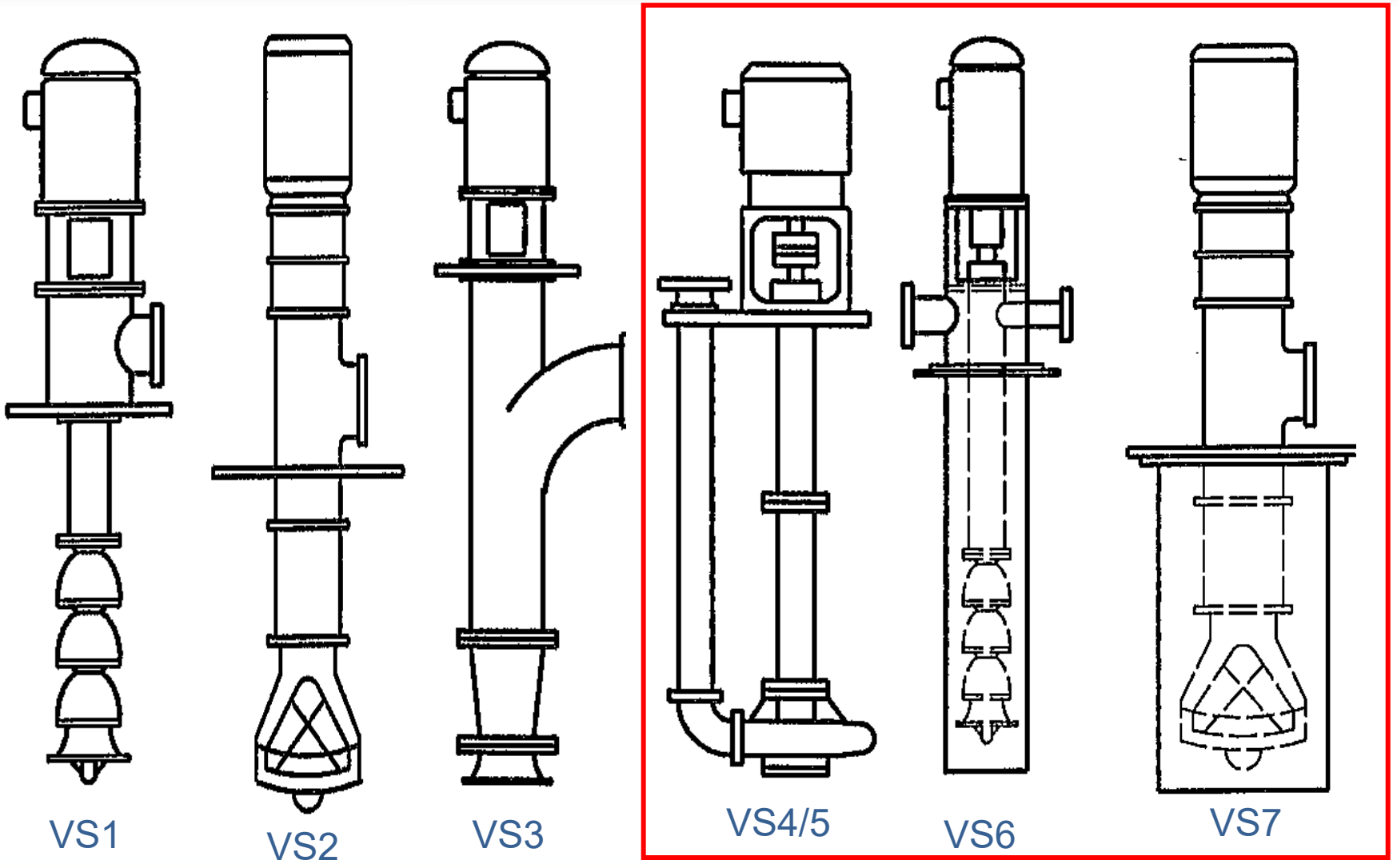
Session 12 –
“Vertical Pumps Part 2 (VS4, VS5, VS6,VS7)”

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



RUHRPUMPEN VERTICAL PRODUCTS

VS1

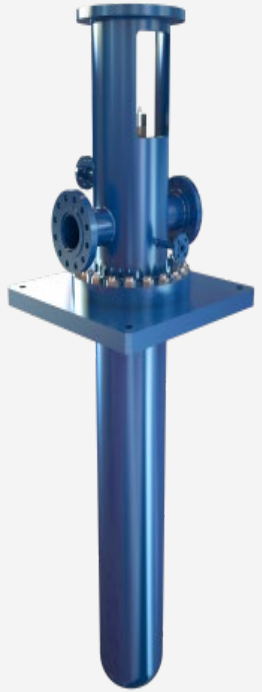
VS1

VS2

VS3

VS4/5

VS6



VS6

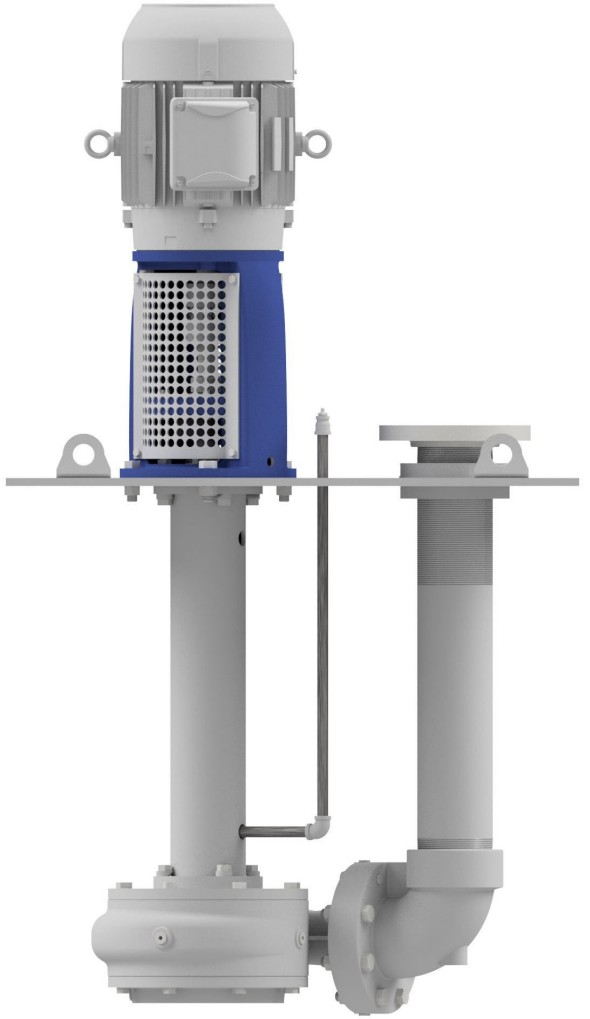
Pump Type VS4
Sump Pumps

General Description

VSP

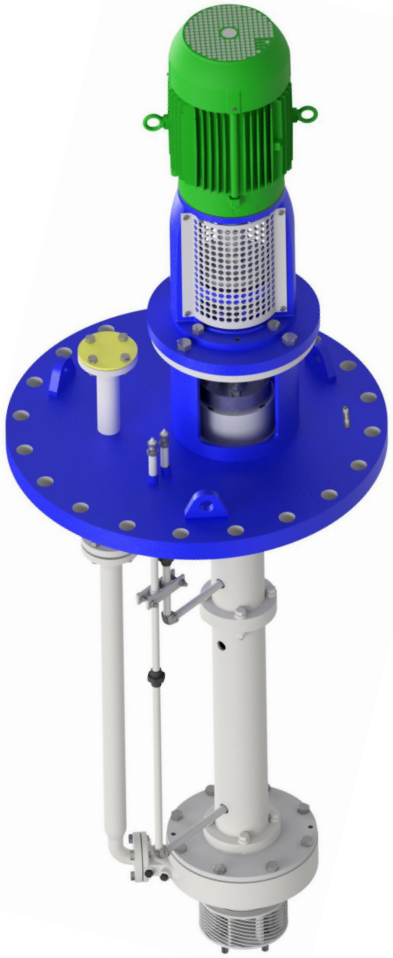
VSP are vertically suspended single casing pumps with separate discharge, semi open or closed impeller designed for wet pit applications.

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



Product Line

VSP



VSP Chem

Product Line

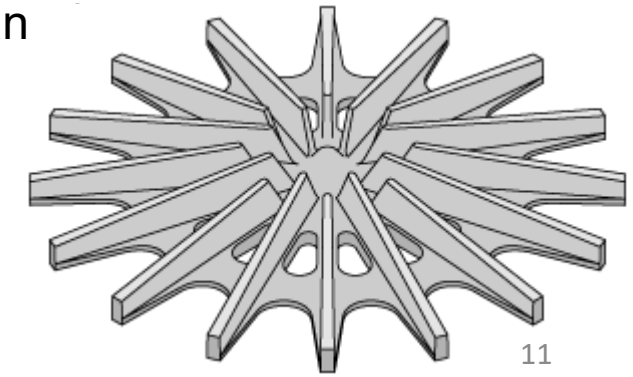
VSP

- 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)

Product Line

VSP - Chem

- 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

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

Application Range

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

Application Range

FLOOD CONTROL

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

Application Range

GENERAL INDUSTRY/CHEMICAL INDUSTRY/WASTE WATER /AUTOMOTIVE SOLVENTS

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

Performance Range

VSP

Capacity	up to 974 m3/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 m3/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 m3/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

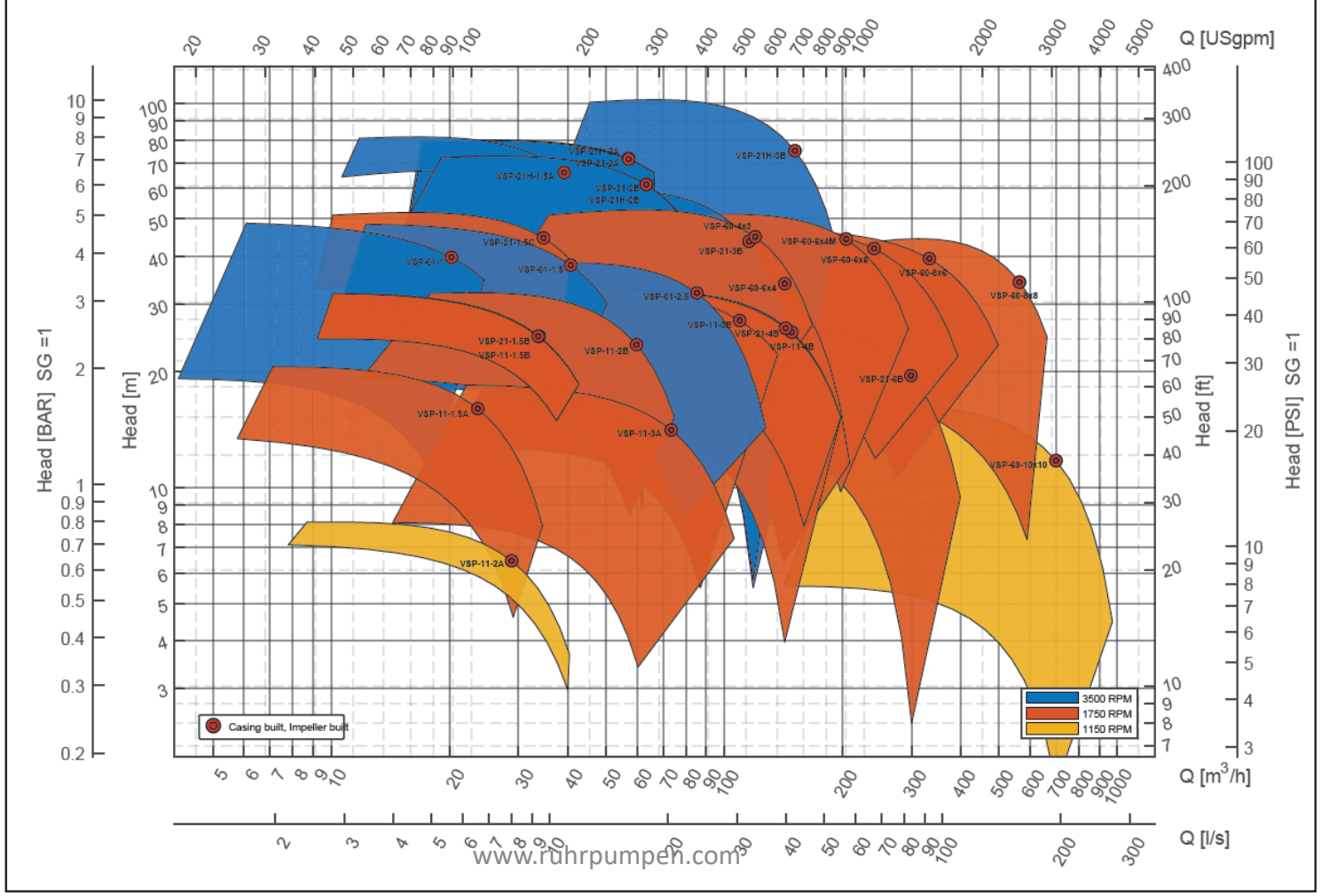
Selection Chart

VSP

RUHRPUMPEN

VSP, 60 Hz

Drawn by:
Date: 05-Mar-2020
Drawing:
Version:

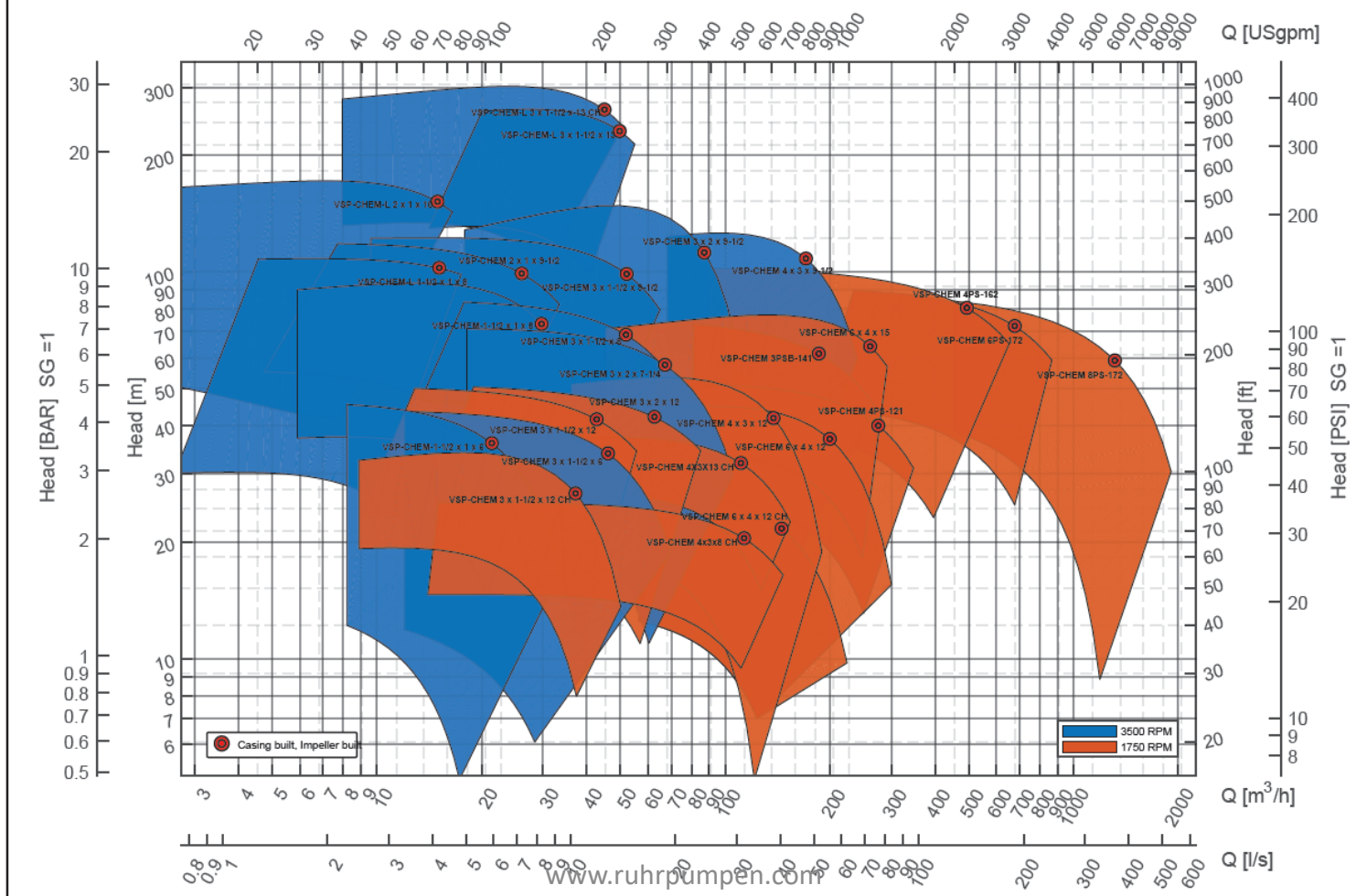


Selection Chart

VSP

RUHRPUMPEN

RUHRPUMPEN	VSP-CHEM, 60 Hz	Drawn by: AMJ Date: 05-Mar-2020 Drawing: Version:

