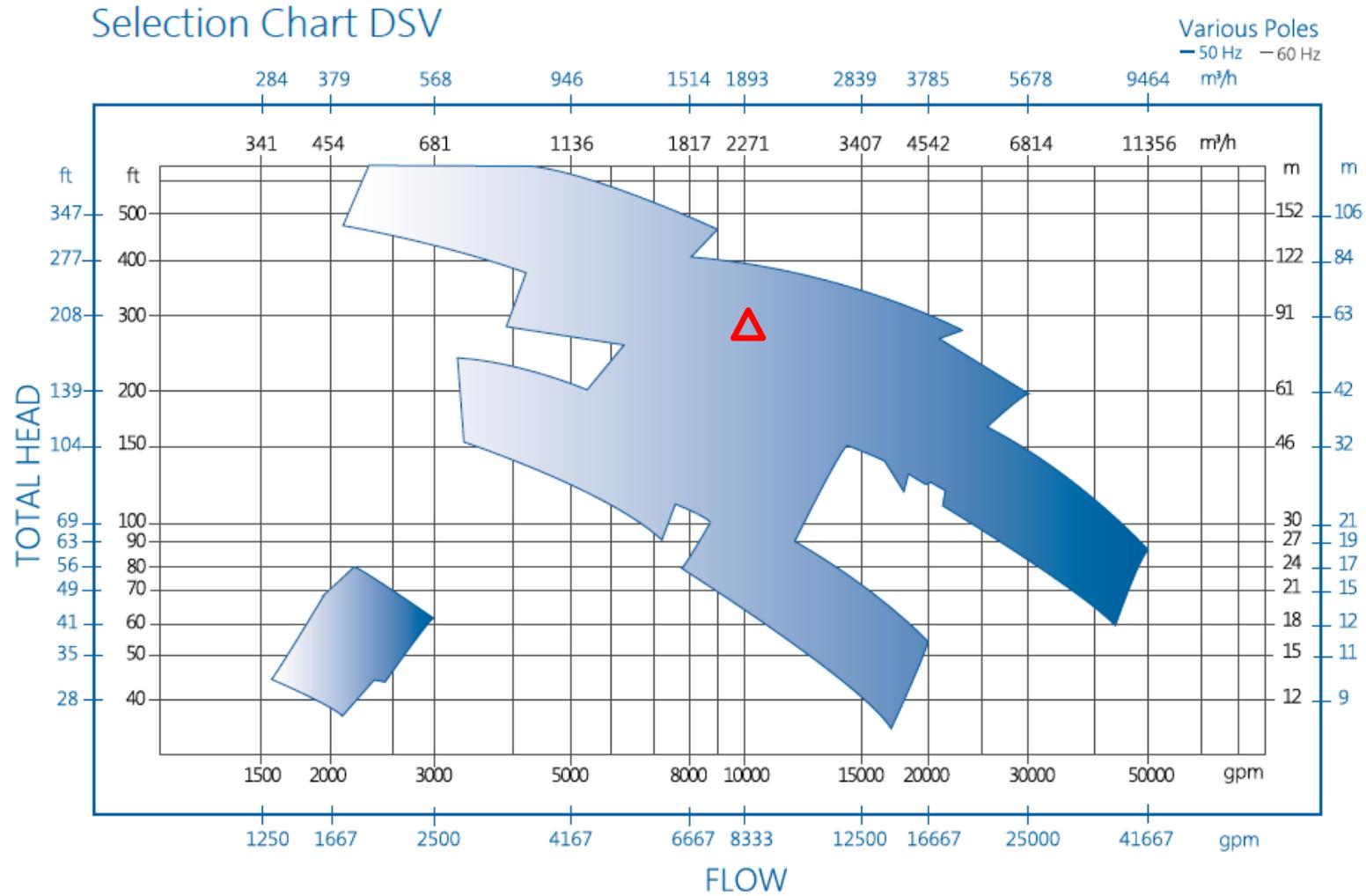
## FEATURES AND BENEFITS

- DSV is a heavy-duty, vertical double-suction, twin volute, single-stage, centrifugal design.
- The single impeller develops the higher heads and capacities without the need for additional stages. This minimizes the number of wearing parts, resulting in easier maintenance and positive alignment. Unlike the vertical turbine pump, this completely eliminates the use of intermediate bowl bearings, which are vulnerable when handling abrasive liquids.



# FEATURES AND BENEFITS

## DSV



## Features and Benefits - Double Suction



Double suction enclosed impeller as a first stage can be manufactured in VCT pumps

**DX First Stage**

# VERTICALS BUSINESS UNIT



## Features and Benefits - Double Suction



**DX First Stage**



## Coming Attractions 😊

### “Performance Testing & Inspection of API 610 Pumps”

Thurs 17<sup>th</sup> Feb – 08.00 (UK GMT) (Eastern Hemisphere) & 17.00 (UK GMT) (Western Hemisphere)

*Aimed at Process and Mechanical Engineers, and Consultant Engineers who specify pumping equipment as well as Applications & Sales Engineers selecting and quoting them.*

*This session will look at the What, the Why and the How of Pump Performance Testing and also look at the various Inspections & Tests that are frequently specified on the Data Sheets.*

*Future sessions : 10<sup>th</sup> March*

*– Start-up, Commissioning & Troubleshooting of Centrifugal Pumps*

The logo consists of a white circle with a stylized 'A' shape inside, formed by two diagonal lines meeting at the top and a horizontal line across the middle. The word 'RUHRPUMPEN' is written in a bold, white, sans-serif font across the middle of the circle.