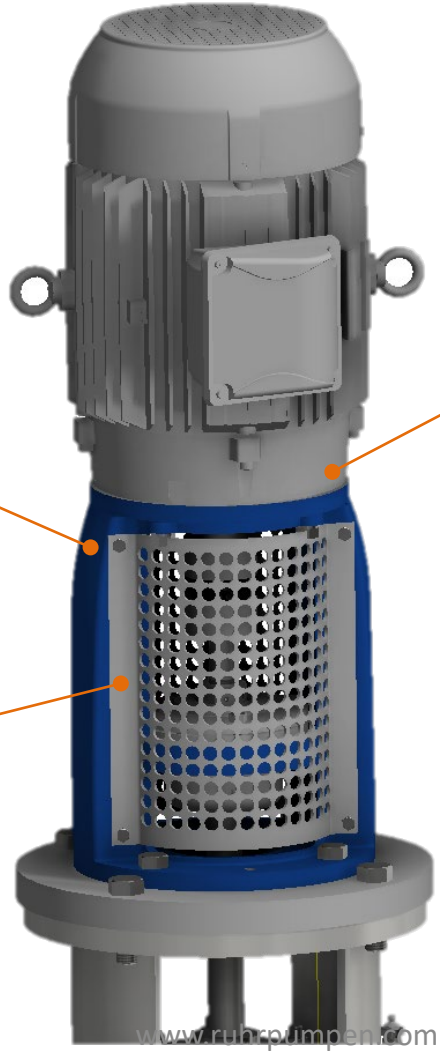


Features & Benefits

VSP

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

COUPLING GUARD
Fabricated in Aluminum or any other material required

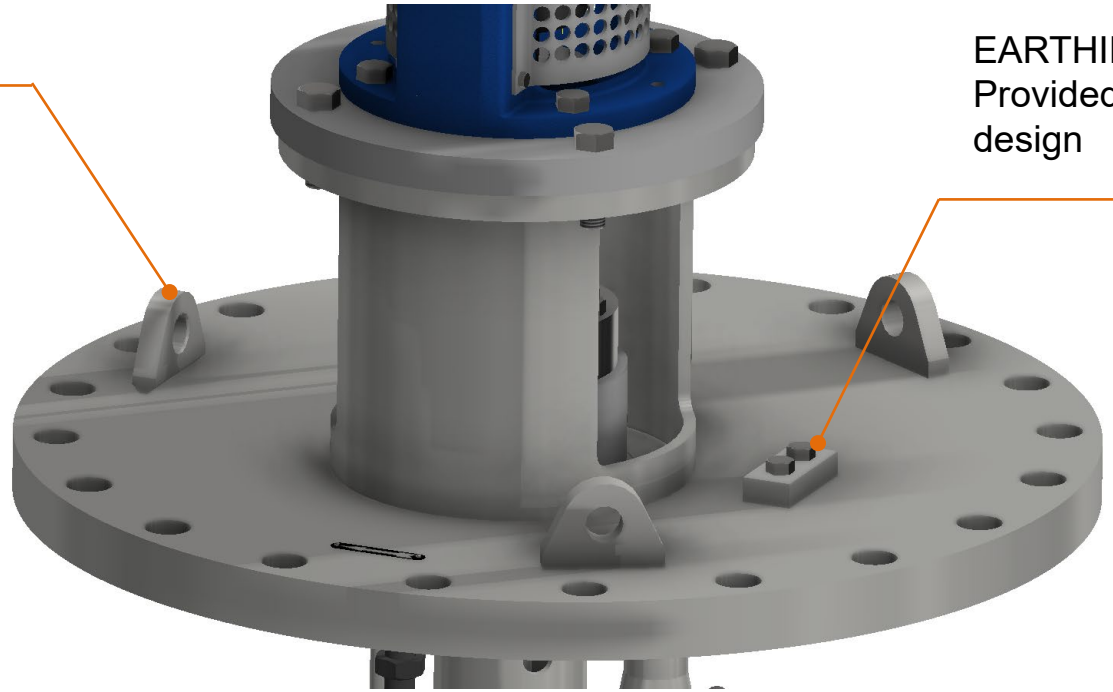


ELECTRICAL MOTORS
Designed for “C”, NEMA and “D” (IEC) Flange

Features & Benefits

VSP

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



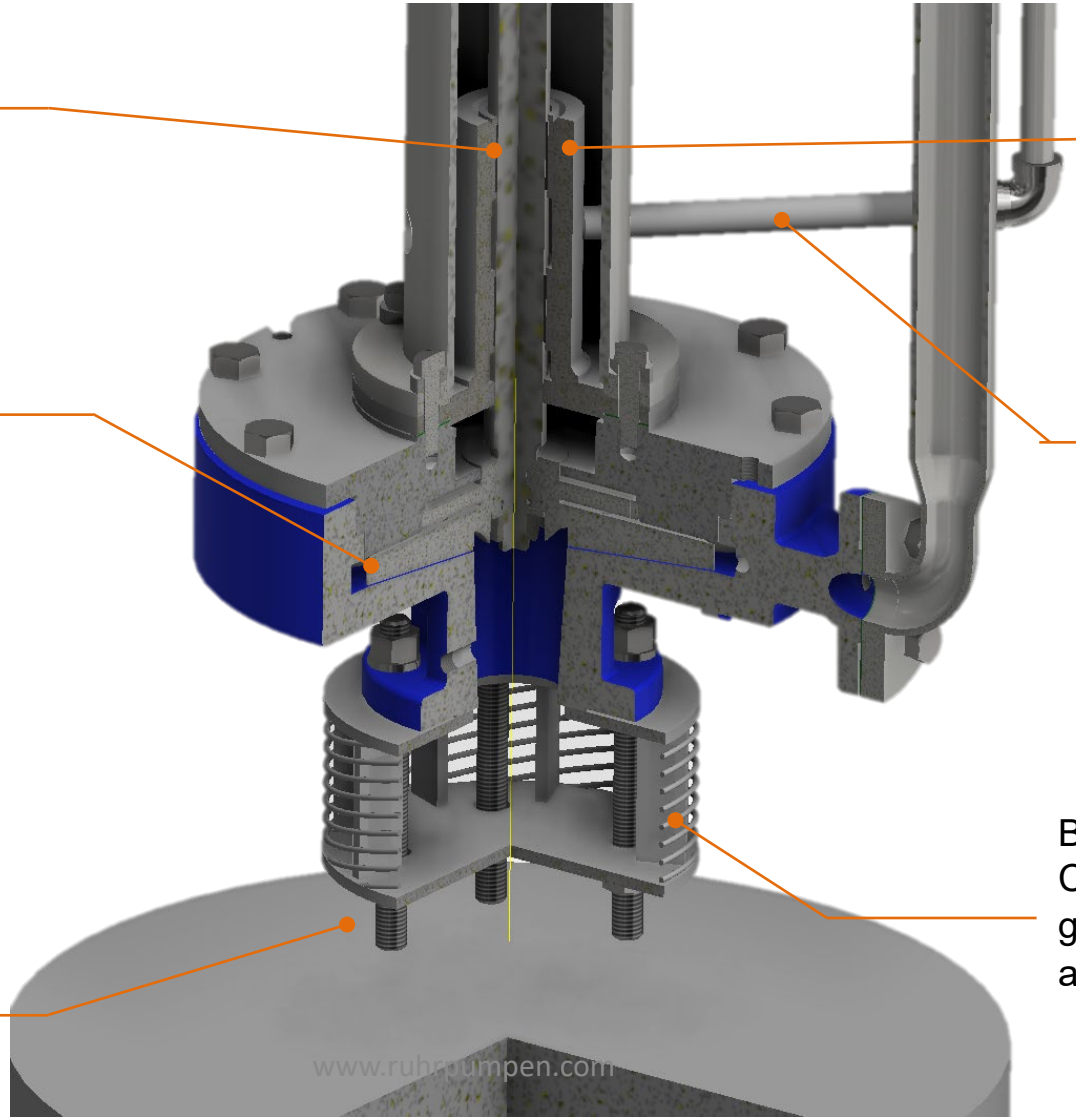
EARTHING LUGS
Provided in API and HI design

Features & Benefits: VSP

PETROCOKE TAPE FOR VSP CHEM
Major durability and resistance to abrasion and wear

CASE & IMPELLERS FROM HORIZONTALS PUMPS
To reduce models inventory

GAP
Small gap to reduce even more the minimum submergence

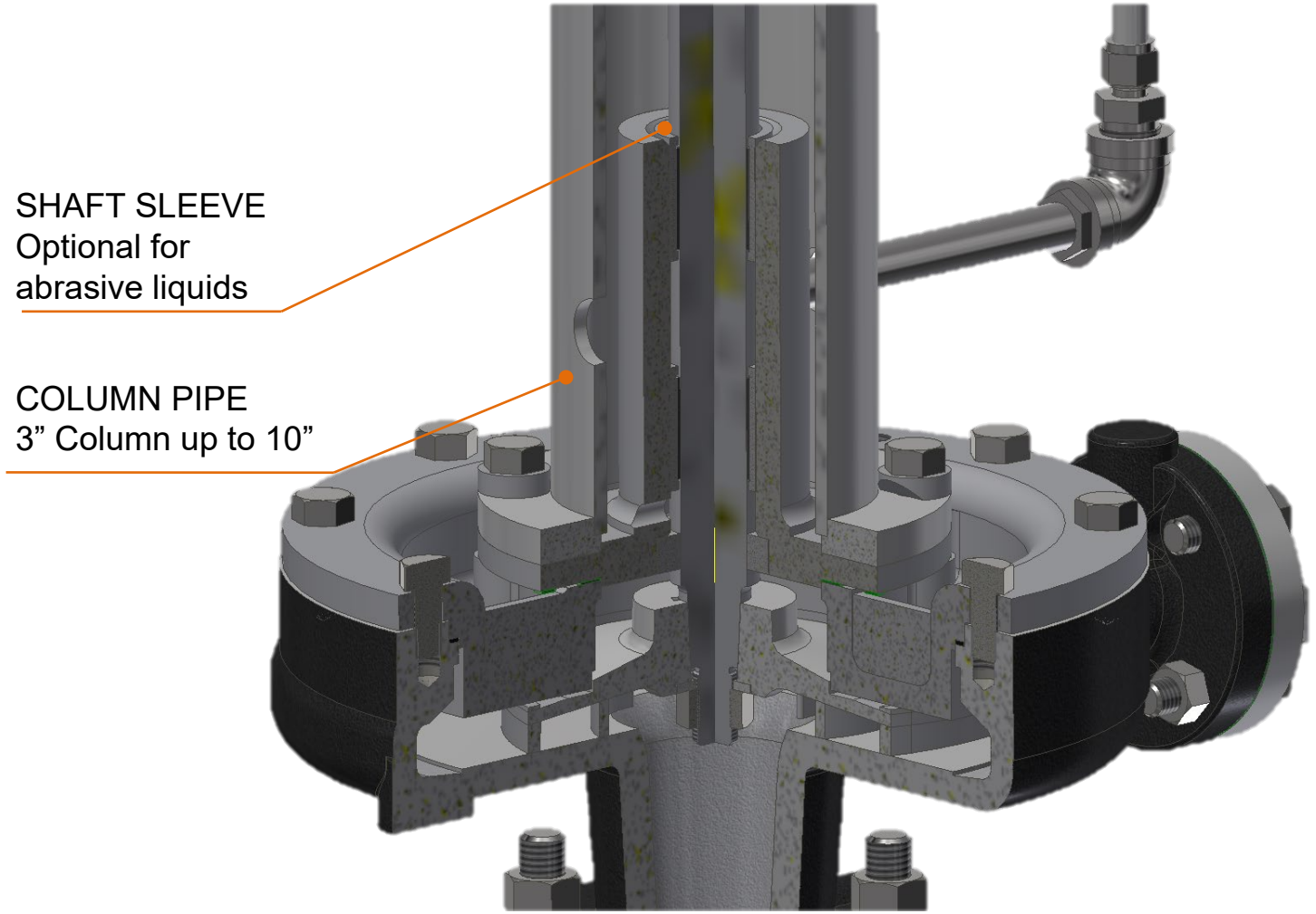


BEARINGS FOR VSP
Bronze as standard design

MINIMUM SUBMERGENCE
Very low levels compared with other brands

BASKET STRAINER
Carbon steel or galvanized (Optional in any other material)

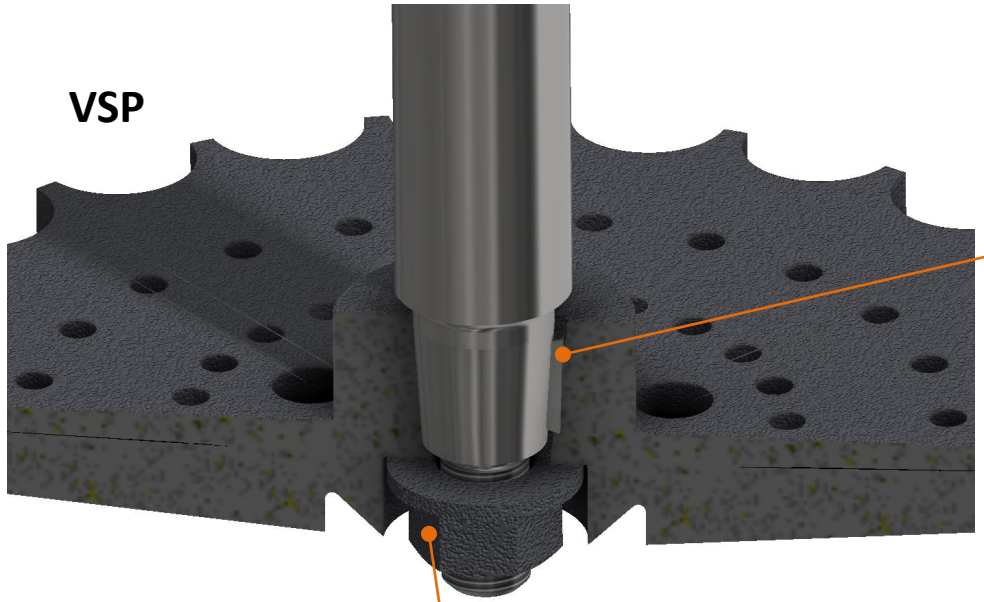
Features & Benefits: Intermediate bearings VSP



Features & Benefits: Impeller

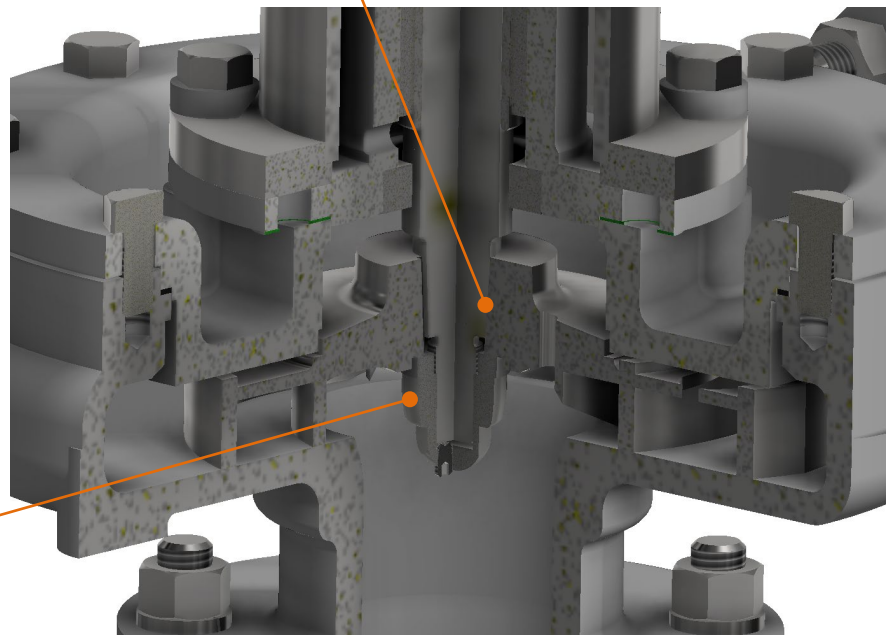
VSP

VSP



IMPELLER
Keyed

VSP-CHEM

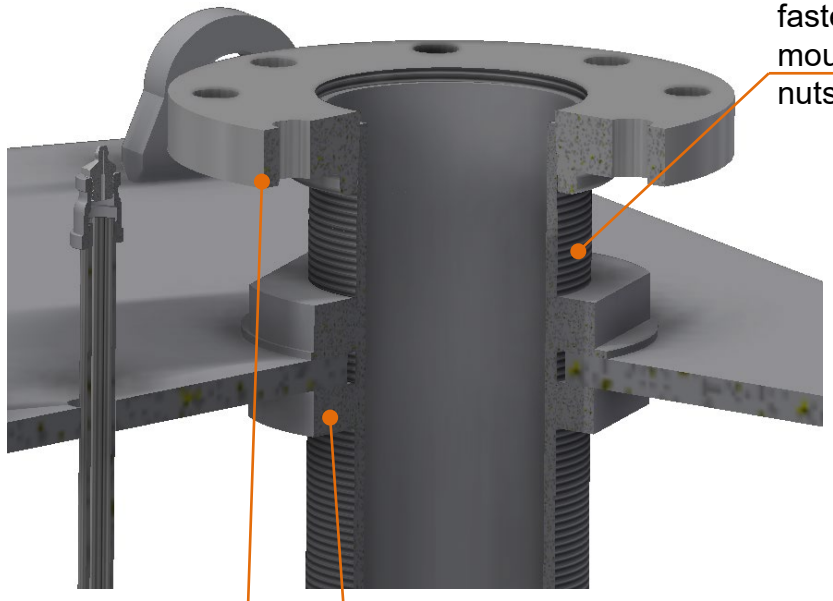


IMPELLER NUT
to avoid the shaft
disassembly if the
pump reverse rotation

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

Features & Benefits: Discharge

VSP



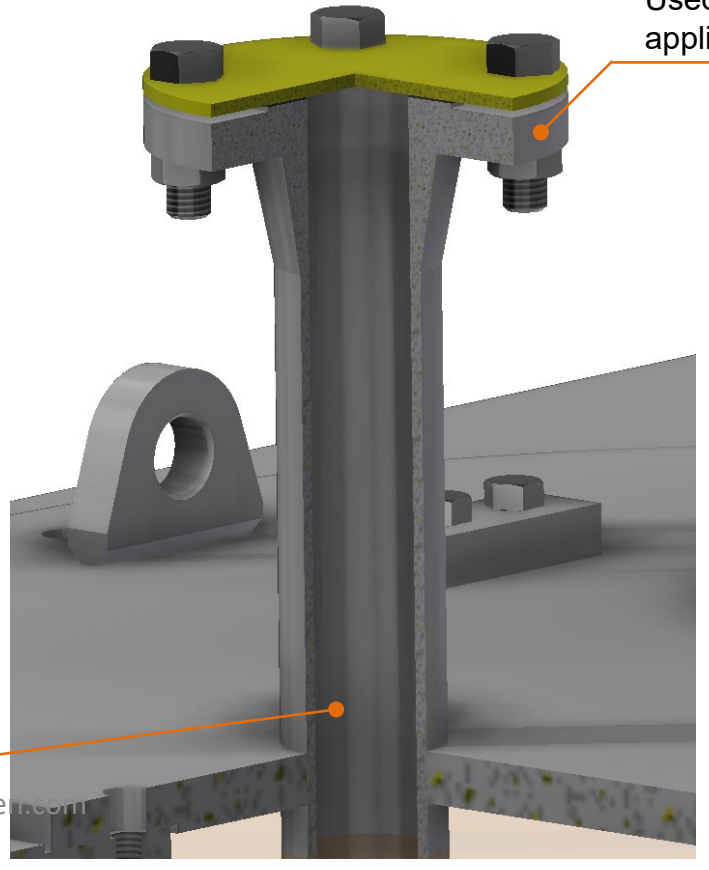
DISCHARGE PIPE
Threaded and fastened to the mounting plate by 2 nuts

THREADED FLANGE

THREADED PIPE NUT

VSP-CHEM

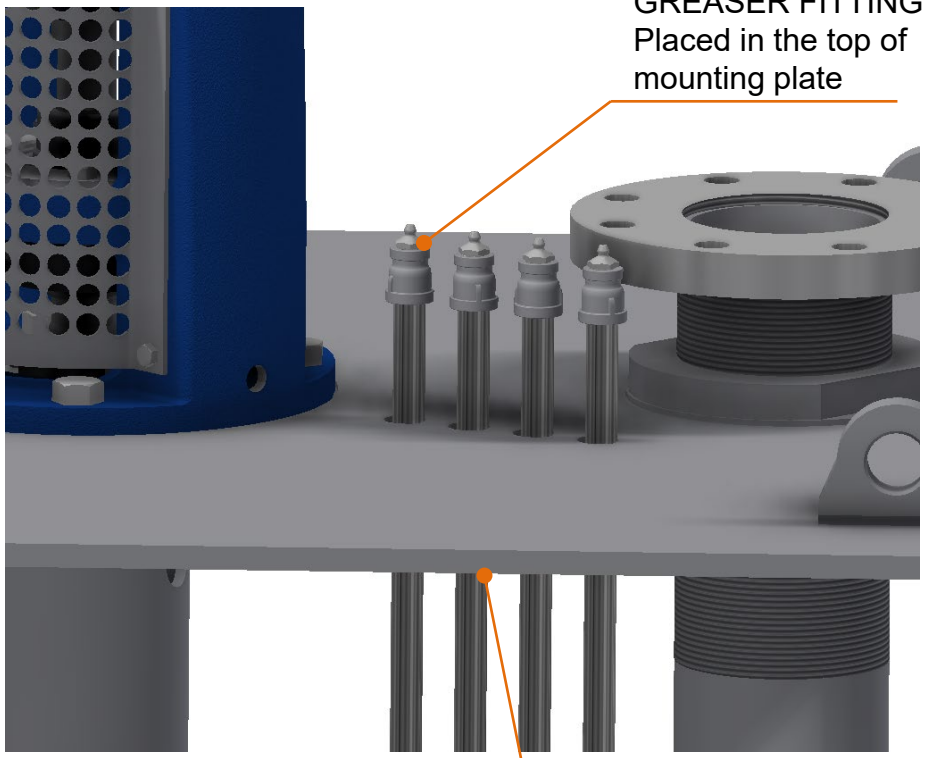
WELDING NECK FLANGE
Used in VSP-Chem applications



WELDED DISCHARGE PIPE
In API design or with Mechanical seal only

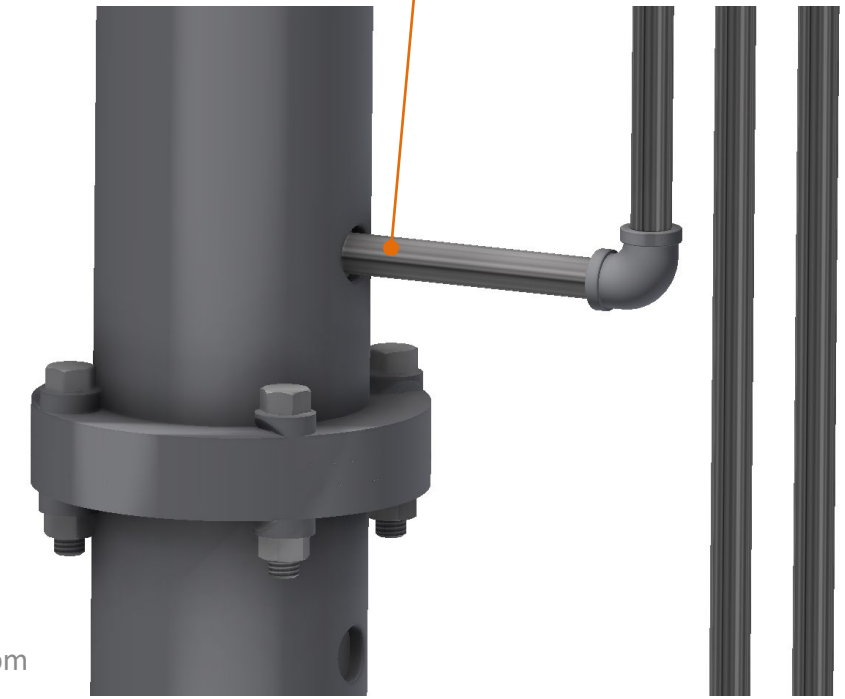
Features & Benefits: Lubrication

VSP



GREASER FITTING
Placed in the top of mounting plate

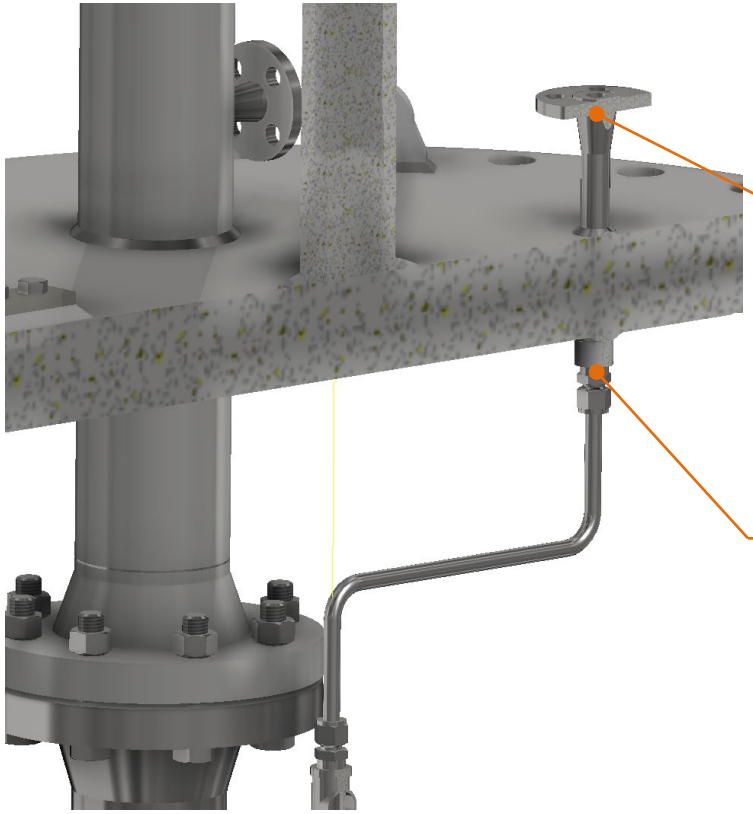
LUBRICATION LINE
The connections pass through the sole plate



LUBRICATION LINE
It is one line per each line shaft bearing

Features & Benefits: Lubrication

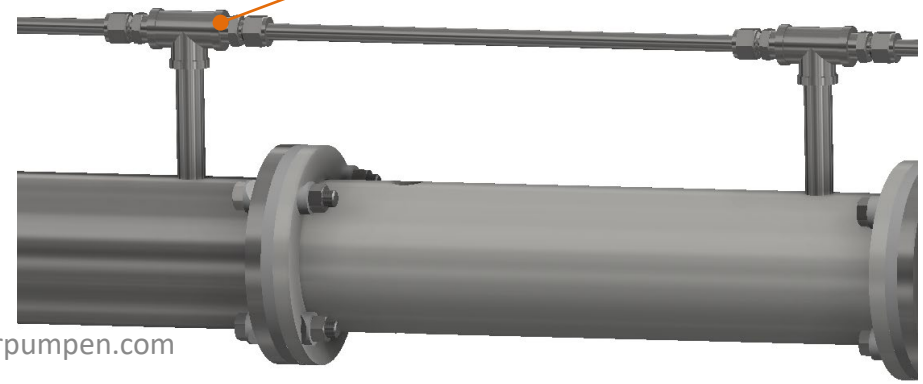
VSP



EXTERNAL CONNECTION
The minimum connection is Ø1/2” and placed over the mounting plate

EXTERNAL CONNECTION
Only one connection is included and welded to the mounting plate

LUBRICATION LINES
Are connected by tee connection when there are two or more column pipes



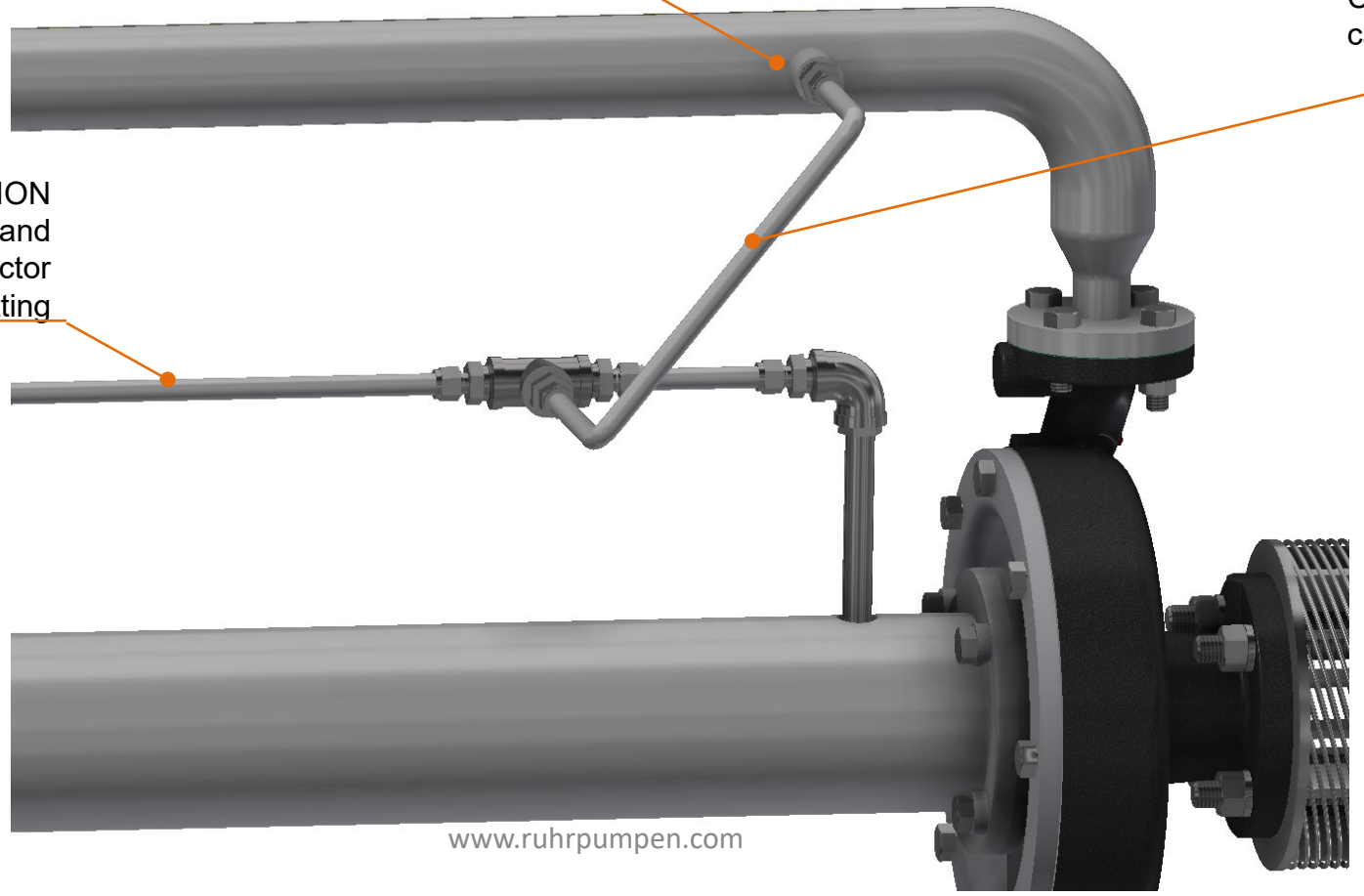
Features & Benefits: Lubrication

VSP

SELF LUBRICATION
An auxiliary connection is taken from the discharge pipe

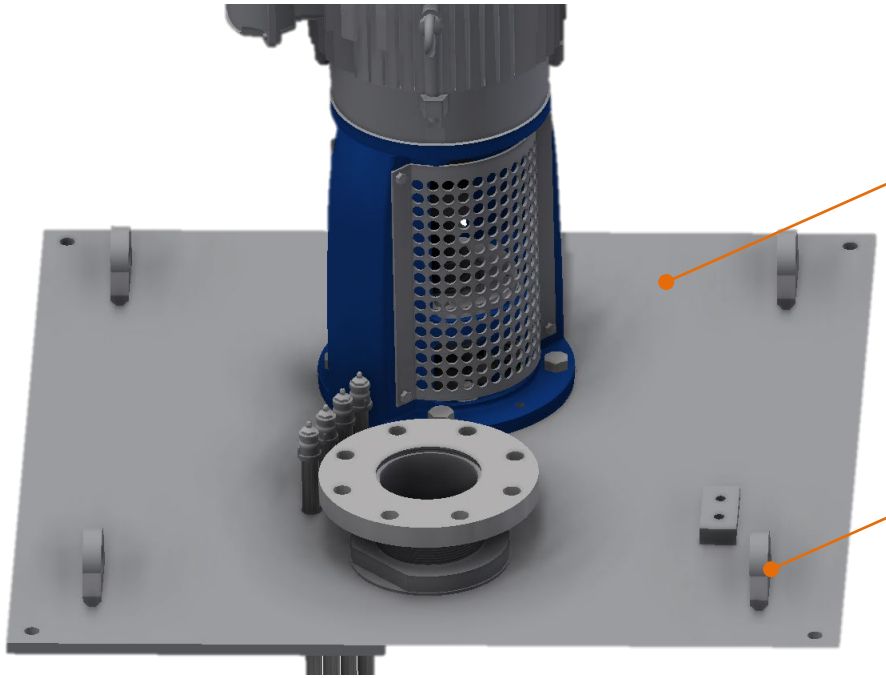
CYCLONE SEPARATOR
can be fitted to remove solids

LINE CONNECTION
Uses tube fitting and connected by male connector and Tee fitting



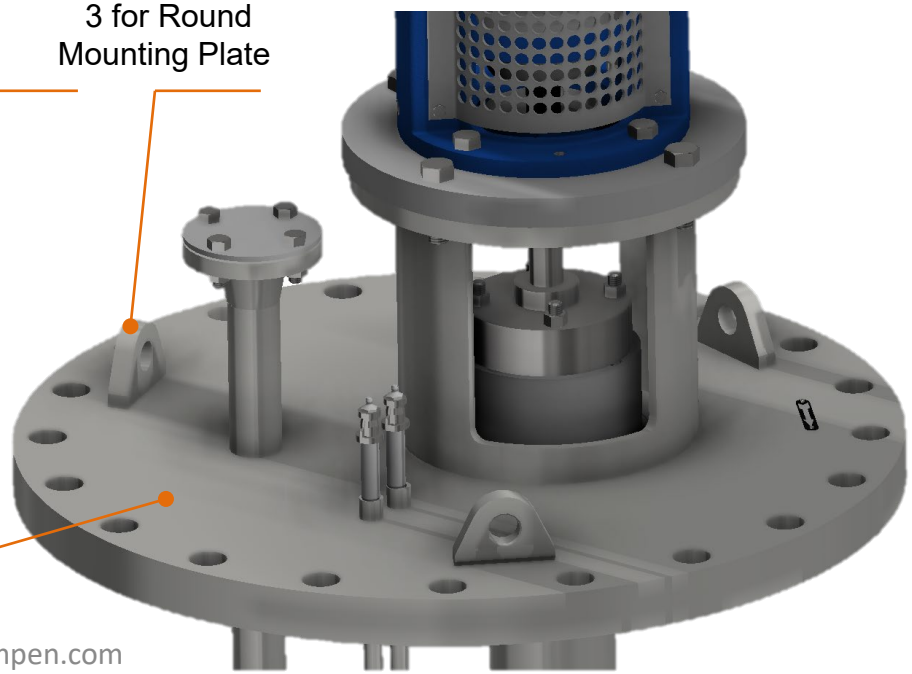
Features & Benefits: Mounting plates

VSP



MOUNTING PLATE
Square or Round can
be provided in the VSP

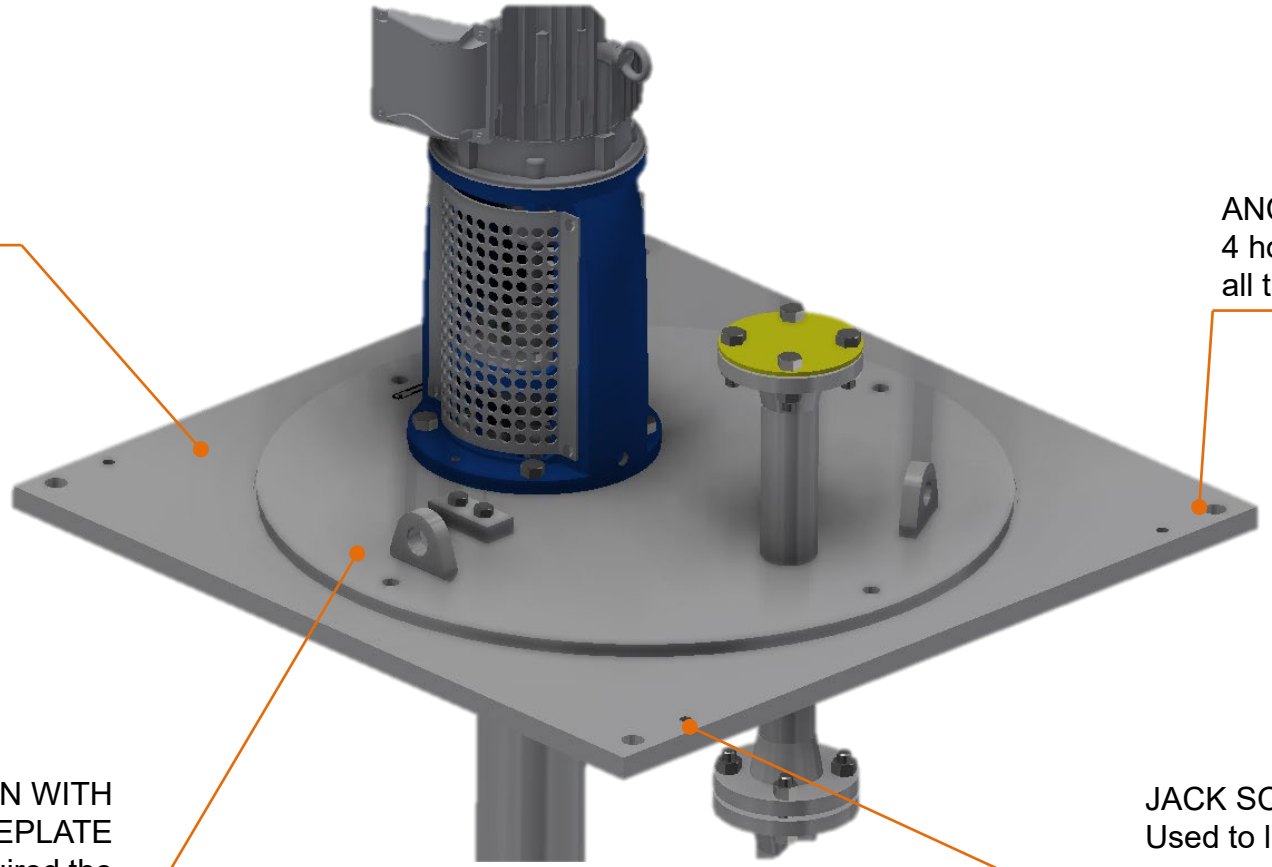
LIFTING LUG
4 for Square &
3 for Round
Mounting Plate



FLANGE TYPE MOUNTING PLATE
Designed according ANSI or DIN STD
(only for VSP CHEM)

Features & Benefits: Soleplate

VSP



SOLEPLATE
Frame plate placed under the Mounting Plate

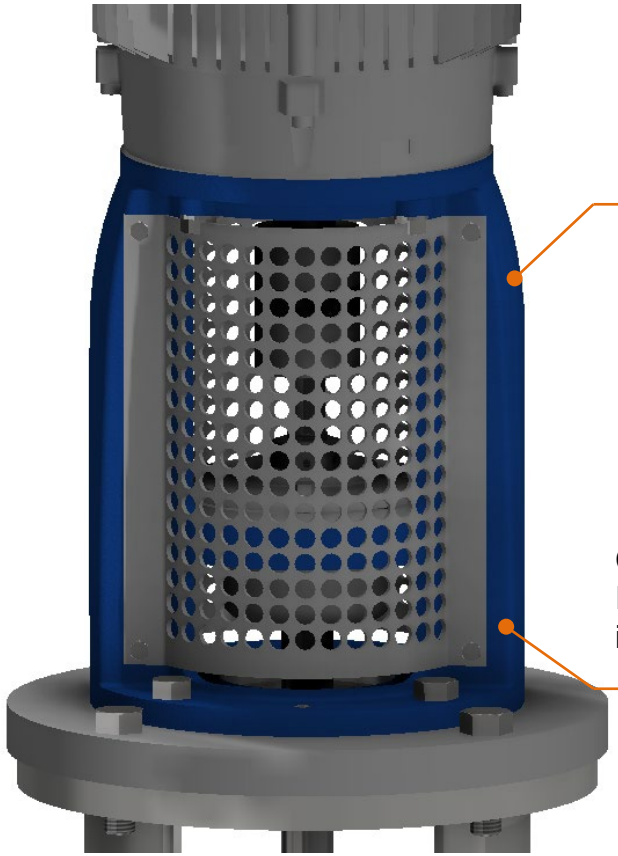
ANCHOR HOLES
4 holes included in all the soleplate

MOUNTING PLATE DESIGN WITH SOLEPLATE
When the Soleplate is required the Mounting Plate will be circular

JACK SCREWS
Used to level the pump on the foundation

Features & Benefits: Bracket

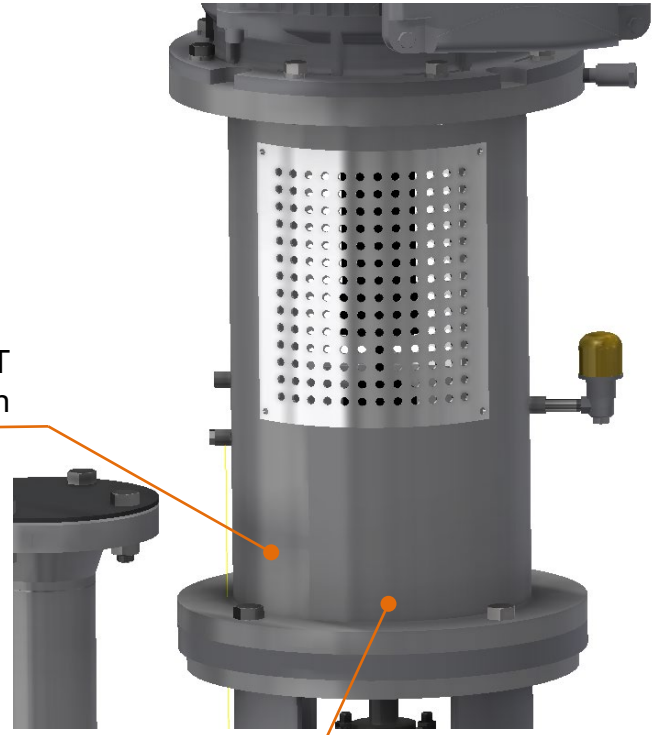
VSP



BEARING BRACKET
For grease lubrication

BEARING BRACKET
For Oil-Bath lubrication

CASTING MOTOR SUPPORT
Is used with grease lubrication
in HI & API Design



FABRICATED MOTOR SUPPORT
Is used with Oil-Bath lubrication in
VSP-Chem Pumps

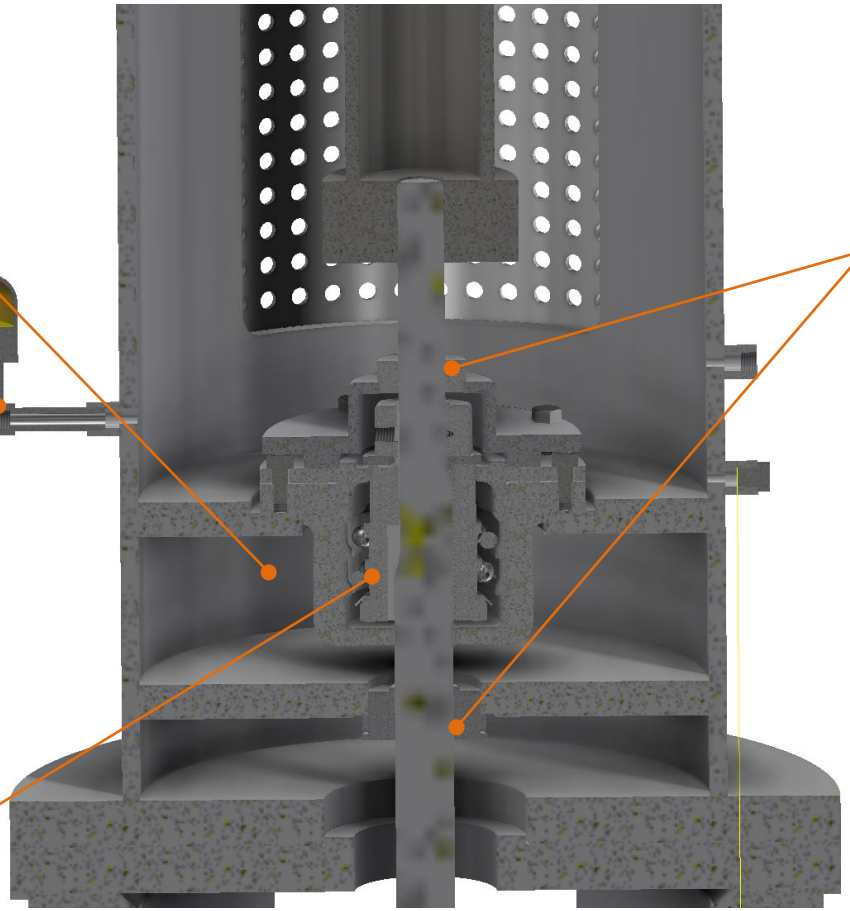
Features & Benefits: Bearing lubrication VSP