# **RUHRPUMPEN**

*Specialist for Pumping Technology*

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

[info@ruhrpumpen.com](mailto:info@ruhrpumpen.com)

# RUHRPUMPEN AT A GLANCE

**VERTICAL  
INTEGRATION**

**SALES  
OFFICES IN  
+35 COUNTRIES**

**MANUFACTURING  
FACILITIES  
IN 10 COUNTRIES**

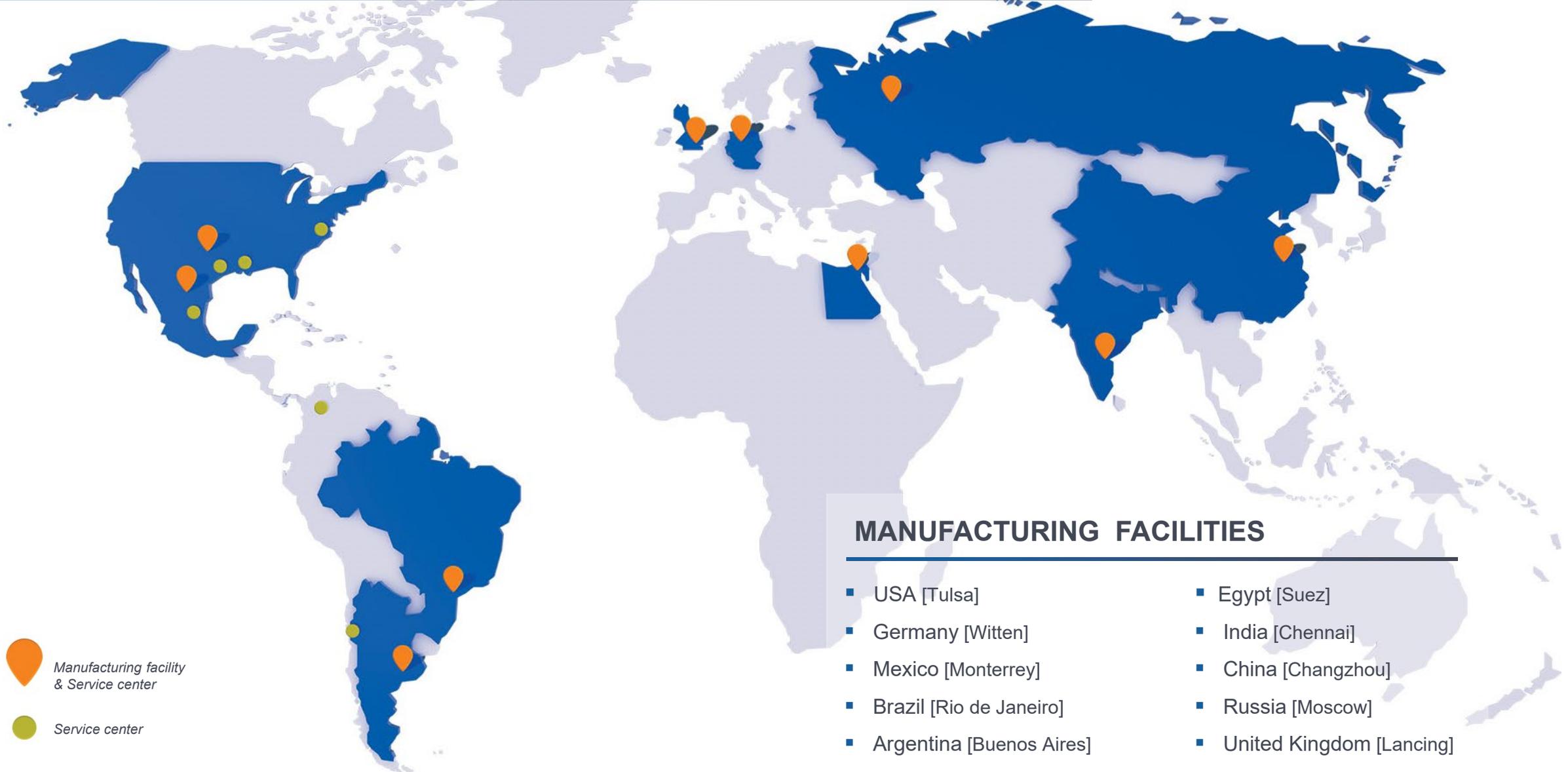
**+70 YEARS  
OF EXPERIENCE**

**+2,000  
EMPLOYEES**

**15 SERVICE  
CENTERS**

**+70,000 PUMPING SOLUTIONS INSTALLED WORLDWIDE**

# A GLOBAL COMPANY



# MARKETS WE SERVE

Our commitment to create innovations that offer reliable solutions to our customers allow us to provide a complete range of pump systems to support **core markets** as:





# OUR PUMP LINES

Ruhrpumpen offers a broad range of highly engineered and standard pumping products that meet and exceed the requirements of the most demanding quality specifications and industry standards.