OIL-BATH

OIL-BATH LUBRICATION
Is used in VSP-Chem Pumps

OILER

THRUST BALL BEARINGS
Axial Thrust ball bearings



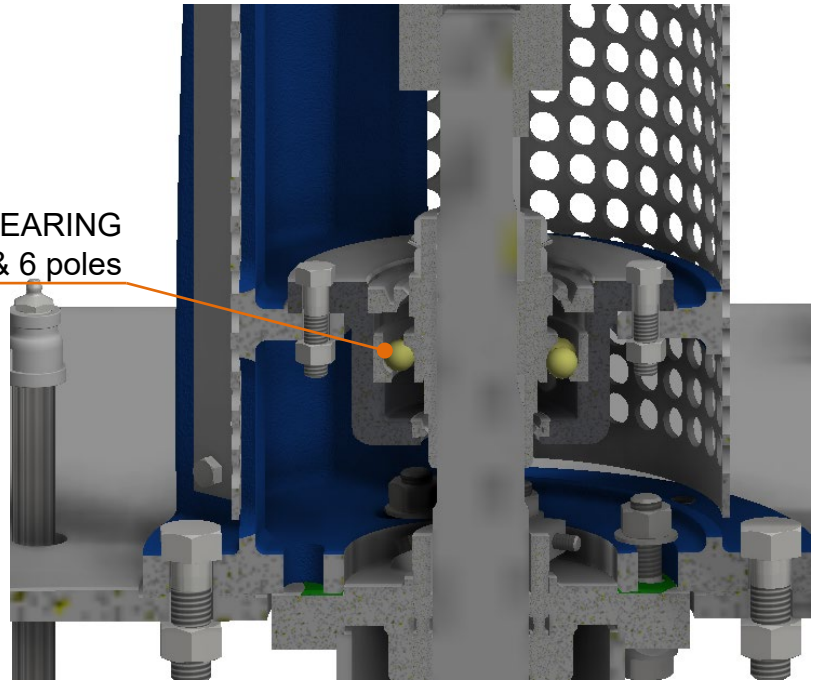
LABYRINTH SEAL
Used avoid oil leaking

Features & Benefits: Bearing lubrication

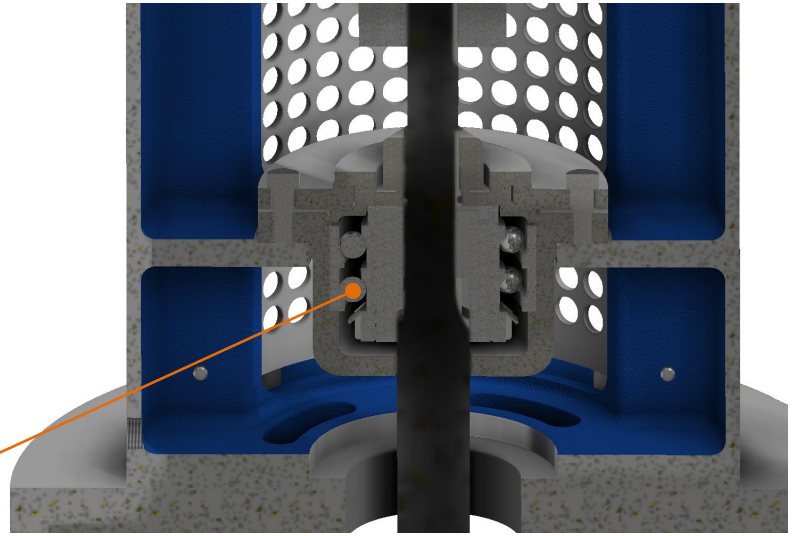
VSP

GREASE

BALL BEARING
1 ball bearing included for 4 & 6 poles

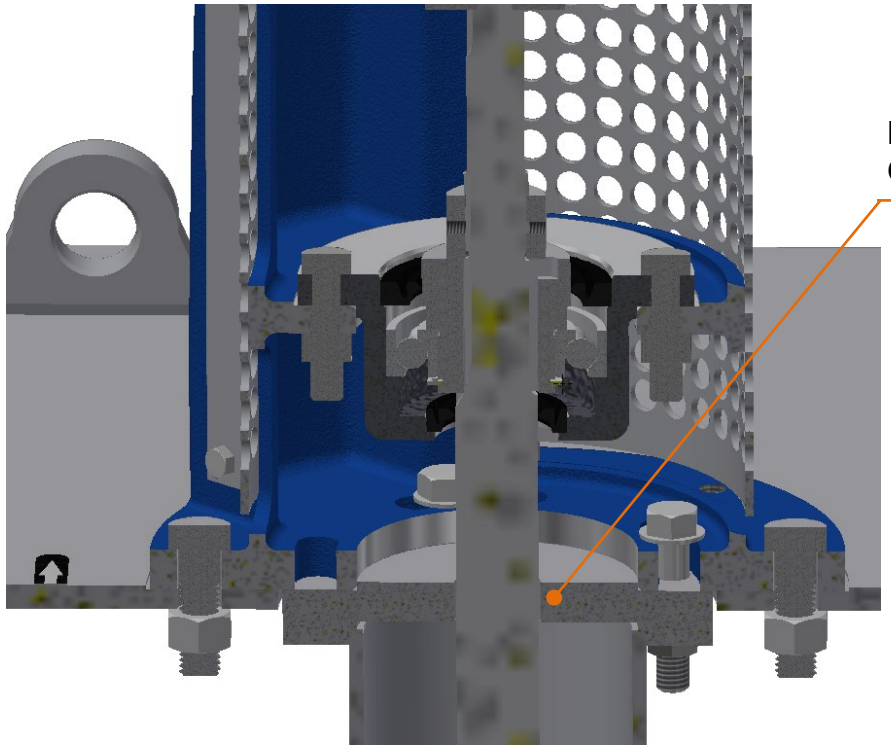


BALL BEARINGS
2 ball bearings when the pump runs at 2 poles

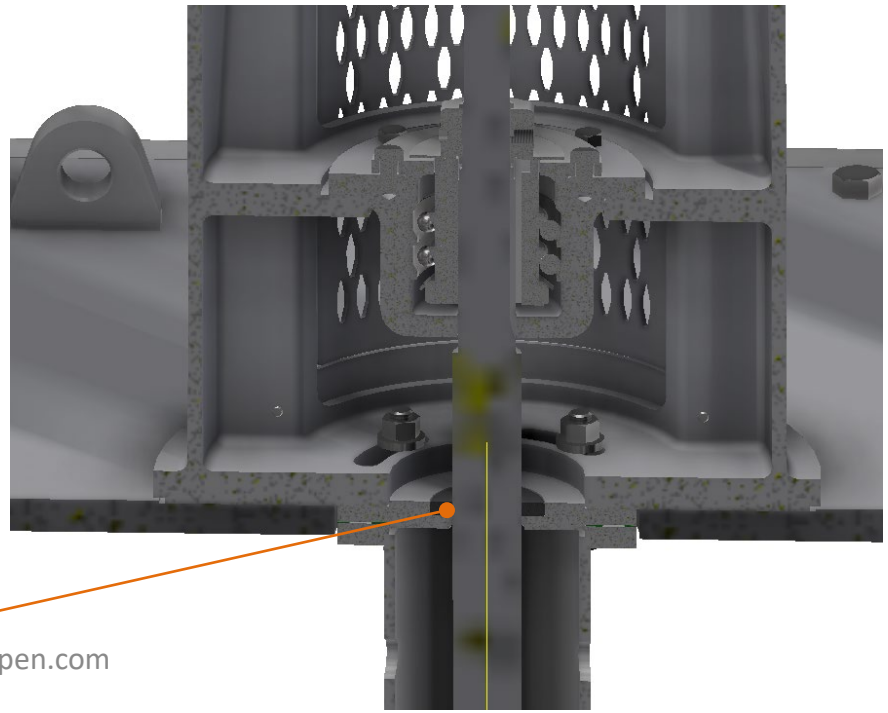


Features & Benefits: Sealing

VSP



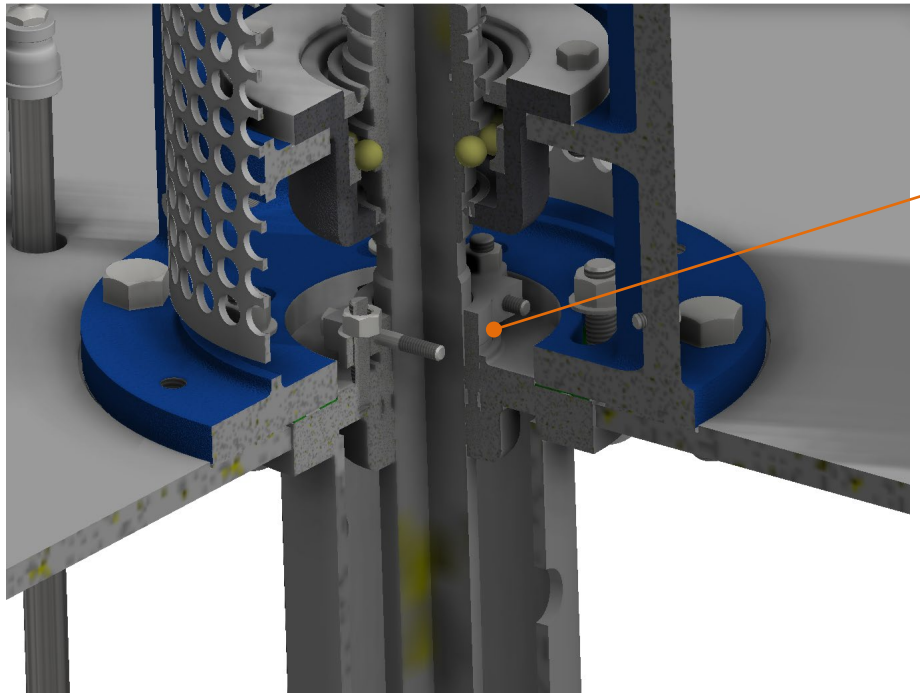
NO SEALING
Open shaft



LIP SEAL
Placed in the column
plate adapter

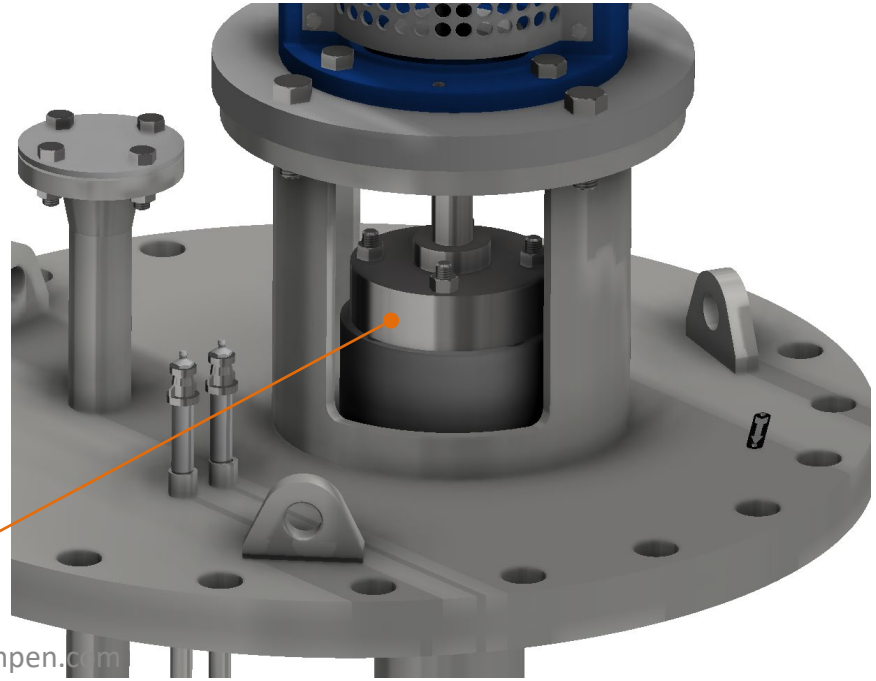
Features & Benefits: Sealing

VSP



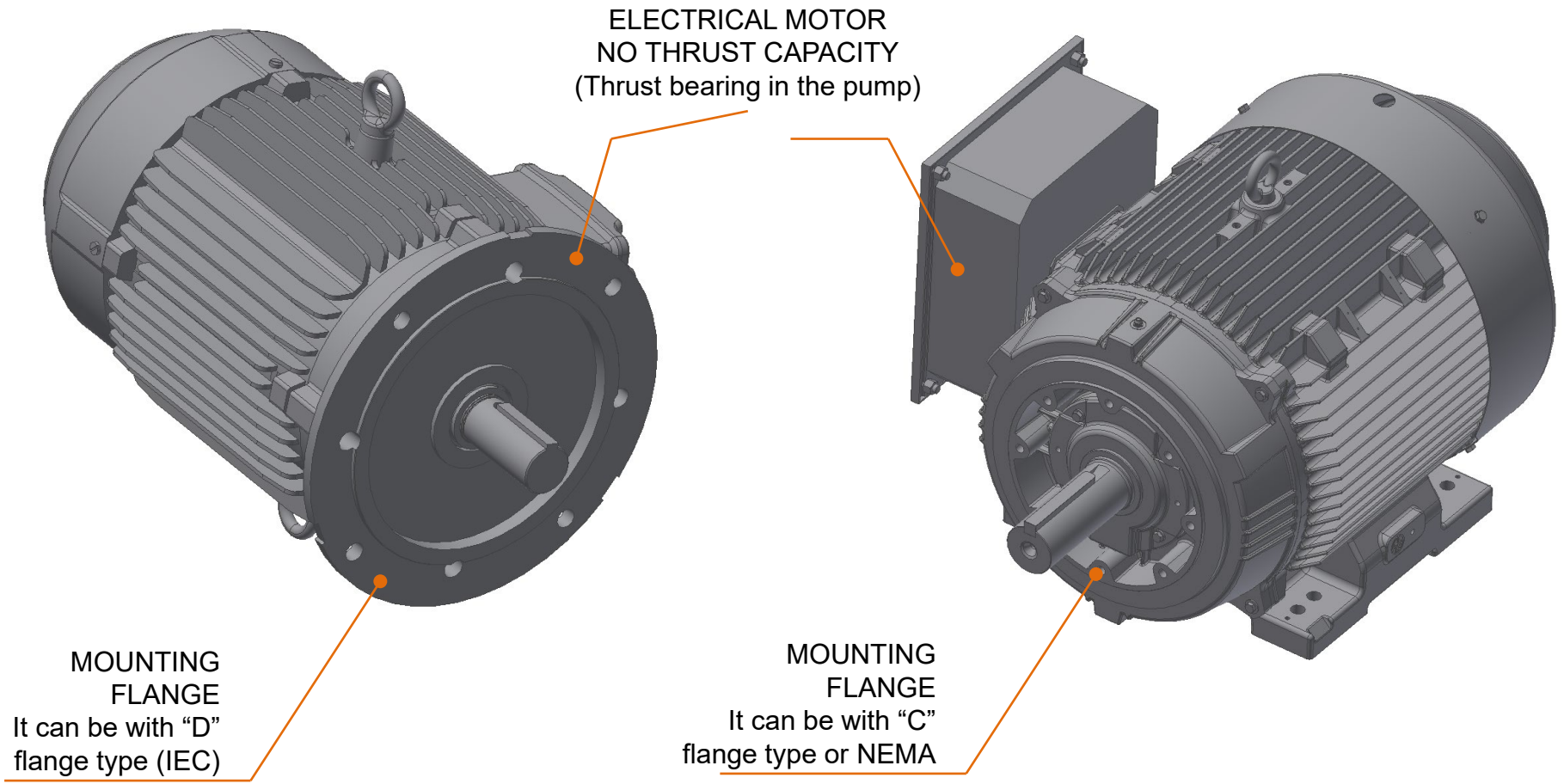
PACKING
Used to avoid leaking of vapors

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



Features & Benefits: Electrical Motors

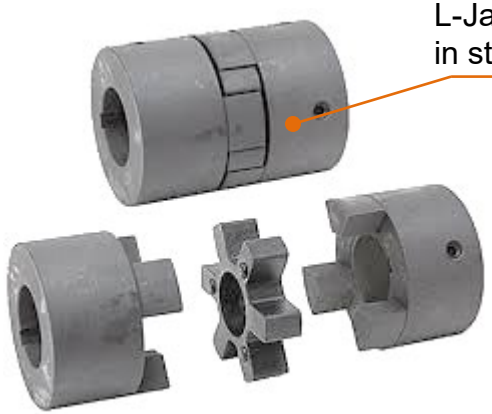
VSP



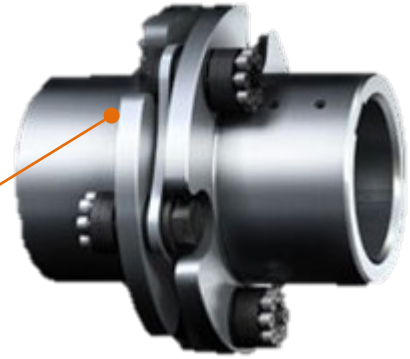
Features & Benefits: Couplings

VSP

STANDARD COUPLINGS
L-Jaw design is provided in standard applications



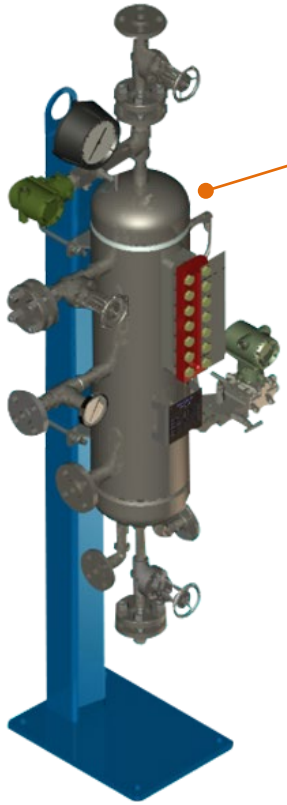
FLEXIBLE COUPLING FOR VSP-CHEM
Without spacer



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

Features & Benefits: Seal Lubrication Plans VSP

PLAN 74



PLAN 52, 53 & 53B

Features & Benefits: accesories

VSP

LEVEL INDICATORS
Float or Ultrasonic

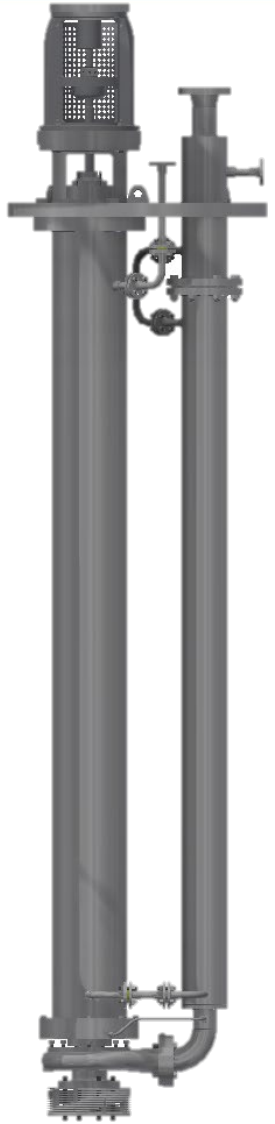
TEMPERATUE INDICATOR
RTD

VIBRATION INDICATORS
Accelerometer

Extra features – Jacketed pumps

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.

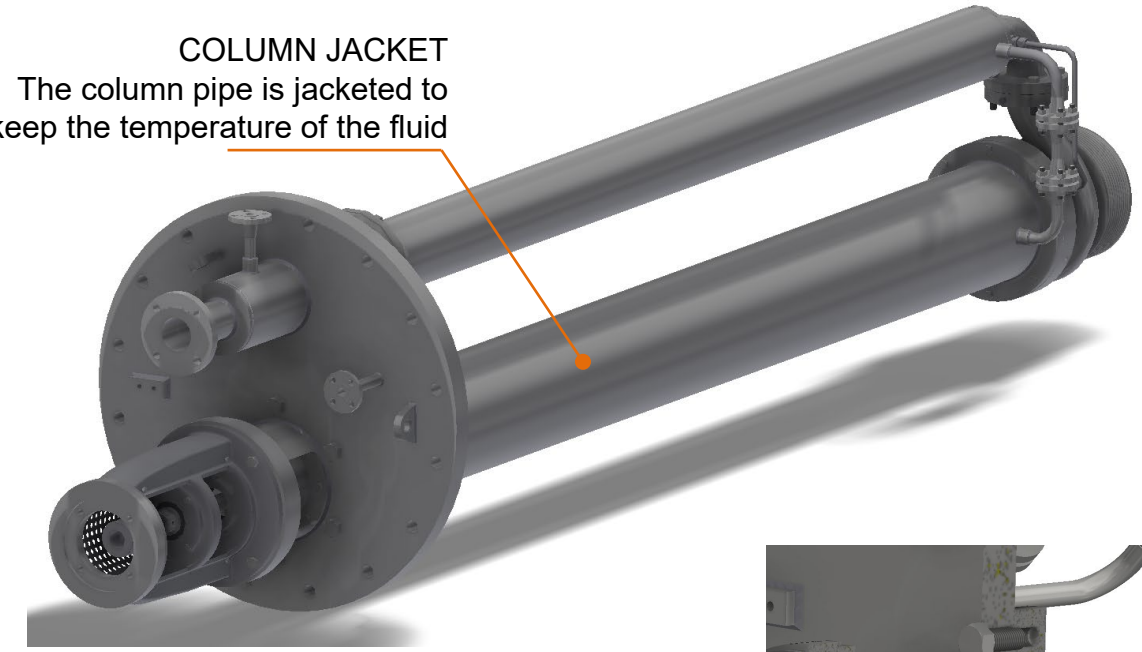
- Pressure of jacket: Up to 14 bar (200 psi)
- Materials: Available in all principal alloys according to API
- Self-lubricating system inside the jacket to avoid solidification of the fluid in the bearings (in case the pump stops).

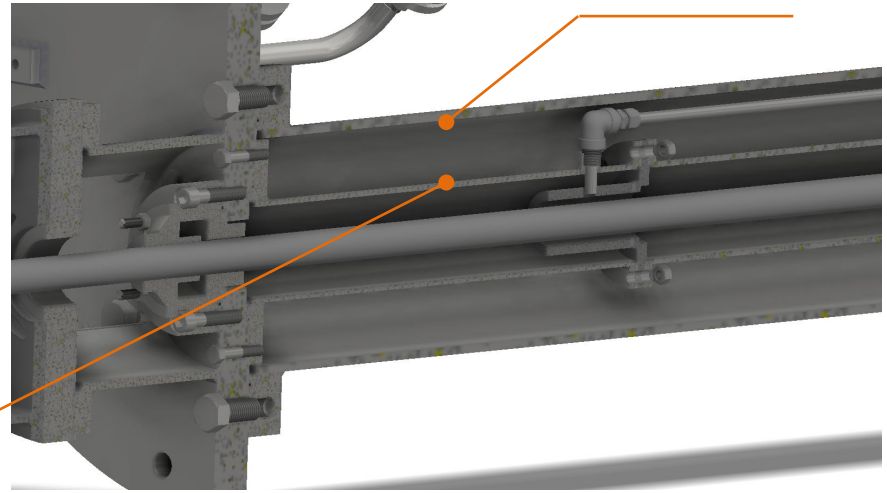


Extra features – Jacket pumps

VSP

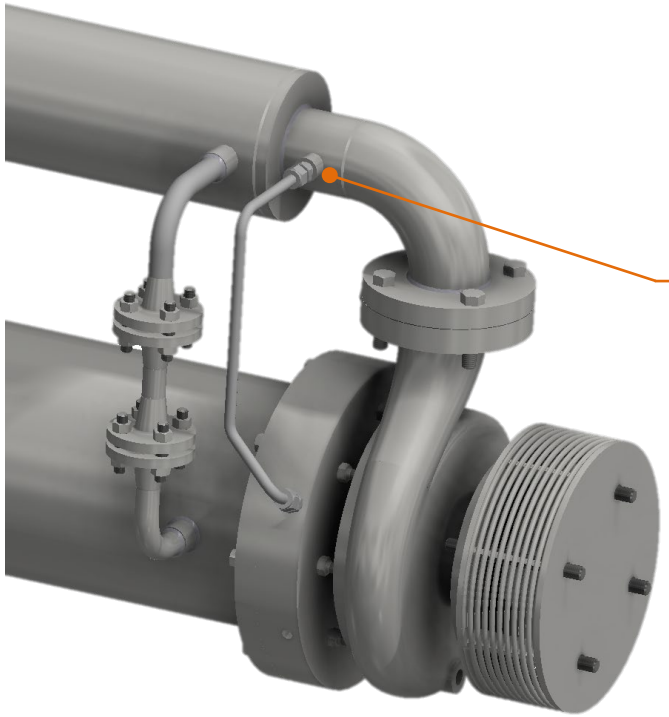
COLUMN JACKET
The column pipe is jacketed to keep the temperature of the fluid



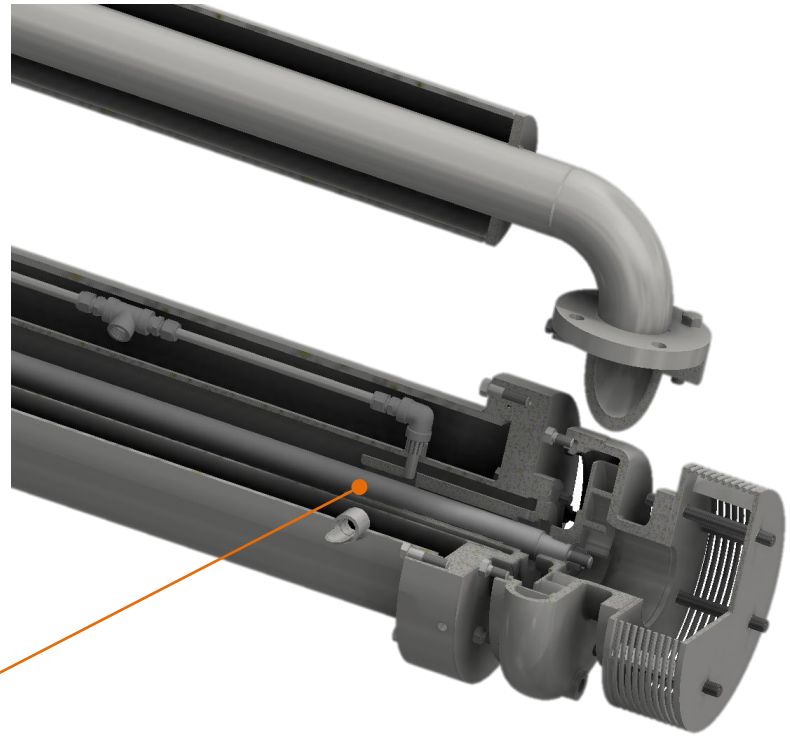


Extra features – Jacket pumps

VSP



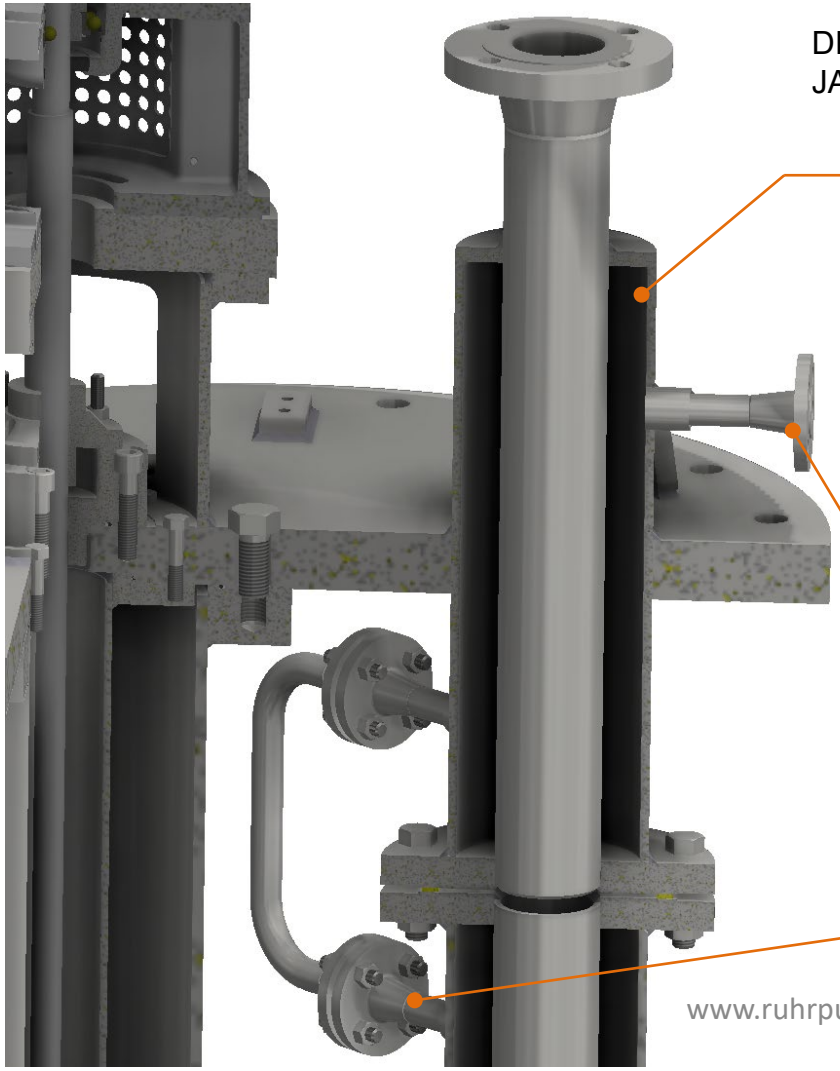
LUBRICATION LINE
The fluid past through an auxiliary connection taken from the discharge pipe



LUBRICATION LINE
Bearings are lubricated by product

Extra features – Jacket pumps

VSP



DISCHARGE PIPE JACKET

VAPOR CONNECTION

VAPOR CONNECTION
These are placed to connect the column pipe jacket to the discharge pipe jacket

Competitors – ITT Goulds

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 m3/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

Competitors – Flowserve

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.

Competitors – Flowserve

Operating Parameters

- Flows to 1400 m3/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

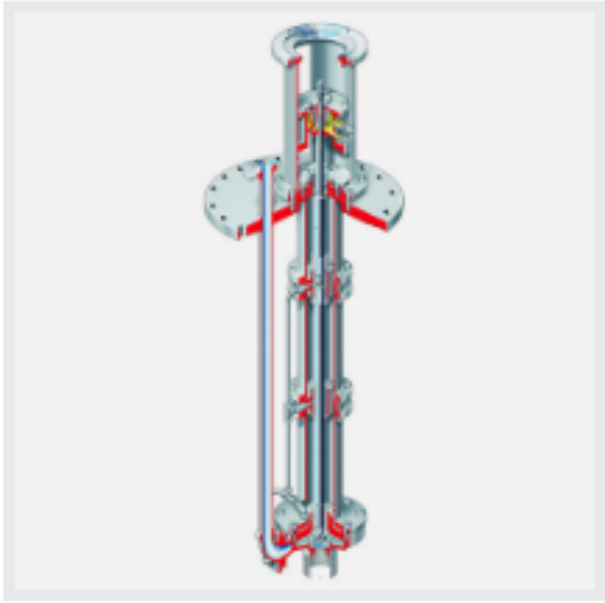
- Heavy-duty casing with integral foot and multi-ribbed discharge flange provides superior resistance to pipe loads
- Standard front vane open-style impeller design delivers high-efficiency performance
- Reverse vane impeller available
- Additional column lengths are provided up to a maximum of 10 m (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

Competitors – Flowserve

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



Competitors – Flowserve

Operating Parameters

- Flows to 1000 m3/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.

Competitors – Sulzer

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

Capacities	Up to 750 m^3/h / 3,200 US gpm
Heads	Up to 120 m / 550 ft
Pressures	Up to 26 bar / 375 psi
Temperatures	-45 to 205°C / -40 to 400°F
Discharge sizes	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.

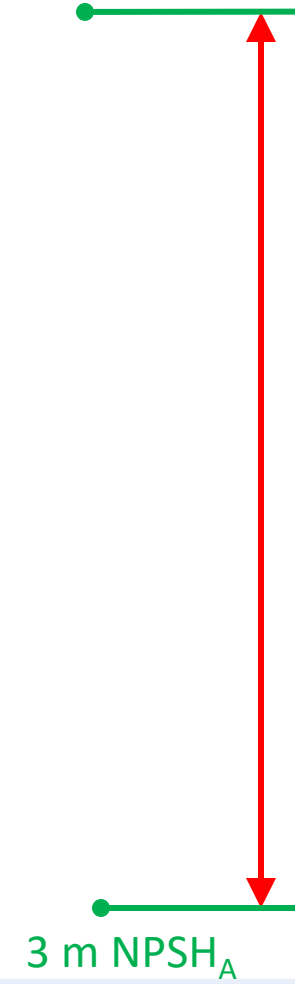
Pump Type VS6
“Double Casing, Diffuser Type, Vertical Suspended” Pumps
“Canned Suction” Pumps
“Vertical Barrel” Pumps

VS6 Pumps – Zero $NPSH_R$

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.

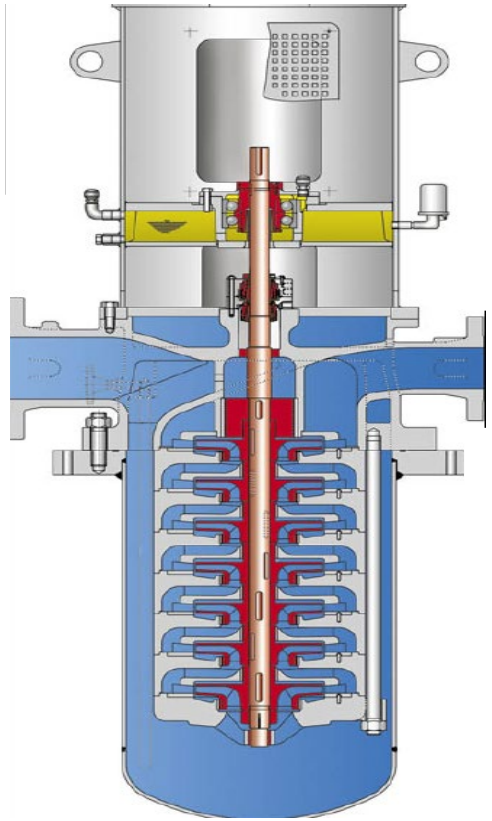
- Not just an NPSH saver but a space saver too. Around 20% of the floorspace of the equivalent BB2
- And a cost saver too. Less expensive than the equivalent BB2
- One seal, one sealing system
- Once you can persuade your civil engineers to dig a hole you are saving all the way.



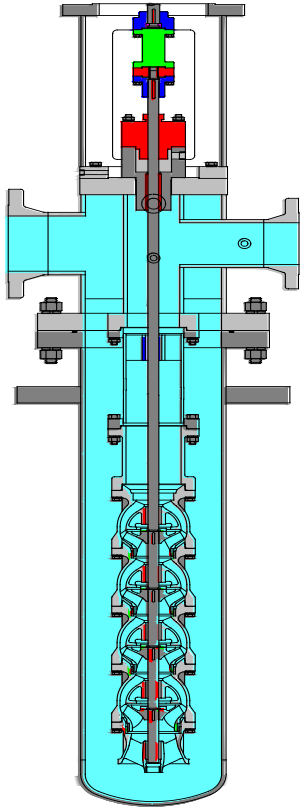
SECTIONAL OF RADIAL VS FRANCIS VANE

RUHRPUMPEN
Specialist for Pumping Technology

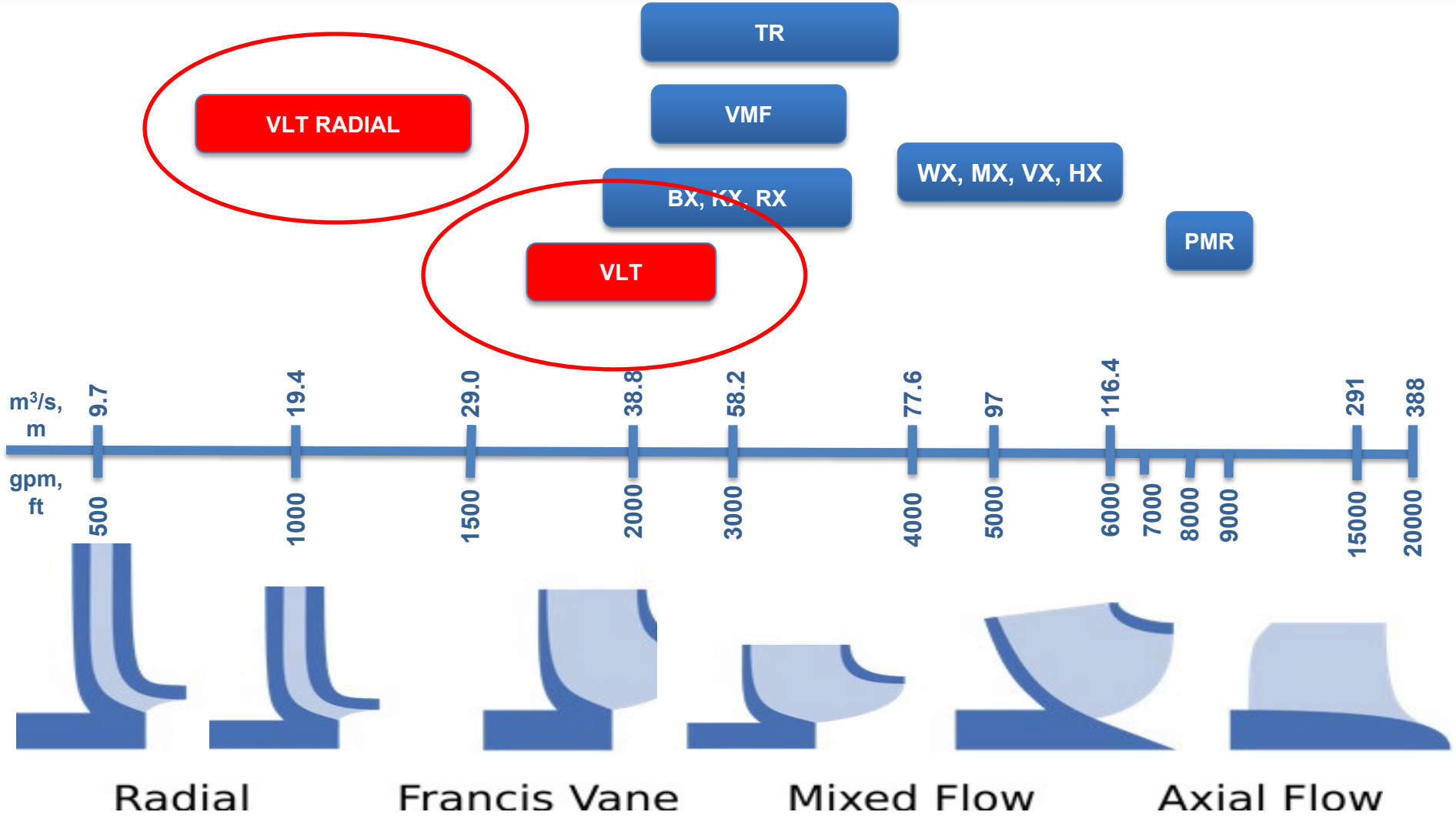
Note the difference between ‘flat’ appearance of radial design “VLT-Radial” model (low flow, high head)