Our pumps can handle head requirements as high as 13,000 ft (4,000 m) and capacities up to 300,000 gpm (68,000 m<sup>3</sup>/hr). Moreover, our pump designs cover temperatures from cryogenic temperatures of -310 °F (-196 °C) up to 752 °F (400 °C).

## Products include:

- Single Stage Overhung Pumps
- Between Bearings Pumps
- Horizontal Multi-Stage Pumps
- Vertical Multi-Stage Pumps
- Vertical Mixed Flow & Axial Flow Pumps
- Positive Displacement Pumps
- Full Range of Industrial Pumps
- Submersible Pumps
- Magnetic Drive Pumps
- Decoking Systems
- Packaged Systems
- Fire Systems





OUR PUMPS

# OVERHUNG PUMPS

CATEGORY	RP MODEL	DESIGN STANDARD	
Sealless Magnetic Drive Pumps	<b>CRP-M / CRP-M-CC</b>	ISO 2858 & 15783 HI design (OH11)	
	<b>SCE-M</b>	API 685	
Foot Mounted OH1 and General End Suction Pumps	<b>IPP</b>	HI design (OH1)	
	<b>CPP / CPP-L</b>	HI design (OH1) ANSI B73.1	
	<b>CPO / CPO-L</b>	HI design (OH1) ANSI B73.1	
	<b>CRP</b>	HI design (OH1) ISO 2858 & 5199	
	<b>GSD</b>	HI design (OH0)	
	<b>SHD / ESK / SK / SKO SKV / ST / STV</b>	HI design (OH1)	
	<b>SWP</b>	HI design (OH3A)	
Centerline Mounted	<b>SCE</b>	API 610 (OH2)	
Vertical In-Line Pumps	<b>SPI</b>	API 610 (OH3)	
	<b>IVP / IVP-CC</b>	HI design (OH4 / OH5)	
	<b>IIL</b>	HI design (OH5) Dimensionally compliant with ANSI B73.2	
	<b>SPN</b>	API 610 (OH5)	





# BETWEEN BEARING PUMPS

CATEGORY		RP MODEL	DESIGN STANDARD	
1 and 2 stage	Axially split	<b>HSC / HSD / HSL HSR / ZW</b>	HI design (BB1)	
		<b>HSM</b>	HI design (BB3)	
		<b>ZM / ZMS ZLM / ZME</b>	API design (BB1)	
	Radially split	<b>HVN / J</b>	API design (BB2)	
		<b>RON / RON-D</b>	API design (BB2)	
Multi-stage	Axially split	<b>SM / SM-I</b>	API design (BB3)	
		<b>JTN</b>	API design (BB3)	
	Radially split <i>single casing</i>	<b>GP</b>	API design (BB4)	
	Radially split <i>double casing</i>	<b>A LINE</b>	API design (BB5)	





# VERTICAL PUMPS

CATEGORY		RP MODEL	DESIGN STANDARD	
Single casing	Diffuser	<b>VTP</b>	HI & API 610 (VS1)	
		<b>VCT</b>	HI & API 610 (VS1)	
		<b>HQ</b>	HI & API 610 (VS1)	
		<b>VLT</b>	HI & API 610 (VS1)	
	Volute	<b>DSV / DX</b>	HI & API 610 (VS2)	
	Discharge through column – Axial flow	<b>VAF</b>	HI & API 610 (VS3)	
Separate discharge line	<b>VSP / VSP-Chem</b>	HI & API 610 (VS4)		
Double casing	Diffuser	<b>VLT / VMT</b>	HI & API 610 (VS6)	
	Volute	<b>DSV / DX</b>	HI & API 610 (VS7)	
Submersible pumps		<b>SMF</b>	HI design (OH8A)	
		<b>VLT-Sub / VTP-Sub</b>	HI design (VS0)	





OUR PUMPS

# SPECIAL SERVICE PUMPS

CATEGORY	RP MODEL	DESIGN STANDARD	
Pitot tube pumps	<b>COMBITUBE</b>	HI design	
Reciprocating pumps	<b>RDP</b>	API 674 ISO 13710	
Vertical turbine generator	<b>VTG</b>	HI design (VS6)	
Barge	<b>LS BARGE</b>	HI design	
Floating dock pumps	<b>ZVZ</b>	HI design	
	<b>LVZ</b>	HI design	
Cryogenic pumps	<b>SVNV</b>	-	
	<b>VTG Cryogenic</b>	-	
	<b>VLT Cryogenic VLTV</b>	-	
<b>Pre-packaged fire pump systems</b>	Fire systems incorporate pumps, drivers, control systems and pipework in a single container. They can be skid mounted, with or without enclosure and supplied with electric motor or diesel engine.	<b>NFPA-20-850</b> UL and FM approved components	