… compared with curved Francis Vane design of “VLT” model

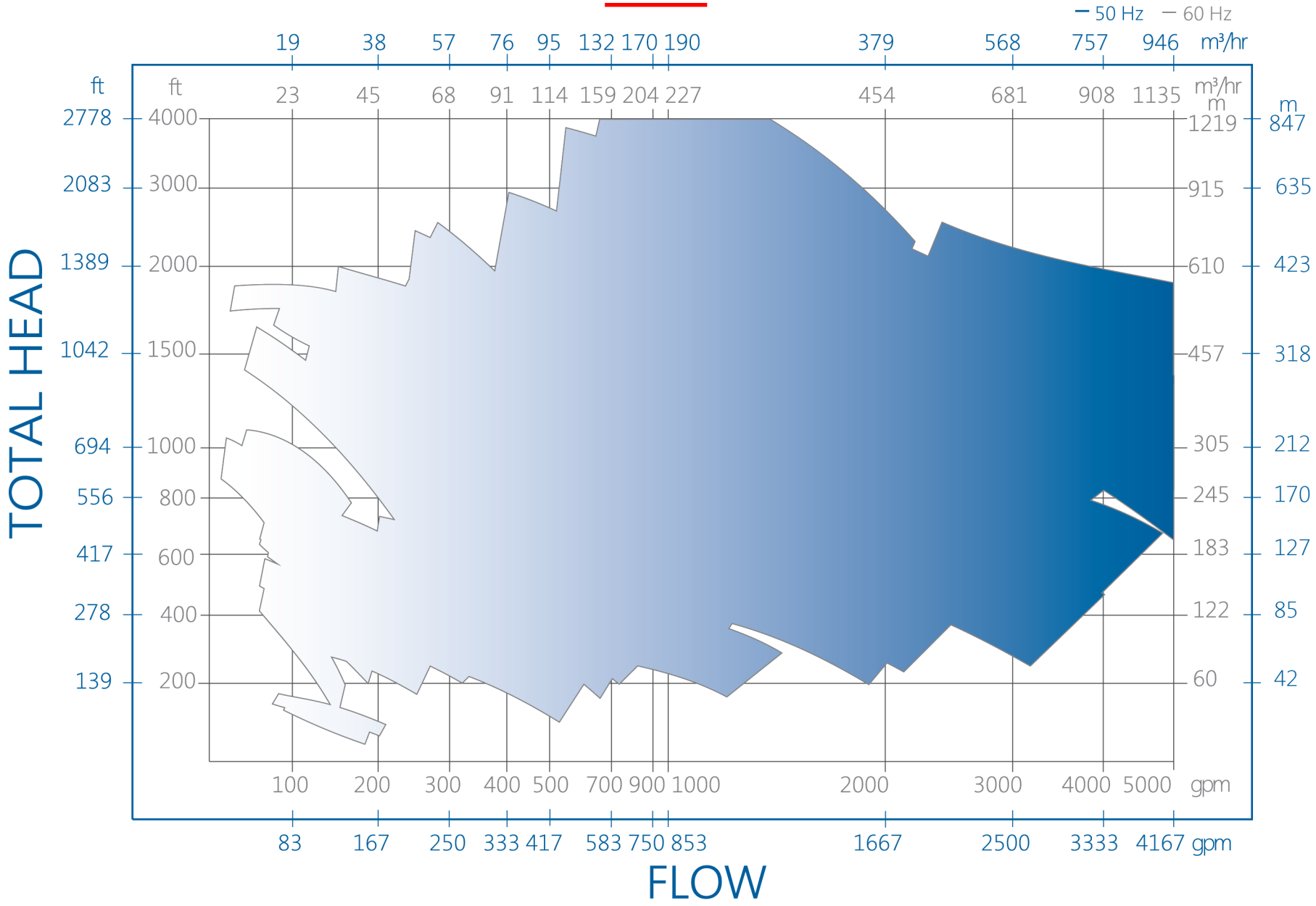


SPECIFIC SPEED, Ns

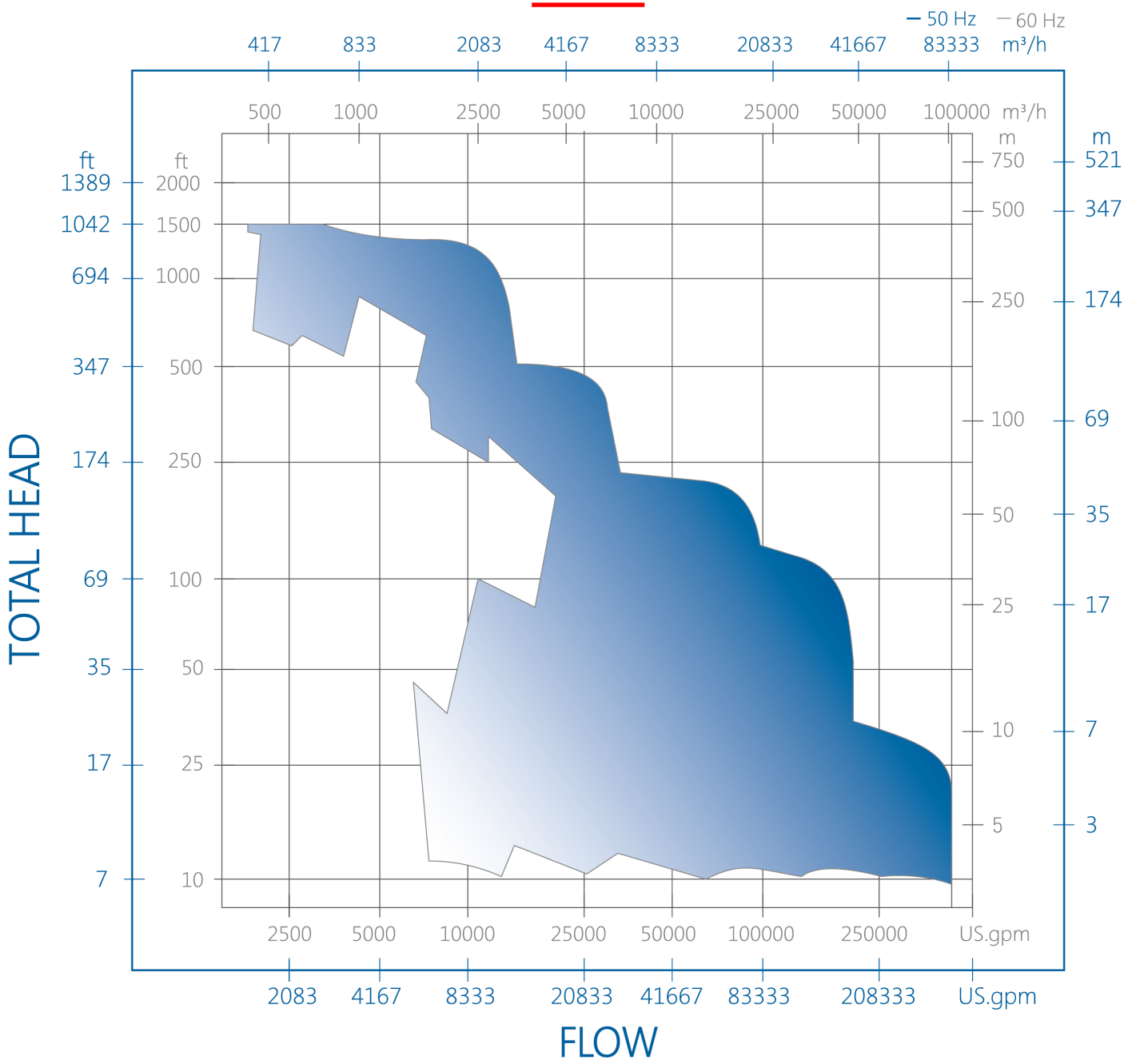


Selection Chart VLT VS6

VS6 – Multispeed – Semi Engineered Range



Selection Chart VMT VS6



VS6 – Multispeed – Engineered Range

CONFIGURATION AND MOUNTING OPTIONS

SH (SUCTION IN HEAD)

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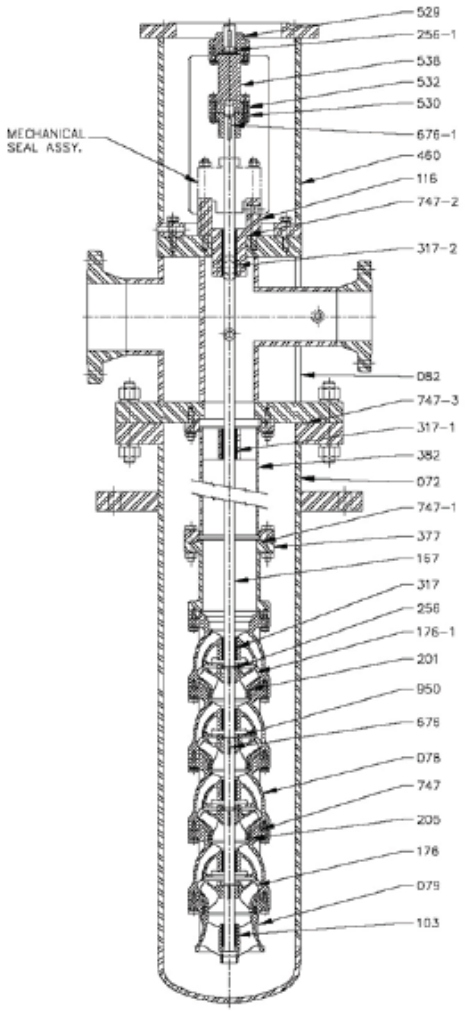
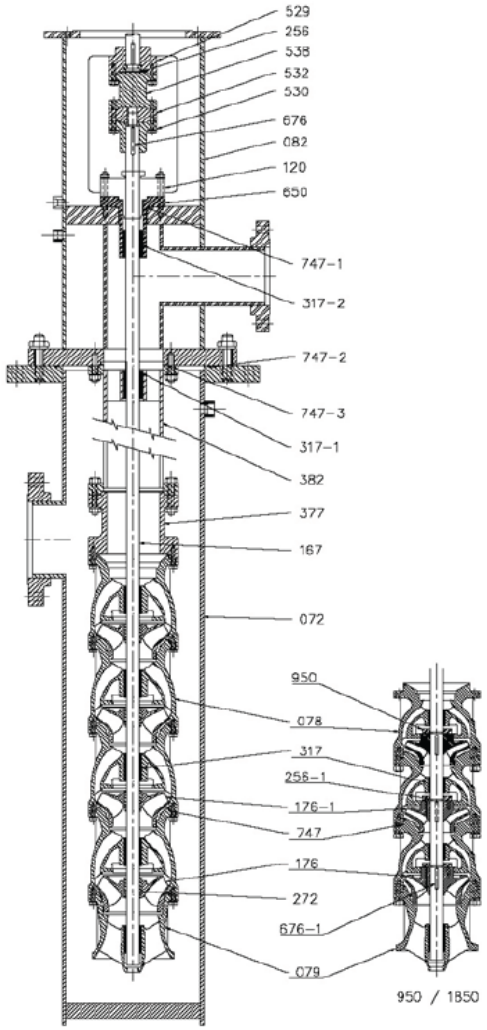


REFERENCE NUMBER	PART DESCRIPTION
072	CAN
078	CASE, SERIES
079	CASE, BOTTOM
082	NOZZLE HEAD
103	BEARING, CASE, BOTTOM
116	SEAL CHAMBER
167	SHAFT, PUMP
176	IMPELLER, 1ST STAGE
176-1	IMPELLER, SERIES
201	WEAR RING, IMPELLER
205	WEAR RING, CASE
256	RING, SPLIT, IMPELLER
256-1	RING, SPLIT, COUPLING
317	BEARING, 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: 5-1 Bowls have integrally cast impeller wear rings as Standard.

SB (SUCTION IN CAN)

RUHRPUMPEN
Specialist for Pumping Technology



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)

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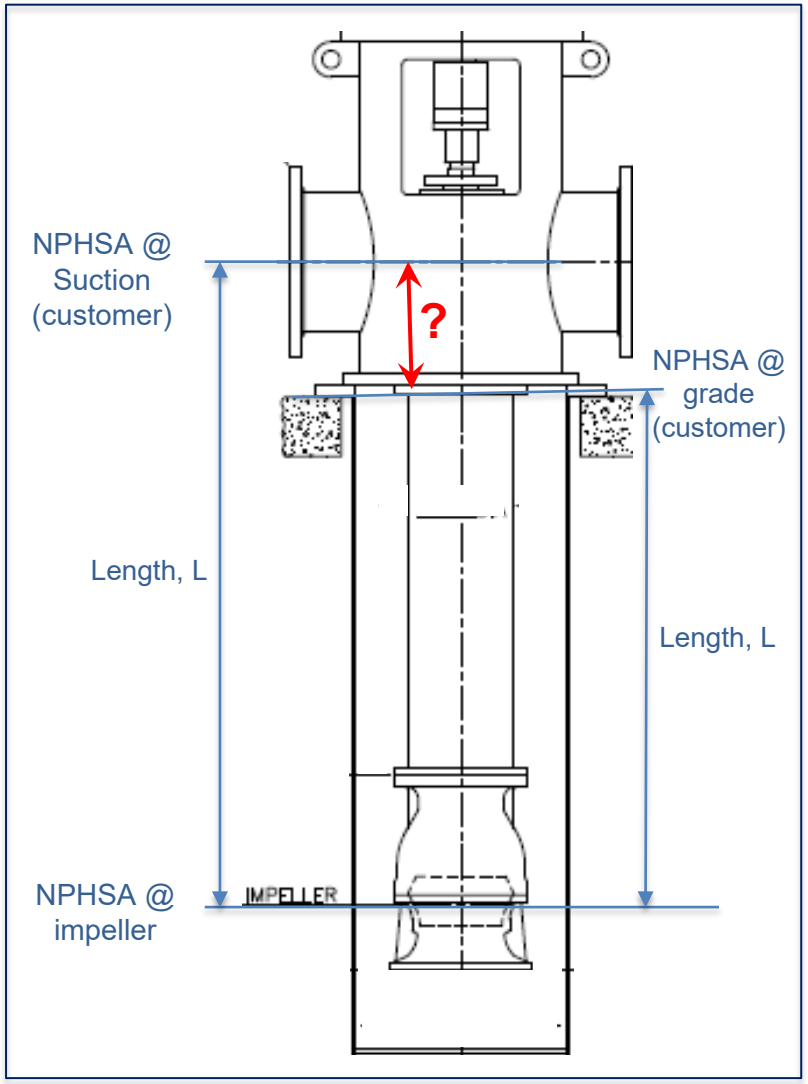
- NPSH Available must be stated by the customer
- We can assume head/can is always full of fluid
- Vendor should ensure that it's clear what is the reference level of customer NPSHA. Often stated @ pump suction flange or @ grade. When stated @ suction flange vendor should check with customer what is 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 1st stage only
- Once 'L' is known then total can length can be calculated



1. IMPACT OF NPSH (SUCTION IN CAN)

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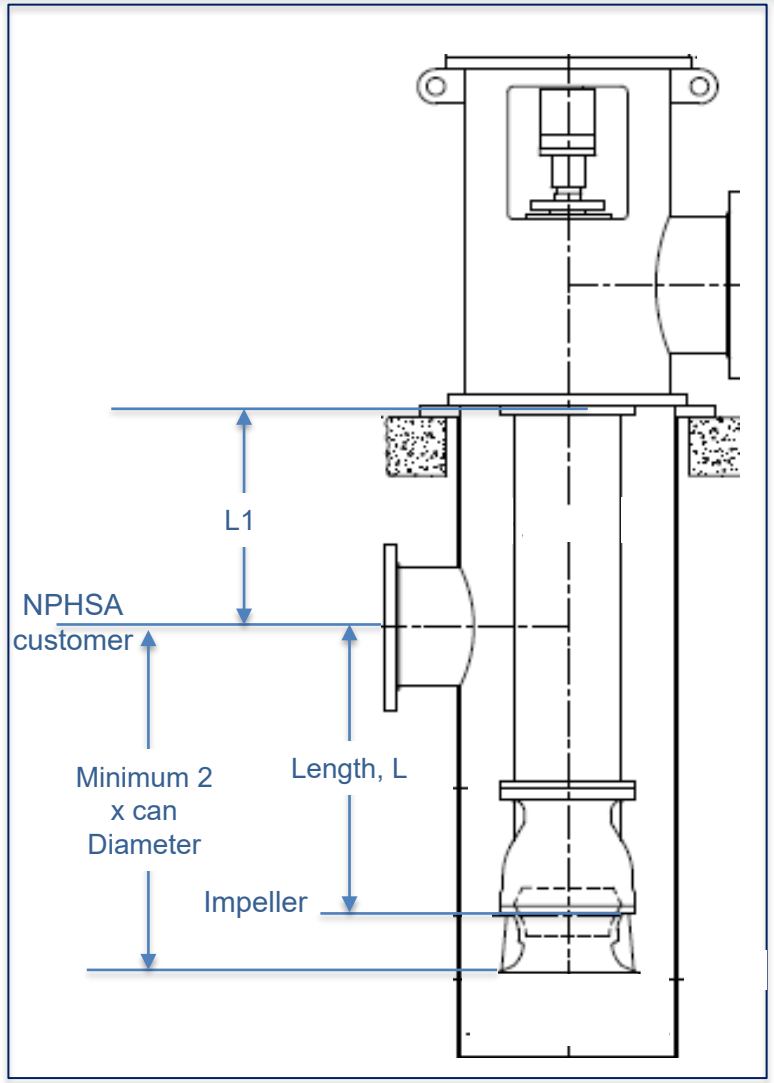
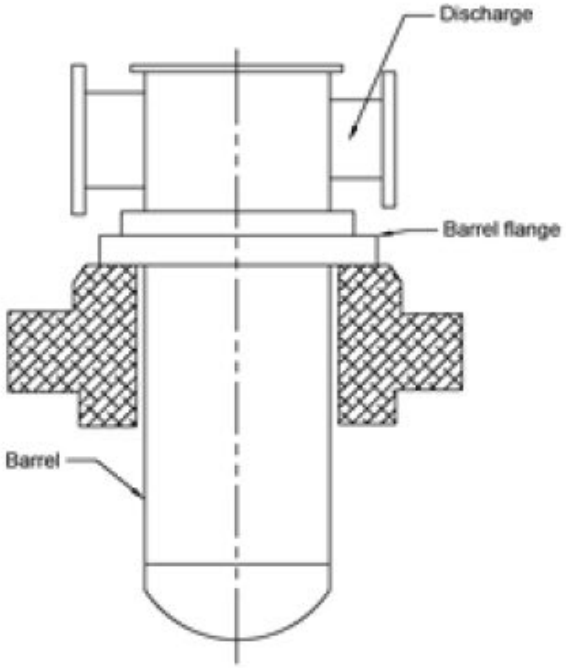
- With suction-in-can the situation is different
- Minimum distance of 2 can diameters must be considered for distance from cL of suction-in-can to inlet of pump
- Vendor shall ensure that it's clear what is the reference level of customer NPSHA and correct to CL suction if necessary

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

- 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

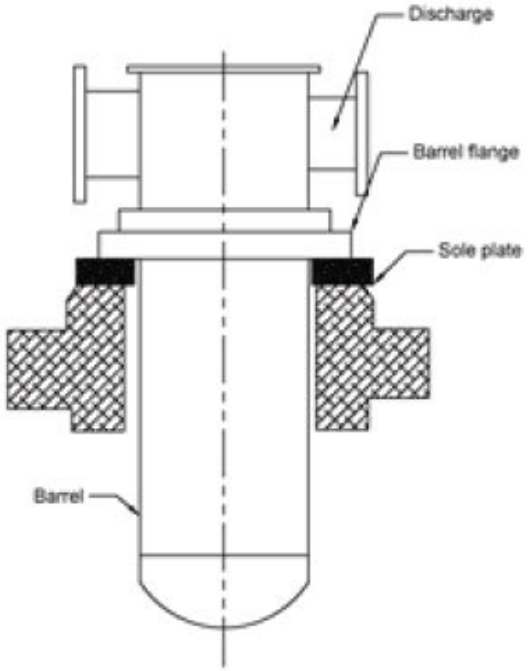


MOUNTING OPTIONS



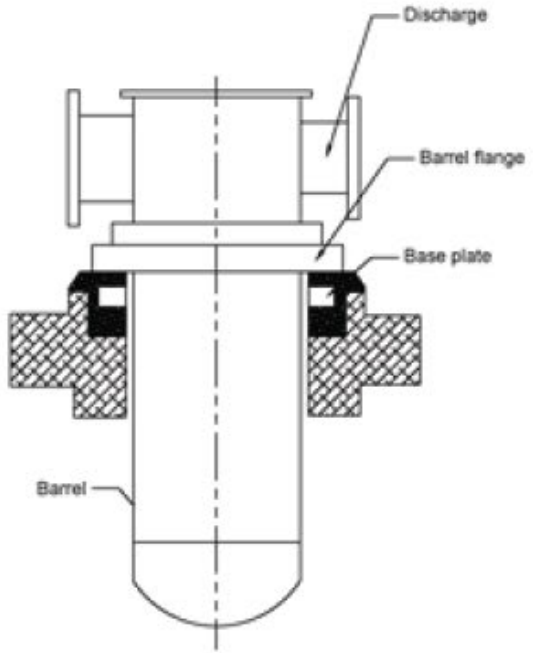
Standard Design

One flange at the barrel
Barrel directly mounted on the foundation



Standard Design with Sole Plate

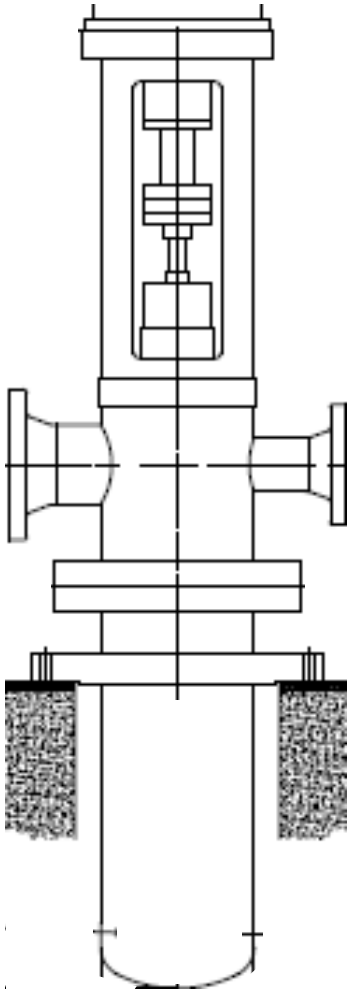
One flange at the barrel
Barrel mounted on the sole plate
Sole plate mounted and adjusted on the foundation



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 8th edition
- No longer required by API, but is available as an option if required by the customer

FLANGED VS THREADED BOWLS

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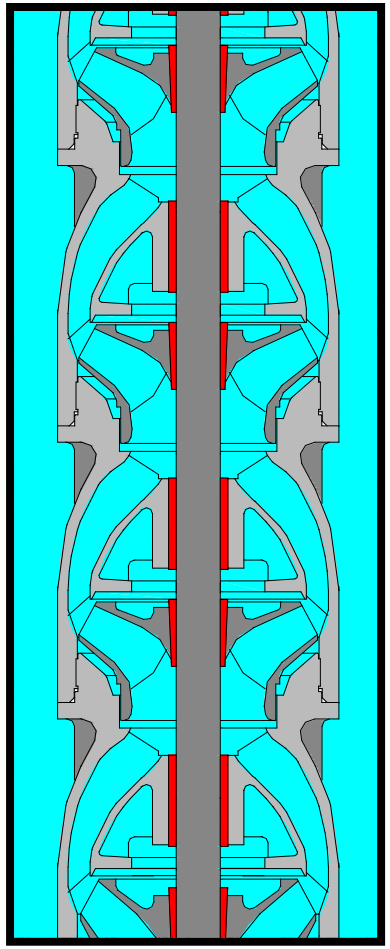
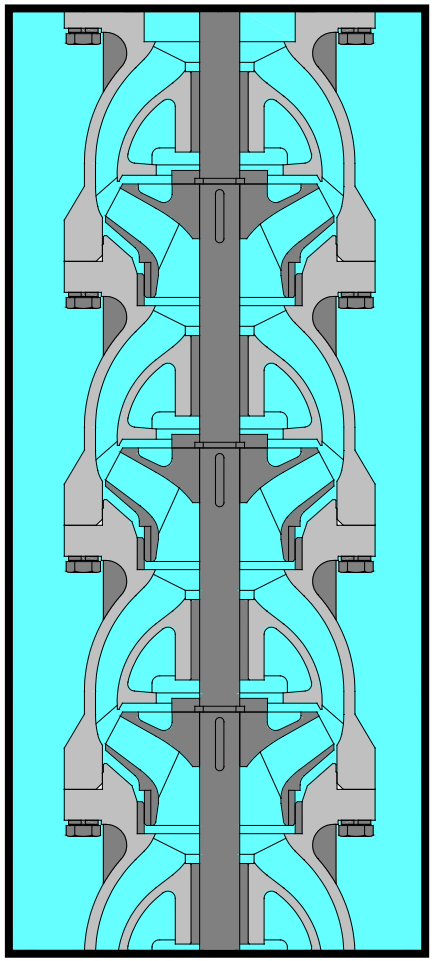
Specialist for Pumping Technology

Threaded Bowls (Non API)



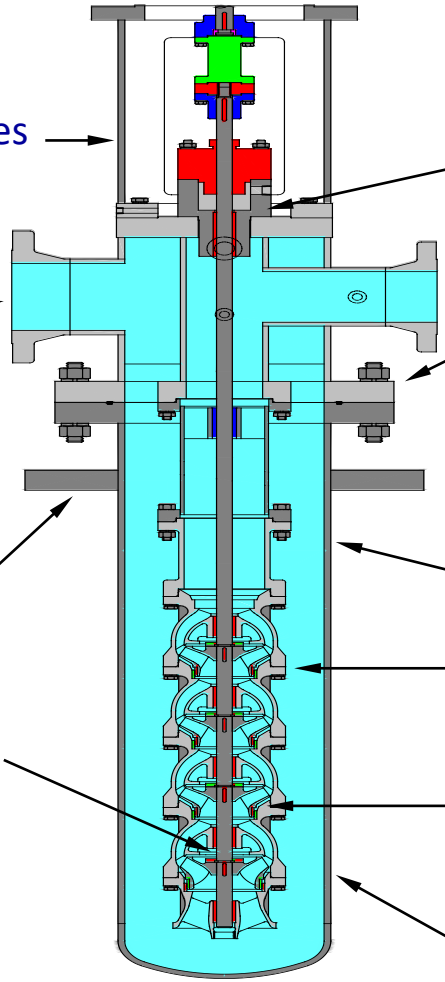
Flanged Bowls (API)



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



Fabrication to ASME Section VIII stresses

External Seal Chamber Sized to API 682

Weld Neck Flanges
Full Penetration Welds,
Access to NDE where possible

Code Certified Welding

Surface Mounting Flange
(mandatory on 8th edition pumps.
Optional for 9th edition onward)*

1/8” Corrosion Allowance*

Flanged bowls

Split Ring and Key Impeller Mounting

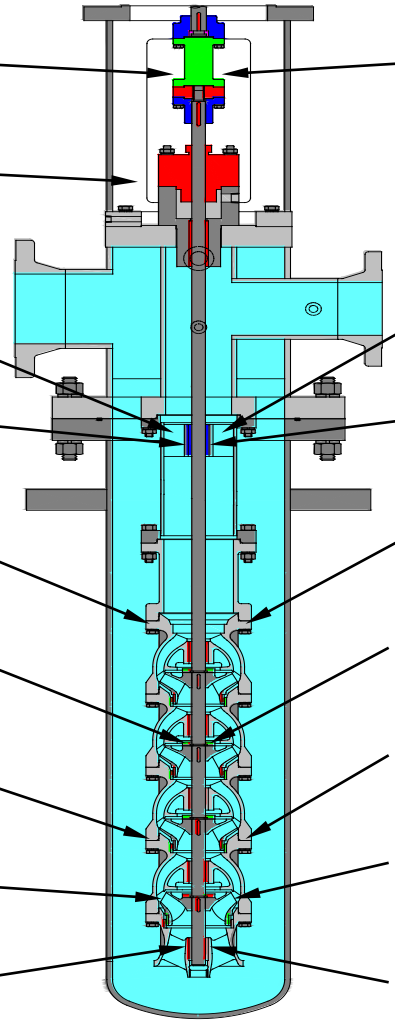
Separate Impeller and Case Wear Rings

A.P.I. Material Codes

FEATURES AND BENEFITS
API 610 VLT

RUHRPUMPEN
Specialist for Pumping Technology

Feature	Benefit
4 - Piece Rigid Adjustment Coupling	Maintains Superior Alignment, Spacer Allows Removal of Cartridge Seal
External Seal, Reduces Pressure for Mechanical Seal	
Integral Welded Spider	Ensures Maximum Shaft Alignment and Support
Carbon Impregnated Bearings throughout	Handles Wide Variety of Low Lubricity Fluids Inert to Chemicals and Hydrocarbons
Flanged and Bolted Bowls for all Metallurgies	Ease of Maintenance with Galling Materials
Positive Split Ring and Key	Takes Thrust Positively, Locates Impeller
Metal to Metal Rabbet Fits with O-Rings	Superior Alignment, No Leakage
Low N.P.S.H. First Stage Impeller for Shockless Fluid Entry	Optimum Efficiency, Shorter Pump Length
Bottom Case Bearing	Shaft Support at Critical Suction Area



FEATURES AND BENEFITS
VLT RADIAL FLOW

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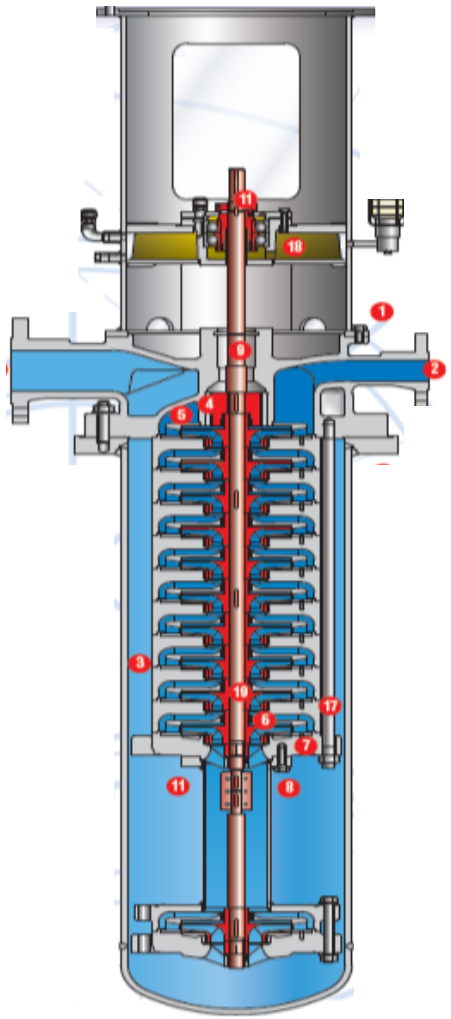
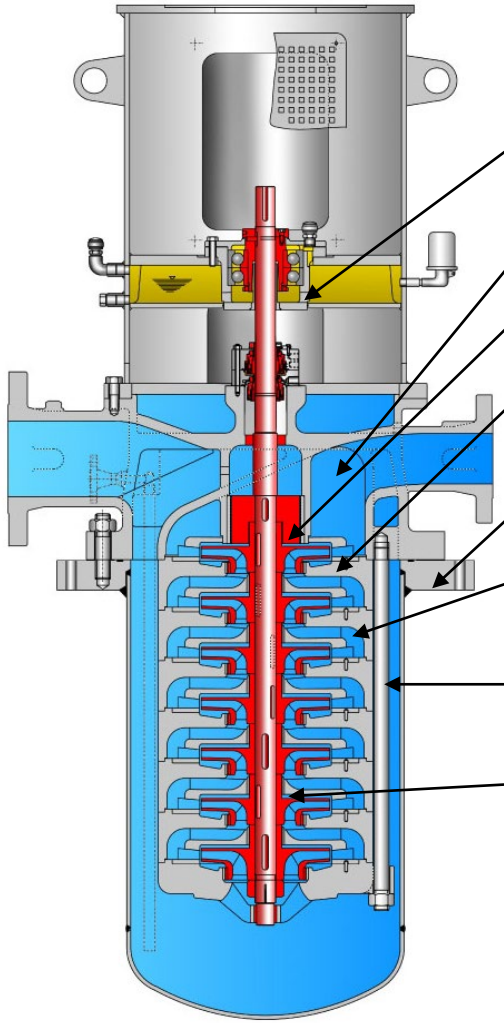
Specialist for Pumping Technology

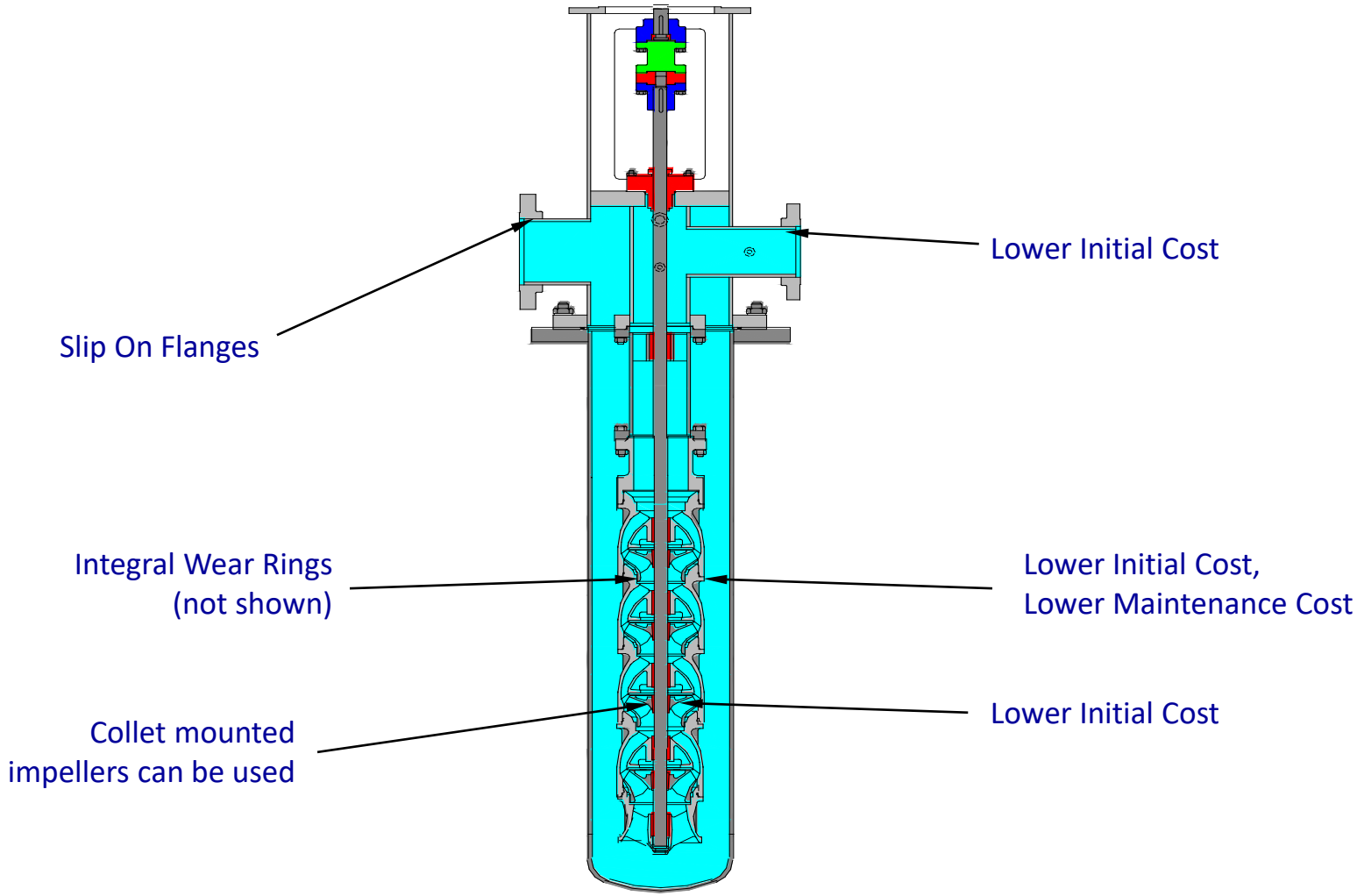




- **Integrated thrust bearing**
- **Casted head**
- **Balance drum**
- **Discharge stage directly mounted to nozzle head**
- **Integral can and mounting flange**
- **Stage casings – metal to metal, rabbet fits, no o-ring**
- **Tie-rod (6x or 12x) design**
- **Impeller hub and interstage bush serve as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

FEATURES AND BENEFITS COMMERCIAL VLT – DIFFERENT FROM API

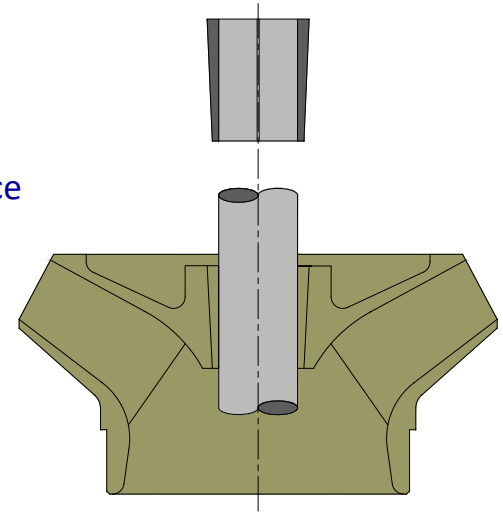
RUHRPUMPEN
Specialist for Pumping Technology



RUHRPUMPEN
Specialist for Pumping Technology

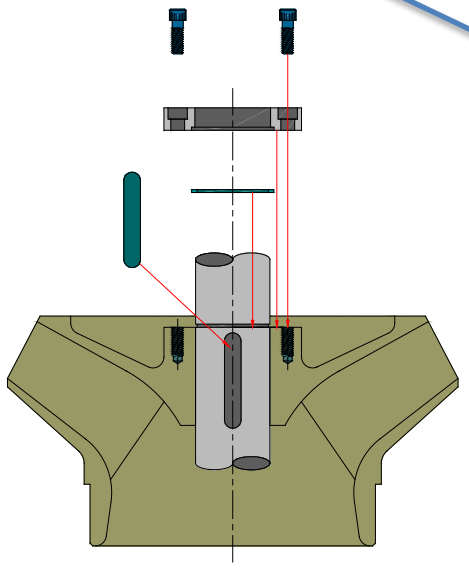
Non API

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



COLLET MOUNTED IMPELLER

API



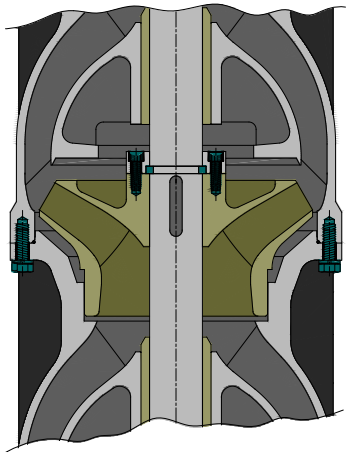
RING & KEYED IMPELLER

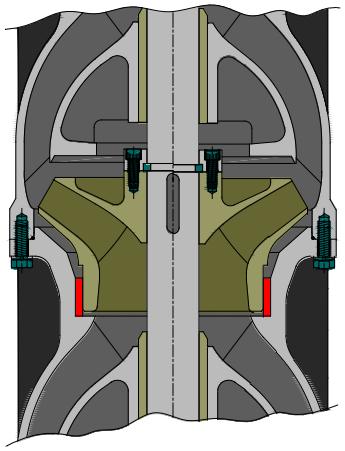
- Locked and keyed Impellers.
  - Positive retention.
  - Important when pumping hot/cold liquids.
  - Less susceptible to loosening when subject to shock load

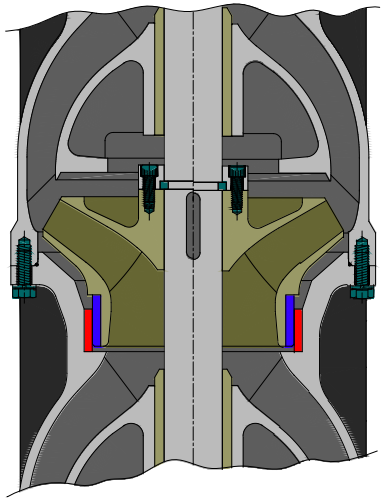
The use of locked and keyed impellers is mandatory for hot services above 230 deg F and below -20 deg F.
The reason for this is the tendency for collets to loosen.

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)**

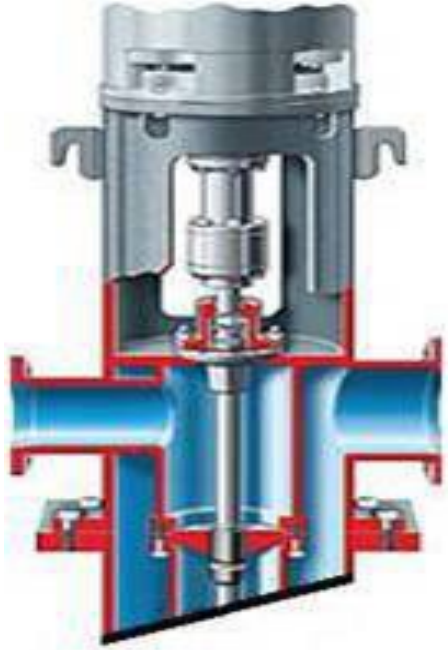
Renewable Wear Rings **(API)**

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

FEATURES AND BENEFITS
NOZZLE HEAD

RUHRPUMPEN
Specialist for Pumping Technology

- 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

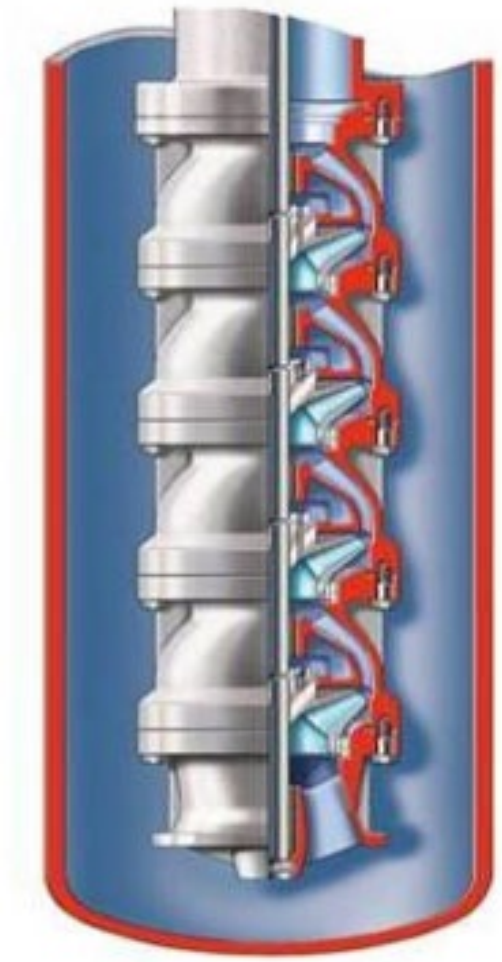
- 150# flanges are standard for Commercial VLT
- 300# and above optional

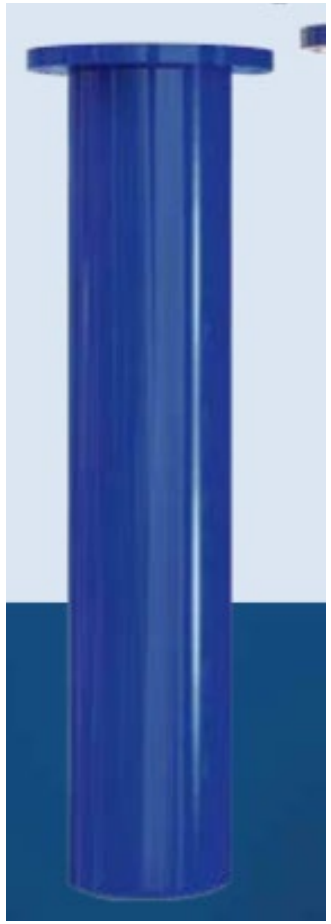
- Top flange has rabbet / register fit for motor - no field doweling or fit-up
- Lifting Lugs
- OSHA coupling guards
- Standard motor mating flanges to NEMA standards for Vertical Solid Shaft Motor

FEATURES AND BENEFITS
SUCTION CAN AND SHAFTING

RUHRPUMPEN
Specialist for Pumping Technology

- 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

RUHRPUMPEN
Specialist for Pumping Technology

- 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

DESIGN CHARACTERISTICS MECHANICAL SEALS

- 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

RUHRPUMPEN
Specialist for Pumping Technology

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

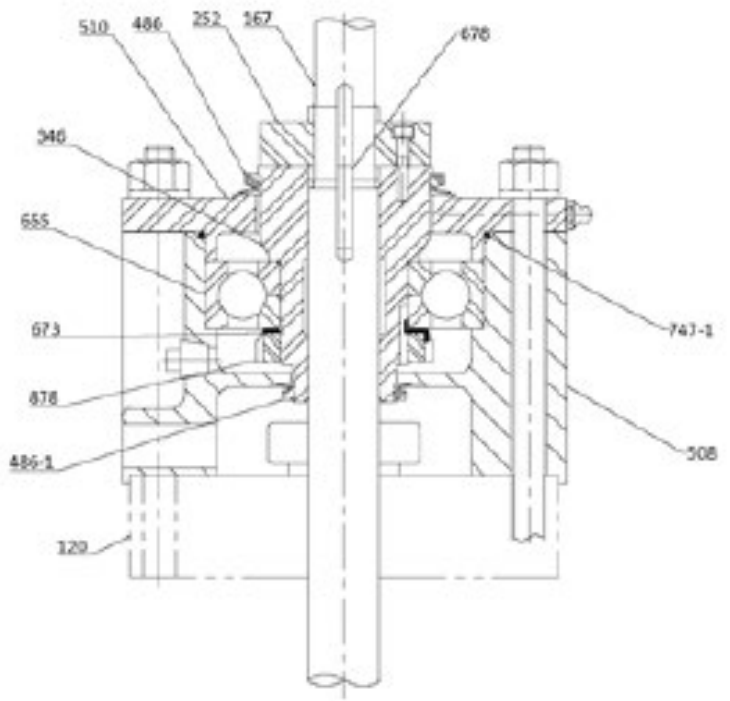


Figure 6.1 Thrust Pot Model 311 / 311 QJ Sectional Drawing

THRUST HANDLING IN PUMP
IN-HEAD THRUST POTS

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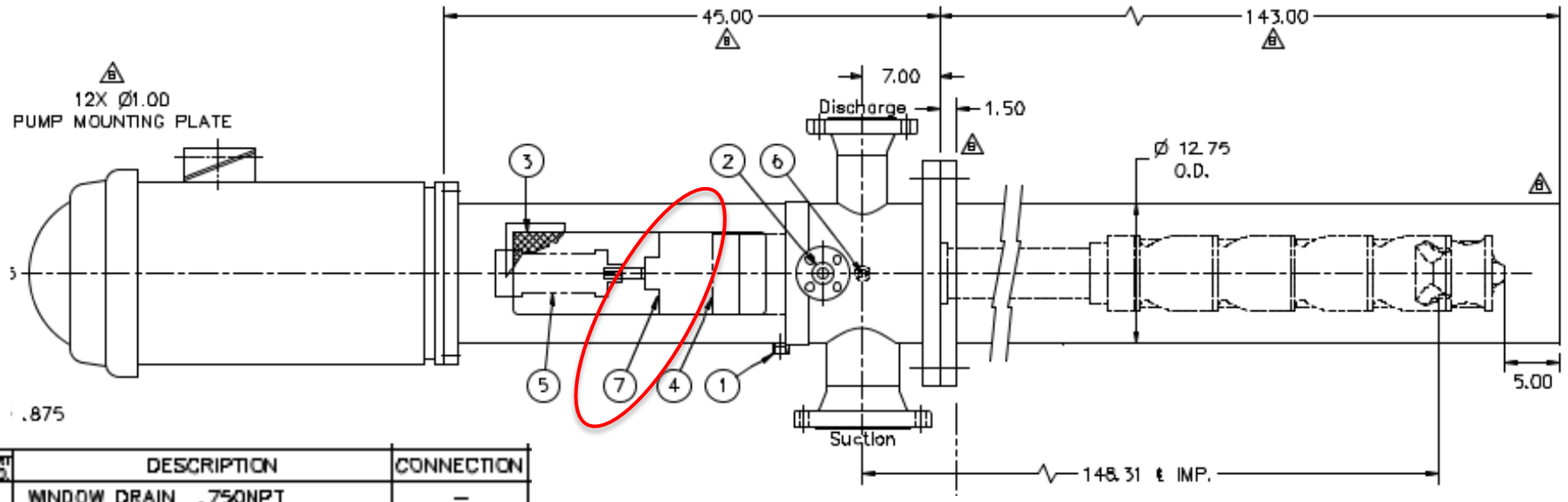
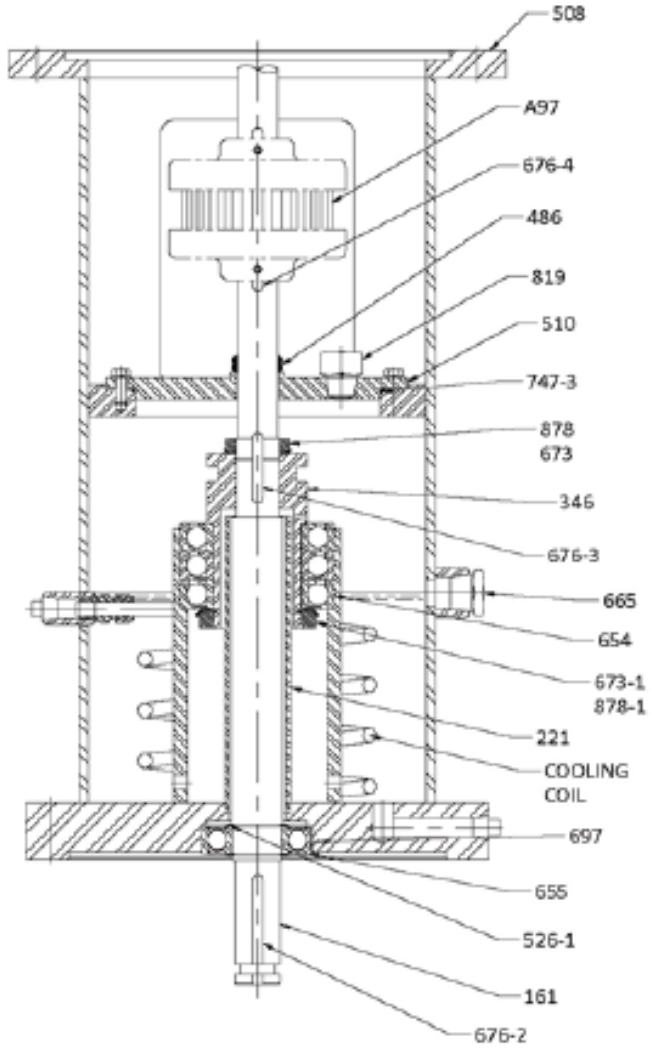


PART NO.	DESCRIPTION	CONNECTION
1	WINDOW DRAIN .750NPT	—
2	SUCTION VENT 1.0 CL300 RFWN	FLANGED
3	COUPLING GUARD	
4	MECH. SEAL	
5	METASTREAM COUPLING ASSY	
6	API PLAN13 CONN. .750NPT — SEE R009332	
7	311 THRUST POT ASSY — SEE R009331	
8		
9		

THRUST HANDLING IN PUMP
SEPARATE THRUST POTS

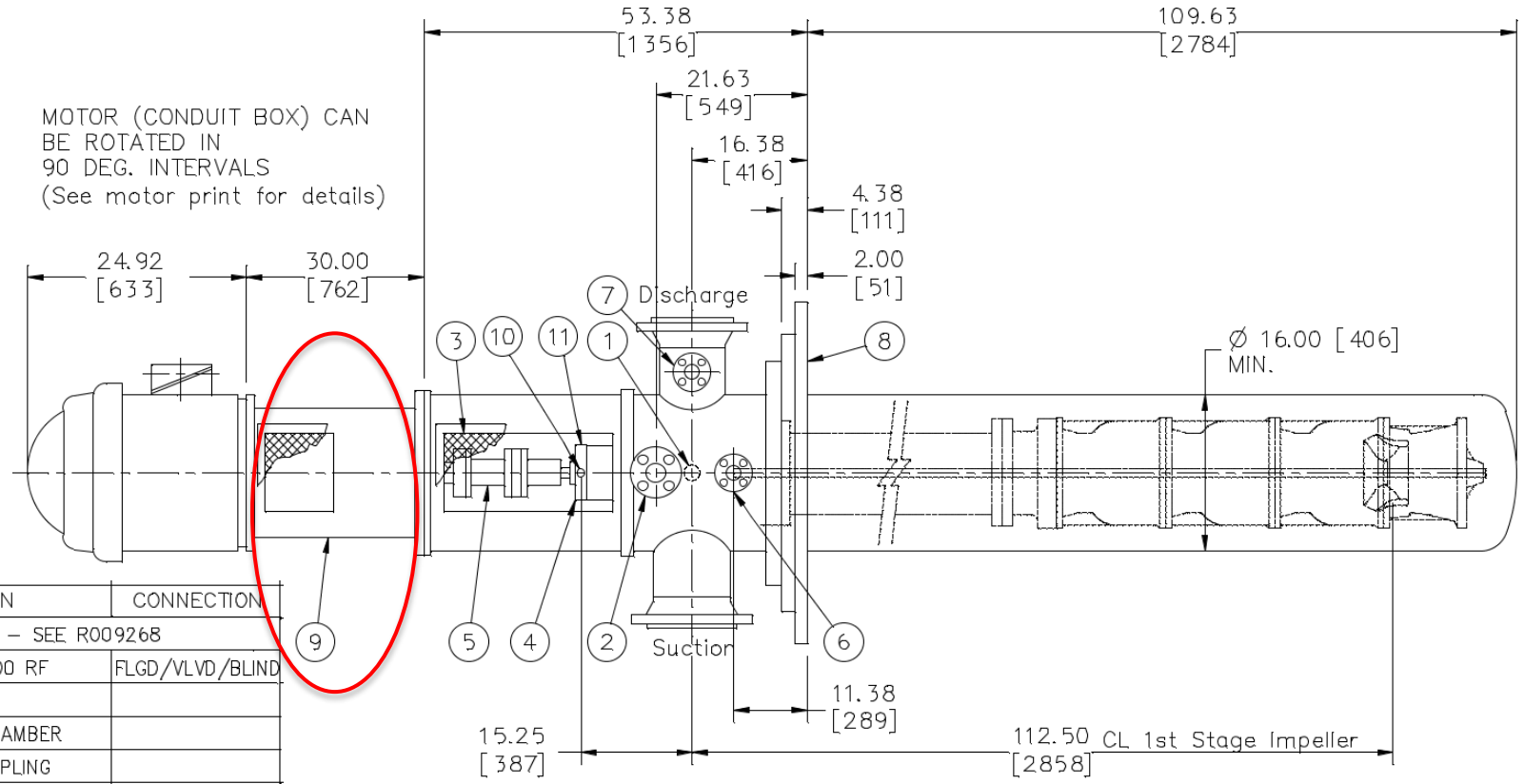
RUHRPUMPEN
Specialist for Pumping Technology

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

RUHRPUMPEN
Specialist for Pumping Technology



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

VLT prepared for Can

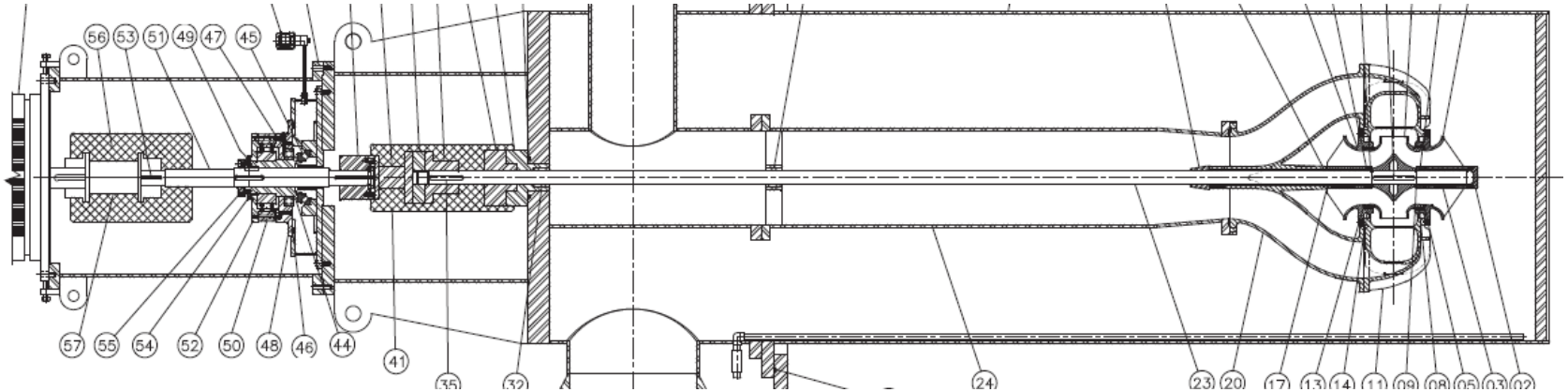
Technical Details	
Pump	VTP 10B-41
Application	Water / Mining
Flow	392 gpm (89 m³/h)
Head	95 ft (29 m)
Motor	15 Hp (11 kW)

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.



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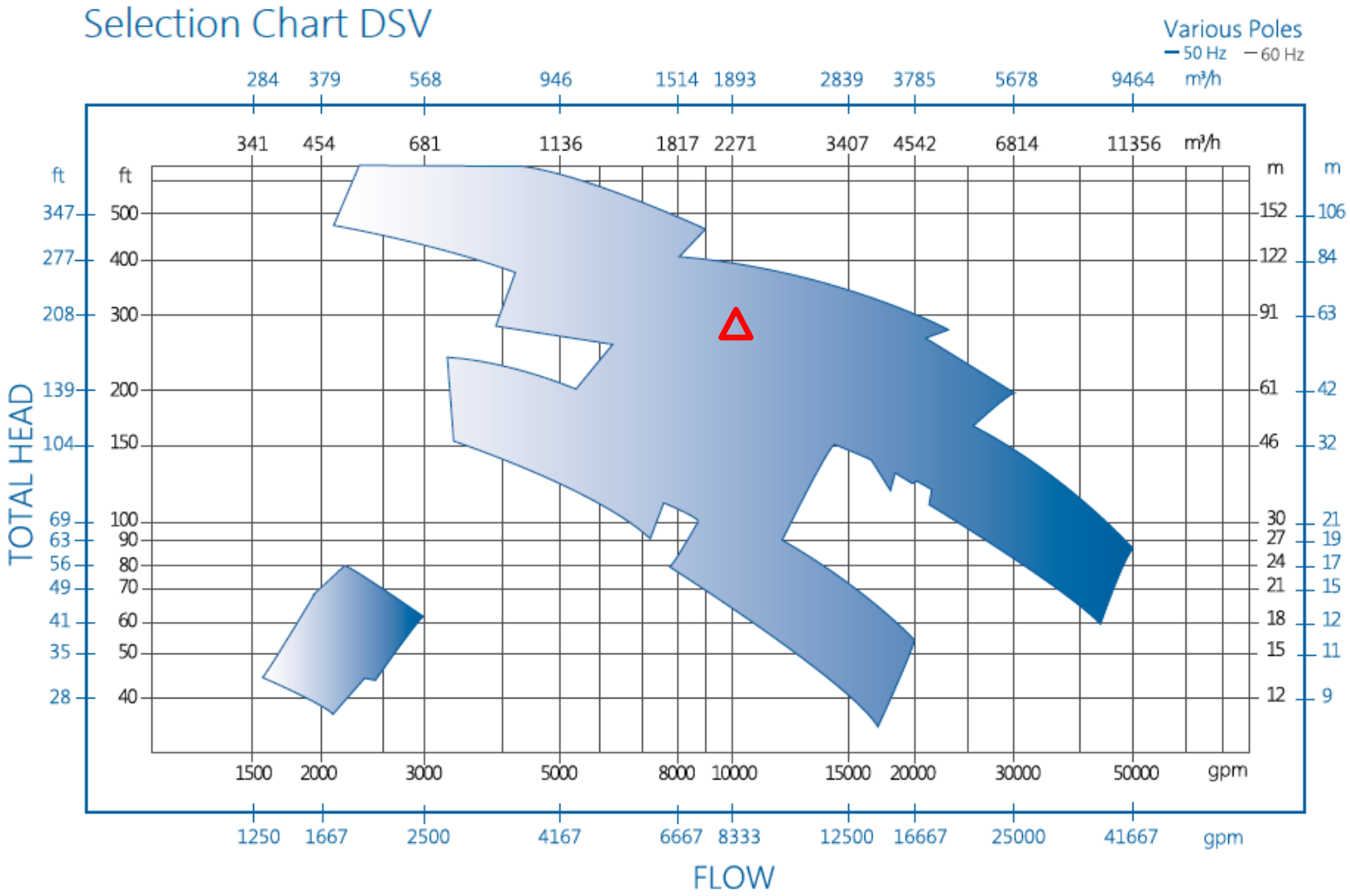

Features and Benefits - Double Suction

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

DX First Stage

Features and Benefits - Double Suction

DX First Stage

Coming Attractions ☺

"Performance Testing & Inspection of API 610 Pumps"

Thurs 17th 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 : 10th March

– Start-up, Commissioning & Troubleshooting of Centrifugal Pumps